California Regional Water Quality Control Board
San Diego Region

Revised Total Maximum Daily Loads for Indicator Bacteria Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)

REVISED DRAFT FINAL
TECHNICAL REPORT
November 25, 2009
~~December 12, 2007~~

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION
9174 Sky Park Court, Suite 100, San Diego, California 92123-4340
Phone • (858) 467-2952 • Fax (858) 571-6972
http://www.waterboards.ca.gov/sandiego.

To request copies of the Basin Plan Amendment and Technical Report for Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek), please contact Mr. Wayne Chiu ~~Benjamin Tobler~~ at (858) 637-5558 ~~467-2736~~, or by email at wchiu@waterboards.ca.gov ~~btobler@waterboards.ca.gov~~.

Documents also are available at: http://www.waterboards.ca.gov/sandiego.

Revised Total Maximum Daily Loads For Indicator Bacteria Project I – Twenty Beaches and Creeks in The San Diego Region (Including Tecolote Creek)

Revised Draft Final
Technical Report

Adopted by the
California Regional Water Quality Control Board
San Diego Region
On Month Day, 2010

Approved by the
State Water Resources Control Board
on _______________, 201x
and the
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on _______________,201x
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on _________________. 201x

Cover Photograph: Aliso Beach, Orange County (2002) by Christina Arias

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION
9174 Sky Park Court, Suite 100
San Diego, California 92123-4340

Telephone (858) 467-2952

STATE OF CALIFORNIA

ARNOLD SCHWARZENEGGER, Governor
LINDA S. ADAMS, Agency Secretary, California Environmental Protection Agency

State Water Resources Control Board

California Regional Water Quality Control Board
San Diego Region

This report was prepared under the direction of

TBD*, Chief, Water Resource Protection Branch*
Deborah Jayne.*, Chief, Water Quality Standards Unit*

by

Wayne Chiu, P.E., *Water Resource Control Engineer*
Christina Arias, *Water Resource Control Engineer*
Benjamin Tobler, *Water Resource Control Engineer*

with the assistance of

Lesley Dobalian, *Environmental Scientist*
Cynthia Gorham-Test, *Environmental Scientist*
Phil Hammer, *Environmental Scientist*
Lisa Honma, *Environmental Scientist*
Amy Mecklenborg, *Environmental Scientist*
Alan Monji, *Environmental Scientist*
Noopur Pathak, *Student Assistant*
Kevin Tan, *Student Assistant*

and technical support provided by

Tetra Tech, Inc., led by Stephen Carter, P.E.

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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
BLRP	Bacteria Load Reduction Plan
BMP(s)	Best Management Practice(s)
CAFOs	Concentrated animal feeding operations
Caltrans	California Department of Transportation
CAMMPR	California's Management Measures for Polluted Runoff
CASQA	California Stormwater Quality Association
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
CLRP	Comprehensive Load Reduction Plan
COLD	Cold freshwater habitat
COMM	Commercial and sport fishing
CWA	Clean Water Act
DEH	San Diego County Department of Environmental Health
DHS	Department of Health Services
EST	Estuarine habitat
EQIP	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
State Water Board	State Water Resources Control Board
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.

Stakeholder Advisory Group

Larissa Aumand	Industrial Environmental Association
Amanda Carr	County of Orange
Rick Gersberg	San Diego State University
Karen Holman	San Diego Unified Port District
Craig Justice	City of Laguna Beach
Ed Kimura	Sierra Club
Ruth Kolb	City of San Diego
Mo Lahsaiezadeh	City of Oceanside
Eric Larson	San Diego Farm Bureau
Sheri McPherson	County of San Diego
Nancy Palmer	City of Laguna Niguel
Carolyn Scullin	Sierra Club
Gabriel Solmer	San Diego Coastkeeper
Patty Vainik	Southern California Association of Publicly Owned Treatment Works; City of San Diego
Debbie White	Padre Dam Municipal Water District
Richard Watson	California Department of Transportation
Jo Ann Weber	County of San Diego
Kathy Weldon	City of Encinitas

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1 Executive Summary

[Executive Summary from Final Technical Report dated December 12, 2007 deleted and replaced with the following Executive Summary.]

The purpose of this technical report is to present the development of the Total Maximum Daily Loads (TMDLs) for 20 beaches and creeks impaired by indicator bacteria (fecal coliform, total coliform, and/or enterococcus) in the San Diego Region. A TMDL represents the maximum amount of the pollutant of concern that the waterbody can receive and still attain water quality standards. Once this maximum pollutant amount has been calculated, it is then divided up and allocated among all of the contributing sources in the watershed. For each of the 20 waterbodies addressed by this TMDL project, separate wet weather TMDLs and dry weather TMDLs were developed for each of the three indicator bacteria.

This technical report is a revised version of the technical report for the Total Maximum Daily Loads for Indicator Bacteria, Project I – Beaches and Creeks in the San Diego Region (or Bacteria TMDLs Project I) adopted by the California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) on December 12, 2007. Bacteria TMDLs Project I addressed 19 beaches and creeks listed as impaired by indicator bacteria on the 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments (303(d) List). Because the State Water Board had not yet considered and approved Bacteria TMDLs Project I, and revisions to Bacteria TMDLs Project I would likely be required soon after its anticipated approval, the San Diego Water Board withdrew Bacteria TMDLs Project I from State Water Board consideration for approval on December 17, 2008.

Significant revisions have been made to the Bacteria Project I technical report, but the underlying technical approach and assumptions used for calculating the TMDLs have not been changed. The revisions are primarily associated with revisions that are required due to the adoption and approval of the Reference System and Antidegradation Approach/Natural Sources Exclusion Approach (RSAA/NSEA) Basin Plan amendment.[1] The "final" TMDLs have been removed and the "interim" TMDLs, which incorporate a reference system approach as discussed below, are the only TMDLs included in the project. Additionally, because the same modeling approaches can be used, and the resources available for the development of TMDLs have become more limited, the bacteria TMDL for Tecolote Creek that was being developed under a separate project has been incorporated in to these bacteria TMDLs for beaches and creeks in the San Diego Region. Finally, the TMDL Implementation Plan has been revised to provide additional guidance on potential actions that may be taken by the San Diego Water Board and/or other entities to implement the TMDLs, minimum monitoring that will be required to assess the implementation of the TMDLs, and the potential for alternative compliance schedules.

The 20 beaches and creeks addressed by this revised TMDL project (Table 1-1) are located within or hydraulically downstream of five watersheds in Orange County (with a small portion in Riverside County) and eight watersheds in San Diego County. Most of the waterways flow

[1] Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL*, adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009, 2009.

directly to the Pacific Ocean, except Tecolote Creek, which flows to Mission Bay, and Chollas Creek, which flows to San Diego Bay. The combined watersheds cover roughly 1,740 square miles (4,500 square kilometers).

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

Watershed	**Type of Listing**	**Impaired Waterbody Name** [a]	**Drainage Area (mi^2)** [b]	**Number of Listings**
San Joaquin HSA/ Laguna Beach HSA	Shoreline	Pacific Ocean Shoreline	13.94	2 [b]
Aliso HSA	Creek Estuary Shoreline	Aliso Creek Aliso Creek (mouth) Pacific Ocean Shoreline	35.74	3
Dana Point HSA	Shoreline	Pacific Ocean Shoreline	8.89	1
Lower San Juan HSA	Creek Estuary Shoreline	San Juan Creek San Juan Creek (mouth) Pacific Ocean Shoreline	177.18	3
San Clemente HA	Shoreline	Pacific Ocean Shoreline	18.78	1
San Luis Rey HU	Shoreline	Pacific Ocean Shoreline (at San Luis Rey River mouth)	560.42 (354.12)	1
San Marcos HA	Shoreline	Pacific Ocean Shoreline	1.43	1
San Dieguito HU	Shoreline	Pacific Ocean Shoreline (at San Dieguito Lagoon mouth)	346.22 (292.24)	1
Miramar Reservoir HA	Shoreline	Pacific Ocean Shoreline	93.73	1
Scripps HA	Shoreline	Pacific Ocean Shoreline	8.75	1
Tecolote HA	Creek	Tecolote Creek	10.00	1
Mission San Diego HSA/ Santee HSA	Creek Creek Shoreline	Forester Creek San Diego River (Lower) Pacific Ocean Shoreline	436.48 (173.95)	3
Chollas HSA	Creek	Chollas Creek	26.80	1
TOTAL NUMBER OF LISTINGS				**20**

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

[a] Listed as impaired on the 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments due to exceedances of the water contact recreation (REC-1) water quality objectives (WQOs) for fecal coliform, and/or total coliform, and/or enterococci indicator bacteria.

[b] Two separate segments of the Pacific Ocean Shoreline are included in the listings for the San Juan Hills/Laguna Beach watershed.

Fecal bacteria originate from the intestinal biota 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. 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, TMDLs for indicator bacteria were developed to address these 20 bacteria-impaired waterbodies in the San Diego Region.

Bacteria densities in these waterbodies have historically exceeded the numeric water quality objectives (WQOs) for total coliform (TC), fecal coliform (FC), and/or *Enterococcus* (ENT) indicator bacteria as defined in the San Diego Water Board's *Water Quality Control Plan for the*

San Diego Basin (9) (Basin Plan) and/or State Water Board's *Water Quality Control Plan for Ocean Waters for California* (Ocean Plan). These exceedances threaten or impair the recreational water contact (REC-1) and non-water contact (REC-2) beneficial uses of these waterbodies.

Because the climate in southern California has two distinct hydrological patterns, two modeling approaches were developed for estimating existing bacteria loads and allowable bacteria loads (i.e., TMDLs) to account for seasonal variations. One modeling approach 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 modeling approach quantified bacteria loading during dry weather conditions, which tend to have flows and loads much smaller in magnitude than wet weather conditions, do not occur from all land use types, and are more uniform than stormflow.

Different numeric targets were selected for calculating the allowable bacteria loads (i.e., TMDLs) under wet weather and dry weather conditions. Single sample maximum WQOs were used as the basis of the wet weather numeric targets. Geometric mean WQOs were used as the basis of the dry weather numeric targets. Although the dry weather TMDLs were calculated based on the geometric mean WQOs, the single sample maximum WQOs must also be met pursuant to the Ocean Plan and Basin Plan. Likewise, even though the wet weather TMDLs were calculated based on the single sample maximum WQOs, the geometric mean WQOs must also be met.

Another difference between the wet weather and dry weather TMDL calculations, besides the use of single sample maximum WQOs versus geometric mean WQOs, is the frequencies that the WQOs are allowed to be exceeded. Allowable exceedance frequencies are based on a reference system approach.[2] 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 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 calculation of the wet weather TMDLs by allowing a 22 percent exceedance frequency of the single sample maximum WQOs for REC-1. The dry weather TMDLs are calculated using a 0 percent allowable exceedance frequency.

Bacteria sources were quantified by land-use type since bacteria loading can be highly correlated with land-use practices. Bacteria loads attributable to point sources are primarily discharged from land uses associated with municipal separate storm sewer systems (MS4s). The principal MS4s contributing bacteria to receiving waters are owned or operated by either municipalities located throughout the watersheds or Caltrans. Additionally, there are wastewater treatment plants located in the watersheds addressed by these TMDLs. However, most of the effluent from these facilities is discharged to the Pacific Ocean through offshore ocean outfalls, and was

[2] Allowing exceedances of the bacteria water quality objectives is authorized within the context of a TMDL pursuant to Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL*, adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009.

therefore not included in the TMDL calculations. The only exception is Padre Dam, which discharges effluent to the San Diego River via a series of ponds that feed the Santee Lakes.

Nonpoint sources were separated into controllable and uncontrollable categories. Controllable nonpoint sources are identified by land use types and coverages. Controllable nonpoint sources include land uses associated with agriculture, dairy/intensive livestock, and horse ranches (collectively referred to as agriculture land uses). 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. Uncontrollable nonpoint sources include loads from open recreation, open space, and water land uses (collectively referred to as open space land uses). Loads from these areas are considered uncontrollable because they come from mostly natural sources (e.g. bird and wildlife feces).

The TMDL is divided up and assigned among the known point sources as wasteload allocations (WLAs) and nonpoint sources as load allocations (LAs). Portions of the TMDLs were assigned as WLAs to Municipal MS4s and Caltrans, and as LAs to Agriculture and Open Space land uses. Discharges from Municipal MS4s, Caltrans, and Agriculture land uses are considered controllable. Discharges from Open Space land uses are considered uncontrollable.

In general, controllable point and nonpoint sources generating less than 5 percent of the total loads (e.g., Caltrans and/or Agriculture) were assigned WLAs and LAs equal to their existing loads, resulting in no load reduction requirements. While they are not required to reduce their existing loads, this means, however, that these sources are not allowed to increase their loads over time, and cannot cause exceedances of the numeric WQOs in the receiving waters.

For the wet weather TMDLs, the Caltrans WLAs (which generates less than 5 percent of the total load in all watersheds) and Open Space LAs (which are uncontrollable) were set equal to the existing wet weather loads, thus load reductions are not required. The remaining portions of the TMDLs were assigned to Municipal MS4s WLAs and Agriculture LAs. In watersheds where the bacteria load from Agriculture land uses were less than 5 percent of the total existing wet weather load, the wet weather Agriculture LAs were set equal to the existing wet weather load, and no load reductions were required. Required load reductions were calculated for Municipal MS4s to achieve the wet weather MS4 WLAs, and for Agriculture land uses, in watersheds where the existing wet weather loads for all indicator bacteria were more than 5 percent of total existing wet weather load, to achieve the wet weather Agriculture LAs.

For the dry weather TMDLs, the discharges and bacteria loads from land uses associated with Caltrans, Agriculture, and Open Space land uses are expected to be zero. This is because there is no flow source that is expected during dry weather to wash bacteria off of these land uses. Thus the dry weather Caltrans WLAs, Agriculture LAs, and Open Space LAs were set equal to zero. The total dry weather TMDLs were assigned to the Municipal MS4s WLAs. Required load reductions were calculated for Municipal MS4s to achieve the dry weather MS4 WLAs.

For both wet weather and dry weather TMDLs, any controllable point source or nonpoint sources that has not been assigned a WLA or LAs, or has a WLA or LA of zero (i.e., WLA or LA = 0) is not expected or allowed to discharge a pollutant load as part of the TMDL. Sources that are assigned an allowable mass load equal to the existing mass load (i.e., WLA or LA = existing mass load) are not allowed to increase their pollutant loads over time.

In order to ensure that the TMDLs are achieved in the receiving waters, and as required under state law, an Implementation Plan was developed. The goal of the Implementation Plan is restore the impaired beneficial uses of the waterbodies addressed by these TMDLs. TMDLs are not self-implementing or directly enforceable against sources in the watershed. Instead, TMDLs must be implemented through the programs or authorities of the San Diego Water Board and/or other entities to compel dischargers responsible for controllable sources to achieve the pollutant load reductions identified by a TMDL analysis to restore and protect the designated beneficial uses of a waterbody.

The San Diego Water Board uses its authorities and programs to regulate discharges from the controllable sources in the Region. The controllable sources that are subject to regulation are, in turn, responsible for complying with the requirements issued the San Diego Water Board. Ultimately, the dischargers subject to regulation are responsible for reducing their pollutant loads in order for the TMDLs, WLAs, and LAs to be achieved. When all discharges from controllable sources meet their assigned WLAs and LAs, and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies) are also met in the receiving waters, compliance with the TMDLs will be achieved.

The authorities that are available to the San Diego Water Board to regulate dischargers are given under the Porter-Cologne Water Quality Control Act (Division 7 of the Water Code). The available regulatory authorities include incorporating discharge prohibitions in to the Basin Plan, issuing individual or general waste discharge requirements (WDRs), or issuing individual or general conditional waivers of WDRs. The San Diego Water Board has the authority to enforce Basin Plan prohibitions, WDRs, or conditional waivers of WDRs through the issuance of enforcements actions (e.g., time schedule orders, cleanup and abatement orders, cease and desist orders, administrative civil liabilities). The San Diego Water Board also has the authority to require monitoring and/or technical reports from dischargers, which may be used to support the development, refinement, and/or implementation of TMDLs, WLAs, and/or LAs.

The TMDLs will be implemented primarily by revising and re-issuing the existing WDRs and National Pollutant Discharge Elimination System (NPDES) requirements that have been issued for discharges from Phase I MS4s and Caltrans MS4s. Federal regulations require that NPDES requirements incorporate water quality based effluent limitations (WQBELs) that must be consistent with the requirements and assumptions of any available WLAs,[3] which may be expressed as numeric effluent limitations, when feasible, and/or as a best management practice (BMP) program of expanded or better-tailored BMPs.[4]

When developing WQBELs to be incorporated in to NPDES requirements, the following summarizes the requirements and assumptions included in the calculation of the TMDLs, WLAs, and LAs that should be considered:

[3] Code of Federal Regulations Title 40 section 122.44(d)(1)(vii)(B)
[4] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)

Numeric Targets

- The numeric targets consist of the numeric WQOs from the Basin Plan and/or Ocean Plan and an allowable exceedance frequency.
- The numeric targets for the wet weather TMDLs consist of the REC-1 single sample maximum WQOs and a 22 percent allowable exceedance frequency.
- The numeric targets for dry weather TMDLs consist of the REC-1 30-day geometric metric mean WQOs and a 0 percent allowable exceedance frequency.
- The TMDL calculations are based on either the single sample maximum WQO (for wet weather) or 30-day geometric mean WQOs (for dry weather), but both the single sample maximum and 30-day geometric mean numeric WQOs must be met in the receiving waters.
- The TMDLs, and in turn the WLAs for point sources and LAs for nonpoint sources, are assumed to be met when the numeric targets for all three indicator bacteria (fecal coliform, total coliform, and *Enterococcus*) are met in the receiving waters.

Critical Conditions

- The mass-load based TMDLs were calculated under critical conditions consisting of flows generated during a critical wet year and estimation of existing and allowable loads at a critical location.
- The flow from the critical wet year is a “worst case” annual wet weather flow and loading scenario. Actual annual wet weather flow and loading will vary from year to year.
- The mass-load based TMDLs calculated at the critical location are dependent on the flow, which can vary from year to year, but the numeric targets will not vary. When the numeric targets are met in the receiving water, the TMDLs are assumed to be met.
- The mass-load based TMDLs, WLAs, and LAs are calculated for the critical location, but the appropriate numeric targets (based on freshwater and/or saltwater REC-1 WQOs and allowable exceedance frequencies) must be met throughout the waterbodies addressed by these TMDLs.

Linkage Analysis

- The linkage analysis was performed by utilizing calibrated and validated models to predict flow from surface runoff and predict bacteria densities under the critical conditions (i.e., during the critical wet year at the critical location). Existing mass loads and allowable mass loads (i.e., TMDLs) were calculated for each watershed. The existing mass loads were calculated based on model-predicted flow and model-predicted bacteria densities. The allowable mass loads (i.e., TMDLs) were calculated based on model-predicted flow and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies).
- The wet weather existing mass loads and allowable mass loads (i.e., wet weather mass-load based TMDLs) are calculated assuming surface runoff is generated by rainfall from storm events and discharged from all land use categories to receiving waters.
- The dry weather existing mass loads and allowable mass loads (i.e., dry weather mass-load based TMDLs) are calculated assuming surface runoff is generated only by anthropogenic activities and discharged from specific land use categories to receiving waters.

Allocations

- Each mass-load based TMDL is allocated to known point sources and nonpoint sources. Wasteload allocations (WLAs) are assigned to point sources, and load allocations (LAs) are assigned to nonpoint sources. WLAs and LAs are the maximum load a source can discharge and still achieve the TMDL in the receiving water.
- The TMDLs, and in turn the WLAs for point sources and LAs for nonpoint sources, are assumed to be met when the numeric targets are met in the receiving waters.
- The sources were identified based on land use and grouped in to Municipal MS4, Caltrans MS4 (Caltrans), Agriculture, and Open Space categories. The Municipal MS4 and Caltrans land use categories are point sources, and the Agriculture and Open Space land use categories are nonpoint sources.
- Sources that are not identified are assumed to be assigned a zero allowable load as part of the mass-load based TMDL (i.e., WLA = 0 or LA = 0). In other words, discharges of pollutant loads from these sources are not expected or allowed as part of the TMDLs.
- Sources that are assigned an allowable load equal to the existing mass load as part of the mass-load based TMDL (i.e., WLA or LA = existing mass load) are not expected or allowed to increase their mass load in the future. In other words, discharges of pollutant loads (i.e., flows and bacteria densities) from these sources are not allowed to increase.
- The allocation of the dry weather mass-load based TMDLs assumes that no surface runoff discharge to receiving waters occurs from Caltrans, Agriculture, or Open Space land use categories (i.e., $WLA_{Caltrans} = 0$, $LA_{Agriculture} = 0$, and $LA_{OpenSpace} = 0$), meaning the entire dry weather mass-load based TMDL (i.e., allowable mass load) is allocated to Municipal MS4 land use categories (i.e., $WLA_{MS4} = TMDL$).
- The allocation of the wet weather mass-load based TMDLs assumes surface runoff discharge occurs from all land use categories, and allocated according to the following steps:
  1) Sources are separated in to controllable and uncontrollable sources. Discharges from Municipal MS4, Caltrans, and Agriculture land use categories are assumed to be controllable (i.e., subject to regulation), and discharges from Open Space land use categories are assumed to be uncontrollable (i.e., not subject to regulation).
  2) Because discharges from Open Space land use categories are uncontrollable (i.e., not subject to regulation), the LAs for Open Space land use categories are set equal to the existing mass loads calculated under the critical conditions.
  3) For discharges from controllable land use categories that do not contribute more than 5 percent of the total existing mass load for all three indicator bacteria, the WLA or LA is set equal to the existing mass loads from those land uses calculated under the critical conditions.
  4) After the WLAs and LAs are assigned based on steps 2 and 3, the remaining portion of the mass-load based TMDL is assigned to discharges from controllable land use categories that contribute more than 5 percent of the total existing mass load for all three indicator bacteria. The allowable mass load for each source (WLA or LA) is calculated based on the ratio of the existing mass loads from those sources relative to each other.

Load Reductions

- The load reductions required to meet the mass-load based TMDLs, WLAs, and LAs are based on reducing the loads compared to pollutant loads from 2001 to 2002.
- Load reductions for each source are calculated based on the difference between the existing mass load and the mass-load based WLA or LA for each source.
- WLAs and LAs that are set equal to the existing mass loads do not require load reductions to be calculated, but this also means that existing mass loads from those sources cannot increase over time (i.e., pollutant loads should be less than or equal to pollutant loads relative to 2001 to 2002).
- The load reductions needed to meet the WLAs for point sources and LAs for nonpoint sources are assumed to be achieved when the numeric targets are met in the receiving waters.

The WQBELs will likely consist of receiving water limitations (based on the numeric targets) and require the implementation of a BMP program to achieve the TMDLs in the receiving waters. The Phase I MS4s and Caltrans will be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the TMDLs in the receiving waters, acceptable to the San Diego Water Board, within 18 months after the effective date of these TMDLs. The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale. BLRPs will only address bacteria. CLRPs will address other pollutant constituents (e.g. metals, pesticides, trash, nutrients, sediment, etc.) together with the bacteria load reduction requirements in these TMDLs. Ideally, the Phase I MS4s and Caltrans will develop and submit their BLRPs or CLRPs together.

The TMDLs and LAs for controllable nonpoint sources will be implemented primarily by utilizing and enforcing conditional waivers of WDRs. Currently, discharges from the identified controllable nonpoint sources may be eligible for one of the general conditional waivers of WDRs, which are provided in the Basin Plan. Conditional waivers of WDRs may not exceed 5 years in duration, but may be revised and renewed, or may be terminated at any time. The San Diego Water Board will implement the conditional waivers of WDRs applicable to the Agriculture land uses to be consistent with the TMDLs and Agriculture LAs.

The San Diego Water Board shall consider enforcement actions, as necessary, for any discharger failing to comply with applicable waiver conditions, WDRs, or Basin Plan waste discharge prohibitions. Enforcement actions can also be taken, as necessary, to control the discharge of bacteria to impaired beaches and creeks, to attain compliance with the assumptions and requirements of the TMDLs, WLAs, and LAs.

The bacteria TMDLs are expected to be implemented in a phased approach with a monitoring component to determine the effectiveness of each phase and guide the selection of BMPs. The Implementation Plan includes a compliance schedule that may be used by the San Diego Water Board if the BLRPs or CLRPs do not include a proposed compliance schedule. The compliance schedule for the Phase I MS4s and Caltrans to attain their respective WLAs will likely be based on the BMP program and compliance schedules proposed in the BLRPs or CLRPs. If the Phase I MS4s and Caltrans choose to submit BLRPs to address only bacteria, the schedule for compliance with the TMDLs cannot extend beyond 10 years. If the Phase I MS4s and Caltrans choose to submit CLRPs to address all constituents of concern in lieu of the BLRP, the schedule for compliance with the TMDLs cannot extend beyond 20 years. If appropriate, the proposed compliance schedules will be incorporated into the various TMDL implementing orders.

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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. 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 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 Clean Water Act 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 waters identified as not meeting water quality standards, or impaired waters, are placed on a list known as the Clean Water Act Section 303(d) List of Water Quality Limited Segments (a.k.a. the "303(d) List"). The ~~CWA~~ Clean Water Act also requires states to establish a priority ranking of Water Quality Limited Segments and to establish Total Maximum Daily Loads (TMDLs) for such waters.

On the 2002 303(d) List, a significant number of waterbodies throughout the San Diego Region were identified and listed as impaired by bacteria. Elevated bacteria levels in the waters in the San Diego Region were resulting in frequent beach closures. At the time, identifying the sources and reducing the discharges of bacteria to the coastal shorelines was set as a very high priority for the Regional Water Quality Control Board, San Diego Region (San Diego Water Board). For this reason, and to maximize the efficiency in TMDL development to address bacteria in the San Diego Region, the San Diego Water Board initiated a TMDL project to address all the waterbodies listed as impaired by bacteria on the 2002 303(d) List. Due to different TMDL modeling approaches required for different types of waterbodies, the initial TMDL project had to be separated in to several smaller projects by waterbody type.

The first of the bacteria TMDL projects developed was known as "*Bacteria TMDLs Project I- Beaches and Creeks in the San Diego Region*" or "*Bacteria TMDLs Project I*." Bacteria TMDLs Project I included TMDLs that addressed 19 beaches and creeks in the San Diego Region, including 9 segments of Pacific Ocean shoreline, 5 creek/lagoon mouths, and 5 creeks. The TMDLs developed for these 19 beaches and creeks included "interim" and "final" wet weather TMDLs. "Interim" wet weather TMDLs included an allowance for exceedances of bacteria water quality objectives due to natural sources, whereas the "final" wet weather TMDLs did not. Bacteria TMDLs Project I was adopted by the San Diego Water Board on December 12, 2007.

The San Diego Water Board adopted Bacteria Project I contingent upon the adoption of a Reference System and Antidegradation Approach/Natural Sources Exclusion Approach (RSAA/NSEA) Basin Plan amendment that would allow for exceedances of bacteria water quality standards within the context of a TMDL. Adoption of the RSAA/NSEA Basin Plan amendment would require Bacteria TMDLs Project I to be revised to remove the "final" wet weather TMDLs.

The RSAA/NSEA Basin Plan amendment was adopted by the San Diego Water Board on May 14, 2008 and appeared likely to be approved by the State Water Board, OAL, and USEPA before or very soon after Bacteria TMDLs Project I. Because the State Water Board had not yet considered and approved Bacteria TMDLs Project I, and it appeared the RSAA/NSEA Basin Plan amendment would be approved and require the revision of Bacteria TMDLs Project I soon after its anticipated approval, the San Diego Water Board withdrew Bacteria TMDLs Project I from State Water Board consideration for approval on December 17, 2008.

This technical report is a revised version of the technical report for Bacteria TMDLs Project I. Significant revisions have been made to the Bacteria TMDLs Project I technical report, but the underlying technical approach and assumptions used for calculating the TMDLs have not been changed. The revisions are primarily associated with revisions that are required due to the adoption and approval of the RSA/NSEA Basin Plan amendment.[5] The "final" TMDLs have been removed and the "interim" TMDLs, which incorporate a reference system approach as discussed below, are the only TMDLs included in the project. Additionally, because the same modeling approaches can be used, and the resources available for the development of TMDLs have become more limited, the bacteria TMDLs for Tecolote Creek that were being developed under a separate project have been incorporated in to these bacteria TMDLs for beaches and creeks in the San Diego Region. Finally, the TMDL Implementation Plan has been revised to provide additional guidance on potential actions that may be taken by the San Diego Water Board and/or other entities to implement the TMDLs, minimum monitoring that will be required to assess the implementation of and compliance with the TMDLs, and the potential for alternative compliance schedules. Hereafter this project will be referred to in this revised technical report as "*Revised Bacteria TMDLs Project I- Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*" or "*Revised Bacteria TMDLs Project I.*"

For Revised Bacteria TMDLs Project I, TMDLs were developed to address 20 waterbodies in the San Diego Region that have been listed as impaired by bacteria on the 2002 303(d) List, including 9 segments of Pacific Ocean shoreline, 5 creek/lagoon mouths, and 6 creeks. The presence of bacteria, especially fecal bacteria, in surface water is often used as an indicator for human pathogens. Pathogens can cause illness in recreational water users, but are usually difficult and/or very expensive to measure. Historically, fecal bacteria have been used as indicators of human pathogens because they are easier and less costly to measure than the pathogens themselves. This TMDL project has been developed to specifically address indicator bacteria as a pollutant causing impairment of the beneficial uses in 20 beaches and creeks in the San Diego Region.

This project involved ~~calculating~~ developing TMDLs for ~~waterbodies~~ beaches and creeks located in ~~12~~ 13 watersheds in the San Diego Region. These watersheds drain to the Pacific Ocean (with

[5] Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL,* adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009

the exception of Tecolote Creek, which flows to Mission Bay, and 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 ~~47~~ 48 impaired beach segments (including creek/lagoon mouths and coastal shoreline segments) and 5 creeks in the San Diego Region. These locations compose ~~19~~ 20 distinct locations identified on the 2002 303(d) 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. ~~Beaches in the Miramar Reservoir and Scripps Hydrologic Areas were delisted by the State Board in 2006 but are included here because monitoring data indicated that water quality at beaches in these areas are impaired, especially during wet weather.~~

~~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.~~

A TMDL is intended to fulfill two purposes: 1) calculation of the assimilative loading capacity for an impaired waterbody, and 2) development of a strategy to restore an impaired waterbody so the water quality can once again meet the water quality standards. Under federal regulations, a TMDL is defined as the "sum of the individual waste load allocations (WLAs) for point sources and load allocations (LAs) for non-point sources and natural background"[6] such that the capacity of the waterbody to assimilate the loading of a specific pollutant (the loading capacity) is not exceeded. The WLA or LA is the maximum allowable amount of a specific pollutant can be discharged by a point or nonpoint source, respectively. When all the sources meet their respective WLAs or LAs, the water quality standards should be restored and attained.

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** (or assimilative 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.

[6] Code of Federal Regulations Title 40 section 130.2(i)

The write-up of the above components is generally referred to as the technical TMDL analysis. The scientific basis of this technical TMDL analysis has undergone external peer review pursuant to Health and Safety Code section 57-004 during the development of Bacteria TMDLs Project I. The scientific basis for this technical TMDL analysis has not been changed for Revised Bacteria TMDLs Project I, thus a second external peer review was not required. 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 results of the technical TMDL analysis were used to develop an **Implementation Plan**. The Implementation Plan describes the pollutant reduction actions that must be taken by the San Diego Water Board and/or other entities to further regulate various dischargers to meet the WLAs and LAs 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 responsible for meeting their assigned WLAs or LAs and for monitoring to assess the effectiveness of the implementation measures at achieving the TMDLs in the receiving waters meeting the load and waste load reductions. A time schedule for meeting the WLAs and LAs is also included in the Implementation Plan.

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).[7] 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 with a compliance schedule and minimum monitoring requirements. Pursuant to the California Environmental Quality Act (CEQA), most 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 State Water Resources Control Board (State Water Board) and the Office of Administrative Law (OAL). The United States Environmental Protection Agency (USEPA) must also approve the any amendment involving surface water. , however, it will take effect following For purposes of state law, however, the effective date of the TMDL Basin Plan amendment will begin upon 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, and/or enforce existing WDRs that implement National Pollutant Discharge Elimination System (NPDES) requirements and/or Basin Plan waste discharge

[7] Pursuant to Code of Federal Regulations section 130.6(c)(1) and Water Code section 13242

prohibitions. For nonpoint sources, the San Diego Water Board will issue, reissue, amend, or enforce WDRs, waivers of WDRs, or adopt Basin Plan waste discharge prohibitions. Water quality based effluent limitations 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 may be expressed as numeric effluent limitations, when feasible, and/or an iterative Best Management Practice as a best management (BMP) approach of program of expanded or better-tailored BMPs.[8]

The final and most important step in the process is the implementation of the TMDLs by the dischargers. Per the governing WDR implementing 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 the Implementation Plan in this Technical Report and the Basin Plan amendment. When each discharger has achieved its required load reduction, WQOs for the impairing pollutants the beneficial uses 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. Participants that have been involved in the SAG Representatives included representatives for 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 During the development of Bacteria TMDLs Project I, 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.

For Revised Bacteria TMDLs Project I, additional meetings were held with the SAG to discuss the revisions made. Public participation also took place through the San Diego Water Board's Basin Plan amendment process, which included a formal public comment period and a public hearing.

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 Clean Water Act section 106 funds to contract the environmental consulting firm, Tetra Tech, Inc. Tetra Tech provided the

[8] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)

San Diego Water Board with technical assistance in calculating the mass-load based 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 modeling approaches were developed for estimating bacteria loads. One model modeling approach 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, 2004 2003). In contrast, the dry weather model modeling approach 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.

A significant portion of bacteria loads can often be attributed to natural sources. Bacteria loads from these natural sources may cause exceedances of bacteria WQOs even if there are no anthropogenic sources. It is not the intent of these TMDLs to require treatment or diversion of natural waterbodies or to require treatment of natural sources of indicator bacteria. Therefore, the San Diego Water Board adopted an amendment to the Basin Plan to incorporate authorization to implement the indicator bacteria WQOs, within the context of a TMDL, using the "reference system approach."[9]

The reference system approach, which is explained in more detail in section 4, allows exceedances of the numeric WQOs for water contact recreation (REC-1) beneficial uses, expressed as an allowable exceedance frequency. The purpose of the allowable 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 bacteria loads generated in the watersheds which can, by themselves, cause exceedances of the numeric WQOs. An allowable exceedance frequency of the numeric WQOs was included in the development of the wet weather and dry weather TMDLs.

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.

[9] A Basin Plan amendment to incorporate a reference system approach for implementation of the WQOs for bacteria (Resolution No. R9-2008-0028) was adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009.

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, within the context of a TMDL, using the reference system approach.[10] 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 MS4 dischargers.[11] 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).

[10] 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.

[11] The dry and wet weather wasteload allocation for discharges from wastewater treatment facilities, also know as publicly owned treatment works (POTWs), is zero. This means that POTWs are not expected or allowed to discharge a bacteria load as part of these TMDLs. The only exception is Padre Dam whose discharge to the San Diego River is regulated by the San Diego Waterboard and must meet REC-1 permit requirements. Therefore Padre Dam received a separate TMDL wasteload allocation which is based on the effluent limitations of its WDRs, and is included in addition to these TMDLs which are based on urban surface runoff. Please see section 8.1.5 for further discussion.

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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) and non-water contact (REC-2) 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. All inland surface waters and coastal marine waters in the Region are designated with both REC-1 and REC-2 beneficial uses.

Although WQOs for REC-1 and REC-2 beneficial uses are written in terms of density of indicator bacteria colonies (most probable number of colonies per 100 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, 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~~ biota 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~~ eight 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 Tecolotec Creek, which flows to Mission Bay, and Chollas Creek, which flows to San Diego Bay. The combined watersheds cover roughly ~~1,730~~ 1,740 square miles (~~4,480~~ 4,500 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 have been documented to be impaired by the State Water Board's *2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs* (2002 303(d) List). 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.

~~The majority of the waterbodies included in this project have been documented to be impaired by the State Water Board's *2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs* (303(d) List). However, the Scripps Hydrologic Area and Miramar Reservoir Hydrologic Area were removed from the 303(d) List in 2006 based on an analysis that did not consider geometric mean objectives and did not separately evaluate wet and dry weather data. The San Diego Water Board has reevaluated the indicator bacteria water quality data from beaches in these hydrologic areas, including consideration of geometric mean water quality objectives and water quality conditions during wet weather. The indicator bacteria water quality conditions of the Scripps Hydrologic Area and Miramar Reservoir Hydrologic Area are discussed in Appendix T.~~

~~Based on the reevaluation of indicator bacteria water quality data from beaches within the Scripps and Miramar Reservoir Hydrologic Areas, both hydrologic areas are expected to be included in the 2008 version of the 303(d) List as water quality limited segments. The data assessment in Appendix T demonstrates that several beaches within the hydrologic areas do not meet water quality standards. Since the Scripps and Miramar Reservoir Hydrologic Areas include a mix of impaired and unimpaired beaches, implementation of the TMDL for these beaches will differ based on their water quality status. These implementation differences are discussed in Section 11.5.3.~~

For this study, a watershed-based approach was developed to calculate bacteria mass 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~~20 waterbodies from the 2002

303(d) List addressed by this TMDL project, including waterbody segment names and approximate length of impairment. Appendix E shows higher resolution maps of the impaired watersheds.

Table 3-1. Beach and Creeks Addressed in this TMDL Analysis

Watershed	**Type of Listing**	**Impaired Waterbody Name** [a]	**Drainage Area (mi^2)** [b]	**Number of Listings**
San Joaquin Hills HSA (901.11)/ Laguna Beach HSA (901.12)	Shoreline	Pacific Ocean Shoreline	13.94	2 [b]
Aliso HSA (901.13)	Creek Estuary Shoreline	Aliso Creek Aliso Creek (mouth) Pacific Ocean Shoreline	35.74	3
Dana Point HSA (901.14)	Shoreline	Pacific Ocean Shoreline	8.89	1
Lower San Juan HSA (901.27)	Creek Estuary Shoreline	San Juan Creek San Juan Creek (mouth) Pacific Ocean Shoreline	177.18	3
San Clemente HA (901.30)	Shoreline	Pacific Ocean Shoreline	18.78	1
San Luis Rey HU (903.00)	Shoreline	Pacific Ocean Shoreline (at San Luis Rey River mouth)	560.42 (354.12)	1
San Marcos HA (904.50)	Shoreline	Pacific Ocean Shoreline	1.43	1
San Dieguito HU (905.00)	Shoreline	Pacific Ocean Shoreline (at San Dieguito Lagoon mouth)	346.22 (292.24)	1
Miramar Reservoir HA (906.10)	Shoreline	Pacific Ocean Shoreline	93.73	1
Scripps HA (906.30)	Shoreline	Pacific Ocean Shoreline	8.75	1
Tecolote HA (906.50)	Creek	Tecolote Creek	10.00	1
Mission San Diego HSA (907.11)/ Santee HSA (907.12)	Creek Creek Shoreline	Forester Creek San Diego River (Lower) Pacific Ocean Shoreline	436.48 (173.95)	3
Chollas HSA (908.22)	Creek	Chollas Creek	26.80	1
TOTAL NUMBER OF LISTINGS				**20**

Note: HSA = hydrologic subarea; HA = hydrologic area; HU = hydrologic unit
[a] Listed as impaired on the 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments due to exceedances of the water contact recreation (REC-1) water quality objectives (WQOs) for fecal coliform, and/or total coliform, and/or enterococci indicator bacteria.
[b] Two separate segments of the Pacific Ocean Shoreline are included in the listings for the San Juan Hills/Laguna Beach watershed.

On the 2002 303(d) List, the Pacific Ocean shoreline is listed for several hydrologic subareas (HSAs), hydrologic areas (HAs), and hydrologic units (HUs). The listing of Pacific Ocean shorelines on the 2002 303(d) List are assumed to be applicable to all the beaches located on the shorelines of the HSAs, HAs, and HUs listed above.

3.3Applicable Water Quality Standards

Water quality standards consist of WQOs, beneficial uses, and an antidegradation policy. 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. Beach and Creek 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.

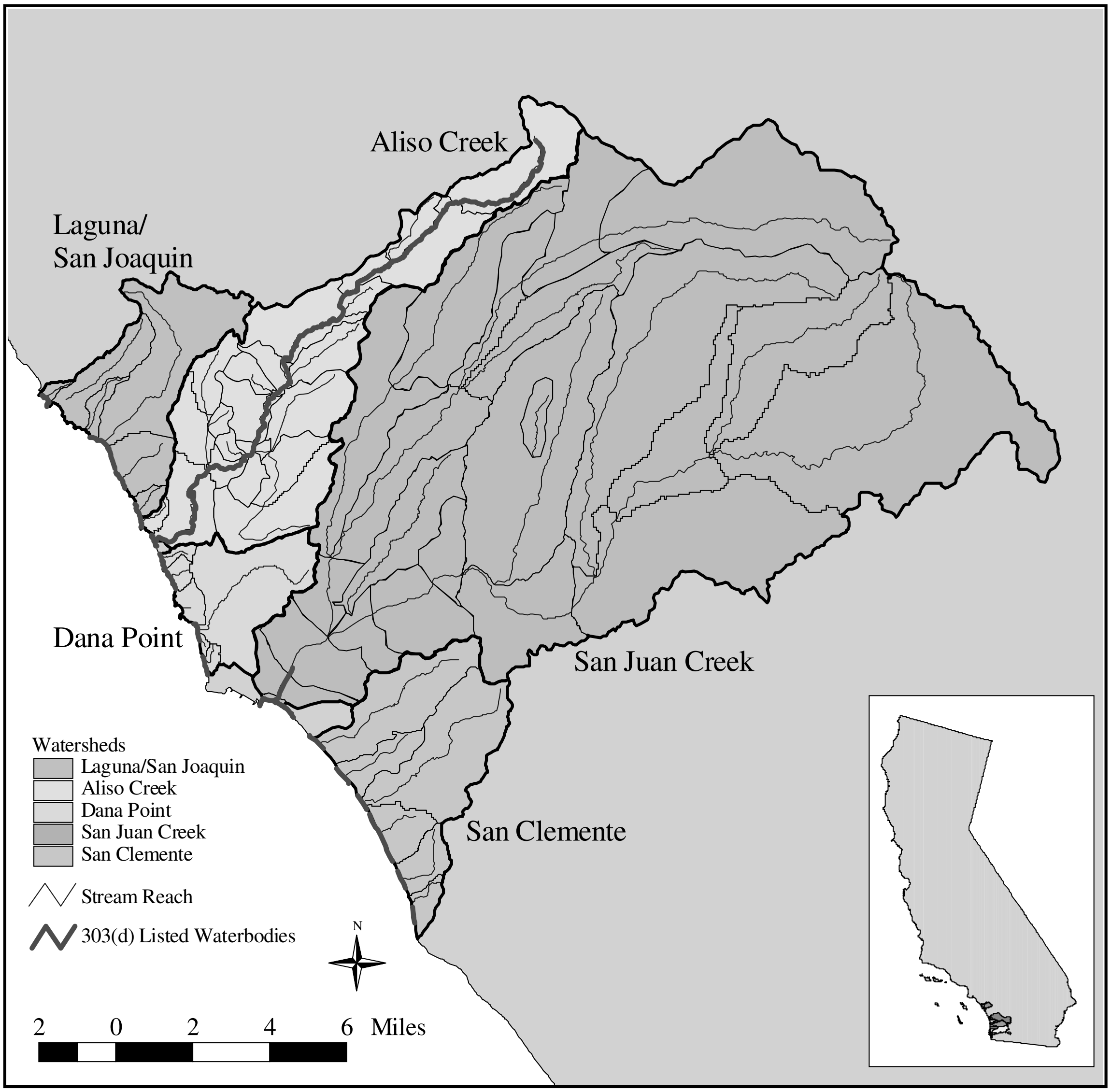

Figure 3-1. Watersheds of interest in Orange County.

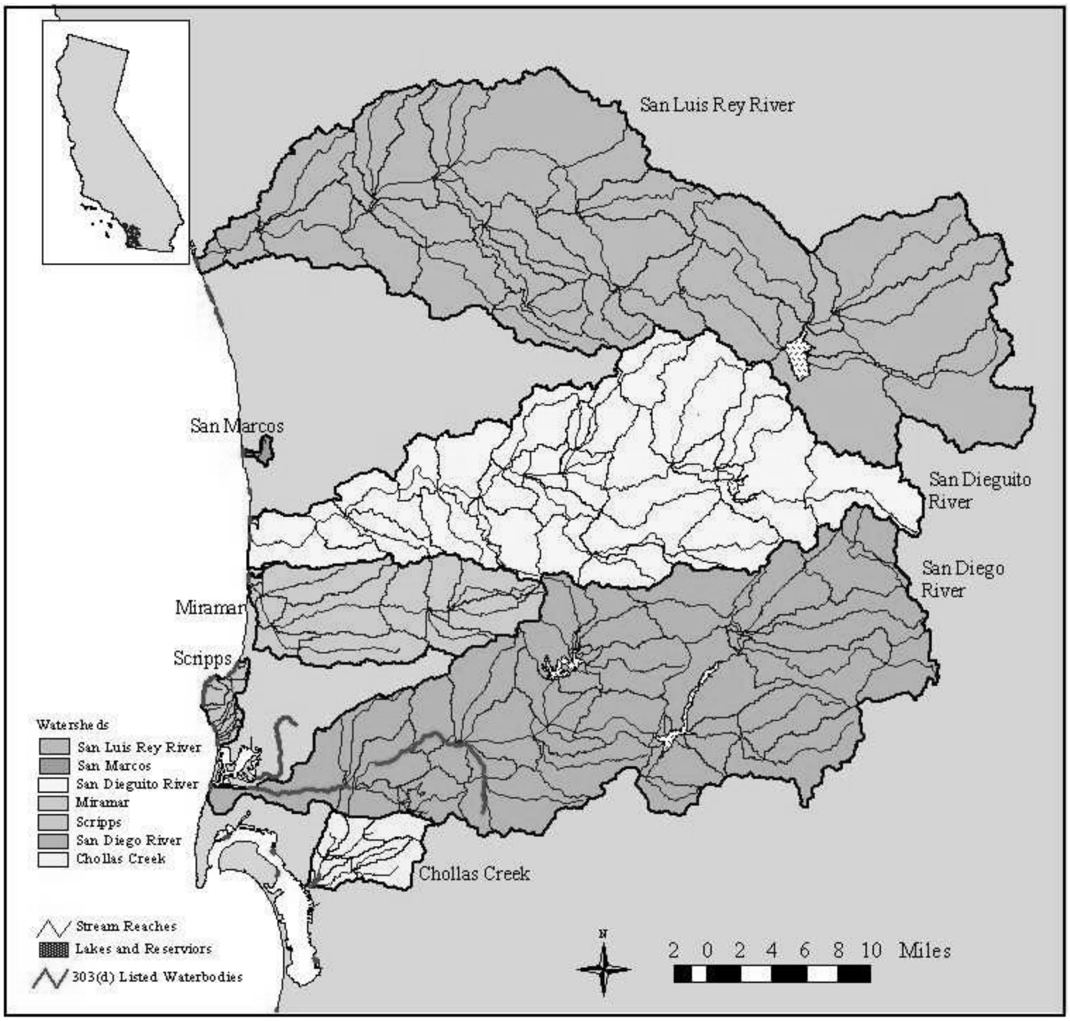

Figure 3-2. Watersheds of interest in San Diego County.

3.3 Applicable Water Quality Standards

Water quality standards consist of WQOs, beneficial uses, and the antidegradation policy. 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.

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)

Table 3-2 lists the beneficial uses for each of the impaired inland segments and the Pacific Ocean shoreline.

Table 3-2. Beneficial Uses of the Impaired Waters

Waterbody Type	Waterbody	Designated Beneficial 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	Tecolote Creek	REC-1,[b] 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 State Water Board 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.

The REC-1 WQOs for indicator bacteria that are applicable to the Pacific Ocean shoreline are contained in the Ocean Plan (~~SWRCB~~State Water Board, 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.[12] In addition, the Basin Plan contains REC-1 objectives for *Escherichia coli* (*E. coli)* for inland surface waters.

[12] The Basin Plan and Ocean Plan also contains SHELL objectives for total coliform. SHELL TMDLs for total coliform are being developed in a separate TMDL or standards action.

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. The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine and fresh waters to protect the water contact recreation (REC-1) use. These targets are the most appropriate indicators of public health risk in recreational waters.

When performing a technical TMDL analysis, one or more quantitative numeric targets are required to calculate a TMDL. Numeric targets are selected based on the water quality standards (i.e., beneficial uses and the water quality objectives) that are applicable to the waterbody. The selected numeric target(s) must be able to implement existing water quality standards. In other words, when the numeric targets are met, the water quality standards should be restored.

The beneficial uses of the beaches and creeks addressed by this technical TMDL analysis are set forth in the Basin Plan, and discussed and summarized in section 3.3 and Table 3-2. This TMDL analysis specifically addresses the water contact recreation (REC-1) and non-water contact recreation (REC-2) beneficial uses. The water quality objectives (WQOs) are set forth in the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan) and in the *Water Quality Control Plan for Ocean Waters of California* (Ocean Plan). The bacteriological objectives are set forth in the Ocean Plan and Basin Plan. Because the REC-1 bacteria WQOs are more stringent than the REC-2 stringent WQOs, waters that can meet the REC-1 bacteria WQOs will also meet the REC-2 WQOs. The REC-1 bacteria WQOs objectives are based on four bacterial indicators and include both geometric mean limits and single sample maximum limits. The Ocean Plan and Basin Plan's objectives for bacteria are as follows that serve as numeric targets for these TMDLs are:

REC-1
Ocean Waters (from Ocean Plan[13])

30-day Geometic Mean – The following standards are based on the geometric mean of the five most recent samples from each site:

i. **Total coliform** density shall not exceed 1,000 MPN per 100 ml;
ii. **Fecal coliform** density shall not exceed 200 MPN per 100 ml; and
iii. **Enterococci** density shall not exceed 35 MPN per 100 ml.

Single Sample Maximum:

i. **Total coliform** density shall not exceed 10,000 MPN per 100 ml;
ii. **Fecal coliform** density shall not exceed 400 MPN per 100 ml;
iii. **Enterococci** density shall not exceed 104 MPN per 100 ml; and

[13] As adopted by the State Water Board on January 20, 2005 and April 21, 2005, approved by OAL on October 12, 2005, and approved by USEPA on February 14, 2006

iv. **Total coliform** density shall not exceed 1,000 MPN per 100 ml when the fecal coliform/total coliform ratio exceeds 0.1.

REC-1
Inland Surface Waters, Enclosed Bays and Estuaries and Coastal Lagoons (from Basin Plan[14])

Fecal Coliform Water Quality Objective for Contact Recreation:

The fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 organisms per 100 ml.

In addition, the fecal coliform concentration shall not exceed 400 organisms per 100 ml for more than 10 percent of the total samples during any 30-day period.

Enterococci and **E. Coli** Water Quality Objectives for Contact Recreation:

The USEPA published E. coli and enterococci bacteriological criteria applicable to waters designated for contact recreation (REC-1) in the Federal Register, Vol. 51, No. 45, Friday, March 7, 1986, 8012-8016.

USEPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION
(in colonies per 100 ml)

	Freshwater		Saltwater
	Enterococci	E. coli	Enterococci
Steady State			
(all areas)	33	126	33
Maximum			
(designated beach)	61	235	61
(moderately or lightly used area)	108	406	108
(infrequently used area)	151	576	151

Total Coliform Water Quality Objective for Contact Recreation for Bays and Estuaries:

In bays and estuaries, the most probable number of total coliform organisms in the upper 60 feet of the water column shall be less than 1,000 organisms per 100 ml (10 organisms per ml); provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 organisms per 100 ml (10 per ml); and provided further that no single sample as described below is exceeded.

[14] As amended in the Basin Plan as part of Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL,* adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009

The most probable number of total coliform organisms in the upper 60 feet of the water column in no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 organisms per 100 ml (100 organisms per ml).

~~**Fecal Coliform / Fresh or Marine Waters:** Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 per 100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400 per 100 ml.~~

~~**Total Coliform / Bays and Estuaries only:** Coliform organisms shall be less than 1,000 MPN per 100 ml (10 per ml); provided that not more than 20 percent of the samples at any station, in any 30-day period, may exceed 1,000 MPN per 100 ml (10 per ml) and provided further that no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 MPN per 100 (100 per ml).~~

~~**Enterococci / Fresh Waters:** In fresh water, the geometric mean of enterococci shall not exceed 33 colonies per 100 ml. The single sample maximum allowable density in designated beach areas is 61 colonies per 100 ml, in moderately or lightly used areas is 108 colonies per 100 ml, in infrequently used areas is 151 colonies per 100 ml.~~

~~**Enterococci / Marine Waters:** In marine waters, the geometric mean of enterococci shall not exceed 35 colonies per 100 ml. The single sample maximum allowable density in designated beach areas is 104 colonies per 100 ml, in moderately or lightly used areas is 276 colonies per 100 ml, in infrequently used areas is 500 colonies per 100 ml.~~

~~***E. coli* / Fresh Waters**[15]**:** In fresh water, the geometric mean of *E. coli* shall not exceed 126 colonies per 100 ml. The single sample maximum allowable density in designated beach areas is 235 colonies per 100 ml, in moderately or lightly used areas is 406 colonies per 100 ml, in infrequently used areas is 567 colonies per 100 ml.~~

These objectives are generally based on an acceptable health risk for recreational waters of 19 illnesses per 1,000 exposed individuals as set forth by the USEPA (US EPA, 1986). The ~~targets~~ bacteria WQOs apply throughout the year.

~~TMDLs were calculated for each impaired waterbody, for each indicator bacteria, for wet and dry weather, and for interim and final phases. The~~ Because the bacteria WQOs are expressed in numeric terms, the numeric targets used in the ~~TMDL calculations were equal to~~ technical TMDL analysis were based on the numeric WQOs for bacteria for the REC-1 beneficial use.

Different dry weather and wet weather numeric targets were used for mass load calculations 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~~ Because wet weather conditions, or storm flow, ~~is~~ are episodic and short in duration, and characterized by rapid wash-off and transport of high bacteria loads, with short residence times,

[15] E.coli TMDLs were not calculated for *E.coli* because fecal coliform TMDLs and load reductions essentially account for *E.coli*.

from all land use types to receiving waters, the single sample maximum WQOs were appropriate for use as wet weather numeric targets. ~~Geometric mean WQOs were used as numeric targets for dry weather periods~~ For dry weather conditions, 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, the geometric mean WQOs were appropriate for use as dry weather numeric targets.

For impaired beaches, the ~~final~~ numeric targets for ~~load~~ the calculations in the technical TMDL analysis are based on ~~were equal to~~ the total coliform, fecal coliform and enterococci WQOs for REC-1 ~~in all cases, because REC-1 requires the most stringent final numeric target. By meeting the REC-1 WQOs, the REC-2 is also automatically met~~. Wet weather ~~final~~ numeric targets ~~were equal to~~ are based on the single sample maximum REC-1 WQOs, while dry weather ~~final~~ numeric targets ~~were equal to~~ are based on the geometric mean REC-1 WQOs.

~~Final~~ The numeric targets used to calculate the mass-load based TMDLs for beaches were also used to calculate TMDLs for impaired creeks. Numeric targets for load calculations for beaches and creeks are summarized in sections 4.1 and 4.2.

Even though beaches and creeks are separate waterbodies with slightly different numeric WQOs, all creeks included in this project eventually discharge to beaches, and therefore WQOs applicable to beaches must be protected at creek mouths. In other words, although the total coliform objective is not an applicable WQO in freshwater creeks and rivers, the total coliform density in these waters where they discharge to the Pacific Ocean must meet the Ocean Plan total coliform WQO at the shorelines. Thus, the WQO for total coliform is the appropriate numeric target for the TMDLs for creeks and rivers even though they do not need to meet this objective. 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. Numeric targets for load calculations for beaches and creeks are summarized in sections 4.1 and 4.2.

4.1 Wet Weather Numeric Targets~~: The Reference System Approach~~

Another difference between the wet weather and dry weather mass-load based TMDL calculations, besides the use of single sample maximum WQOs versus geometric mean WQOs, is the allowable exceedance frequency that is applied. The wet weather numeric targets are implemented in the TMDL by allowing the single sample WQOs for REC-1 to be exceeded due to bacteria loads that are attributed to natural, uncontrollable sources of bacteria. The allowable exceedances of the single sample maximum bacteria WQOs is authorized by a Basin Plan amendment that was recently adopted by the San Diego Water Board. ~~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.~~

4.1.1 Authorization to Allow Exceedances of Bacteria Water Quality Objectives

A Basin Plan amendment was recently adopted by the San Diego Water Board authorizing the development of indicator bacteria TMDLs that account for exceedances of bacteria WQOs due to bacteria loads from natural uncontrollable sources.[16] Allowing exceedances of bacteria WQOs may be incorporated into the bacteria TMDLs using a reference system approach or natural sources exclusion approach.

The reference system approach incorporates an allowable exceedance frequency into the calculation of the TMDLs. 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 in the context of a TMDL.[17]

The allowable exceedance frequency is determined by identifying an appropriate reference system. An appropriate reference system is a beach and upstream watershed that are minimally impacted by anthropogenic activities. The frequency of exceedances of the indicator bacteria single sample maximum WQOs at a reference system can be used to determine an allowable exceedance frequency for the target watershed. The reference system approach also incorporates antidegradation principles in that, if water quality in the target waterbody 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 first 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 in the context of a TMDL.[18]

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[16] Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL,* was adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009.

[17] 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).

[18] 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).

The Basin Plan amendment also authorizes the implementation of indicator bacteria single sample maxmum WQOs (REC-1 & REC-2) using a natural sources exclusion approach in the context of a TMDL. This approach authorizes the development or re-calculation of a bacteria TMDL that allows exceedances of WQOs after all sources of indicator bacteria associated with human and domesticated animal wastes are controlled. Under the natural sources exclusion approach, after all such anthropogenic sources of indicator bacteria have been controlled, a certain frequency of exceedance of WQOs can be authorized for developing TMDLs based on the residual exceedance frequency of the WQO in the specific waterbody. The residual exceedance frequency can be used to calculate the allowable exceedance load due to natural sources.

More specifically, in determining appropriate interim wet weather TMDLs, the San Diego Water Board chose to apply the 22 percent exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. Since then, four other reference beaches have been characterized by SCCWRP. Based on all the available reference beach data, a watershed specific exceedance frequency will be determined for all watersheds in this TMDL once the reference system basin plan amendment has been adopted. Revised final wet weather TMDLs will then be calculated based on these watershed specific exceedance frequencies. The 22 percent exceedance frequency used to calculate the interim wet weather TMDLs was justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach. If this does indeed turn out to be the case, or if the exceedance frequency is greater, then the resulting final wet weather TMDLs will be the same as, or less stringent than, the interim TMDLs. In this case, a 10-year compliance period would be appropriate for the revised final TMDLs.

The reference system approach may be used to account for exceedances of bacteria WQOs during the initial development and calculation of bacteria TMDLs. The natural sources exclusion approach can only be used to account for exceedances of bacteria WQOs after the responsible dischargers demonstrate that all controllable anthropogenic sources have been eliminated, typically after a bacteria TMDL has already been adopted and implemented.

Implementation of indicator bacteria WQOs using a reference system approach requires control of indicator bacteria from anthropogenic sources so that the bacteriological water quality that is achieved is consistent with that of a reference system. In contrast, implementation of indicator bacteria water quality objectives using the natural sources exclusion approach also requires control of indicator bacteria from anthropogenic sources, but rather than requiring achievement of reference system bacteria levels, it requires evidence that remaining indicator bacteria densities do not indicate a human health risk. For these TMDLs, the reference system approach appears to be an appropriate method for accounting for exceedances of bacteria WQOs in the calculation of the wet weather TMDLs, as discussed below.

4.1.1 4.1.2 Applicability of the Reference System Approach Local Reference Conditions

The need to use a Determining whether the use of the reference system approach in the calculation of wet weather indicator bacteria TMDLs in the San Diego Region is appropriate was evaluated by analyzing data collected 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). These data were only evaluated in this TMDL technical analysis to show that using the reference system approach is appropriate for these TMDLs. The data were not used to determine region specific or watershed specific exceedance frequencies for the watersheds addressed by these TMDLs. 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 were collected by the San Diego County Department of Environmental Health (DEH) during routine monitoring as part of a wider beach-monitoring program. The data were not collected for purposes of characterizing a reference watershed and are 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 (85 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.

Most of the San Mateo Creek watershed is open space (85 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. Because of the high percentage of open space and land uses with low anthropogenic activities, the San Mateo Creek watershed appears to be a potential reference system in the San Diego Region. A recent study of potential reference systems in southern California conducted by the Southern California Coastal Water Research Project (SCCWRP) also included the San Mateo Creek watershed in the study (Schiff, et al., 2006).

The data evaluated in this TMDL technical analysis were collected by the San Diego County Department of Environmental Health (DEH) during routine monitoring as part of a wider beach-monitoring program. The DEH collected bacteria data at two stations located near the mouth of San Mateo Creek from 1999 through 2002 (Appendix G, No. 16).

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). Once the data for all stations were designated as wet or dry samples, the wet weather samples were compared to single sample maximum WQOs for fecal coliform, total coliform, and enterococci at each station (Tables 4-1).

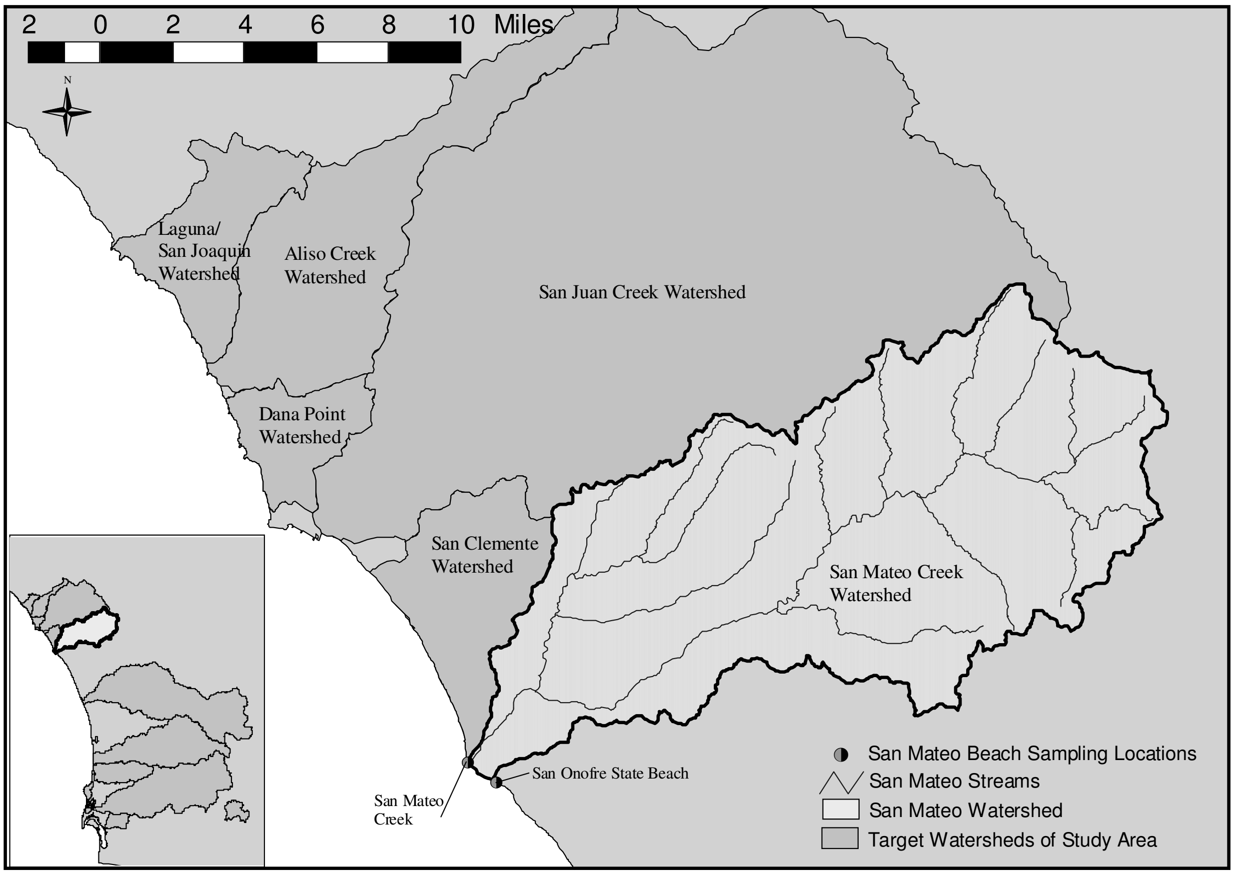


Figure 4-1. San Mateo watershed and San Onofre State Beach.

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%

An analysis of the wet weather water quality data provided by DEH (Table 4-1) from San Mateo Creek and San Onofre State Beach show that single sample maximum WQOs for fecal coliform, total coliform, or enterococci are exceeded in 17 to 50 percent of the wet weather samples depending on the indicator. 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). 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 calculating the wet weather indicator bacteria TMDLs for 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 (REC-1) using a reference system approach in the context of a TMDL is being developed by the San Diego Water Board[19] 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 for enterococci and fecal coliform 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. If adequate data are collected to characterize dry weather flows and bacteria densities using a statistical approach, the reference system approach may also be appropriate for revising the final dry weather TMDLs.

The Basin Plan amendment will also authorize the implementation of single sample and geometric mean E.coli, enterococci, fecal coliform, and total coliform WQOs (REC-1 & REC-2) using a natural sources exclusion approach in the context of a TMDL. This approach will authorize the development of a TMDL that results in exceedances of WQOs after all sources of

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

indicator bacteria associated with human and domesticated animal wastes are controlled. Under the natural sources exclusion approach, after all such anthropogenic sources of indicator bacteria have been controlled, a certain frequency of exceedance of WQOs can be authorized for developing TMDLs based on the residual exceedance frequency of the WQO in the specific water body. The residual exceedance frequency can be used to calculate the allowable exceedance load due to natural sources. Alternatively, a TMDL could also be calculated directly, without an allowable exceedance frequency, based on the existing bacteria loading in the waterbody after anthropogenic sources have been adequately controlled. This approach could be used to revise TMDLs based on single sample and geometric mean WQOs.

4.1.3 Allowable Exceedance Frequency for the Reference System Approach

In the calculation of the wet weather mass-load based TMDLs, the San Diego Water Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. Since then, additional data were collected and analyzed for five other reference beaches by SCCWRP (Schiff, et al., 2006).

The study conducted by SCCWRP occurred over only two wet seasons (2004-2005 and 2005-2006). The data collected and analyzed by SCCWRP indicate that the flux of indicator bacteria from undeveloped watersheds and the resulting frequency of water quality threshold exceedences at reference beaches during wet weather can be correlated to watershed size, storm size, and early versus late season storms. Exceedance frequencies ranged from zero percent to 30 percent for an exceedance of any bacteria indicator.

Two of the reference beaches included in the study were from the San Diego Region (San Onofre State Beach at the mouth of San Onofre Creek and San Mateo State Beach at the mouth of San Mateo Creek). Both reference beaches had the highest exceedance frequencies during wet weather, but were also the largest watersheds in the study. The exceedance frequencies for these two San Diego Region watersheds may not be appropriate for every watershed addressed by these TMDLs. Additional data will be required to determine appropriate watershed specific exceedance frequencies for indicator bacteria TMDLs in the San Diego Region. If watershed specific exceedance frequencies are determined for any of the watersheds addressed in this TMDL, the wet weather TMDLs can be re-calculated based on these watershed specific exceedance frequencies.

At this time, however, the 22 percent exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Water Board. If this exceedance frequency does indeed turn out to be appropriate for all the watersheds addressed in this TMDL, or if an appropriate exceedance frequency is determined to be greater for one or more watersheds, then the resulting wet weather TMDLs will be the same as, or less stringent than, the wet weather TMDLs that have been developed. If so, the wet weather TMDLs may be revised if requested. If, however, the appropriate exceedance frequency is determined to be lower for one or more watersheds, then the resulting wet weather TMDLs may be more stringent, and the San

Diego Water Board may determine that the wet wet weather TMDLs need to be revised to restore and protect the beneficial uses of the waterbodies in these watersheds.

4.1.24.1.4 Summary of Wet Weather Numeric Targets for Mass-Load Based Calculations

The numeric targets used in the wet weather mass-load based TMDL calculations are based on the REC-1 single sample maximum WQOs. The numeric targets used in the calculations of the wet weather TMDLs include a 22 percent allowable exceedance frequency of the REC-1 single sample maximum WQOs. The allowable mass load (i.e., TMDL) that is calculated based on these numeric targets consists of the sum of two parts: 1) the bacteria load that is calculated with the REC-1 WQOs and, 2) the bacteria load that is associated with the allowable exceedance frequency.

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 based on REC-1 WQOs are as follows: ; 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 single sample maximum values may be exceeded 22 percent of the time in the calculation of the wet weather mass-load based TMDLs. (these are single sample maximum values that can be exceeded 22 percent of the time). The **final** wet weather numeric targets are fecal coliform 400 MPN/100 mL; total coliform 10,000 MPN/100 mL; and enterococci 104 MPN/100 mL (single sample maximums in all instances).

For San Juan Creek and downstream beach, Aliso Creek and downstream beach, Tecolote Creek, Forrester Creek and the (lower) San Diego River and downstream beach, and Chollas and Forrester Chollas Creeks; Table 4-3), the **interim** wet weather numeric targets are as follows: fecal coliform 400 MPN/100 mL; total coliform 10,000 MPN/100 mL; and enterococci 61 MPN/100 mL. These single sample maximum values may be exceeded 22 percent of the time in the calculation of the wet weather mass-load based TMDLs. or 104 MPN/100 mL, depending on the frequency of usage[20] (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 10,000 MPN/100 mL; and enterococci 61 MPN/100 mL or 104 MPN/100 mL, depending on the frequency of usage (single sample maximums in all instances).

Different enterococci REC-1 WQOs were used to calculate TMDLs in watersheds modeled with the inland freshwater creeks (i.e., San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek, (lower) San Diego River, and Chollas Creek) and watersheds modeled only with coastal saltwater beaches. The WQOs applicable to ocean waters are provided in the Ocean Plan. The Ocean Plan is applicable only to ocean waters and does not apply to marine bays, estuaries and lagoons. The WQOs applicable to all other surface waters in the San Diego Region (e.g., marine

[20] The enterococci WQOs in the Basin Plan are structured to reflect the frequency of recreational use. The enterococci freshwater WQO for a “designated beach” area is 61 MPN/100 mL. For a “moderately or lightly used area,” the WQO is 108 MPN/100 mL. The saltwater WQO for “designated beach” area is 104 MPN/100 mL. Where the “moderately or lightly used area” designation is appropriate for creeks, the saltwater WQO of 104 MPN/100 mL could be used as the numeric target because it is also protective of both the freshwater creek and the downstream marine beach.

bays, estuaries and lagoons, and freshwater inland surface waters) are contained in the Basin Plan.

There are different enterococci REC-1 WQOs in the Ocean Plan compared to the Basin Plan. Specifically, the Ocean Plan contains REC-1 single sample maximum and 30-day geometric mean WQOs for ocean waters that do not vary. In the Basin Plan, however, the REC-1 single sample maximum WQOs for enterococci are dependent upon the type (e.g., freshwater or saltwater) and usage frequency (e.g., designated beach, moderately or lightly used area, or infrequently used area) of the waterbody, and the REC-1 geometric mean WQOs are dependent of the type (e.g., freshwater or saltwater) of waterbody. The enterococci saltwater REC-1 WQOs in the Basin Plan, for waters designated with “designated beach” usage frequency, are the same as the enterococci REC-1 WQOs in the Ocean Plan.

For the application of the Basin Plan’s enterococci REC-1 WQOs, unless otherwise specified in the Basin Plan, all waterbodies in the San Diego Region designated with REC-1 beneficial use are assumed to have a “designated beach” usage frequency. The “designated beach” usage frequency has the most conservative and protective enterococci REC-1 WQOs in the Basin Plan. The enterococci REC-1 single sample maximum WQOs in the Basin Plan are more stringent for freshwater (61 MPN/100mL) than for saltwater (104 MPN/100mL) waterbodies. The enterococci REC-1 geometric mean WQOs in the Basin Plan are also more stringent for freshwater (33 MPN/100mL) than for saltwater (35 MPN/100mL) waterbodies. Since coastal saltwater beaches are downstream of inland freshwater creeks, TMDLs for coastal saltwater beaches are calculated using the more conservative enterococci REC-1 WQOs applicable to freshwater creeks (i.e., 61 MPN/100mL and 33 MPN/100mL). The numeric targets used in the calculation of the TMDLs for Tecolote Creek and Chollas Creek are also based on the enterococci REC-1 WQOs applicable to freshwater creeks.

As a conservative approach, the freshwater designated beach WQO was used as the numeric target for the enterococci TMDLs for four impaired creeks (San Juan Creek, Aliso Creek, San Diego River, and Chollas Creek) and their downstream beaches (see Table 4-2). However, the dischargers commented that the “designated beach” category may be over-protective of water quality because of the infrequent recreational use in the impaired creeks. The recreational usage frequency in these creeks may correspond to the “moderately to lightly used area” category in the Basin Plan, which has an enterococci WQO of 108 MPN/100mL. . In such cases, the “designated beach” enterococci saltwater REC-1 single sample maximum WQO (104 MPN/100mL) would also be protective of the “moderately to lightly used area” freshwater creek In these cases, using a less stringent numeric target, based on the saltwater enterococci WQO of 104 MPN/100 mL (“designated beaches” usage frequency) would result in TMDLs protective of REC-1 uses in the creeks and at the downstream beaches. Therefore, if the “moderately to lightly used area” usage frequency is appropriate for the four impaired creeks, the WQO of 104 MPN/100 mL should be used as the numeric target. Since the information to make this evaluation is not available, the enterococci TMDLs were calculated using both numeric targets. However, the dischargers should submit evidence justifying the “moderately to lightly used area” usage frequency for the four impaired creeks before the San Diego Water Board issues orders to implement the TMDLs. Otherwise, we will implement the more stringent enterococci TMDLs based on the “designated beach” usage frequency.

Before the less stringent enterococci single sample maximum saltwater REC-1 WQO may be applied to a freshwater creek, the Basin Plan must be amended to designate a lower usage frequency (i.e., "moderately to lightly used area") for each freshwater creek. If information and evidence are provided to justify the "moderately to lightly used area" usage frequency for a freshwater creek, and the designated usage frequency of the freshwater creek is amended to "moderately to lightly used area" in the Basin Plan, the wet weather TMDLs that were calculated in a watershed that was modeled with a freshwater creek using the enterococci saltwater REC-1 WQOs can be implemented instead.

Table 4-2. Wet Weather Numeric Targets

Indicator Bacteria	**Numeric Target (MPN/100mL)**	**Allowable Exceedance Frequency [a]**
Fecal coliform	400 [b]	22%
Total coliform	10,000 [c]	22%
Enterococci	104[d] / 61[e]	22%

a. Percent of wet days (i.e., rainfall events of 0.2 inches or greater and the following 72 hours) allowed to exceed the wet weather numeric targets. Exceedance frequency based on reference system in the Los Angeles Region.
b. Fecal coliform single sample maximum WQO for REC-1 use in creeks and at beaches.
c. Total coliform single sample maximum WQO for REC-1 use at beaches and the point in creeks that discharges to beaches.
d. Enterococci single sample maximum WQO for REC-1 use in creeks established and designated as "moderately or lightly used" in the Basin Plan and at beaches downstream of those creeks, as well as all other beaches.
e. Enterococci single sample maximum WQO for REC-1 use in creeks not established and designated as "moderately or lightly used" in the Basin Plan and at beaches downstream of those creeks ("designated beach" frequency of use; applicable to San Juan Creek and downstream beach, Aliso Creek and downstream beach, Tecolote Creek, Forrester Creek, San Diego River and downstream beach, and Chollas Creek).

~~*Table 4-2. Interim and Final Wet Weather Numeric Targets*~~

~~**Indicator Bacteria**~~	~~**Interim Targets**~~		~~**Final Targets**~~	
	~~**Numeric Target (MPN/100mL)**~~	~~**Allowable Exceedance Frequency [a]**~~	~~**Numeric Target [d] (MPN/100mL)**~~	~~**Allowable Exceedance Frequency [b]**~~
~~Fecal coliform~~	~~400 [c]~~	~~22%~~	~~400 [c]~~	~~Not applicable~~
~~Total coliform~~	~~10,000 [d]~~	~~22%~~	~~10,000 [e]~~	~~Not applicable~~
~~Enterococci~~	~~104 [f] / 61 [g]~~	~~22%~~	~~104 [f] / 61 [g]~~	~~Not applicable~~

~~[a] Exceedance frequency based on reference system in the Los Angeles Region.~~

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

~~[c] Fecal coliform single sample maximum WQO for REC-1 use at creeks and at beaches.~~

~~[d] Total coliform single sample maximum WQO for REC-1 use at creeks and at beaches.~~

~~[e] Total coliform single sample maximum WQO for REC-1 use at beaches.~~

~~[f] Enterococci single sample maximum WQO for REC-1 use for "moderately or lightly used" and at "designated beach" frequency of use.~~

~~[g] Enterococci single sample maximum WQO for REC-1 use at impaired creeks and downstream beaches ("designated beach" frequency of use; applicable to San Juan Creek and downstream beach, Aliso Creek and downstream beach, San Diego River and downstream beach, Chollas Creek, and Forrester Creek).~~

4.2 Dry Weather Numeric Targets

Implementing the dry weather numeric targets with a reference system approach cannot be used here because dry weather flow and water quality data for the watersheds were inadequate to calculate the TMDLs using a statistical approach. The dry weather modeling approach used to calculate the TMDLs preclude application of a reference system approach.

4.2.1 Allowable Exceedance Frequency for Dry Weather

Additionally, there is littleLittle data are available regarding exceedances of WQOs in a reference system (i.e., a beach and upstream watershed that are minimally impacted by anthropogenic activities) during dry weather. Water quality data from the mouth of San Mateo Creek and San Onofre State Beach (Table 4-3) indicate that exceedances of the single sample WQOs during dry weather conditions are uncommon in the relatively undeveloped San Mateo watershed these relatively undeveloped watersheds. Furthermore, if the exceedance of the single sample maximum WQOs is unlikely, exceedances of the geometric mean are even more unlikely. However, if adequate data are collected to characterize dry weather flows and bacteria densities using a statistical approach, the reference system approach may be an option that would allow an exceedance frequency to be included with the dry weather numeric targets in the dry weather TMDLs to revise the final dry weather targets in this TMDL project.

The low percentage of exceedances of the single sample maximum WQOs during dry weather conditions 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 the beach data was were 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. Therefore, WQOs, without any allowable exceedances, are sufficient for use as dry weather TMDL targets. Although the dry weather allowable mass loads were calculated based on the geometric mean WQOs, the single sample maximum WQOs must also be met pursuant to the Ocean Plan and Basin Plan.

Table 4-3. Single Sample Maximum 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%

4.2.14.2.2 Summary of Dry Weather Targets for Load Calculations

The numeric targets used in the dry weather mass-load based TMDL calculations are based on the REC-1 geometric mean WQOs. The numeric targets used in the calculations of the dry weather TMDLs include a 0 percent allowable exceedance frequency of the REC-1 geometric mean WQOs.

For all beaches (except those that are downstream of San Juan Creek, Aliso Creek and the San Diego River), The **final** the dry weather numeric targets based on REC-1 WQOs are as follows: for beaches 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). These geometric mean values may be exceeded 0 percent of the time in the calculation of the dry weather mass-load based TMDLs.

For San Juan Creek and downstream beach, Aliso Creek and downstream beach, Tecolote Creek, Forrester Creek and the (lower) San Diego River and downstream beach, and Chollas Creek, For the creeks included in this project, (Aliso Creek, San Juan Creek, the San Diego River, Chollas Creek and Forrester Creek, (Table 4-4), the **final** numeric targets are as follows: 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). These geometric mean values may be exceeded 0 percent of the time in the calculation of the dry weather mass-load based TMDLs.

Table 4-4. Dry Weather Numeric Targets

Indicator Bacteria	**Numeric Target (MPN/100mL)**	**Allowable Exceedance Frequency [a]**
Fecal coliform	200 [b]	0%
Total coliform	1,000 [c]	0%
Enterococci	35 [d] / 33 [e]	0%

a. Percent of dry days (i.e., days with less than 0.2 inch of rainfall observed on each of the previous 3 days) allowed to exceed the dry weather numeric targets.
b. Fecal coliform 30-day geometric mean WQO for REC-1 use in creeks and at beaches.
c. Total coliform 30-day geometric mean WQO for REC-1 at beaches and the point in creeks that discharges to beaches.
d. Enterococci 30-day geometric mean WQO for REC-1 at beaches.
e. Enterococci 30-day geometric mean WQO for REC-1 use in impaired creeks and beaches downstream of those creeks (applicable to San Juan Creek and downstream beach, Aliso Creek and downstream beach, Tecolote Creek, Forrester Creek, San Diego River and downstream beach, and Chollas Creek).

Table 4-4. Final Dry Weather Numeric Targets

Indicator Bacteria	**Final Targets (MPN/100mL)**
Fecal coliform	200 [a]
Total coliform	1,000 [b]
Enterococci	35 [c] / 33 [d]

[a] Fecal coliform 30-day geometric mean WQO for REC-1 use at creeks and beaches.

[b] Total coliform 30-day geometric mean WQO for REC-1 at beaches.

[c] Enterococci 30-day geometric mean WQO for REC-1 at beaches.

[d] Enterococci 30-day geometric mean WQO for REC-1 use at impaired creeks and downstream beaches (applicable to San Juan Creek and downstream beach, Aliso Creek and downstream beach, San Diego River and downstream beach, Chollas Creek, and Forrester Creek).

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

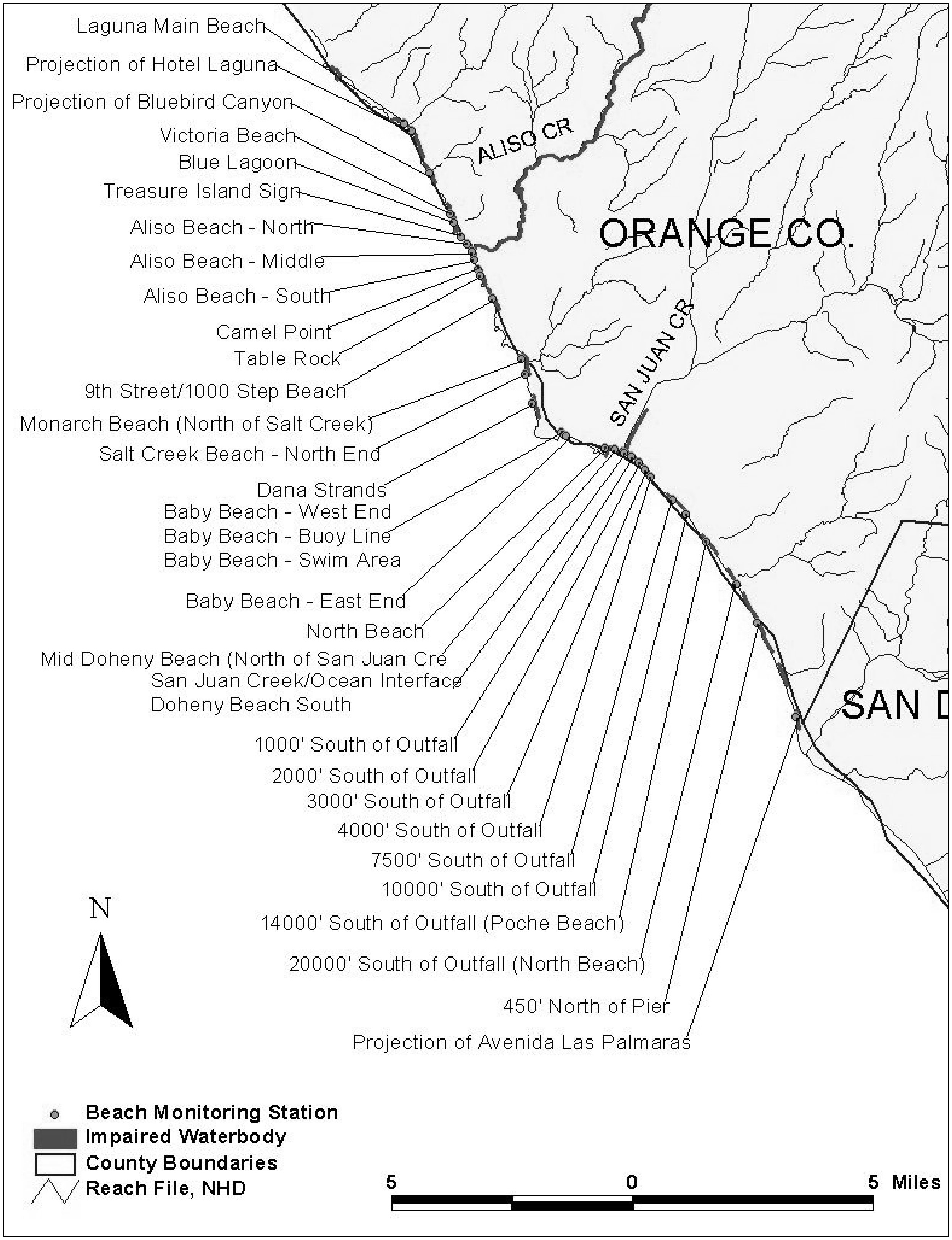


Figure 5-1. Beach monitoring station locations in Orange County.

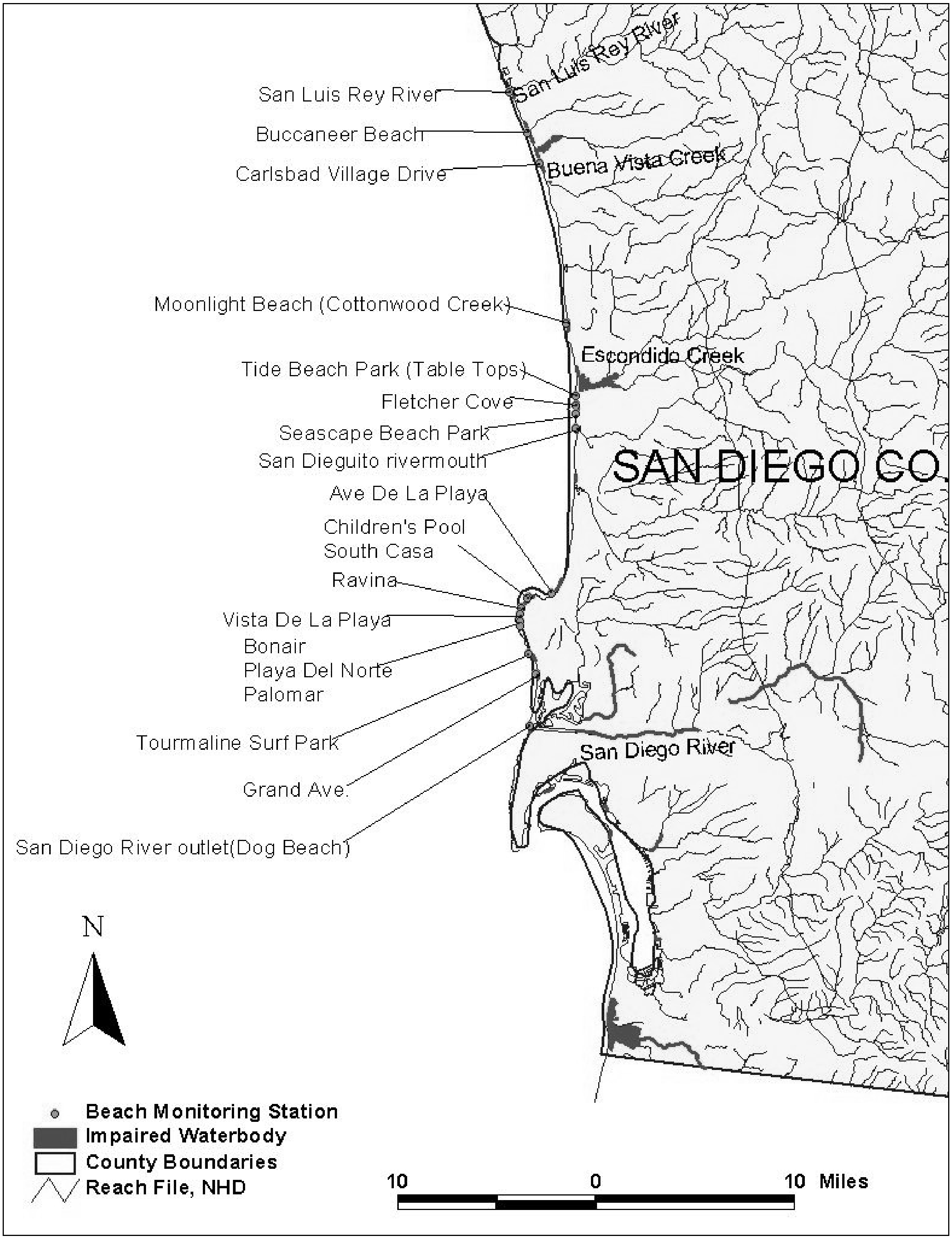


Figure 5-2. Beach monitoring station locations in San Diego County.

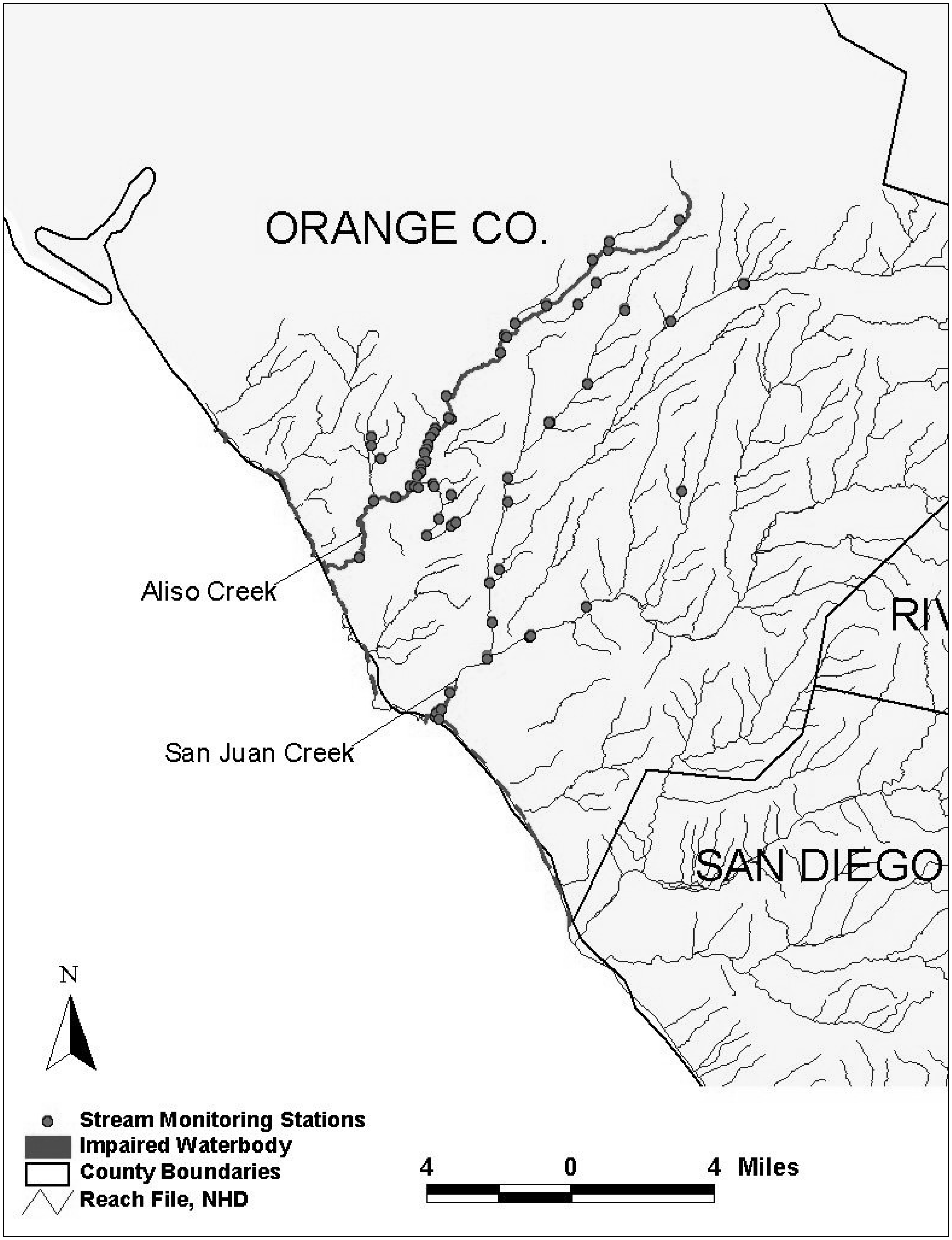


Figure 5-3. Bacteria monitoring stations on Aliso Creek and San Juan Creek.

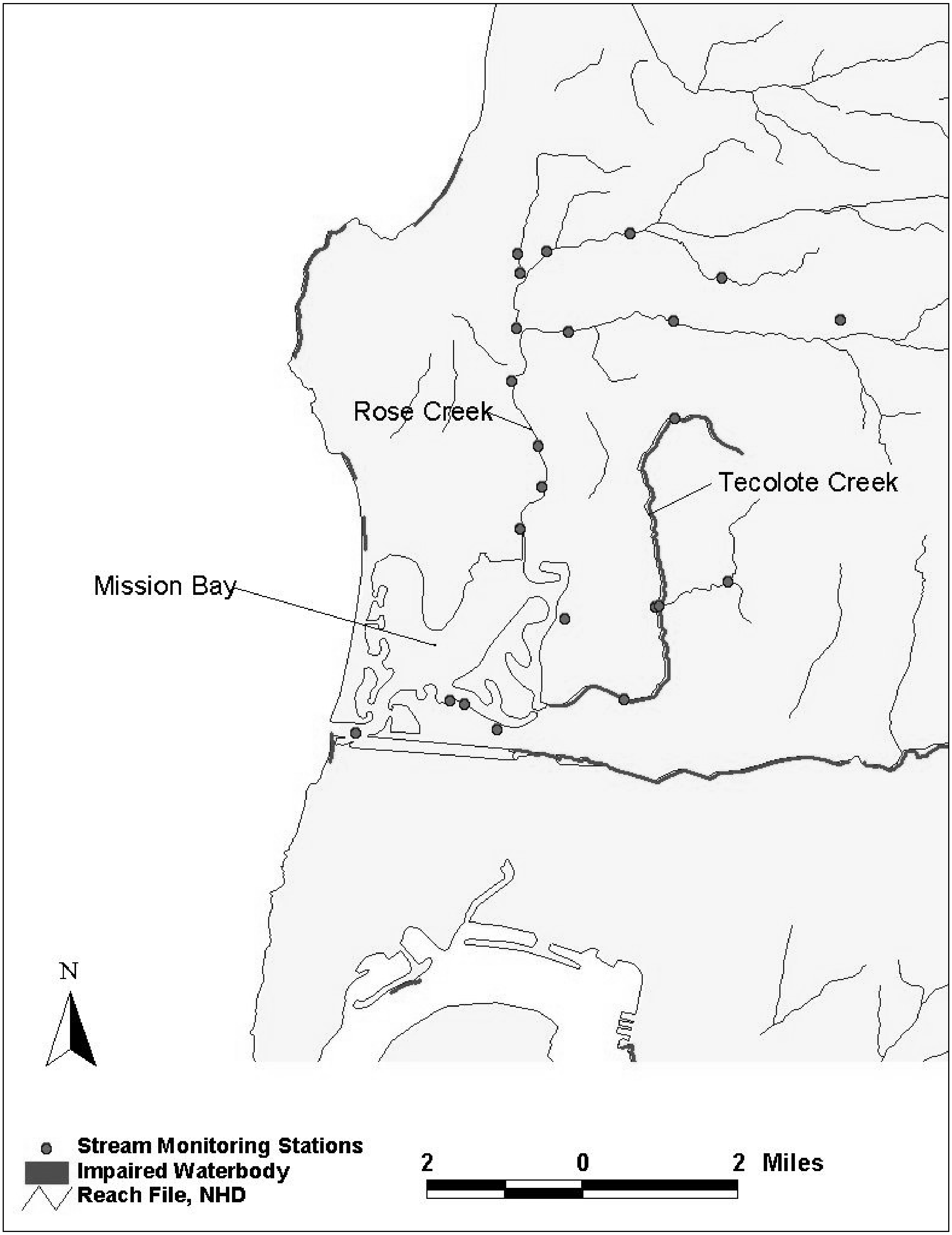


Figure 5-4. Bacteria monitoring stations on Rose Creek and Tecolote Creek.

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, enterococci and 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, Tecolote 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, 5, 6, 10, 11, 12, 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%
Tecolote Creek	5	208	5	16,429	1,732,870	40%
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%
Tecolote Creek	5	208	959	171,746	2,419,200	63%
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

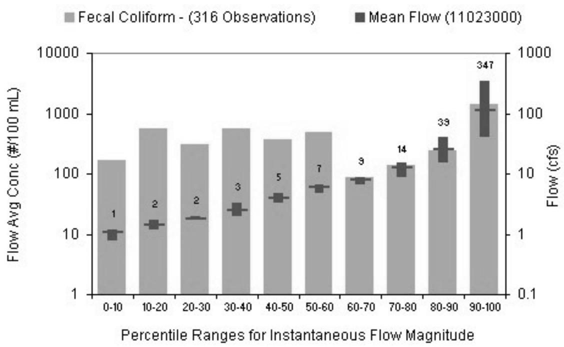
Stream	Number of Monitoring Stations	Total Number of Samples	Enterococci (MPN/100 mL)			Frequency of Exceedance of WQOs for marine waters
			Minimum	Mean	Maximum	
Aliso Creek	108	8,817	1	6,018	492,800	98%
Tecolote Creek	5	208	5	15,099	2,419,200	95%
San Juan Creek	31	357	5	4,834	280,000	89%

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

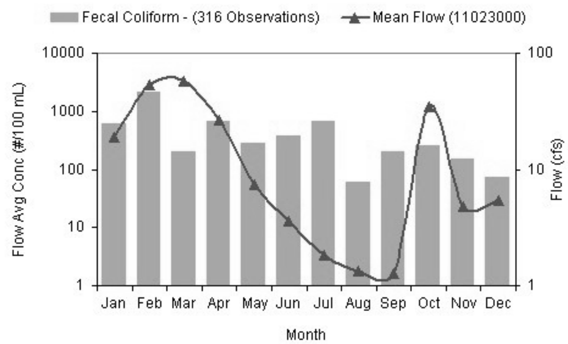
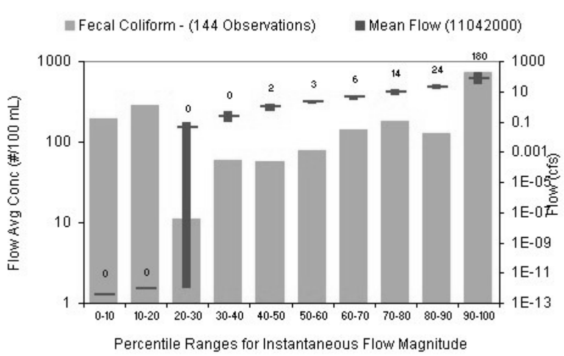


Figure 5-5. Flow versus fecal coliform concentration near San Diego River outlet (Dog Beach).

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

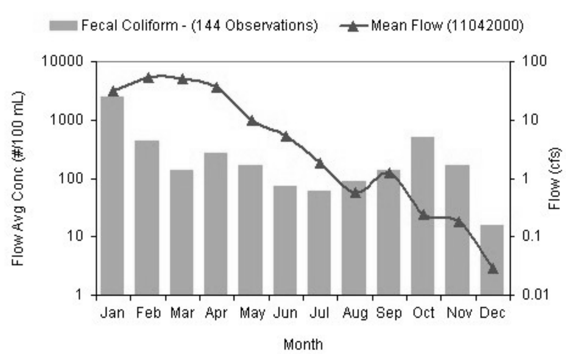


Figure 5-6. Flow versus fecal coliform concentration near San Luis Rey River~~.~~

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6 Source Analysis

The purpose of the source analysis is to identify and quantify the sources of bacteria causing or contributing to the impairment of the 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 State Water Board or the San Diego Water Board through various orders.[21] 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 (hereafter referred to collectively as agriculture land uses) may be regulated through WDRs, or may be eligible for conditional waivers of WDRs 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 may 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 technical TMDL 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.

[21] A discussion of the SWRCB State Water Board 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.[22]

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.

6.4 Wastewater Treatment Facilities and Collection Systems

Wastewater treatment facilities and collection systems are located in the watersheds ~~effected~~ addressed by these TMDLs. However, most of the effluent from these facilities is discharged to the Pacific Ocean through offshore ocean outfalls. Therefore, these loads were not included in the TMDL calculations. The only exception is the Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), which discharges effluent to the San Diego River via a series of ponds that feed the Santee Lakes. However, Padre Dam's bacterial discharges do not contribute to the San Diego River's bacterial impairment because Padre Dam's effluent meets the REC-1 water quality standard.

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

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7 Linkage Analysis

The technical TMDL analysis of pollutant loading from watersheds, and the waterbody response to this loading is referred to as the linkage analysis. The purpose of the linkage analysis is to quantify the "existing" bacteria loads that are currently generated by the pollutant sources in the watershed under critical conditions, and quantify the maximum allowable bacteria loading to each impaired waterbody ~~resulting~~ that will result in in attainment of ~~WQOs~~ the numeric targets under the same critical conditions. ~~This value is in fact,~~ This maximum allowable bacteria loading is, in other words, the TMDL. Existing loads and 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~~ load reduction from the total existing load in a watershed needed in order to attain ~~WQOs~~ the TMDLs in the receiving waters 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~~ The linkage analysis utilized two district modeling approaches for calculating bacteria loads. One modeling approach specifically quantified loading during wet weather events. The other modeling approach quantified loading during dry weather 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 9-4 ~~9-10~~.

7.1 *Consideration Factors for Model Selection*

In selecting an appropriate linkage analysis 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~~ water quality standards 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. 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~~ is 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 the numeric targets, and thus the TMDLs, in the receiving waters ~~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 critical conditions typically include the location and 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~~ numeric targets 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 water quality standards (i.e., the beneficial uses and the WQOs that support those uses) ~~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 support and 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, or built up, 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~~ The wet weather modeling 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 modeling approach chosen for use in this project is based on the application of the USEPA's Loading Simulation Program in C++ (LSPC) model 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.

Although the name implies that a "daily load" is calculated, wet weather mass-load based TMDLs for each watershed are expressed as "annual loads" in terms of number of bacteria colonies per year (billion MPN/yr). Wet weather mass-load based TMDLs are expressed in terms of annual loads because wet weather events (i.e., storm events) do not occur on a regular basis in any given year, and expressing the TMDL on a daily basis would be extremely difficult.

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.

Dry weather mass-load based TMDLs for each watershed are expressed as "monthly loads" in terms of number of bacteria colonies per month (billion MPN/mo). Dry weather mass-load based TMDLs are expressing in terms of monthly loads because the dry weather numeric targets are based on 30-day geometric means, and expressing the TMDL on a daily basis would not be strictly comparable to the numeric targets.

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8 Allocation and Reduction Calculations

The calibrated models were used to simulate flow and bacteria densities for use in estimating existing bacteria mass loads to the impaired waterbodies under the critical conditions. 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. The simulated flow from the models and the numeric targets were used in estimating the allowable bacteria mass loads (i.e., mass-load based TMDLs) that could be assimilated by the impaired waterbodies. The estimated existing mass loads were compared to the calculated mass-load based TMDLs, and the difference between the two were quantified as the mass load reductions needed to meet the numeric targets in the receiving waters, which are based on the numeric indicator bacteria WQOs and allowable exceedance frequency.

Although allocations are distributed to the dischargers of bacteria identified in the technical TMDL analysis, this does not imply that other potential sources do not exist. Any potential sources in the watersheds not receiving an explicit allocation (i.e., WLA = 0 or LA = 0) described in the technical TMDL analysis is not expected or allowed to discharge bacteria to the impaired beaches and creeks.

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

8.1 Wet Weather Mass Loading Analysis

The LSPC model (see Appendix J) was used to estimate existing bacteria mass loads at critical conditions for comparison to allowable bacteria mass loads calculated based on the 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 numeric targets are met in impaired waterbodies during wet weather events, a critical period associated with extreme wet conditions was selected for the wet weather mass-load based 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 92^{nd} 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 Mass Load Estimation

Estimation of "existing" mass loading and "allowable" mass loading (i.e., mass-load based TMDL) ~~current loading~~ to the impaired waterbodies required use of the model to predict flows and bacteria densities under critical conditions. 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
San Joaquin Hills HSA/Laguna Beach HSA ~~Laguna/San Joaquin~~	69
Aliso HSA~~Aliso Creek~~	69
Dana Point HSA~~Dana Point~~	69
Lower San Juan HSA~~San Juan Creek~~	76
San Clemente HA~~San Clemente~~	73
San Luis Rey HU~~San Luis Rey River~~	90
San Marcos HA~~San Marcos~~	49
San Dieguito HU~~San Dieguito River~~	98
Miramar Reservoir HA~~Miramar~~	94
Scripps HA~~Scripps~~	57
Tecolote HA	57
Mission San Diego HSA/Santee HSA~~San Diego River~~	86
Chollas HSA~~Chollas Creek~~	65

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

8.1.3 Identification of Allowable Wet Weather Exceedance Days

The numeric targets used to ~~estimate both interim and final~~ calculate the wet weather mass-load based TMDLs is discussed in section 4.1.4 ~~4.1.2~~. ~~For the interim period,~~ For the calculation of the wet weather mass-load based TMDLs, these numeric targets include a 22 percent allowable exceedance frequency. This exceedance frequency is used to identify the number of allowable exceedance days during the critical period. The allowable exceedance days, or 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 by these TMDLs ~~in this document~~. Calculations of the allowable exceedance days for each watershed were performed by multiplying the allowable exceedance frequency (22 percent or 0.22) by the number of wet days for the critical period, as presented in Table 8-1 ~~(Table 8-1)~~. For example, the number of allowable exceedance days for the Aliso HSA watershed is 22 percent of 69 wet days during the critical period, which is equal to 15 allowable exceedance days during the critical period. The resulting number of allowable exceedance days for each watershed is listed in Table 8-2.

Table 8-2. Allowable Wet Weather Exceedance Days in the Critical Period (1993) for Watersheds Affecting Impaired Waterbodies

Watershed	**Number of Allowable Wet Exceedance Days**
San Joaquin Hills HSA/Laguna Beach HSA	15
Aliso HSA	15
Dana Point HSA	15
Lower San Juan HSA	17
San Clemente HA	16
San Luis Rey HU	20
San Marcos HA	11
San Dieguito HU	22
Miramar Reservoir HA	21
Scripps HA	13
Tecolote HA	13
Mission San Diego HSA/Santee HSA	19
Chollas HSA	14

8.1.4 Critical Points for Wet Weather Mass-Load Based TMDL Calculation

~~TMDLs and existing loads were calculated from modeled flow and bacteria densities~~ The existing mass loads and mass-load based TMDLs were calculated 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~~ the wet weather mass load calculation was identical for both impaired beaches and impaired creeks, one critical point was identified for each watershed. The critical point in the wet weather 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 mass loads discharged from the watersheds ~~to the ocean~~, compliance with ~~WQOs~~

TMDLs in the receiving waters 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 Wet Weather Mass-Load Based TMDLs*

For each modeled subwatershed discharging to an impaired waterbody (subwatersheds and proximity to impaired waterbodies are shown in Appendix E), existing wet weather mass loads were compared to mass-load based 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 mass loads to be compared to interim and final the numeric targets. Load-duration curves for each modeled watershed are provided in Appendix O. 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 mass loads. This is due to model predicted flows or bacterial concentrations densities 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 mass load and mass-load based TMDL calculations as described below.

1. Calculation of allowable mass-load based on numeric targetsREC-1 single sample maximum WQO – daily flows were multiplied by the representative numeric targets REC-1 single sample maximum WQO to create a "numeric target line" across the load-duration curves;
2. Calculation of daily exceedance existing mass loads – daily existing loads (colored bars) for the wet weather days in the critical period (1993) were ranked based on their associated flow percentile; daily loads above the numeric target line are in exceedance of the numeric target REC-1 single sample maximum WQO, while loads below the numeric target line do not cause the numeric target REC-1 single sample maximum WQO to be exceeded;
3. Calculation Determination of the allowable exceedance mass 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 as the blue bar segments above the numeric target line in the load-duration curves). The number of allowable exceedance days was equal to 22 percent of the wet days during the critical period of 1993 for each watershed (see Table 8-2);
4. Calculation of non-allowable exceedance mass loads - sum of the daily loads exceeding the numeric targets minus allowable exceedance loads from Step 3 (shown as the patterned bar segments above the numeric target line); and
5. Calculation of the required annual load reduction - total calculated existing mass load (sum of all the colored bar segments above and below the numeric target line) minus allowable mass loads (sum of bar segments below numeric target line and blue bar segments above numeric target line), equal to the non-allowable exceedance mass loads from Step 4. non-allowable exceedance load minus allowable loads.

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

For the San Diego River wet weather mass-load based TMDLs, the wasteload from the Padre Dam waste water discharge was added to the load calculated from the flow duration curves. The Padre Dam facility discharges effluent pursuant to San Diego Water Board Order No. R9-2003-0179, Waste Discharge Requirements for the discharge of effluent to the San Diego River. These requirements allow the Padre Dam facility to discharge 2.0 million gallons per day of tertiary treated municipal wastewater to the San Diego River. These discharges have bacteria MPN limits for fecal coliform.

According to Order No. R9-2003-0179, the "fecal coliform concentration based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml." This is consistent with the REC-1 water quality standard for fecal coliform in the Basin Plan.

At a rate of 2.0 million gallons per day, the associated average permitted yearly discharge of fecal coliform is 5,526 billion MNP per year. Accordingly, the waste load allocation for the Padre Dam facility is 5,526 billion MNP per year. Padre Dam's bacterial discharges do not contribute to the San Diego River bacterial impairment because Padre Dam's effluent is required to meet the REC-1 water quality standard.

In order to distribute this yearly wasteload into the appropriate wet and dry weather allocations, the wet and dry weather days for the 1993 critical period were utilized to apportion the load. In 1993, there were 86 wet days and 279 dry days in the San Diego River Watershed. Therefore, the wet weather WLA is (5,526 billion MNP per year) x (86/365) = 1,302 billion MNP per year. The dry weather WLA is (5,526 billion MNP per year) x (279/365) = 4,224 billion MNP per year, or 461 billion MNP per month.

8.1.6 Allocation of Wet Weather Bacteria Mass Loads to Point and Nonpoint Sources

The mass-load based 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 natural and wildlife sources. For each watershed, wasteload allocations (WLAs) were developed for municipal discharges and Caltrans discharges from urban lands.[23] Load allocations (LAs) were developed for controllable nonpoint source discharges that include agricultural land uses (i.e., agriculture, horse ranches, dairies/intensive livestock) ~~and livestock facilities~~. Finally, ~~load allocations~~ LAs 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~~ WLAs were developed for the municipalities and Caltrans for each watershed. The wet weather WLAs ~~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 wet weather load. The rationale and methodology for distributing the WLAs ~~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 activities that generate bacteria pollutant loads on these ~~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).

[23] The dry and wet weather wasteload allocation for discharges from wastewater treatment facilities, also know as publicly owned treatment works (POTWs), is zero. The only exception is Padre Dam whose discharge to the San Diego River is regulated by the San Diego Waterboard and must meet REC-1 permit requirements. Therefore Padre Dam received a wasteload allocation which is based on the effluent limitations of its WDRs, and is included in addition to these TMDLs which are based on urban runoff. Please see section 8.1.5 for further discussion.

In the watersheds ~~affected~~ addressed by these TMDLs, there are four concentrated animal feeding operations (CAFOs) that are regulated as point source discharges under NPDES requirements.[24] 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~~ WLAs 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~~accounted for in the wet weather mass-load based 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 WLAs assigned to point sources and LAs assigned to and nonpoint sources ~~load and wasteload allocations~~ is presented in Appendix I.

8.1.7 Margin of Safety

~~Once TMDLs are calculated, they must be assigned~~ TMDLs must include 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~~ For the wet 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 expected to be protective of beneficial uses during extreme conditions ~~water quality~~. Because of the conservative assumptions that were included in the development of the TMDLs, there was no explicit margin of safety included. Instead, the TMDLs include an implicit margin of safety. ~~Because an implicit margin of saftey was incorporated into the TMDLs, an additional explicit MOS was not required.~~ The following examples describe the conservative assumptions that constitute the implicit MOS for the wet weather TMDLs.

- *Critical Point for Loading Assessments* - For existing mass load and mass-load based TMDL calculations, the water quality is assessed 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

[24] 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*.

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 wWeather 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 REC-1 single-sample maximum WQOs were determined to be most appropriate for calculating the wet weather TMDLs. The numeric targets used for the wet weather mass-load based and concentration based TMDLs are assumed to be conservative by utilizing the most stringent REC-1 single sample maxmimum WQOs contained in the Ocean Plan and/or Basin Plan.
- *Wet wWeather Critical Wet Weather Condition* – The critical wet weather condition was selected based on identification of the wettest year of the 12 years of record (1990 through 2002) included in this technical 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. This resulted in selection of 1993 as the critical wet year for assessment of wet weather mass 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.

8.1.8 Seasonality

Through simulation of an entire critical wet year, daily existing wet weather mass loads were estimated for all seasons of that year and compared to mass-load based 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 wet 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 a separate dry weather modeling approach was used.

8.2 Dry Weather Loading Analysis

The A low-flow, steady state modeling apporach was used to estimate bacteria mass loads during dry weather conditions. The steady-state aspect of the model resulted in estimation of a constant bacteria mass load from each watershed. This mass 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 the dry weather 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 WeatherMass 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 mass loads were assumed constant for all dry days.

For consistency with the wet weather modeling approach, dry days were assessed for the critical wet year, identified as 1993. The dry days in 1993 (365 days minus the wet days in Table 8-1) 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
San Joaquin Hills HSA/Laguna Beach HSA ~~Laguna/San Joaquin~~	296
Aliso HSA~~Aliso Creek~~	296
Dana Point HSA~~Dana Point~~	296
LowerSan Juan HSA~~San Juan Creek~~	289
San Clemente HA~~San Clemente~~	292
San Luis Rey HU~~San Luis Rey River~~	275
San Marcos HA~~San Marcos~~	316
San Dieguito HU~~San Dieguito River~~	267
Miramar Reservoir HA~~Miramar~~	271
Scripps HA~~Scripps~~	308
Tecolote HA	308
Mission San Diego HSA/Santee HSA ~~San Diego River~~	279
Chollas HSA~~Chollas Creek~~	300

8.2.2 Dry Weather Numeric Targets

Dry weather numeric targets consist of the REC-1 30-day geometric mean WQOs and a zero percent allowable exceedance frequency. ~~These targets are~~ Since the REC-1 30-day geometric mean WQO is an average bacteria density of 5 samples over 30 days, using the 30-day geometric mean in the numeric target is 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 Dry Weather Mass-Load Based TMDL Calculation

Consistent with the approach used for wet weather analysis, the dry weather existing mass loads and mass-load based 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 to calculate the bacteria mass loads discharged from the watersheds ~~for TMDL analysis~~, compliance ~~to WQOs~~ with the TMDLs in the receiving waters must be assessed and maintained for all segments of a waterbody to ensure that impairments of beneficial uses do not occur ~~are not observed~~. Beneficial uses apply throughout all segments of a waterbody.

8.2.4 Calculation of Dry Weather Mass-Load Based 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 existing mass loads based on model-predicted flows multiplied by applicable model-predicted bacteria densities;
2. ~~1.~~ Calculation of the mass-load based TMDLs based on model-predicted flows multiplied by applicable numeric targets; and
3. ~~2.~~ Calculation of required load reductions based on the difference between ~~TMDLs and current~~ existing bacteria mass loads from Step 1 and mass-load based TMDLs from Step 2.

For the San Diego River dry weather mass-load based TMDLs, the wasteload from the Padre Dam discharge was added to the model predicted load. The Padre Dam facility discharges effluent pursuant to San Diego Water Board Order No. R9-2003-179, Waste Discharge Requirements for the discharge of effluent to the San Diego River. These requirements allow the Padre Dam facility to discharge 2.0 million gallons per day of tertiary treated municipal wastewater to the San Diego River. These discharges have bacteria MPN limits for fecal coliform.

According to Order No. R9-2003-179, the "fecal coliform concentration based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml." This is consistent with the REC-1 water quality standard for fecal coliform in the San Diego Basin Plan.

At a rate of 2.0 million gallons per day, the associated average permitted yearly discharge of fecal coliform is 5,526 Billion MNP per year. Accordingly, the waste load allocation for the Padre Dam facility is 5,526 Billion MNP per year. Padre Dam's bacterial discharges do not contribute to the San Diego River bacterial impairment because Padre Dam's effluent meets the REC-1 water quality standard.

In order to distribute this yearly load into the appropriate dry and wet weather allocations, the dry and wet weather days for the 1993 critical period were utilized in order to determine the ration. In 1993, there were 279 dry days and 86 wet days. Therefore, the dry weather WLA is (5,526 Billion MNP per year) x (279/365) = 4,224 Billion MNP per year. The wet weather WLA is (5,526 Billion MNP per year) x (86/365) = 1,302 Billion MNP per year.

8.2.5 Allocation of Wet Weather Bacteria Mass Loads to Point and Nonpoint Sources

Unlike the wet weather approach, for the dry weather approach, the allocation of the dry weather mass-load based TMDLs assumes that no surface runoff discharge to receiving waters occurs from Caltrans, agricultural, or undeveloped land use categories (i.e., $WLA_{Caltrans} = 0$, $LA_{Agriculture} = 0$, and $LA_{OpenSpace} = 0$), meaning the entire dry weather mass-load based TMDL (i.e., allowable mass load) is allocated to Municipal MS4 land use categories (i.e., $WLA_{MS4} = TMDL$). the TMDLs were allocated solely to MS4 discharges as WLAs (no LA component was broken out).[25] 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 assigning dry weather WLAs.

8.2.5 8.2.6 Margin of Safety

As with the wet weather TMDLs, conservative assumptions were made during the development of the dry weather TMDLs. These assumptions are conservative in that they are expected to be protective of beneficial uses during extreme condition. Because of the conservative assumptions that were included in the development of the TMDLs, there was no explicit margin of safety included. Instead, the TMDLs include an implicit 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. Because an implicit margin of safety was incorporated into the TMDLs, an additional explicit MOS was not required. The following examples describe list describes the conservative assumptions that constitute the implicit MOS for the dry weather TMDLs.

- *Critical Point for Loading Assessments* - For existing mass load and mass-load based TMDL calculations, the water quality is assessed at a *critical point* or location in each

[25] For the San Diego River, Padre Dam also received a WLA based on the effluent limitations in its WDRs.

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 wWeather TMDL Numeric Targets* - Because dry weather conditions have flows and bacteria loads much smaller in magnitude than wet weather conditions, do not occur from all land use types, and are more uniform than stormflow, the REC-1 30-day geometric mean WQOs were determined to be most appropriate for the dry weather TMDLs. The numeric targets used for the dry weather mass-load based and concentration based TMDLs are assumed to be conservative by utilizing the most stringent REC-1 30-day geometric mean WQOs contained in the Ocean Plan and/or Basin Plan.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.

8.2.68.2.7 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 (i.e., loading capacity or allowable load) for a specific pollutant and waterbody combination is the total amount of the pollutant of concern that can be assimilated by the receiving waterbody while still achieving water quality standards under all conditions. In California, water quality standards primarily consist of beneficial uses and the water quality objectives (WQOs) that support those uses.[26]

Quantitative numeric targets were selected for development of the TMDLs (see section 4). Numeric targets are selected to implement existing water quality standards. For these TMDLs, the numeric targets were set equal to the numeric WQOs that support the REC-1 and REC-2 beneficial uses with an allowable exceedance frequency. In other words, when the numeric targets are met, the REC-1 and REC-2 beneficial uses should be restored. Of particular note, however, is that while the TMDLs use numeric targets to interpret water quality standards, *TMDLs are not water quality standards*.

~~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~~ The TMDL is set equal to the sum of individual wasteload 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:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

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. The San Diego Water Board is responsible for incorporating the WLAs and LAs into the enforceable regulatory mechanisms that are available to compel controllable sources to reduce their pollutant loads. Controllable sources are responsible for taking actions to reduce their pollutant loads to meet their assigned WLAs or LAs. When all the regulated controllable sources meet their assigned WLAs and LAs, and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies) are also met in the receiving waters, compliance with the TMDLs will be achieved.

~~In the case of beaches and creeks in the San Diego Region, applicable WQOs are designed to protect the REC-1 beneficial use. 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)].~~

[26] Water quality standards in California also include an anti-degradation policy.

For this project, TMDLs are expressed as number of bacteria colonies per month or year (billion MPN/mo or year).[27] 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.

TMDLs can be expressed as mass per time (i.e., mass-loading basis), or other appropriate measure (e.g., as a concentration).[28] For these TMDLs, the wet weather and dry weather TMDLs are expressed both in terms of concentration and on a mass loading basis. The concentration based TMDLs will be used to determine compliance with the TMDLs in the receiving waters. Mass-load based TMDLs were calculated for the impaired waterbodies in each watershed. The mass-load based TMDLs were allocated to the identified point and nonpoint sources and used to identify the controllable sources that need to reduce their bacteria loads in order for the concentration based TMDLs to be met in the receiving waters. The concentration based TMDLs, mass-load based TMDLs, and allocations are discussed below.

9.1 Concentration Based TMDLs

The wet weather and dry weather concentration based TMDLs are based on meeting the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies) in the receiving waters. The numeric WQOs for REC-1 beneficial uses are the basis of the numeric targets used to calculate the TMDLs, expressed as number of bacteria colonies per volume. An allowable exceedance frequency is included as part of the numeric target to allow for exceedances that may be caused by natural sources, based on a reference system. Tables 9-1 and 9-3 summarize the concentration based TMDLs, which are expressed as numeric objectives and allowable exceedance frequencies in the receiving waters for each watershed, for wet weather and dry weather, respectively. Meeting the concentration based TMDLs in the receiving waters will be used to determine compliance with the TMDLs.

9.2 Mass-Load Based TMDLs

The numeric targets were used to calculate the TMDLs on a mass loading basis under a set of critical conditions. The TMDLs that were calculated in terms of mass loading were used to identify the bacteria loads from controllable sources that need to be reduced in order for the numeric targets to be met in the receiving waters.

On a mass loading basis, TMDLs are defined as the maximum mass of a pollutant the waterbody can receive and still protect the designated beneficial uses. Separate mass-load based TMDLs were calculated for wet weather and dry weather conditions to account for seasonal variations,

[27] Although load and wasteload allocations for most constituents are usually expressed as loads, the wasteload allocations 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 load and wasteload allocations expressed 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.

[28] Code of Federal Regulations Title 40 section 130.2(1) [40CFR130.2(1)]

and because the transport mechanism, flow, and bacteria loads are different between dry and wet weather conditions.

On a mass-loading basis, the TMDLs are expressed as number of bacteria colonies per unit time. In order for bacteria loading to be calculated, both flow rates and bacteria densities must be measured at a point in time and location. When multiplied together, these two parameters result in bacteria mass loading, or the number of bacteria colonies measured per unit time.

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

~~Determination of bacteria loading cannot take place solely in the wavewash, since flow measurements cannot be obtained there. Estimation of bacteria loading from the watersheds to determine compliance with the TMDLs may or may not be required from dischargers, depending on how practically and effectively it can be done. 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.~~

The wet weather mass-load based TMDLs are expressed as "annual loads" in terms of number of bacteria colonies per year (billion MPN/yr). The dry weather mass-load based TMDLs are expressed as "monthly loads" in terms of number of bacteria colonies per month (billion MPN/mth).

~~9.1~~9.3 Summary of Technical Approach for Mass-Load Based TMDL Calculations

Calibrated models were used to simulate flow and bacteria densities. This information was used to calculate the "existing" bacteria mass loads to, and allowable mass loads (i.e., mass-load based TMDLs) for, each impaired segment. The existing mass loads that were calculated represent the worst case flows and bacteria densities that are expected from the watershed during the critical wet year. The mass-load based TMDLs were calculated based on the flows expected during the critical wet year and the numeric targets. Existing mass loads were compared to the mass-load based TMDLs. The difference between the existing mass loads and the mass-load based TMDLs is the load reduction required to meet the numeric targets in the receiving waters.

For each watershed containing an impaired waterbody, existing mass loads and mass-load based TMDLs were calculated ~~based on modeled flow and bacteria density at the model~~ at a critical point for both wet weather events and dry weather conditions during a critical wet year. The calculations and technical approaches were different for the two conditions.

~~9.1.1~~9.3.1 Summary of Wet Weather Mass-Load Based TMDL Calculations

For wet weather, TMDLs were calculated ~~for interim and final periods~~, and allocations were divided among point source dischargers and nonpoint source dischargers. The mass-load based 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 numeric targets used to calculate the wet weather mass-load based TMDLs utilized the single sample maximum component of the REC-1 WQOs and a 22 percent allowable exceedance frequency.

Interim TMDLs were calculated using interim numeric targets. Final TMDLs were calculated using final numeric targets, i.e., numeric targets equal to the WQOs protective of the REC-1 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, the USEPA requires that final TMDLs 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.[29] The only wet weather point sources identified to affect impaired waterbodies addressed in this study were MS4s (municipal and Caltrans), 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 mass loads estimated from computer modeling the wet weather modeling approach were solely the result of watershed runoff, not other types of point sources. WLAs were assigned to municipalities and Caltrans. The exception to this is the San Diego River wet weather mass-load based TMDLs where a WLA was assigned to the Padre Dam facility as previously described.

TMDLs must also include LAs for each nonpoint source. LAs were divided into controllable and uncontrollable categories. Controllable sources include discharges from agriculture land uses, 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.

In general, controllable point and nonpoint sources generating less than 5 percent of the total loads (e.g., Caltrans and/or Agriculture) were assigned wet weather WLAs and LAs equal to their existing loads, resulting in no load reduction requirements. While they are not required to reduce their existing loads, this means, however, that these sources are not allowed to increase their loads over time, and cannot cause exceedances of the numeric WQOs in the receiving waters.

[29] Code of Federal Regulations Title 40 section 130.7 [40 CFR 130.7]

For the wet weather mass-load based TMDLs, the Caltrans WLAs (which generates less than 5 percent of the total load in all watersheds) and Open Space LAs (which are uncontrollable) were set equal to the existing wet weather mass loads, thus load reductions are not required. The remaining portions of the wet weather mass-load based TMDLs were assigned to Municipal MS4 WLAs and Agriculture LAs. In watersheds where the bacteria load from Agriculture land uses were less than 5 percent of the total existing wet weather load, the wet weather Agriculture LAs were set equal to the existing wet weather load, and no load reductions were required. Required load reductions were calculated for Municipal MS4s to achieve the wet weather Municipal MS4 WLAs, and for Agriculture land uses, in watersheds where the existing wet weather loads for all indicator bacteria were more than 5 percent of total existing wet weather load, to achieve the wet weather Agriculture LAs.

Because the wet weather modeling approach used to calculate the mass-load based TMDLs, WLAs, LAs, and existing wasteloads and loads were based on critical conditions (i.e., worst case loading scenario), the mass loading numbers (i.e., existing mass loads, and mass-load based TMDLs, WLAs, and LAs expressed in terms of billion MPN/year) presented in Tables 9-1 and 9-2a through 9-2c represent conservative mass-load estimates expected to be protective of the beneficial uses under extreme conditions. The mass loading numbers also provide a tool for identifying bacteria sources that need to be controlled and existing bacteria loads that need to be reduced to meet the TMDLs in the receiving waters.

Ultimately, controllable point and nonpoint sources must reduce their anthropogenic loads so the wet weather concentration based TMDLs, which are based on the numeric REC-1 WQOs in the Basin Plan and allowable exceedance frequencies, can be met during wet weather conditions during each year. Meeting the wet weather numeric targets in the discharge and/or receiving water will indicate the wet weather TMDLs, WLAs, and/or LAs have been met.

~~9.1.2~~9.3.2 *Summary of Dry Weather Mass-Load Based TMDL Calculations*

For dry weather, TMDLs were calculated ~~for interim and final periods~~, and allocations were assigned solely to point source dischargers. Available data show that exceedances of REC-1 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. The numeric targets used to calculate the dry weather TMDLs utilized the REC-1 geometric mean WQOs and a 0 percent allowable exceedance frequency. ~~Interim and final TMDLs were identical for fecal coliform, enterococci, and total coliform (no reference system approach was used) and were calculated using the REC-1 WQOs as numeric targets. 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 and in the San Diego River watershed, for the Padre Dam facility. The only dry weather point sources identified to affect impaired waterbodies addressed in this study were MS4s (municipal), although other point sources of bacteria exist (such as CAFOs or POTWs). In the San Diego River watershed, the Padre Dam facility, which has its own NPDES requirements, was also identified as a dry weather point source. USEPA's permitting regulations require municipalities to obtain NPDES requirements for all urban runoff discharges from MS4s. The existing mass loads estimated from computer modeling the wet weather modeling approach 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 assigned 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. This is because land uses associated with nonpoint sources are not expected to discharge bacteria to receiving waters during dry weather conditions. Because Caltrans is not assigned a WLA and controllable nonpoint sources are not assigned LAs, discharge of pollutants is not expected, nor allowed, under the dry weather TMDLs. TMDLs and associated WLAs and LAs are presented in Tables 9-1 through 9-10.

Because the dry weather modeling approach used to calculate the mass-load based TMDLs, WLAs, LAs, and existing wasteloads and loads were based on critical conditions (i.e., worst case loading scenario), the mass loading numbers (i.e., existing loads, TMDLs, WLAs and LAs expressed in terms of billion MPN/month) presented in Tables 9-3 and 9-4a through 9- represent conservative mass-load estimates expected to be protective of the beneficial uses under extreme conditions. The mass loading numbers also provide a tool for identifying bacteria sources that need to be controlled and existing bacteria loads that need to be reduced to meet the TMDLs in the receiving waters.

Ultimately, controllable point and nonpoint sources must reduce their anthropogenic loads so the dry weather concentration based TMDLs, which are based on the numeric REC-1 WQOs in the Basin Plan and allowable exceedance frequencies, can be met during dry weather conditions during each year. Meeting the dry weather numeric targets in the discharge and/or receiving water will indicate the dry weather TMDLs, WLAs, and/or LAs have been met.

Table 9-1. Summary of Wet Weather Numeric Targets and Existing and Allowable Indicator Bacteria Loads

Watershed - Impaired Waterbody	Indicator Bacteria	Existing Bacteria Load (Billion MPN/year)	Single Sample Maximum Objective (MPN/100mL)	Allowable Numeric Objective Load (Billion MPN/year)	Total Wet Days in Critical Year	Allowable Exceedance Frequency	Allowable Wet Exceedance Days in Critical Year	Allowable Exceedance Load (Billion MPN/year)	TotalAllowable Load [=TMDL] (Billion MPN/year)
San Joaquin Hills HSA (901.11) **and Laguna Hills HSA** (901.12) - Pacific Ocean Shoreline	Fecal Coliform	705,015	**400**	16,043	69	**22%**	15	648,591	664,634
	Total Coliform	8,221,901	**10,000**	401,049				7,044,601	7,445,649
	Enterococcus	852,649	**104**	4,175				778,624	782,799
Aliso HSA (901.13) - Pacific Ocean Shoreline - Aliso Creek - Aliso Creek mouth	Fecal Coliform	1,752,096	**400**	84,562	69	**22%**	15	1,494,512	1,579,073
	Total Coliform	23,210,774	**10,000**	2,109,600				18,081,198	20,190,798
	Enterococcus	2,230,206	**104***	22,682				1,929,834	1,952,517
		2,230,206	**61**	13,644				1,937,321	1,950,964
Dana Point HSA (901.14) - Pacific Ocean Shoreline	Fecal Coliform	403,911	**400**	14,894	69	**22%**	15	362,419	377,313
	Total Coliform	6,546,962	**10,000**	372,328				5,659,144	6,031,472
	Enterococcus	501,526	**104**	3,875				458,431	462,306
Lower San Juan HSA (901.27) - Pacific Ocean Shoreline - San Juan Creek - San Juan Creek mouth	Fecal Coliform	15,304,790	**400**	358,410	76	**22%**	17	14,356,423	14,714,833
	Total Coliform	130,258,863	**10,000**	8,947,114				113,932,076	122,879,189
	Enterococcus	12,980,098	**104***	95,357				12,063,781	12,159,138
		12,980,098	**61**	56,119				12,096,327	12,152,446
San Clemente HA (901.30) - Pacific Ocean Shoreline	Fecal Coliform	1,441,723	**400**	36,481	73	**22%**	16	1,342,450	1,378,931
	Total Coliform	16,236,606	**10,000**	911,994				14,235,609	15,147,603
	Enterococcus	1,663,100	**104**	9,491				1,553,696	1,563,187
San Luis Rey HU (903.00) - Pacific Ocean Shoreline	Fecal Coliform	33,120,012	**400**	640,595	90	**22%**	20	31,803,647	32,444,242
	Total Coliform	231,598,677	**10,000**	15,993,384				208,157,151	224,150,535
	Enterococcus	18,439,920	**104**	167,152				17,296,466	17,463,618
San Marcos HA (904.50) - Pacific Ocean Shoreline	Fecal Coliform	20,886	**400**	1,559	49	**22%**	11	15,665	17,224
	Total Coliform	515,278	**10,000**	38,984				386,099	425,083
	Enterococcus	40,558	**104**	406				32,559	32,966
San Dieguito HU (905.00) - Pacific Ocean Shoreline	Fecal Coliform	21,286,910	**400**	425,968	98	**22%**	22	20,675,680	21,101,649
	Total Coliform	163,541,133	**10,000**	10,637,225				149,176,959	159,814,184
	Enterococcus	14,796,210	**104**	113,253				14,193,834	14,307,087
Miramar Reservoir HA (906.10) - Pacific Ocean Shoreline	Fecal Coliform	10,392	**400**	312	94	**22%**	21	9,943	10,256
	Total Coliform	212,986	**10,000**	7,809				202,371	210,180
	Enterococcus	11,564	**104**	81				11,323	11,405

Table 9-1. Summary of Wet Weather Numeric Targets and Existing and Allowable Indicator Bacteria Loads (Cont'd)

Watershed - Impaired Waterbody	**Indicator Bacteria**	**Existing Bacteria Load (Billion MPN/year)**	**Single Sample Maximum Objective** (MPN/100mL)	**Allowable Numeric Objective Load (Billion MPN/year)**	**Total Wet Days in Critical Year**	**Allowable Exceedance Frequency**	**Allowable Wet Exceedance Days in Critical Year**	**Allowable Exceedance Load (Billion MPN/year)**	**TotalAllowable Load [=TMDL] (Billion MPN/year)**
Scripps HA (906.30)	Fecal Coliform	204,057	**400**	10,329				166,578	176,907
- Pacific Ocean Shoreline	Total Coliform	5,029,519	**10,000**	258,228	57	**22%**	13	4,098,745	4,356,973
	Enterococcus	377,839	**104**	2,686				321,347	324,032
Tecolote HA (906.50)	Fecal Coliform	261,966	**400**	25,080				204,241	229,322
- Tecolote Creek	Total Coliform	7,395,789	**10,000**	626,414	57	**22%**	13	5,753,355	6,379,770
	Enterococcus	708,256	**104***	6,522				597,659	604,180
		708,256	**61**	3,825				599,936	603,761
Mission San Diego HSA (907.11)	Fecal Coliform	4,932,380	**400**	310,820				4,370,018	4,680,838
and Santee HSA (907.12)	Total Coliform	72,757,569	**10,000**	7,752,284	86	**22%**	19	58,352,938	66,105,222
- Forrester Creek - San Diego River (lower)	Enterococcus	7,255,759	**104***	80,899				6,514,309	6,595,208
- Pacific Ocean Shoreline		7,255,759	**61**	47,479				6,543,487	6,590,966
Chollas HSA (908.22)	Fecal Coliform	603,863	**400**	55,516				464,924	520,440
- Chollas Creek	Total Coliform	15,390,608	**10,000**	1,386,037	65	**22%**	14	11,861,589	13,247,626
	Enterococcus	1,371,972	**104***	15,008				1,138,590	1,153,599
		1,371,972	**61**	9,073				1,143,572	1,152,645

* Total Maximum Daily Load calculated using a Enterococcus numeric target of 61 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for freshwater creeks and downstream beaches. If the usage frequency of the freshwater creeks can be established as "moderately to lightly used" in the Basin Plan, alternative Total Maximum Daily Loads calculated using an Enterococcus numeric target of 104 MPN/ml may be used.

Existing Bacteria Load = Predicted existing bacteria load discharged from the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993

Single Sample Maximum Objective = Target bacteria densities based on numeric single sample maximum water quality objectives that are protective of REC-1 beneficial uses
Allowable Numeric Objective Load = Allowable load from the watershed calculated by the LSPC model using modeled flows and the numeric single sample maximum water quality objective bacteria densities for all wet days during the critical year 1993

Total Wet Days in Critical Year = Number of wet days (i.e., rainfall events of 0.2 inches or greater and the following 72 hours) in the critical year 1993 (i.e., wettest year between 1990 and 2002)
Allowable Exceedance Frequency = Assumed to be 22 percent exceedance frequency. In the calculation of the wet weather TMDLs, the San Diego Regional Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. The 22 percent allowable exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Regional Board.
Allowable Wet Exceedance Days = (Total Wet days in Critical Year) X (Allowable Exceedance Frequency)
Allowable Exceedance Load = Sum of exceedance loads from the allowable exceedance days with the highest exceedance loads calculated by the LSPC model using modeled flows and bacteria densities for all wet days during the critical year 1993

Total Allowable Load [i.e. TMDL] = (Allowable Numeric Objective Load) + (Allowable Exceedance Load)

Table 9-2a. Wet Weather Fecal Coliform Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Annual Loads (Billion MPN/year)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	705,015	664,634	77,548	37,167	52.07%	179	179	0.00%	7,346	7,346	0.00%	619,942	619,942	0.00%
Aliso HSA (901.13)	1,752,096	1,579,073	650,092	477,069	26.62%	260	260	0.00%	26,508	26,508	0.00%	1,075,237	1,075,237	0.00%
Dana Point HSA (901.14)	403,911	377,313	179,043	152,446	14.86%	13	13	0.00%	0	0	0.00%	224,854	224,854	0.00%
Lower San Juan HSA (901.27)	15,304,790	14,714,833	1,326,469	1,156,419	12.82%	1,713	1,713	0.00%	3,275,477	2,855,570	12.82%	10,701,131	10,701,131	0.00%
San Clemente HA (901.30)	1,441,723	1,378,931	255,445	192,653	24.58%	335	335	0.00%	366	366	0.00%	1,185,577	1,185,577	0.00%
San Luis Rey HU (903.00)	33,120,012	32,444,242	943,501	914,026	3.12%	1,537	1,537	0.00%	20,687,954	20,041,659	3.12%	11,487,019	11,487,019	0.00%
San Marcos HA (904.50	20,886	17,224	8,095	6,558	18.98%	8	8	0.00%	11,199	9,073	18.98%	1,585	1,585	0.00%
San Dieguito HU (905.00)	21,286,910	21,101,649	810,008	798,175	1.46%	1,310	1,310	0.00%	11,872,240	11,698,811	1.46%	8,603,352	8,603,352	0.00%
Miramar Reservoir HA (906.10)	10,392	10,256	6,839	6,703	1.99%	0	0	0.00%	0	0	0.00%	3,552	3,552	0.00%
Scripps HA (906.30)	204,057	176,907	128,403	101,253	21.14%	0	0	0.00%	0	0	0.00%	75,654	75,654	0.00%
Tecolote HA (906.5)	261,966	229,322	159,449	126,806	20.47%	553	553	0.00%	0	0	0.00%	101,963	101,963	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	4,932,380 +1,302**	4,680,838 +1,302*	472,660	221,117	53.22%	1,009	1,009	0.00%	414,721	414,721	0.00%	4,043,991	4,043,991	0.00%
Chollas HSA (908.22)	603,863	520,440	335,901	252,479	24.84%	892	892	0.00%	0	0	0.00%	267,070	267,070	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the single sample maximum WQO for fecal coliform (400 MPN/100mL) and a 22 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.
** Permitted existing fecal coliform bacteria load from Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), assigned as a separate point source wasteload allocation for discharges from Padre Dam equal to the permitted existing load
Watershed Existing Load = Predicted existing fecal coliform bacteria loads discharged from all land use categories in the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed on an annual basis
MS4 Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the LSPC model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)
Caltrans Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Caltrans land use areas in the watershed calculated as a fraction of the discharge from industrial/transportation land use category area
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)
Agriculture Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) calculated by the LSPC model
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to Agriculture Existing Load in watersheds with existing bacteria load contributions for all three indicator bacteria of less than 5 percent; calculated as a relative load percent of the TMDL minus Caltrans WLA and Open Space LA, based on existing load contributions from MS4 and Agriculture land use categories in watersheds with existing bacteria load contributions for all three indicator bacteria of greater than 5 percent
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)
Open Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) calculated by the LSPC model
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-2b. Wet Weather Total Coliform Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Annual Loads (Billion MPN/year)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	8,221,901	7,445,649	1,656,904	880,652	46.85%	7,722	7,722	0.00%	50,774	50,774	0.00%	6,506,501	6,506,501	0.00%
Aliso HSA (901.13)	23,210,774	20,190,798	11,943,241	8,923,264	25.29%	11,003	11,003	0.00%	179,828	179,828	0.00%	11,076,702	11,076,702	0.00%
Dana Point HSA (901.14)	6,546,962	6,031,472	3,919,497	3,404,008	13.15%	634	634	0.00%	0	0	0.00%	2,626,830	2,626,830	0.00%
Lower San Juan HSA (901.27)	130,258,863	122,879,189	19,919,322	16,093,160	19.21%	60,480	60,480	0.00%	18,499,884	14,946,372	19.21%	91,779,178	91,779,178	0.00%
San Clemente HA (901.30)	16,236,606	15,147,603	4,566,742	3,477,739	23.85%	13,534	13,534	0.00%	2,370	2,370	0.00%	11,653,960	11,653,960	0.00%
San Luis Rey HU (903.00)	231,598,677	224,150,535	15,229,456	14,373,954	5.62%	54,508	54,508	0.00%	117,360,800	110,768,160	5.62%	98,953,913	98,953,913	0.00%
San Marcos HA (904.50	515,278	425,083	366,021	298,430	18.47%	533	533	0.00%	122,414	99,809	18.47%	26,311	26,311	0.00%
San Dieguito HU (905.00)	163,541,133	159,814,184	17,406,569	16,660,538	4.29%	47,969	47,969	0.00%	69,551,416	66,570,499	4.29%	76,535,178	76,535,178	0.00%
Miramar Reservoir HA (906.10)	212,986	210,180	174,243	171,436	1.61%	9	9	0.00%	0	0	0.00%	38,734	38,734	0.00%
Scripps HA (906.30)	5,029,519	4,356,973	4,120,310	3,447,764	16.32%	0	0	0.00%	0	0	0.00%	909,209	909,209	0.00%
Tecolote HA (906.5)	7,395,789	6,379,770	6,152,484	5,136,598	16.51%	27,095	27,095	0.00%	0	0	0.00%	1,216,077	1,216,077	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	72,757,569	66,105,222	17,442,867	10,790,520	38.14%	53,141	53,141	0.00%	3,495,960	3,495,960	0.00%	51,765,601	51,765,601	0.00%
Chollas HSA (908.22)	15,390,608	13,247,626	12,023,766	9,880,784	17.82%	45,652	45,652	0.00%	0	0	0.00%	3,321,191	3,321,191	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the single sample maximum WQO for total coliform (10,000 MPN/100mL) and a 22 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

Watershed Existing Load = Predicted existing total coliform bacteria loads discharged from all land use categories in the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed on an annual basis

MS4 Existing Load = Predicted exiting total coliform bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the LSPC model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Predicted exiting total coliform bacteria loads discharged from Caltrans land use areas in the watershed calculated as a fraction of the discharge from industrial/transportation land use category area
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Predicted exiting total coliform bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) calculated by the LSPC model
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to Agriculture Existing Load in watersheds with existing bacteria load contributions for all three indicator bacteria of less than 5 percent; calculated as a relative load percent of the TMDL minus Caltrans WLA and Open Space LA, based on existing load contributions from MS4 and Agriculture land use categories in watersheds with existing bacteria load contributions for all three indicator bacteria of greater than 5 percent
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Predicted exiting total coliform bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) calculated by the LSPC model
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-2c. Wet Weather Enterococci Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Annual Loads (Billion MPN/year)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	852,649	782,799	136,267	66,417	51.26%	365	365	0.00%	3,201	3,201	0.00%	712,816	712,816	0.00%
Aliso HSA (901.13)	2,230,206	1,950,964**	1,014,732	735,490	27.52%	516	516	0.00%	11,245	11,245	0.00%	1,203,713	1,203,713	0.00%
Dana Point HSA (901.14)	501,526	462,306	258,747	219,528	15.16%	25	25	0.00%	0	0	0.00%	242,753	242,753	0.00%
Lower San Juan HSA (901.27)	12,980,098	12,152,446**	1,900,520	1,385,094	27.12%	2,823	2,823	0.00%	1,151,266	839,040	27.12%	9,925,490	9,925,490	0.00%
San Clemente HA (901.30)	1,663,100	1,563,187	395,581	295,668	25.26%	635	635	0.00%	148	148	0.00%	1,266,736	1,266,736	0.00%
San Luis Rey HU (903.00)	18,439,920	17,463,618	1,472,296	1,300,235	11.69%	2,397	2,397	0.00%	6,881,755	6,077,514	11.69%	10,083,473	10,083,473	0.00%
San Marcos HA (904.50	40,558	32,966	29,784	23,771	20.19%	26	26	0.00%	7,825	6,246	20.19%	2,923	2,923	0.00%
San Dieguito HU (905.00)	14,796,210	14,307,087	1,911,170	1,763,603	7.72%	2,288	2,288	0.00%	4,423,566	4,082,010	7.72%	8,459,187	8,459,187	0.00%
Miramar Reservoir HA (906.10)	11,564	11,405	8,269	8,109	1.93%	0	0	0.00%	0	0	0.00%	3,295	3,295	0.00%
Scripps HA (906.30)	377,839	324,032	285,842	232,035	18.82%	0	0	0.00%	0	0	0.00%	91,997	91,997	0.00%
Tecolote HA (906.5)	708,256	603,761**	575,708	471,211	18.15%	1,266	1,266	0.00%	0	0	0.00%	131,284	131,284	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	7,255,759	6,590,966*	1,555,411	890,617	42.74%	2,430	2,430	0.00%	213,149	213,149	0.00%	5,484,770	5,484,770	0.00%
Chollas HSA (908.22)	1,371,972	1,152,645**	1,022,245	802,918	21.46%	2,062	2,062	0.00%	0	0	0.00%	347,665	347,665	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the single sample maximum WQO for enterococcus (104 MPN/100mL or 61 MPN/100mL) and a 22 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

** Total Maximum Daily Load calculated using a Enterococcus numeric target of 61 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for freshwater creeks and downstream beaches. If the usage frequency of the ffreshwater creeks can be established as "moderately to lightly used," alternative Total Maximum Daily Loads calculated using an Enterococcus numeric target of 104 MPN/ml presented in Table 9-5 may be used.

Watershed Existing Load = Predicted existing Enterococcus bacteria loads discharged from all land use categories in the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993

Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all lan uses in the watershed on an annual basis

MS4 Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the LSPC model

MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses

MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Caltrans land use areas in the watershed calculated as a fraction of the discharge from industrial/transportation land use category area

Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to Caltrans Existing Load

Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) calculated by the LSPC model

Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to Agriculture Existing Load in watersheds with existing bacteria load contributions for all three indicator bacteria of less than 5 percent; calculated as a relative load percent of the TMDL minus Caltrans WLA and Open Space LA, based on existing load contributions from MS4 and Agriculture land use categories in watersheds with existing bacteria load contributions for all three indicator bacteria of greater than 5 percent

Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) calculated by the LSPC model

Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load

Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load))

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Table 9-3. Summary of Dry Weather Numeric Targets and Existing and Allowable Indicator Bacteria Loads

Watershed - Impaired Waterbody	Indicator Bacteria	Existing Bacteria Load (Billion MPN/mth)	30-Day Geometric Mean Objective (MPN/100mL)	Allowable Numeric Objective Load (Billion MPN/year)	Total Dry Days in Critical Year	Allowable Exceedance Frequency	Allowable Dry Exceedance Days in Critical Year	Allowable Exceedance Load (Billion MPN/mth)	TotalAllowable Load [=TMDL] (Billion MPN/mth)
San Joaquin Hills HSA (901.11) **and Laguna Hills HSA** (901.12) - Pacific Ocean Shoreline	Fecal Coliform	2,741	**200**	227	296	**0%**	0	0	227
	Total Coliform	13,791	**1,000**	1,134				0	1,134
	Enterococcus	2,321	**35**	40				0	40
Aliso HSA (901.13) - Pacific Ocean Shoreline - Aliso Creek - Aliso Creek mouth	Fecal Coliform	5,470	**200**	242	296	**0%**	0	0	242
	Total Coliform	26,639	**1,000**	1,208				0	1,208
	Enterococcus	4,614	**33***	40				0	40
Dana Point HSA (901.14) - Pacific Ocean Shoreline	Fecal Coliform	1,851	**200**	92	296	**0%**	0	0	92
	Total Coliform	9,315	**1,000**	462				0	462
	Enterococcus	1,567	**35**	16				0	16
Lower San Juan HSA (901.27) - Pacific Ocean Shoreline - San Juan Creek - San Juan Creek mouth	Fecal Coliform	6,455	**200**	1,665	289	**0%**	0	0	1,665
	Total Coliform	30,846	**1,000**	8,342				0	8,342
	Enterococcus	5,433	**33***	275				0	275
San Clemente HA (901.30) - Pacific Ocean Shoreline	Fecal Coliform	3,327	**200**	192	292	**0%**	0	0	192
	Total Coliform	16,743	**1,000**	958				0	958
	Enterococcus	2,817	**35**	33				0	33
San Luis Rey HU (903.00) - Pacific Ocean Shoreline	Fecal Coliform	1,737	**200**	1,058	275	**0%**	0	0	1,058
	Total Coliform	8,549	**1,000**	5,289				0	5,289
	Enterococcus	1,466	**35**	185				0	185
San Marcos HA (904.50) - Pacific Ocean Shoreline	Fecal Coliform	149	**200**	26	316	**0%**	0	0	26
	Total Coliform	751	**1,000**	129				0	129
	Enterococcus	126	**35**	5				0	5
San Dieguito HU (905.00) - Pacific Ocean Shoreline	Fecal Coliform	1,631	**200**	1,293	267	**0%**	0	0	1,293
	Total Coliform	7,555	**1,000**	6,468				0	6,468
	Enterococcus	1,368	**35**	226				0	226
Miramar Reservoir HA (906.10) - Pacific Ocean Shoreline	Fecal Coliform	205	**200**	7	271	**0%**	0	0	7
	Total Coliform	1,030	**1,000**	36				0	36
	Enterococcus	173	**35**	1				0	1

Table 9-3. Summary of Dry Weather Numeric Targets and Existing and Allowable Indicator Bacteria Loads (Cont'd)

Watershed - Impaired Waterbody	**Indicator Bacteria**	**Existing Bacteria Load (Billion MPN/mth)**	**30-Day Geometric Mean Objective** (MPN/100mL)	**Allowable Numeric Objective Load (Billion MPN/year)**	**Total Dry Days in Critical Year**	**Allowable Exceedance Frequency**	**Allowable Dry Exceedance Days in Critical Year**	**Allowable Exceedance Load (Billion MPN/mth)**	**TotalAllowable Load [=TMDL] (Billion MPN/mth)**
Scripps HA (906.30)	Fecal Coliform	3,320	**200**	119	308	**0%**	0	0	119
- Pacific Ocean Shoreline	Total Coliform	16,707	**1,000**	594				0	594
	Enterococcus	2,811	**35**	21				0	21
Tecolote HA (906.50)	Fecal Coliform	4,329	**200**	234	308	**0%**	0	0	234
- Tecolote Creek	Total Coliform	21,349	**1,000**	1,171				0	1,171
	Enterococcus	3,657	**33***	39				0	39
Mission San Diego HSA (907.11)	Fecal Coliform	4,928	**200**	1,506	279	**0%**	0	0	1,506
and Santee HSA (907.12)	Total Coliform	28,988	**1,000**	7,529				0	7,529
- Forrester Creek (lower 1 mile) - San Diego River (lower 6 miles) - Pacific Ocean Shoreline	Enterococcus	4,106	**33***	248				0	248
Chollas HSA (908.22)	Fecal Coliform	5,068	**200**	398	300	**0%**	0	0	398
- Chollas Creek	Total Coliform	25,080	**1,000**	1,991				0	1,991
	Enterococcus	4,283	**33***	66				0	66

* Total Allowable Load [=TMDL] calculated using a Enterococcus numeric target of 33 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for watersheds with impaired freshwater creeks.

Existing Bacteria Load = Predicted existing bacteria load discharged from the watershed calculated by the plug-flow reactor model using estimated flows and bacteria densities for 30 dry days during the critical year 1993

30-Day Geometric Mean Objective = Target bacteria densities based on numeric 30-day geometric mean water quality objectives that are protective of REC-1 beneficial uses
Allowable Numeric Objective Load = Allowable load from the watershed calculated by the plug-flow reactor model using estimated flows and the numeric 30-day geometric mean water quality objective bacteria densities for 30 dry days during the critical year 1993

Total Dry Days in Critical Year = Number of dry days (i.e., day not including rainfall events of 0.2 inches or greater and the following 72 hours) in the critical year 1993 (i.e., wettest year between 1990 and 2002)
Allowable Exceedance Frequency = Assumed to be zero; data collected from reference systems generally do not show exceedances of REC-1 water quality objectives
Allowable Wet Exceedance Days = (Total Dry Days in Critical Year) X (Allowable Exceedance Frequency)
Allowable Exceedance Load = Sum of exceedance loads from the allowable exceedance days for all dry days during the critical year 1993

Total Allowable Load [i.e. TMDL] = (Allowable Numeric Objective Load) + (Allowable Exceedance Load) for a 30-day period

Table 9-4a. Dry Weather Fecal Coliform Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Monthly Loads (Billion MPN/month)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	2,741	227	2,741	227	91.72%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Aliso HSA (901.13)	5,470	242	5,470	242	95.58%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Dana Point HSA (901.14)	1,851	92	1,851	92	95.03%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Lower San Juan HSA (901.27)	6,455	1,665	6,455	1,665	74.21%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Clemente HA (901.30)	3,327	192	3,327	192	94.23%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Luis Rey HU (903.00)	1,737	1,058	1,737	1,058	39.09%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Marcos HA (904.50	149	26	149	26	82.55%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Dieguito HU (905.00)	1,631	1,293	1,631	1,293	20.72%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Miramar Reservoir HA (906.10)	205	7	205	7	96.59%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Scripps HA (906.30)	3,320	119	3,320	119	96.42%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Tecolote HA (906.5)	4,329	234	4,329	234	94.59%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	4,928 +461**	1,506 +461*	4,928	1,506	69.44%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Chollas HSA (908.22)	5,068	398	5,068	398	92.15%	0	0	0.00%	0	0	0.00%	0	0	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the 30-day geometric mean WQO for fecal coliform (200 MPN/100mL) and a 0 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

** Permitted existing fecal coliform bacteria load from Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), assigned as a separate point source wasteload allocation for discharges from Padre Dam equal to the permitted existing load

Watershed Existing Load = Predicted existing fecal coliform bacteria loads discharged from all land use categories in the watershed calculated by a plug-flow reactor model using estimated flows and bacteria densities for 30 dry days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed for a 30-day period

MS4 Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the plug-flow reactor model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Fecal coliform bacteria loads discharged from Caltrans land use areas in the watershed assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to the Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Fecal coliform bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to the Open Space Existing Load
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Fecal coliform bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-4b. Dry Weather Total Coliform Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Monthly Loads (Billion MPN/month)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	13,791	1,134	13,791	1,134	91.78%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Aliso HSA (901.13)	26,639	1,208	26,639	1,208	95.47%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Dana Point HSA (901.14)	9,315	462	9,315	462	95.04%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Lower San Juan HSA (901.27)	30,846	8,342	30,846	8,342	72.96%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Clemente HA (901.30)	16,743	958	16,743	958	94.28%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Luis Rey HU (903.00)	8,549	5,289	8,549	5,289	38.13%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Marcos HA (904.50	751	129	751	129	82.82%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Dieguito HU (905.00)	7,555	6,468	7,555	6,468	14.39%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Miramar Reservoir HA (906.10)	1,030	36	1,030	36	96.50%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Scripps HA (906.30)	16,707	594	16,707	594	96.44%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Tecolote HA (906.5)	21,349	1,171	21,349	1,171	94.51%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	28,988	7,529	28,988	7,529	74.03%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Chollas HSA (908.22)	25,080	1,991	25,080	1,991	92.06%	0	0	0.00%	0	0	0.00%	0	0	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the 30-day geometric mean WQO for total coliform (1,000 MPN/100mL) and a 0 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

Watershed Existing Load = Predicted existing total coliform bacteria loads discharged from all land use categories in the watershed calculated by a plug-flow reactor model using estimated flows and bacteria densities for 30 dry days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed for a 30-day period

MS4 Existing Load = Predicted exiting total coliform bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the plug-flow reactor model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Total coliform bacteria loads discharged from Caltrans land use areas in the watershed assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to the Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Total coliform bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to the Open Space Existing Load
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Total coliform bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-4c. Dry Weather Enterococci Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Monthly Loads (Billion MPN/month)

Watershed	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	2,321	40	2,321	40	98.28%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Aliso HSA (901.13)	4,614	40**	4,614	40	99.13%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Dana Point HSA (901.14)	1,567	16	1,567	16	98.98%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Lower San Juan HSA (901.27)	5,433	275**	5,433	275	94.94%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Clemente HA (901.30)	2,817	33	2,817	33	98.83%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Luis Rey HU (903.00)	1,466	185	1,466	185	87.38%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Marcos HA (904.50	126	5	126	5	96.03%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Dieguito HU (905.00)	1,368	226	1,368	226	83.48%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Miramar Reservoir HA (906.10)	173	1	173	1	99.42%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Scripps HA (906.30)	2,811	21	2,811	21	99.25%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Tecolote HA (906.5)	3,657	39**	3,657	39	98.94%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	4,106	248**	4,106	248	93.96%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Chollas HSA (908.22)	4,283	66**	4,283	66	98.46%	0	0	0.00%	0	0	0.00%	0	0	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the 30-day geometric mean WQO for enterococcus (35 MPN/100mL or 33 MPN/100mL) and a 0 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

** Total Maximum Daily Load calculated using a Enterococcus numeric target of 33 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for freshwater creeks and downstream beaches.

Watershed Existing Load = Predicted existing Enterococcus bacteria loads discharged from all land use categories in the watershed calculated by a plug-flow reactor model using estimated flows and bacteria densities for 30 dry days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed for a 30-day period

MS4 Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the plug-flow reactor model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Enterococcus bacteria loads discharged from Caltrans land use areas in the watershed assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to the Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Enterococcus bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to the Open Space Existing Load
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Enterococcus bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

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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 Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)	101 103	52,676	49,474	2,765	52.2%	545	0.0%	16	46,318
Laguna Beach HSA (901.12)	104 105 106	652,339	615,160	34,405	52.2%	6,787	0.0%	196	573,602
Aliso HSA (901.13)	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)	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)	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)	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)	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)	1101	20,886	17,224	6,558	19.1%	9,073	19.0%	8	1,585
San Dieguito HU (905.00)	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)	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)	1501 1503 1505 1507	204,057	176,906	101,262	21.1%	0	0.0%	0	75,644
San Diego HU (907.11) Santee HSA (907.12)	1801	4,933,682[C]	4,682,452[D]	221,233	53.3%	414,813	0.0%	1,045	4,044,058
Chollas HSA (908.22)	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.
[C] The Existing Load is the sum of the model predicted load based on storm water runoff (4,932,380) and the wet weather load allocated to Padre Dam (1,302). Please see section 8.1.5 for further details.
[D] The Total Maximum Daily Load is the sum of the model predicted load based on storm water runoff (4,681,150) and the wet weather load allocated to Padre Dam (1,302). Please see section 8.1.5 for further details.

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 Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)	101 103	52,676	46,318	0	100%	0	100%	0	46,318
Laguna Beach HSA (901.12)	104 105 106	652,339	573,602	0	100%	0	100%	0	573,602
Aliso HSA (901.13)	201 202	1,752,095	1,075,085	0	100%	0	100%	0	1,075,085
Dana Point HSA (901.14)	301 302 304 305 306	403,911	224,857	0	100%	0	100%	0	224,857
Lower San Juan HSA (901.27)	401	15,304,790	10,701,109	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)	501 502 503 504 505 506	1,441,719	1,185,526	0	100%	0	100%	0	1,185,526
San Luis Rey HU (903.00)	701	33,120,012	11,486,020	0	100%	0	100%	0	11,486,020
San Marcos HA (904.50)	1101	20,886	1,585	0	100%	0	100%	0	1,585
San Dieguito HU (905.00)	1301 1302	21,286,909	8,604,169	0	100%	0	100%	0	8,604,169
Miramar Reservoir HA (906.10)	1401	10,392	3,552	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)	1501	204,057	75,644	0	100%	0	100%	0	75,644
	1503								
	1505								
	1507								
San Diego HU (907.11) Santee HSA (907.12)	1801	4,933,682[C]	4,045,360[D]	0	100%	0	100%	0	4,044,058
Chollas HSA (908.22)	1901	603,863	267,028	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.
[C] The Existing Load is the sum of the model predicted load based on storm water runoff (4,932,380) and the wet weather load allocated to Padre Dam (1,302). Please see section 8.1.5 for further details.
[D] The Total Maximum Daily Load is the sum of the model predicted load for Open Space based on storm water runoff (4,044,058) and the wet weather load allocated to Padre Dam (1,302). Please see section 8.1.5 for further details.

Table 9-3. 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)	101 103	511	16	16	96.9%
Laguna Beach HSA (901.12)	104 105 106	2,230	211	211	90.5%
Aliso HSA (901.13)	201 202	5,470	242	242	95.6%
Dana Point HSA (901.14)	301 302 304 305 306	1,851	92	92	95.0%
Lower San Juan HSA (901.27)	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. 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)	501 502 503 504 505 506	3,327	192	192	94.2%
San Luis Rey HU (903.00)	701	1,737	1,058	1,058	39.1%
San Marcos HA (904.50)	1101	149	26	26	82.6%
San Dieguito HU (905.00)	1301 1302	1,631	1,293	1,293	20.7%
Miramar Reservoir HA (906.10)	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. 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			
Scripps HA (906.30)	1501 1503 1505 1507	3,320	119	119	96.4%
San Diego HU (907.11) Santee HSA (907.12)	1801	5,389[C]	1,967[D]	1,506	69.4%
Chollas HSA (908.22)	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.
[C] The Existing Load is the sum of the model predicted load based on dry weather runoff (4,928) and the dry weather load allocated to Padre Dam (461). Please see section 8.1.5 for further details.
[D] The Total Maximum Daily Load is the sum of the model predicted load based on dry weather runoff (1,506) and the dry weather load allocated to Padre Dam (461). Please see section 8.1.5 for further details.

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 Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)	101, 103	628,669	567,611	67,154	47.0%	3,884	0.0%	564	497,466
Laguna Beach HSA (901.12)	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)	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)	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)	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)	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)	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)	1101	515,278	425,083	298,420	18.6%	99,848	18.4%	536	26,279
San Dieguito HU (905.00)	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)	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)	1501	5,029,518	4,356,972	3,448,138	16.3%	0	0.0%	0	908,834
	1503								
	1505								
	1507								
San Diego HU (907.11) Santee HSA (907.12)	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)	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)	101, 103	628,669	497,466	0	100%	0	100%	0	497,466
Laguna Beach HSA (901.12)	104, 105, 106	7,593,233	6,008,525	0	100%	0	100%	0	6,008,525
Aliso HSA (901.13)	201, 202	23,210,774	11,076,181	0	100%	0	100%	0	11,076,181
Dana Point HSA (901.14)	301, 302, 304, 305, 306	6,546,962	2,626,641	0	100%	0	100%	0	2,626,641
Lower San Juan HSA (901.27)	401	130,258,863	91,780,395	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)	501 502 503 504 505 506	16,236,540	11,652,965	0	100%	0	100%	0	11,652,965
San Luis Rey HU (903.00)	701	231,598,677	98,962,115	0	100%	0	100%	0	98,962,115
San Marcos HA (904.50)	1101	515,278	38,984	8657	97.6%	2891	97.6%	536	26,279
San Dieguito HU (905.00)	1301 1302	163,541,132	76,537,250	0	100%	0	100%	0	76,537,250
Miramar Reservoir HA (906.10)	1401	212,986	38,742	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)	1501 1503 1505 1507	5,029,518	908,834	0	100%	0	100%	0	908,834
San Diego HU (907.11) Santee HSA (907.12)	1801	72,757,569	51,759,735	0	100%	0	100%	0	51,759,735
Chollas HSA (908.22)	1901	15,390,608	3,321,293	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 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)	101	2,571	78	78	97.0%
	103				
Laguna Beach HSA (901.12)	104	11,220	1,056	1,056	90.6%
	105				
	106				
Aliso HSA (901.13)	201	26,639	1,208	1,208	95.9%
	202				
Dana Point HSA (901.14)	301	9,315	462	462	95.0%
	302				
	304				
	305				
	306				
Lower San Juan HSA (901.27)	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. 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)	501	16,743	958	958	94.3%
	502				
	503				
	504				
	505				
	506				
San Luis Rey HU (903.00)	701	8,549	5,289	5,289	38.1%
San Marcos HA (904.50)	1101	751	129	129	82.7%
San Dieguito HU (905.00)	1301	7,555	6,468	6,468	14.4%
	1302				
Miramar Reservoir HA (906.10)	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. 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			
Scripps HA (906.30)	1501 1503 1505 1507	16,707	594	594	96.4%
San Diego HU (907.11) Santee HSA (907.12)	1801	28,988	7,529	7,529	74.0%
Chollas HSA (908.22)	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)	101, 103	61,351	56,419	4,787	51.4%	227	0.0%	25	51,289
Laguna Beach HSA (901.12)	104, 105, 106	791,298	726,379	61,701	51.4%	2,928	0.0%	316	661,526
Aliso HSA (901.13)	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)	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)	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)	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)	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)	1101	40,558	32,966	23,768	20.3%	25	6,249	20.2%	2,924
San Dieguito HU (905.00)	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)	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)	1501 1503 1505 1507	377,839	324,033	232,029	18.8%	0	0.0%	0	92,004
San Diego HU (907.11) Santee HSA (907.12)	1801	7,255,759	6,591,843	891,519	42.8%	213,319	0.0%	2,376	5,484,628
Chollas HSA (908.22)	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)	101 103	61,351	51,289	0	100%	0	100%	0	51,289
Laguna Beach HSA (901.12)	104 105 106	791,298	661,526	0	100%	0	100%	0	661,526
Aliso HSA (901.13)	201 202	2,230,206	1,203,642	0	100%	0	100%	0	1,203,642
Dana Point HSA (901.14)	301 302 304 305 306	501,525	242,738	0	100%	0	100%	0	242,738
Lower San Juan HSA (901.27)	401	12,980,098	9,925,881	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)	501 502 503 504 505 506	1,663,093	1,266,612	0	100%	0	100%	0	1,266,612
San Luis Rey HU (903.00)	701	18,439,920	10,082,948	0	100%	0	100%	0	10,082,948
San Marcos HA (904.50)	1101	40,558	2,924	0	100%	0	100%	0	2,924
San Dieguito HU (905.00)	1301 1302	14,796,210	8,460,473	0	100%	0	100%	0	8,460,473
Miramar Reservoir HA (906.10)	1401	11,564	3,295	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)	1501	377,839	92,004	0	100%	0	100%	0	92,004
	1503								
	1505								
	1507								
San Diego HU (907.11) Santee HSA (907.12)	1801	7,255,759	5,484,628	0	100%	0	100%	0	5,484,628
Chollas HSA (908.22)	1901	1,371,972	347,658	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. 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)	101	433	3	3	99.4%
	103				
Laguna Beach HSA (901.12)	104	1,888	37	37	98.0%
	105				
	106				
Aliso HSA (901.13)	201	4,614	40	40	99.1%
	202				
Dana Point HSA (901.14)	301	1,567	16	16	99.0%
	302				
	304				
	305				
	306				
Lower San Juan HSA (901.27)	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. 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)	501	2,817	33	33	98.8%
	502				
	503				
	504				
	505				
	506				
San Luis Rey HU (903.00)	701	1,466	185	185	87.4%
San Marcos HA (904.50)	1101	126	5	5	96.4%
San Dieguito HU (905.00)	1301 1302	1,368	226	226	83.4%
Miramar Reservoir HA (906.10)	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. 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)	1501 1503 1505 1507	2,811	21	21	99.3%
San Diego HU (907.11) Santee HSA (907.12)	1801	4,106	248	248	93.9%
Chollas HSA (908.22)	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.

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9.1.39.3.3 Alternative Enterococci Wet Weather TMDLs for Impaired Creeks and Downstream Beaches

As mentioned in section 4, there are different enterococci REC-1 WQOs in the Ocean Plan compared to the Basin Plan. Specifically, the Ocean Plan contains REC-1 single sample maximum and 30-day geometric mean WQOs that apply only to ocean waters. In the Basin Plan, the REC-1 WQOs for enterococci are dependent upon the type (e.g., freshwater or saltwater) and usage frequency (e.g., designated beach, moderately or lightly used area, or infrequently used area) of the waterbody. The enterococci REC-1 WQOs in the Basin Plan only apply to inland surface waters, enclosed bays and estuaries, and coastal lagoons. The enterococci saltwater REC-1 WQOs in the Basin Plan, for waters designated with "designated beach" usage frequency, are the same as the enterococci REC-1 WQOs in the Ocean Plan.

As mentioned in section 4, the freshwater WQOs for enterococci in the Basin Plan can vary, based on frequency of usage of the waterbody. Of the saltwater and various freshwater enterococci REC-1 WQOs in the Basin Plan, the most stringent is the fresh-water REC-1 WQO for the "designated beach" frequency of use (61 MPN/100mL). Therefore, as a conservative approach, the freshwater designated beach REC-1 WQO was used as basis for the numeric targets for the enterococci wet weather TMDLs for four six impaired creeks (San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek and the (lower) San Diego River, and Chollas Creek) and their associated downstream beaches (see Tables 4-2 and 4-3), as applicable.

In comments, the municipal dischargers pointed out that, for the impaired creeks, the "designated beach" usage frequency REC-1 WQO for enterococci may be over-protective of water quality because of the infrequent recreational use in the impaired creeks. They claim that the recreational usage frequency in these creeks more likely corresponds to the "moderately to lightly used area" category in the Basin Plan, which has an enterococci REC-1 WQO of 108 MPN/100mL. In these cases, using a less stringent numeric target, based on the saltwater enterococci REC-1 WQO of 104 MPN/100 mL ("designated beaches" usage frequency) would result in wet weather TMDLs protective of REC-1 uses in the inland freshwater creeks and at the downstream coastal saltwater beaches.[30] Therefore, if the "moderately to lightly used area" usage frequency is appropriate for the four six impaired creeks, and the enterococci saltwater REC-1 single sample maximum WQO of 104 MPN/100 mL should could be used as the basis of the numeric target for the enterococci wet weather TMDLs. Since we do not have the information to make this evaluation, the enterococci TMDLs were calculated using both numeric targets. TMDLs calculated with the 104 MPN/100mL target are presented in Tables 9.11 and 9.12. The dischargers should submit evidence justifying the "moderately to lightly used area" usage frequency for the four impaired creeks before the San Diego Water Board issues orders to implement the TMDLs. Otherwise, we will implement the more stringent enterococci TMDLs

[30] The enterococci WQOs in the Basin Plan are structured to reflect the frequency of recreational use. The enterococci freshwater WQO for a "designated beach" area is 61 MPN/100 mL. For a "moderately or lightly used area," the WQO is 108 MPN/100 mL. The saltwater WQO for "designated beach" area is 104 MPN/100 mL. Where the "moderately or lightly used area" designation is appropriate for creeks, the saltwater WQO of 104 MPN/100 mL could be used as the numeric target because it is also protective of both the freshwater creek and the downstream marine beach.

based on the freshwater "designated beach" usage frequency WQO of 61 MPN/100mL (Tables 9.8 and 9.9)

The six creeks included in these TMDLs, however, have not been designated in the Basin Plan as "moderately to lightly used area" waterbodies as of the adoption of these TMDLs. If the Basin Plan does not specify the usage frequency of a waterbody, the most stringent and conservative WQOs are appropriate and applicable. For enterococci, the most stringent and conservative WQOs for the freshwater creeks are associated with the "designated beach" usage frequency and freshwater waterbody type. Thus, the enterococci WQOs associated with the freshwater "designated beach" usage frequency are applicable until sufficient evidence is provided to warrant an amendment to the Basin Plan that designates a lower usage frequency to one or more of the six creeks addressed by these TMDLs (San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek, San Diego River, and Chollas Creek).

According to the federal regulations,[31] usage frequencies are defined as follows:

- Designated Beach Area: those recreation waters that, during the recreation season, are heavily used (based upon a comparison of use within the state) and may have a lifeguard, bathhouse facilities, or public parking for beach access. States may include any other waters in this category even if the waters do not meet these criteria.

- Moderate Full Body Contact Recreation: those recreation waters that are not designated bathing beach waters but typically, during the recreation season, are used by at least half of the number of people as at typical designated bathing beach waters within the state. States may also include light use or infrequent use coastal recreation waters in this category.

- Lightly Used Full Body Contact Recreation: those recreation waters that are not designated bathing beach waters but typically, during the recreation season, are used by less than half of the number of people as at typical designated bathing beach waters within the state, but are more than infrequently used. States may also include infrequent use coastal recreation waters in this category.

- Infrequently Used Full Body Contact: those recreation waters that are rarely or occasionally used.

If sufficient evidence can be provided to the San Diego Water Board that can demonstrate the usage frequency for one or more of the six impaired creeks falls under the "Lightly Used Full Body Contact Recreation" or "Infrequently Used Full Body Contact" usage frequency, the Basin Plan may be amended to designate one or more of the creeks with the "moderately to lightly used area" usage frequency.

If one or more of the six creeks (San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek, San Diego River, and/or Chollas Creek) are designated in the Basin Plan with the "moderately to lightly used area" usage frequency, the enterococci wet weather TMDLs, WLAs, and LAs based on the 104 MPN/100mL (see Table 9-1 and Table 9-5) will be implemented. Otherwise, the

[31] Code of Federal Regulations Title 40 section 131.41 [40CFR131.41]

more stringent enterococci wet weather TMDLs, WLAs, and LAs based on the freshwater "designated beach" usage frequency WQO of 61 MPN/100mL (see Table 9-1 and Table 9-2c) will be implemented.

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Table 9-5. Alternative Wet Weather Enterococci Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Annual Loads (Billion MPN/year)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
Aliso HSA (901.13)	2,230,206	1,952,517**	1,014,732	737,042	27.37%	516	516	0.00%	11,245	11,245	0.00%	1,203,713	1,203,713	0.00%
Lower San Juan HSA (901.27)	12,980,098	12,159,138**	1,900,520	1,389,261	26.90%	2,823	2,823	0.00%	1,151,266	841,564	26.90%	9,925,490	9,925,490	0.00%
Tecolote HA (906.50)	708,256	604,180**	575,708	471,630	18.08%	1,266	1,266	0.00%	0	0	0.00%	131,284	131,284	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	7,255,759	6,595,208**	1,555,411	894,859	42.47%	2,430	2,430	0.00%	213,149	213,149	0.00%	5,484,770	5,484,770	0.00%
Chollas HSA (908.22)	1,371,972	1,153,599**	1,022,245	803,871	21.36%	2,062	2,062	0.00%	0	0	0.00%	347,665	347,665	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the single sample maximum WQO for enterococcus (104 MPN/100mL) and a 22 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

** Total Maximum Daily Load calculated using a Enterococcus numeric target of 104 MPN/ml protective of the REC-1 "moderately to lightly used area" usage frequency that is protective freshwater creeks and downstream beaches. Acceptable evidence that impaired freshwater creeks can be considered "moderately to lightly used areas" must be provided before these alternative wet weather TMDLs, WLAs, and LAs can be implemented in these watersheds.

Watershed Existing Load Predicted existing Enterococcus bacteria loads discharged from all land use categories in the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed on an annual basis

MS4 Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the LSPC model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = = Predicted exiting Enterococcus bacteria loads discharged from Caltrans land use areas in the watershed calculated as a fraction of the discharge from industrial/transportation land use category area
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) calculated by the LSPC model
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to Agriculture Existing Load in watersheds with existing bacteria load contributions for all three indicator bacteria of less than 5 percent; calculated as a relative load percent of the TMDL minus Caltrans WLA and Open Space LA, based on existing load contributions from MS4 and Agriculture land use categories in watersheds with existing bacteria load contributions for all three indicator bacteria of greater than 5 percent
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) calculated by the LSPC model
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-11. Alternative 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	
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	2,230,206	1,952,516	736,989	27.4%	11,374	0.0%	511	1,203,642
Lower San Juan HSA (901.27) San Juan Creek	401	12,980,098	12,159,138	1,391,334	26.9%	847,520	26.4%	2,941	9,925,881
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach) Santee HSA (907.12) Forrester Creek San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	7,255,759	6,596,073	895,750	42.5%	213,319	0.0%	2,376	5,484,628
Chollas HSA (908.22) Chollas Creek	1901	1,371,972	1,153,598	803,900	21.5%	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 9-12. Alternative 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 (Caltrans)	Load Allocation[B] (Open Space)
		Billion MPN/year				Billion MPN/year		Billion MPN/year	
Aliso HSA (901.13) Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach Aliso Creek	201 202	2,230,206	1,203,642	0	100%	0	100%	0	1,203,642
Lower San Juan HSA (901.27) San Juan Creek	401	12,980,098	9,925,881	0	100%	0	100%	0	9,925,881
San Diego HU (907.11) at San Diego River Mouth (aka Dog Beach) Santee HSA (907.12) Forrester Creek San Diego HU (907.11) & Santee HSA (907.12) San Diego River, Lower	1801	7,255,759	5,484,628	0	100%	0	100%	0	5,484,628
Chollas HSA (908.22) Chollas Creek	1901	1,371,972	347,658	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 because allocations are equal to existing loads.

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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[32] 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 framework ~~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~~ Clean Water Act 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 Limitations (WQBELs). TBELs represent the degree of control that can be achieved by point sources using various levels of~~

[32] 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.

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[33] (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[34] to make them consistent with the assumptions and requirements of the TMDL WLAs.[35] A time schedule to achieve compliance should also be incorporated into the NPDES

[33] Division 7 of the Water Code, commencing with section 13000
[34] In the case of NPDES requirements, WQBELs may include best management practices that evidence shows are consistent with the WLAs.
[35] 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 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.

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 point sources identified as discharing bacteria loading within urbanized areas were largely determined to be from storm water and non-storm water urban runoff discharged from MS4s (Municipal and Caltrans), the primary mechanism for TMDL attainment will be regulation of these discharges with WDRs that implement NPDES requirements. 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 LAs for nonpoint sources sources are not directly enforceable under the CWA Clean Water Act 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 regulation of discharges from controllable 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 controllable wet weather nonpoint sources are have been identified as potentially significant sources of bacteria. 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 Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HA watersheds 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 cannot be regulated. A description of theThe State policy pertaining to regulation of nonpoint sources of pollution in California is provided in the *Plan for California's Nonpoint Source Pollution Control Plan* (NPS

Program Plan; State Water Board, 2000) and the *Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Implementation and Enforcement Policy; State Water Board, 2004) 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[36] (MMs) and related management practices[37] (MPs) in six land use categories by the year 2013.[38]

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,[39] 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 State Water Board 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 implementation

[36] MMs serve as general goals for the control and prevention of nonpoint source polluted runoff.
[37] 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.
[38] 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).
[39] 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.

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).[40] 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;
- The discharge shall not cause a violation of any applicable water quality standard; and

[40] 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 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[41] 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 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

[41] 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).

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[42] 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:

- 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.

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

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[43] 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*:

- 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.*

[43] 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.

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). Persons identified as responsible for point source discharges of bacteria include the following:

- municipal Phase I urban runoff dischargers (Phase I MS4s),
- municipal Phase II urban runoff dischargers (Phase II MS4s),
- Caltrans,
- publicly owned treatment works (POTWs) and waste water collection systems, and
- concentrated animal feeding operations (CAFOs) of a certain size that subject them to regulation underNPDES requirements.

Caltrans and the Municipal MS4s have been assigned WLAs, as shown in Tables 9-2a through 9-2c and 9-4a through 9-4c. These point sources are regulated under WDRs that implement NPDES requirements. The Padre Dam POTW, which is regulated under WDRs that implement NPDES requirement, has been assigned a fecal coliform TMDL based on its NPDES requirements (see Tables 9-2a and 9-4a). CAFOs that are regulated under NPDES requirements have not been assigned a WLA. Any point source that has not been assigned a WLA or has a WLA of zero is not allowed to discharge a pollutant load as part of the TMDL.

10.3.1Municipal 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.

10.3.2Municipal Phase II Dischargers of Urban Runoff

A statewide order prescribing general NPDES requirements for discharges from small MS4s[44] 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.

[44] 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.*

10.3.3California 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.[45] 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.

10.3.4Publicly 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. The only exception is the Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), which discharges effluent to the San Diego River via a series of ponds that feed the Santee Lakes. All POTWs, including the one mentioned here, are subject to NPDES requirements with effluent limits for various pollutants, including bacteria.

Sewage discharges to surface and groundwaters are subject to enforcement actions including fines. Typically surface spills are detected and mitigated quickly, however leaking underground sewer pipes, or sewer pipes that become cross-connected with stormwater pipes, may go undetected for long periods of time. Therefore, both wet and dry weather may bring sewage in contact with MS4s, creeks and beaches.

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 had been successful at reducing the number and volume of spills and protecting water quality, the environment, and public health. While Order No. 2006-0003-DWQ prohibits sanitary overflows to surface or ground waters in general, Order No. R9-2007-0005 is more stringent and prohibits "(t)he discharge of sewage from a sanitary sewer system at

[45] 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).*

any point upstream of a sewage treatment plant…"[46] Together, these orders prohibit most kinds of discharge, including but not limited to sewer overflows and leaking underground sewer pipes. Accordingly, the dry and wet weather wasteload allocation for discharges from all POTWs, except Padre Dam, is zero.

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[47] 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.[48] 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

Controllable nonpoint source discharges are present in most watersheds, however, in only 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 Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HA watersheds.

The persons identified as responsible for controllable nonpoint source bacteria discharges in these watershed include the owners and operators of the following:

- agriculture facilities (including nurseries),
- dairy/intensive livestock facilities,

[46] Order No. R9-2007-0005 *Waste Discharge Requirements for Sewage Collection Agencies in the San Diego Region, Section B. Prohibition 1*.
[47] 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*.
[48] 40 CFR Part 122.23

- horse ranches,
- manure composting and soil amendment operations not regulated by NPDES requirements, and
- individual septic systems.

Agriculture land uses (i.e., agriculture facilities, dairy/intensive livestock facilities, and horse ranches) are controllable nonpoint sources that have been assigned LAs, as shown in Tables 9-2a through 9-2c and 9-4a through 9-4c. The persons responsible for controllable nonpoint source bacteria discharges are the owners and operators of agricultural facilities, nurseries, dairy/intensive livestock, 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 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 Controllable nonpoint sources will be regulated via individual or general WDRs, conditional waivers of WDRs, or Basin Plan discharge prohibitions as mandated by California's NPS Implementation and Enforcement Policy, preferably through a third party agreement with the San Diego Water Board. Any controllable nonpoint source that has not been assigned a LA or has a LA of zero is not allowed to discharge a pollutant load as part of the TMDL.

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.

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11 IMPLEMENTATION PLAN

The ultimate goal of the Implementation Plan is to restore the impaired beneficial uses of the waterbodies addressed by these TMDLs. Restoring the impaired beneficial uses will be accomplished by achieving the TMDLs in the receiving waters, and the wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources. This section describes the actions necessary to implement the TMDLs to restore the recreational beneficial uses in the bacteria impaired beaches and creeks. 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[49] 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 is not re-listed on the List of Water Quality Limited Segments. Attaining and maintaining WQOs will be accomplished by achieving wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources.

TMDLs are not self-implementing or directly enforceable for sources in the watershed. Instead, TMDLs must be implemented through the programs or authorities of the San Diego Water Board and/or other entities to compel dischargers responsible for controllable sources to achieve the pollutant load reductions identified by a TMDL analysis to restore and protect the designated beneficial uses of a waterbody. Federal regulations require TMDLs to be incorporated into the Basin Plan.[50] Because TMDLs must be incorporated into the Basin Plan, and are developed to implement previously established water quality standards (i.e., beneficial uses and WQOs), state statute requires the Basin Plan amendment to include a program of implementation (or Implementation Plan) for achieving water quality objectives.[51]

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 The USEPA is authorized to require implementation plans for TMDLs.[52] USEPA regulations implementing Clean Water Act 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

[49] [40 CFR 131.38(b)(2)]
[50] Code of Federal Regulations Title 40 section 130.6(c)(1)
[51] Water Code section 13242
[52] Code of Federal Regulations Title 40 section 130 [40CFR130]

aspects of the plan.[53] USEPA policy is that states must include implementation plans as an element of TMDL Basin Plan amendments submitted to USEPA for approval.[54]

TMDL implementation plans are required under State law. Basin plans must have a program of implementation to achieve WQOs.[55] 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.[56] 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.[57]

11.2 San Diego Water Board Actions

This section describes the actions that the San Diego Water Board will take to implement the TMDLs. The San Diego Water Board uses its authorities and programs to regulate discharges from the controllable sources in the Region. The controllable sources that are subject to regulation are, in turn, responsible for complying with the requirements issued by the San Diego Water Board. Ultimately, the dischargers subject to regulation are responsible for reducing their pollutant loads in order for the TMDLs, WLAs, and LAs to be achieved. When all discharges from controllable sources meet their assigned WLAs and LAs, and the numeric targets are met in the receiving waters, the beneficial uses should be restored and compliance with the TMDLs will be achieved.

The authorities that are available to the San Diego Water Board to regulate dischargers are given under the Porter-Cologne Water Quality Control Act (Division 7 of the Water Code). The available regulatory authorities include incorporating discharge prohibitions in to the Basin Plan,[58] issuing individual or general WDRs,[59] or issuing individual or general conditional waivers of WDRs.[60] The San Diego Water Board has the authority to enforce Basin Plan prohibitions, WDRs, or conditional waivers of WDRs through the issuance of enforcements actions (e.g., time schedule orders, cleanup and abatement orders, cease and desist orders, administrative civil liabilities).[61] The San Diego Water Board also has the authority to require monitoring and/or technical reports from dischargers,[62] which may be used to support the development, refinement, and/or implementation of TMDLs, WLAs, and/or LAs.

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[53] Code of Federal Regulations Title 40 section 130.6 [40CFR130.6]
[54] See *Guidance for Developing TMDLs in California,* USEPA Region 9, (January 7, 2000).
[55] 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.
[56] See Water Code section 13242.
[57] See ~~CWA~~ Clean Water Act section 303(e).
[58] Pursuant to Water Code section 13243
[59] Pursuant to Water Code section 13263 and 13264
[60] Pursuant to Water Code section 13269
[61] Pursuant to Water Code sections 13301-13304, 13308, 13350, 13385 and/or 13399
[62] Pursuant to Water Code sections 13225, 13267, and/or 13383

The actions taken by the San Diego Water Board depends on the regulatory authority and the source. The regulatory authorities and actions that the San Diego Water Board will use to implement these TMDLs are as follows.

11.2.1 Basin Plan Waste Discharge Prohibitions

The San Diego Water Board may specify certain conditions or areas where the discharge of waste, or certain types of waste is not permitted, known as "waste discharge prohibitions," in the Basin Plan.[63] Waste discharge prohibitions can apply to any controllable sources, including point sources and nonpoint sources discharged to ground or surface waters. The waste discharge prohibitions for the San Diego Region are listed in Chapter 4 (Implementation) of the Basin Plan, under the heading "Waste Discharge Prohibitions." Basin Plan waste discharge prohibitions that are applicable to the implementation of these TMDLs include the following:

- The discharge of waste to waters of the state in a manner causing, or threatening to cause a condition of pollution, contamination or nuisance as defined in Water Code section 13050, is prohibited.

- The discharge of waste to inland surface waters, except in cases where the quality of the discharge complies with applicable receiving water quality objectives, is prohibited. Allowances for dilution may be made at the discretion of the Regional Board. Consideration would include streamflow data, the degree of treatment provided and safety measures to ensure reliability of facility performance. As an example, discharge of secondary effluent would probably be permitted if streamflow provided 100:1 dilution capability.

- The dumping, deposition, or discharge of waste directly into waters of the state, or adjacent to such waters in any manner which may permit its being transported into the waters, is prohibited unless authorized by the Regional Board.

- Any discharge to a storm water conveyance system that is not composed entirely of "storm water" is prohibited unless authorized by the Regional Board. [The federal regulations, 40 CFR 122.26(b)(13), define storm water as storm water runoff, snow melt runoff, and surface runoff and drainage. 40 CFR 122.26(b)(2) defines an illicit discharge as any discharge to a storm water conveyance system that is not composed entirely of storm water except discharges pursuant to a NPDES permit and discharges resulting from fire fighting activities.] [Section 122.26 amended at 56 FR 56553, November 5, 1991; 57 FR 11412, April 2, 1992].

- The unauthorized discharge of treated or untreated sewage to waters of the state or to a storm water conveyance system is prohibited.

Existing discharges are violating one or more of these of these Basin Plan prohibitions. The existing Basin Plan prohibitions are consistent with the TMDLs, WLAs, and LAs. If necessary, the San Diego Water Board may amend the Basin Plan to revise current waste discharge

[63] Authorized pursuant to Water Code section 13243

prohibitions or include new waste discharge prohibitions. The controllable sources must comply with the Basin Plan waste discharge prohibitions.

11.2.2 Waste Discharge Requirements

The primary regulatory authority used by the San Diego Water Board to protect water resources and water quality in the San Diego Region is the issuance of WDRs.[64] The San Diego Water Board can issue WDRs to any controllable point source or nonpoint source discharging waste to ground or surface waters of the state. The WDRs impose conditions which protect water quality, implement the provisions of the Basin Plan, and when the discharge is to waters of the United States, meet the requirements of the Clean Water Act.

The San Diego Water Board will issue, or revise and re-issue WDRs to point sources and/or nonpoint sources in the San Diego Region to be consistent with the TMDLs, WLAs, and LAs. Specific San Diego Water Board actions with regard to WDRs for point sources and nonpoint sources are discussed in the following subsections.

11.2.2.1 Point Sources

The USEPA has delegated responsibility to the State and Regional Boards for implementation of the federal National Pollutant Discharge Elimination System (NPDES) program, which specifically regulates discharges of "pollutants" from point sources to "waters of the United States." The San Diego Water Board regulates discharges from point sources to surface waters with WDRs that implement federal NPDES regulations (NPDES requirements).

The NPDES requirements may include numerical effluent limitations, when feasible, on the amounts of specified pollutants that may be discharged and / or specified best management practices (BMPs) designed to minimize water quality impacts.[65] 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 WLAs of any applicable TMDL.[66]

Although NPDES requirements must contain WQBELs that are consistent with the assumptions and requirements of the TMDL WLAs, the federal regulations do not specifically 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 WLA to be consistent with the TMDL assumptions and requirements. For example, the WLAs in Tables 9-2a through 9-2c and 9-4a through 9-4c are expressed as

[64] Authorized pursuant to Water Code sections 13263 and 13264
[65] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)
[66] Code of Federal Regulations Title 40 section 122.44(d)(1)(vii)(B)

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 and/or as BMP development, implementation, and revision requirements.

When developing WQBELs to be incorporated in to NPDES requirements, the following summarizes the requirements and assumptions included in the calculation of the TMDLs, WLAs, and LAs that should be considered:

Numeric Targets

- The numeric targets consist of the numeric WQOs from the Basin Plan and/or Ocean Plan and an allowable exceedance frequency.
- The numeric targets for the wet weather TMDLs consist of the REC-1 single sample maximum WQOs and a 22 percent allowable exceedance frequency.
- The numeric targets for dry weather TMDLs consist of the REC-1 30-day geometric metric mean WQOs and a 0 percent allowable exceedance frequency.
- The TMDL calculations are based on either the single sample maximum WQO (for wet weather) or 30-day geometric mean WQOs (for dry weather), but both the single sample maximum and 30-day geometric mean numeric WQOs must be met in the receiving waters.
- The TMDLs, and in turn the WLAs for point sources and LAs for nonpoint sources, are assumed to be met when the numeric targets for all three indicator bacteria (fecal coliform, total coliform, and *Enterococcus*) are met in the receiving waters.

Critical Conditions

- The mass-load based TMDLs were calculated under critical conditions consisting of flows generated during a critical wet year and estimation of existing and allowable loads at a critical location.
- The flow from the critical wet year is a "worst case" annual wet weather flow and loading scenario. Actual annual wet weather flow and loading will vary from year to year.
- The mass-load based TMDLs calculated at the critical location are dependent on the flow, which can vary from year to year, but the numeric targets will not vary. When the numeric targets are met in the receiving water, the TMDLs are assumed to be met.
- The mass-load based TMDLs, WLAs, and LAs are calculated for the critical location, but the appropriate numeric targets (based on freshwater and/or saltwater REC-1 WQOs and allowable exceedance frequencies) must be met throughout the waterbodies addressed by these TMDLs.

Linkage Analysis

- The linkage analysis was performed by utilizing calibrated and validated models to predict flow from surface runoff and predict bacteria densities under the critical conditions (i.e., during the critical wet year at the critical location). Existing mass loads and allowable mass loads (i.e., TMDLs) were calculated for each watershed. The existing mass loads were calculated based on model-predicted flow and model-predicted bacteria densities. The allowable mass loads (i.e., TMDLs) were calculated based on model-predicted flow and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies).

- The wet weather existing mass loads and allowable mass loads (i.e., wet weather mass-load based TMDLs) are calculated assuming surface runoff is generated by rainfall from storm events and discharged from all land use categories to receiving waters.
- The dry weather existing mass loads and allowable mass loads (i.e., dry weather mass-load based TMDLs) are calculated assuming surface runoff is generated only by anthropogenic activities and discharged from specific land use categories to receiving waters.

Allocations

- Each mass-load based TMDL is allocated to known point sources and nonpoint sources. Wasteload allocations (WLAs) are assigned to point sources, and load allocations (LAs) are assigned to nonpoint sources. WLAs and LAs are the maximum load a source can discharge and still achieve the TMDL in the receiving water.
- The TMDLs, and in turn the WLAs for point sources and LAs for nonpoint sources, are assumed to be met when the numeric targets are met in the receiving waters.
- The sources were identified based on land use and grouped in to Municipal MS4, Caltrans MS4 (Caltrans), Agriculture, and Open Space categories. The Municipal MS4 and Caltrans land use categories are point sources, and the Agriculture and Open Space land use categories are nonpoint sources.
- Sources that are not identified are assumed to be assigned a zero allowable load as part of the mass-load based TMDL (i.e., WLA = 0 or LA = 0). In other words, discharges of pollutant loads from these sources are not expected or allowed as part of the TMDLs.
- Sources that are assigned an allowable load equal to the existing mass load as part of the mass-load based TMDL (i.e., WLA or LA = existing mass load) are not expected or allowed to increase their mass load in the future. In other words, discharges of pollutant loads (i.e., flows and bacteria densities) from these sources are not allowed to increase.
- The allocation of the dry weather mass-load based TMDLs assumes that no surface runoff discharge to receiving waters occurs from Caltrans, Agriculture, or Open Space land use categories (i.e., $WLA_{Caltrans} = 0$, $LA_{Agriculture} = 0$, and $LA_{OpenSpace} = 0$), meaning the entire dry weather mass-load based TMDL (i.e., allowable mass load) is allocated to Municipal MS4 land use categories (i.e., $WLA_{MS4} = TMDL$) (see Tables 9-4a through 9-4c).
- The allocation of the wet weather mass-load based TMDLs assumes surface runoff discharge occurs from all land use categories, and allocated according to the following steps (see Tables 9-2a through 9-2c):
  1) Sources are separated in to controllable and uncontrollable sources. Discharges from Municipal MS4, Caltrans, and Agriculture land use categories are assumed to be controllable (i.e., subject to regulation), and discharges from Open Space land use categories are assumed to be uncontrollable (i.e., not subject to regulation).
  2) Because discharges from Open Space land use categories are uncontrollable (i.e., not subject to regulation), the LAs for Open Space land use categories are set equal to the existing mass loads calculated under the critical conditions.
  3) For discharges from controllable land use categories that do not contribute more than 5 percent of the total existing mass load for all three indicator bacteria, the WLA or LA is set equal to the existing mass loads from those land uses calculated under the critical conditions.

4) After the WLAs and LAs are assigned based on steps 2 and 3, the remaining portion of the mass-load based TMDL is assigned to discharges from controllable land use categories that contribute more than 5 percent of the total existing mass load for all three indicator bacteria. The allowable mass load for each source (WLA or LA) is calculated based on the ratio of the existing mass loads from those sources relative to each other.

Load Reductions

- The load reductions required to meet the mass-load based TMDLs, WLAs, and LAs are based on reducing the loads compared to pollutant loads from 2001 to 2002.
- Load reductions for each source are calculated based on the difference between the existing mass load and the mass-load based WLA or LA for each source (see Tables 9-2a through 9-2c and 9-4a through 9-4c).
- WLAs and LAs that are set equal to the existing mass loads do not require load reductions to be calculated, but this also means that existing mass loads from those sources cannot increase over time (i.e., pollutant loads should be less than or equal to pollutant loads relative to 2001 to 2002).
- The load reductions needed to meet the WLAs for point sources and LAs for nonpoint sources are assumed to be achieved when the numeric targets are met in the receiving waters.

The persons identified as responsible for point source discharges causing or contributing to bacteria impairments at the beaches and creeks addressed in these TMDLs include:

- Phase I MS4s,
- Phase II MS4s,
- Caltrans,
- POTWs and wastewater collection systems, and
- CAFOs.

According to Tables 9-1 through 9-4, Municipal (Phase I and Phase II) MS4s and Caltrans are the only point sources that have been assigned WLAs. POTWs,[67] CAFOs, and any other unidentified point sources were not assigned WLAs, which is equivalent to being assigned a WLA of zero. All these identified point sources are subject to NPDES regulations.

In order for the WDRs, NPDES requirements, and discharges from these point sources to be consistent with the TMDLs and WLAs, the San Diego Water Board will issue or revise and re-issue the WDRs for these point sources as follows:

Phase I MS4s

According to Tables 9-1 through 9-4, Municipal MS4s were identified as requiring load reductions to achieve and meet its WLAs. The linkage analysis identified urban land uses, primarily associated with Phase I MS4s, as the most significant controllable point source causing

[67] Not including Padre Dam, which has been allocated a fecal coliform TMDL based on the effluent limitations in the WDRs for Padre Dam

or contributing to the bacteria impairments during wet and dry weather conditions in all the watersheds addressed in these TMDLs.

The TMDLs and Municipal MS4 WLAs, with respect to discharges from Phase I MS4s, will be implemented primarily by revising and re-issuing the existing NPDES requirements that have been issued for Phase I MS4 discharges.

The Phase I MS4s subject to these TMDLs are regulated under San Diego Water Board WDRs that implement NPDES requirements.68 The NPDES requirements regulating the Phase I MS4s include discharge prohibitions and receiving water limitations that are applicable to the implementation of these TMDLs, as summarized below:

- Discharges from MS4s are subject to all Basin Plan prohibitions.
- Discharges from MS4s that cause or contribute to the violation of water quality standards (designated beneficial uses and water quality objectives developed to protect beneficial uses) are prohibited.
- Discharges into and from MS4s in a manner causing, or threatening to cause, a condition of pollution, contamination, or nuisance, in waters of the state are prohibited.
- Effectively prohibit all types of non-storm water discharges into the MS4 unless such discharges are either authorized by separate NPDES requirements, or not prohibited (i.e., exempted) by the NPDES requirements regulating the MS4. Exempted non-storm water discharges into the MS4 are not prohibited unless the discharge category is identified as a significant source of pollutants to waters of the United States.

The available data reported by the Phase I MS4s and the results of the technical TMDL analysis indicate that discharges into and from MS4s are likely in violation of the discharge prohibitions and receiving water limitations above. Enforcement of the current discharge prohibitions and receiving water limitations is an action that the San Diego Water Board can immediately implement to compel the MS4s to reduce discharge of bacteria to the receiving waters.

In addition to the discharge prohibitions and receiving water limitations, WQBELs consistent with the assumptions and requirements of the WLAs of any applicable TMDL must also be incorporated into the NPDES requirements. The San Diego Water Board will revise and re-issue the WDRs and NPDES requirements for Phase I MS4s to incorporate the following:

- WQBELs consistent with the requirements and assumptions of the Municipal MS4 WLAs described in Tables 9-1 through 9-4. WQBELs may be expressed as numeric effluent limitations, when feasible, and/or as a BMP program of expanded or better-tailored BMPs.[69]

[68] Phase I MS4s in Orange County are regulated under San Diego Water Board Order No. R9-2002-0001 or subsequent orders; Phase I MS4s in San Diego County are regulated under San Diego Water Board Order No. R9-2007-0001 or subsequent orders.
[69] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)

- If the WQBELs include a BMP program, periodic reporting requirements on BMP planning, implementation, and effectiveness in improving water quality at impaired beaches and creeks (i.e., progress reports). Progress reports will also be required to include water quality monitoring results. Progress reports will be required as long as necessary to ensure that the beneficial uses of the impaired waterbodies have been restored and maintained.

- Compliance schedule for Phase I MS4s to attain the Municipal MS4 WLAs and TMDLs in the receiving waters.

The WQBELs will likely consist of receiving water limitations (based on the numeric targets) and require the implementation of a BMP program to achieve the TMDLs in the receiving waters. The Phase I MS4s will be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) to the San Diego Water Board within 18 months after the effective date of these TMDLs.[70] Ideally, the Phase I MS4s and Caltrans will develop and submit their BLRPs or CLRPs together. The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale. The BLRPs or CLRPs should be developed and incorporated as part of the Watershed Runoff Management Programs required under the Phase I MS4 NPDES requirements. Ideally, the Phase I MS4s and Caltrans will develop and coordinate the elements of their BLRPs or CLRPs together.

If the receiving water limitations (based on the numeric targets) are met in the receiving waters, the assumption will be that the Phase I MS4s have met their WLAs. If, however, the receiving water limitations are not being met in the receiving waters, the Phase I MS4s will be responsible for reducing their bacteria loads and/or demonstrating that discharges from the Phase I MS4s are not causing the exceedances.

Phase II MS4s
According to Tables 9-1 through 9-4, Municipal MS4s were identified as requiring load reductions to achieve and meet its WLAs. The linkage analysis identified urban land uses, primarily associated with Phase I MS4s, as the most significant controllable point source causing or contributing to the bacteria impairments during wet and dry weather conditions in all the watersheds addressed in these TMDLs. Some urban land uses are associated with non-traditional, small MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes (hereafter refer to as Phase II MS4s).

The TMDLs and Municipal MS4 WLAs, with respect to discharges from Phase II MS4s, will be implemented primarily by requiring compliance with the existing general WDRs and NPDES requirements that have been issued for Phase II MS4 discharges. Phase II MS4s are subject to regulation under State Water Board general WDRs implementing NPDES requirements.[71]

[70] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.
[71] Phase II MS4s in the San Diego Region are subject to regulation under State Water Board Order No. 2003-0005-DWQ, or subsequent orders.

Under these general WDRs and NPDES requirements, Phase II MS4s are required to develop and implement a Stormwater Management Plan/Program (SWMP) with the goal of reducing the discharge of pollutants to the maximum extent practicable (MEP). MEP is the performance standard specified in Clean Water Act section 402(p). The SWMPs 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.

The State Water Board general WDRs for Phase II MS4s identifies the facilities in the San Diego Region subject to regulation under the NPDES requirements. Currently, none of these facilities are enrolled under the Phase II MS4 general WDRs. Appendix Q contains the current list of the Phase II MS4 facilities in the watersheds addressed by these TMDLs.

Owners and operators of Phase II MS4s in the watersheds subject to these TMDLs, identified by the San Diego Water Board as significant sources of bacteria discharging to the receiving waters and/or Phase I MS4s, will be required to submit a Notice of Intent[72] to comply with the NPDES requirements in the State Water Board general WDRs as soon as possible after the effective date of these TMDLs.[73] Once enrolled under the general WDRs, Phase II MS4 owners and operators are required to comply with the provisions of the State Water Board general WDRs and NPDES requirements to reduce the discharge of bacteria to the MEP as specified in their SWMPs.

For any individual Phase II MS4s that are identified as a significant source of pollutants, the San Diego Water Board may also issue individual WDRs requiring the implementation of WQBELs that are consistent with the requirements and assumptions of the Municipal MS4 WLAs described in Tables 9-1 through 9-4. Upon issuance of such individual WDRs by the San Diego Water Board, the State Water Board general WDRs for Phase II MS4s shall no longer regulate the affected individual Phase II MS4s.[74]

Similarly, for any category of Phase II MS4s that are identified as a significant source of pollutants, the San Diego Water Board may issue general WDRs requiring the implementation of WQBELs that are consistent with the requirements and assumptions of the Municipal MS4 WLAs described in Tables 9-1 through 9-4. Upon issuance of such general WDRs by the San Diego Water Board, the State Water Board general WDRs for Phase II MS4s shall no longer regulate the affected category of Phase II MS4s.[75]

In the event that the San Diego Water Board issues individual or general WDRs for Phase II MS4s in the San Diego Region, the WQBELs will likely consist of receiving water limitations (based on the numeric targets) and require the implementation of a BMP program to achieve the TMDLs in the receiving waters. The Phase II MS4s will likely be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the TMDLs in the receiving water, acceptable to the San Diego Water Board. When

[72] The Notice of Intent, or NOI, is attachment 7 to Order No. 2003-0005-DWQ.
[73] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.
[74] As authorized under State Water Board Order No. 2003-0005-DWQ, section G.
[75] Ibid.

and where possible, the San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale and have the Phase II MS4 BMP programs coordinate with the BMPs programs for Phase I MS4s and Caltrans.

If the receiving water limitations (based on the numeric targets) are met in the receiving waters, the assumption will be that the Phase II MS4s have met their WLAs. If, however, the receiving water limitations are not being met in the receiving waters and one or more Phase II MS4 dischargers are identified as sources of bacteria causing exceedances, the specific Phase II MS4s will be responsible for reducing their bacteria loads and/or demonstrating that discharges from those specific Phase II MS4s are not causing the exceedances.

Caltrans
According to Tables 9-1 through 9-4, the WLAs for Caltrans are equal to the existing load estimated from Caltrans discharges. Caltrans has been assigned an allowable load (i.e., WLA) during wet weather conditions, and no allowable load (i.e., WLA = 0) during dry weather conditions. 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 loads above current levels. The TMDLs and Caltrans WLAs will be implemented primarily by revising and re-issuing the existing NPDES requirements that have been issued for Caltrans discharges.

Caltrans is regulated under State Water Board general WDRs that implement NPDES requirements.[76] The San Diego Water Board will request the State Water Board to revise and re-issue the WDRs and NPDES requirements to incorporate the following for Caltrans discharges in the San Diego Region:

- WQBELs consistent with the requirements and assumptions of the Caltrans WLAs described in Tables 9-1 through 9-4. WQBELs may be expressed as numeric effluent limitations, when feasible, and/or as a BMP program of expanded or better-tailored BMPs.[77]

- If the WQBELs include a BMP program, periodic reporting requirements on BMP planning, implementation, and effectiveness in improving water quality at impaired beaches and creeks (i.e., progress reports). Progress reports will also be required to include water quality monitoring results. Progress reports will be required as long as necessary to ensure that the beneficial uses of the impaired waterbodies have been restored and maintained.

- Compliance schedule for Caltrans to attain the Caltrans WLAs and TMDLs in the receiving waters.

The WQBELs will likely consist of receiving water limitations (based on the numeric targets) and require the implementation of a BMP program to achieve TMDLs in the receiving waters. Caltrans will be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) outlining a proposed BMP program that will be capable of

[76] Caltrans is subject to regulation under State Water Board Order No. 99-06-DWQ, and subsequent orders.
[77] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)

attaining the TMDLs in the receiving waters, acceptable to the San Diego Water Board, within 18 months after the effective date of these TMDLs.[78] The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale. Ideally, Caltrans and the Phase I MS4s will develop and coordinate the elements of their BLRPs or CLRPs together.

If the receiving water limitations (based on the numeric targets) are met in the receiving waters, the assumption will be that Caltrans has met its WLAs. If, however, the receiving water limitations are not being met in the receiving waters, and Caltrans MS4s are identified as a source of bacteria causing exceedances, Caltrans will be responsible for reducing its bacteria loads and/or demonstrating that discharges from the Caltrans MS4s are not causing the exceedances.

Publicly Owned Treatment Works and Wastewater Collection Systems
Tables 9-1 through 9-4 do not include WLAs for POTWs and wastewater collection systems (i.e., WLA = 0).[79] In other words, discharges of bacteria from POTWs and wastewater collection systems to the impaired waters addressed by these TMDLs are not expected or allowed.

The TMDLs, with respect to discharges from POTWs and wastewater collection systems, will be implemented primarily by requiring compliance with any existing individual and/or general WDRs and NPDES requirements that have been issued. POTWs are subject to regulation under individual WDRs that implement NPDES requirements. Wastewater collection systems are subject to regulation under general WDRs issued by the State Water Board and San Diego Water Board.[80]

If necessary, individual WDRs for POTWs and/or the San Diego Water Board WDRs for wastewater collection systems can be revised to require more aggressive monitoring, maintenance, and repair schedules to ensure discharges of bacteria wasteloads to surface waters are minimized and/or eliminated.

Concentrated Animal Feeding Operations
Tables 9-1 through 9-4 do not include WLAs for CAFOs (i.e., WLA = 0). In other words, discharges of bacteria from CAFOs to the impaired waters addressed by these TMDLs are not expected or allowed.

The TMDLs, with respect to discharges from CAFOs, will be implemented primarily by requiring compliance with any existing individual and/or general WDRs and NPDES requirements that have been issued. CAFOs that discharge to surface waters are subject to regulation under general WDRs that implement NPDES requirements.

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[78] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.
[79] Except for the permitted existing wet weather and dry weather fecal coliform bacteria loads from the Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), assigned as a separate point source wasteload allocation for discharges from Padre Dam that was set equal to the permitted existing load.
[80] State Water Board Order No. 2006-0003-DWQ and San Diego Water Board Order No. R9-2007-0005

If necessary, the general WDRs and NPDES requirements for CAFOs can be revised to require more aggressive monitoring, maintenance, and repair schedules to ensure discharges of bacteria wasteloads to surface waters are minimized and/or eliminated.

Other Unidentified Point Sources

Tables 9-1 through 9-4 do not include WLAs for any other unidentified point sources (i.e., WLA = 0). In other words, discharges of bacteria from any other unidentified point sources to the impaired waters addressed by these TMDLs are not expected or allowed.

The TMDLs, with respect to discharges from unidentified point sources to surface waters, will be implemented primarily by issuing WDRs implementing NPDES requirements, or requiring the point sources to cease their discharges.

11.2.2.2 Nonpoint Sources

Unlike discharges from point sources to surface waters, discharges from nonpoint sources to surface waters are not subject to regulation under the federal Clean Water Act. Discharges from nonpoint sources, however, are subject to regulation under the California state Porter-Cologne Water Quality Control Act. The San Diego Water Board can regulate discharges from controllable nonpoint sources to surface waters with individual or general WDRs.

The persons identified as responsible for controllable nonpoint source bacteria discharges causing or contributing to bacteria impairments at the beaches and creeks in these watersheds include the owners and operators of the following:

- agricultural facilities,
- nurseries,
- dairy/intensive livestock facilities,
- horse ranches,
- manure composting and soil amendment operations not regulated by NPDES requirements, and
- individual septic systems.

The California's Nonpoint Source Implementation and Enforcement Policy requires that controllable nonpoint sources be regulated via individual or general WDRs, conditional waivers of WDRs, or Basin Plan waste discharge prohibitions. Agriculture (including nurseries), dairy/livestock, and horse ranch land uses (collectively called "agriculture" land uses) are controllable nonpoint sources that have been assigned Agriculture LAs, as shown in Tables 9-1 through 9-4. Manure composting operations, soil amendment operations, and individual septic systems that are not part of agriculture land uses, and any other unidentified controllable nonpoint sources were not assigned LAs, which is equivalent to being assigned a LA of zero. Any controllable nonpoint source that has not been assigned a LA or has a LA of zero is not allowed to discharge a pollutant load as part of the TMDL.

Controllable nonpoint source discharges are present in most watersheds, however, in only four watersheds do these discharges require load reductions to meet the Agriculture LAs. These watersheds are the Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HU watersheds (see Tables 9-1 through 9-4).

In general, discharges from controllable nonpoint sources in the San Diego Region are not regulated under WDRs. The San Diego Water Board prefers to utilize conditional waivers of WDRs for discharges from controllable nonpoint sources. If necessary, however, the San Diego Water Board will issue individual WDRs to a specific nonpoint source operation that is identified as a significant source causing or contributing to an impairment in the waterbodies addressed in these TMDLs. Likewise, the San Diego Water Board may issue general WDRs for a type or category of controllable nonpoint source discharges that is identified as a significant source causing or contributing to an impairment in the watersheds and/or waterbodies addressed in these TMDLs.

If individual or general WDRs are developed and issued to controllable nonpoint sources, the WDRs should incorporate one or more the following:

- Effluent limitations that are consistent with the requirements and assumptions of the nonpoint source LAs described in Tables 9-1 through 9-4. Effluent limitations should be expressed as numeric effluent limitations, if feasible, and/or as a BMP program.

- Periodic reporting requirements on BMP planning, implementation, and effectiveness in improving the water quality of discharges from the nonpoint source (i.e., progress reports). Progress reports will also be required to include water quality monitoring results. Progress reports will be required as long as necessary to ensure that the beneficial uses of the impaired waterbodies have been restored and maintained.

- Compliance schedule and/or implementation milestones.

The San Diego Water Board will work with the nonpoint source dischargers and/or stakeholders when developing the WDRs. When and where possible, the San Diego Water Board will have the nonpoint source BMP programs coordinate with the BMPs programs for Phase I MS4s and Caltrans.

If the receiving water limitations (based on the numeric targets) are met in the receiving waters, the assumption will be that controllable nonpoint sources have met their LAs. If, however, the receiving water limitations are not being met in the receiving waters, and one or more controllable nonpoint source dischargers are identified as sources of bacteria causing exceedances, the San Diego Water Board may regulate those identified nonpoint sources, as needed, with WDRs or other enforcement actions, and those nonpoint sources will be responsible for reducing their bacteria loads and/or demonstrating that discharges from those nonpoint sources are not causing the exceedances.

11.2.3 Conditional Waivers of Waste Discharge Requirements

There are several types of point source, as well as nonpoint source discharges that may not have an adverse affect on the quality of the waters of the state, and/or are not readily amenable to regulation under WDRs. For these types of discharge, the San Diego Water Board has the authority to issue conditional waivers of WDRs.[81] The types of discharge which may be eligible for a waiver only include discharges to land and groundwater, and discharges to surface waters that are not otherwise subject to National Pollutant Discharge Elimination System (NPDES) regulations.[82] NPDES regulations are federal regulations. There are no federal or state regulations that allow NPDES regulations to be waived.

The point sources that were identified as causing or contributing to the bacteria impairments in the waterbodies addressed in these TMDLs are subject to regulation under WDRs that implement NPDES requirements. Thus, discharges from these point sources would not be eligible for conditional waivers of WDRs.

There are, however, controllable nonpoint source land uses (agriculture, horse ranches, and dairies/intensive livestock) that were identified in 8 watersheds that are contributing to the bacteria impairments. Four of the 8 watersheds were identified as requiring load reductions (Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HU) to meet the assigned wet weather Agriculture LAs.

In general, the San Diego Water Board utilizes conditional waivers of WDRs to address the discharges from controllable nonpoint sources. Development and enforcement of waiver conditions that are protective of water quality will likely be sufficient to implement the Agriculture LAs. The controllable nonpoint sources eligible for conditional waivers must comply with the conditions of the waiver to be consistent with the TMDLs and Agriculture LAs. Controllable nonpoint sources that do not comply with the waiver conditions are no longer eligible for the waiver and must either come into compliance with the waiver conditions, become regulated under WDRs, or cease any discharge of wastes to waters of the state.

Currently, discharges from these controllable nonpoint sources may be eligible for one of the general conditional waivers of WDRs, which are provided in the Basin Plan.[83] Conditional waivers of WDRs may not exceed 5 years in duration, but may be revised and renewed, or may be terminated at any time.[84] The San Diego Water Board will implement the conditional waivers of WDRs applicable to the Agriculture land uses to be consistent with the TMDLs and Agriculture LAs.

Because the conditional waivers of WDRs that may be utilized to implement the Agriculture LAs are contained in the Basin Plan, any revision f the conditions will require a Basin Plan amendment. If needed, the San Diego Water Board may amend the Basin Plan to remove these conditional waivers of WDRs from the Basin Plan and re-issue the conditional waivers of WDRs as a general order to reduce the administrative requirements for revising waiver conditions.

[81] Authorized pursuant to Water Code section 13269
[82] Defined in Code of Federal Regulations Title 40 section 122.3 [40 CFR 122.3]
[83] The current general conditional waivers in the Basin Plan were adopted under San Diego Water Board Resolution No. R9-2007-0104. These waivers will expire December 31, 2012. Conditional Waiver No. 3 (Animal Operations) and Conditional Waiver No. 4 (Agriculture and Nursery Operations) may be utilized to implement the Agriculture LAs.
[84] Pursuant to Water Code section 13269(a)(2)

As required, the effectiveness of the conditional waivers of WDRs must be evaluated at least once every 5 years. If the conditions in the waivers of WDRs are not sufficient to implement the TMDLs and Agriculture LAs, the San Diego Water Board will amend the waiver conditions to include more stringent conditions, including, but not limited to, additional BMP implementation, monitoring, and/or reporting.

If a conditional waiver of WDRs no longer appears to be effective in protecting water quality from discharges from specific nonpoint source facilities or category of nonpoint source facilities, the waiver may be terminated. For nonpoint source facilities that are no longer eligible for a conditional waiver of WDRs, they will need to be regulated under WDRs, or cease any discharges of waste to waters of the state.

11.2.4 Enforcement Actions

The regulatory actions described above generally consist of requirements that a discharge from a controllable source must comply with in order for the discharge to legally occur. If a discharge does not comply with those requirements, a violation has occurred. Violations are subject to enforcement action by the San Diego Water Board.

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 schedule (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.

For the controllable sources that have been identified (i.e., Municipal MS4s, Caltrans, and Agriculture land uses), the requirements in existing Basin Plan waste discharge prohibitions, WDRs and NPDES requirements, and conditional waivers of WDRs can be immediately enforced to compel dischargers to implement measures to improve water quality in the receiving waters.

For example, the general WDRs and NPDES requirements for Phase I MS4s and Caltrans require additional BMPs be implemented 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 State Water Board or San Diego Water Board determines that Phase I MS4 and Caltrans discharges are *causing or contributing to an exceedance* of an applicable water quality objective, in this case indicator bacteria REC-1 WQOs. Designation of beaches and/or creeks as water quality limited segments under 303(d) List provided sufficient evidence that that Phase I MS4 and Caltrans discharges are causing or contributing to the violation of water quality standards. Thus, Phase I MS4s and Caltrans should be implementing these provisions of the WDRs and NPDES requirements with respect to bacteria discharges into water quality limited segments. The San Diego Water Board could immediately issue enforcement actions to direct the Phase I MS4s and Caltrans to implement measures to restore compliance with the bacteria WQOs.

The San Diego Water Board shall consider enforcement actions, as necessary, against any discharger failing to comply with applicable waiver conditions, WDRs, and/or Basin Plan waste discharge prohibitions.[85] Enforcement actions can also be taken, as necessary, to control the discharge of bacteria to impaired beaches and creeks, to attain compliance with the assumptions and requirements of the TMDLs, WLAs, and LAs.

In order for implementation of the TMDLs to begin as soon as possible, the San Diego Water Board may issue enforcement actions, in lieu of or before revising and re-issuing general WDRs and NPDES requirements, for Phase I MS4s and Caltrans, directing them to begin implementing additional measures to restore compliance with the bacteria WQOs. Enforcement actions may also be issued to require the submission of Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) to the San Diego Water Board within 18 months after the effective date of these TMDLs,[86] or sooner. The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale.

The San Diego Water Board will also issue enforcement actions, as necessary, to any other discharger that is identified by the San Diego Water Board or other parties as a significant source causing or contributing to the bacteria impairments in the water bodies addressed in these TMDLs.

11.2.5 Investigative Orders

The San Diego Water Board has the authority to require any state or local agency to investigate and report on any technical factors involved in water quality control or to obtain and submit analyses of water.[87] The San Diego Water Board has the authority to require technical or monitoring program reports from persons who have discharged or are discharging waste that could affect the quality of the waters in the San Diego Region.[88] The San Diego Water Board also has the authority to establish monitoring and recordkeeping requirements for discharges regulated under NPDES requirements.[89]

The San Diego Water Board may issue investigative orders requiring the submission of Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) to the San Diego Water Board within 18 months after the effective date of these TMDLs.[90] The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale. The San Diego Water Board may require the Phase I MS4s and Caltrans to develop and submit their BLRPs or CLRPs together.

[85] Authorized pursuant to Water Code sections 13300-13304, 13308, 13350, 13385, and/or 13399
[86] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.
[87] Authorized pursuant to Water Code section 13225
[88] Authorized pursuant to Water Code section 13267
[89] Authorized pursuant to Water Code section 13383
[90] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.

The BLRPs or CLRPs will allow the Phase I MS4s and Caltrans to propose methods for assessing compliance and a compliance schedule for WQBELs that implement the TMDLs. The compliance schedule for the Phase I MS4s and Caltrans to attain the their respective WLAs will be based on the BMP program proposed in the BLRPs or CLRPs, as discussed in section 11.5. Components that are recommended for incorporation in the BLRPs or CLRPs are presented in Appendix P. The San Diego Water Board may issue subsequent investigative orders to confirm items in the BLRPs or CLRPs.

The San Diego Water Board will also issue investigative orders requiring BLRPs or CLRPs, or other technical or monitoring program reports, as necessary, to any other discharger that is identified by the San Diego Water Board or other parties as causing or contributing to the bacteria impairments in the waterbodies addressed in these TMDLs.

11.2.6 Basin Plan Amendments

As the implementation of these TMDLs progress, the San Diego Water Board recognizes that revisions to the TMDLs, WLAs, LAs, Implementation Plan, and potentially to beneficial uses and water quality objectives for specific waterbodies may be necessary in the future. Any future revisions to the Basin Plan necessary to implement these TMDLs will require a Basin Plan amendment.

Revisions to the Basin Plan typically require substantial evidence and supporting documentation to initiate the Basin Plan amendment process. Given the severely limited resources available to the San Diego Water Board for developing Basin Plan amendment projects, developing the evidence and documentation to initiate a Basin Plan amendment will be the responsibility of the dischargers and/or other parties interested in amending the requirements or provisions implementing these TMDLs.

The San Diego Water Board will initiate a Basin Plan amendment project to revise the requirements and/or provisions for implementing these TMDLs (including, but not limited to, the TMDLs, WLAs, LAs, Implementation Plan, numeric targets, watershed specific allowable exceedance frequencies, specific waterbody usage frequencies) if all the following conditions are met:

- Sufficient data are collected to provide the basis for the Basin Plan amendment.
- A report is submitted to the San Diego Water Board documenting the findings from the collected data.
- A request is submitted to the San Diego Water Board with specific revisions proposed to the Basin Plan, and the documentation supporting such revisions.

The San Diego Water Board will work with the project proponents to ensure that the data and documentation will be adequate for the initiation of the Basin Plan amendment. If the data and documentation are adequate, the San Diego Water Board will be responsible for taking the Basin Plan amendment project through the administrative and regulatory processes for adoption by the San Diego Water Board, and approval by the State Water Board, OAL, and USEPA.

11.2.7 Other Actions

In addition to the regulatory authorities and actions that the San Diego Water Board can use to implement these TMDLs, the San Diego Water Board may take other actions to help the regulated community implement measures to comply with the regulatory actions above.

For these TMDLs, the San Diego Water Board shall recommend that the State Water Board assign a high priority to awarding grant funding[91] 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 TMDLs, WLAs, and LAs.

Implementation of these TMDLs by the San Diego Water Board should not require any special studies to be conducted by the dischargers or other entities. The San Diego Water Board, however, will encourage and support any special studies proposed and undertaken by the dischargers or other entities that will provide information to refine and improve the implementation of these TMDLs. The San Diego Water Board may develop agreements (e.g., a Memorandum of Understanding) with one or more entities to support and use the findings from any special studies that may be conducted. Proposing a special study project and initiating an agreement with the San Diego Water Board to use the results of the study to modify this TMDL Implementation Plan is the responsibility of the project proponent(s). A few topics that may require additional investigation with a special study are discussed in section 11.4.

11.3 Monitoring for TMDL Compliance and Compliance Assessment

An essential component of implementation is water quality monitoring. Monitoring is needed to evaluate the progress toward attainment of the TMDLs and restoring the beneficial uses in the receiving waters. When all discharges from controllable sources meet their assigned WLAs and LAs, and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies) are also met in the receiving waters, compliance with the TMDLs will be achieved. Additionally, sufficient water quality data are necessary to support the removal of a waterbody from the 303(d) List. Water quality data can also be used identify additional regulatory actions that may need to be implemented by the San Diego Water Board to restore and protect beneficial uses.

The minimum components for any monitoring program that will be used to evaluate progress toward attainment of the TMDLs should include the following:

- For beaches addressed by these TMDLs, monitoring locations should consist of, at a minimum, the same locations used to collect data required under MS4 NPDES monitoring requirements and beach monitoring for Health and Safety Code section 115880.[92] If exceedances of the receiving water limitations are observed in the monitoring data, additional monitoring locations must be added to identify the sources

[91] The State Water Board 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.
[92] Commonly referred to as AB 411 monitoring

causing the exceedances. An adequate number of additional monitoring locations and frequency of monitoring must be added to identify the sources causing the exceedances in the receiving waters. The additional monitoring locations must also be used to demonstrate that the bacteria loads from the sources have been addressed and no longer causing exceedances in the receiving waters.

- For creeks addressed by these TMDLs, monitoring locations should consist of, at a minimum, a location at or near the mouth of the creek (e.g., Mass Loading Station or Mass Emission Station) and one or more locations upstream of the mouth (e.g., Watershed Assessment Stations). If exceedances of the receiving water limitations are observed in the monitoring data, additional monitoring locations must be added to identify the sources causing the exceedances. An adequate number of additional monitoring locations and frequency of monitoring must be added to identify the sources causing the exceedances in the receiving waters. The additional monitoring locations must also be used to demonstrate that the bacteria loads from the sources have been addressed and no longer causing exceedances in the receiving waters.

- Because there are dry weather and wet weather TMDLs, monitoring under both conditions is needed. Wet weather[93] monitoring should occur at least once within 24 hours of the end of a storm event[94] that occurs during the rainy season (i.e., October 1 through April 30). Dry weather[95] monitoring should occur at least on a monthly basis, and may be required more often during the summer months (e.g., weekly) when the REC-1 and REC-2 beneficial uses occur most frequently in the creeks and at the beaches.

Compliance with the TMDLs, WLAs, and LAs will be assessed primarily by comparing receiving water indicator bacteria results from the monitoring locations outlined above with receiving water limitations expressed in terms of the appropriate numeric REC-1 WQOs and allowable exceedance frequencies of the appropriate numeric REC-1 WQOs. The appropriate numeric WQOs and allowable exceedance frequencies are dependent upon the type of receiving water (i.e., beach or creek) and weather conditions (i.e., dry weather or wet weather), as shown in Tables 11-1 and 11-2.

[93] Defined as days with a storm with at least 0.2 inches of rainfall and the 72 hour period after the storm event
[94] The end of a storm event is when there is no more precipitation
[95] Defined as days with less than 0.2 inches of rainfall on each of the previous three days

Table 11-1. Receiving Water Limitations for Beaches

	Wet Weather Days [a]		Dry Weather Days [b]	
Indicator Bacteria	**Wet Weather Numeric Objective [c] (MPN/100mL)**	**Wet Weather Allowable Exceedance [d] Frequency**	**Dry Weather Numeric Objective [e] (MPN/100mL)**	**Dry Weather Allowable Exceedance Frequency**
Fecal Coliform	400	22%	200	0%
Total Coliform	10,000	22%	1,000	0%
Enterococcus	104	22%	35	0%

a. Wet weather days defined as days with rainfall events of 0.2 inches or greater and the following 72 hours.
b. Dry weather days defined as days with less than 0.2 inch of rainfall observed on each of the previous 3 days.
c. Wet weather numeric objectives based on the single sample maximum water quality objectives in the California Ocean Plan (2005). Compliance with the wet weather TMDLs in the receiving water is based on the frequency that the wet weather days in any given year exceed the wet weather numeric objective, but 30-day geometric mean must also be met.
d. The wet weather allowable exceedance frequency is set at 22%. In the calculation of the wet weather TMDLs, the San Diego Regional Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. The 22 percent allowable exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Regional Board.
e Dry weather numeric objectives based on the 30-day geometric mean water quality objectives in the California Ocean Plan (2005). Compliance with the dry weather TMDLs in the receiving water is based on the frequency that the dry weather days in any given year exceed the dry weather numeric objective.

Table 11-2. Receiving Water Limitations for Creeks

	Wet Weather Days [a]		Dry Weather Days [b]	
Indicator Bacteria	**Wet Weather Numeric Objective [c] (MPN/100mL)**	**Wet Weather Allowable Exceedance [d] Frequency**	**Dry Weather Numeric Objective [e] (MPN/100mL)**	**Dry Weather Allowable Exceedance Frequency**
Fecal Coliform	400	22%	200	0%
Total Coliform [f]	10,000	22%	1,000	0%
Enterococcus	61 (104) [g]	22%	33	0%

a. Wet weather days defined as days with rainfall events of 0.2 inches or greater and the following 72 hours.
b. Dry weather days defined as days with less than 0.2 inch of rainfall observed on each of the previous 3 days.
c. Wet weather numeric objectives based on the single sample maximum (or equivalent) water quality objectives in the Water Quality Control Plan for the San Diego Basin (1994). Compliance with the wet weather TMDLs in the receiving water is based on the frequency that the wet weather days in any given year exceed the wet weather numeric objective, but 30-day geometric mean must also be met.
d. The wet weather allowable exceedance frequency is set at 22%. In the calculation of the wet weather TMDLs, the San Diego Regional Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. The 22 percent allowable exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Regional Board.
e. Dry weather numeric objectives based on the 30-day geometric mean (or equivalent) water quality objectives in Water Quality Control Plan for the San Diego Basin (1994). Compliance with the dry weather TMDLs in the receiving water is based on the frequency that the dry weather days in any given year exceed the dry weather numeric objective.
f. Wet and dry weather numeric objectives for total coliform apply at the point in a creek that discharges to a beach, bay, or estuary.
g. A wet weather numeric objective for Enterococcus of 104 MPN/100mL may be applied as a receiving water limitation for creeks, instead of 61 MPN/100mL, if one or more of the creeks addressed by these TMDLs (San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek, San Diego River, and/or Chollas Creek) is designated with a "moderately to lightly used area" or less frequent usage frequency in the Basin Plan. Otherwise, the wet weather numeric objective of 61 MPN/100mL for Enterococcus will be used to assess compliance with the wet weather allowable exceedance frequency.

At the end of the TMDL Compliance Schedules, which are discussed in section 11.5, the receiving waters must meet the receiving water limitations above to be considered in compliance with these TMDLs, WLAs, and LAs. Determination of compliance with the TMDLs will be assessed differently for dry weather and wet weather as follows:

1. *Compliance with Dry Weather TMDLs*: At the end of the dry weather TMDL compliance schedule, the bacteria densities in the receiving waters for all dry weather days[96] must be less than or equal to the 30-day geometric mean REC-1 WQOs 100 percent of the time (i.e., dry weather days in a 30-day period shall not exceed the 30-day geometric mean REC-1 WQOs more than 0 percent of the time). In addition, the bacteria densities must be consistent with the single sample maximum REC-1 WQOs in the Ocean Plan for beaches, and the Basin Plan for creeks.

   The method and number of samples needed for calculating the 30-day geometric mean should be consistent with the number of samples required by the Ocean Plan for beaches, and the Basin Plan for creeks. Analysis of the monitoring results should also be consistent with the methods given in the Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List.

   Because the dry weather TMDLs are assigned entirely to the Municipal MS4s as WLAs, the Municipal MS4s are assumed to be the only source of bacteria during dry weather (i.e., dry weather TMDL = MS4 WLA). Discharges from other sources (i.e., Caltrans, Agriculture, and Open Spaces) during dry weather are not expected and/or not allowed (i.e., WLA = 0 or LA = 0). If at the end of the dry weather TMDL compliance schedule the receiving waters exceed the 30-day geometric mean REC-1 WQOs more than 0 percent of the time, the municipal Phase I MS4s are responsible for demonstrating their discharges into the receiving waters are not causing the exceedances, or they will be considered out of compliance.

   The Phase I MS4s may demonstrate that their discharges are not causing the exceedances in the receiving waters by providing data from their discharge points to the receiving waters, by providing data collected at jurisdictional boundaries, and/or by using other methods accepted by the San Diego Water Board. Otherwise, at the end of the dry weather TMDL compliance schedule, the municipal Phase I MS4s will be held responsible and considered out of compliance unless other information or evidence indicates another controllable or uncontrollable source is responsible for the exceedances in the receiving waters. If controllable sources other than discharges from the municipal Phase I MS4s are identified before or after the end of the dry weather TMDL Compliance Schedule as causing the exceedances, those controllable sources will be responsible for reducing their bacteria loads and/or demonstrating that discharges from those sources are not causing the exceedances. The San Diego Water Board shall implement additional actions (e.g., issue enforcement actions, amend existing NPDES requirements or conditional waivers), as needed, to bring all controllable sources into compliance with the dry weather TMDLs.

[96] Defined as days with less than 0.2 inches of rainfall on each of the previous three days

2. *Compliance with Wet Weather TMDLs*: At the end of the wet weather TMDL compliance schedule, the bacteria densities in the receiving waters for all wet weather days[97] cannot exceed the single sample maximum REC-1 WQOs more than the allowable exceedance frequency. In addition, the bacteria densities must be less than or equal to the 30-day geometric mean REC-1 WQOs 100 percent of the time (i.e., both dry and wet weather days in a 30-day period shall not exceed the 30-day geometric mean REC-1 WQOs more than 0 percent of the time).

As described in the minimum monitoring components above, at least one sample should be collected within 24 hours of the end of a storm event that occurs during the rainy season (i.e., October 1 through April 30). If only one sample is collected for a storm event, the bacteria density for every wet weather day associated with that storm event shall be equal to the results from that one sample. If more than one sample is collected for a storm event, but not on a daily basis, the bacteria density for all the wet weather days not sampled shall be equal to the highest bacteria density result reported from samples collected. The exceedance frequency shall be calculated by dividing the number of wet weather days that exceed the single sample maximum REC-1 WQOs by the total number of wet weather days during the rainy season. If at the end of the wet weather TMDL Compliance Schedule the receiving waters exceed the single sample maximum REC-1 WQOs more than the allowable exceedance frequency, all controllable sources are responsible for demonstrating their discharges into the receiving waters are not causing the exceedances, or they will be considered out of compliance.

The data collected for compliance with the dry weather TMDLs, described above, shall be used in addition to the data collected for wet weather with the wet weather TMDLs to calculate the wet weather 30-day geometric mean. If at the end of the wet weather TMDL Compliance Schedule the receiving waters exceed the 30-day geometric mean REC-1 WQOs at any time, all controllable sources are responsible for demonstrating their discharges into the receiving waters are not causing the exceedances, or they will be considered out of compliance.

Because the Phase I MS4s are located at the base of the watersheds and have been identified as the most significant controllable source of bacteria, the municipal Phase I MS4s will have the primary responsible for monitoring the receiving waters. The municipal Phase I MS4s are responsible for reducing their bacteria loads and/or demonstrating their discharges into the receiving waters are not causing the exceedances.

The municipal MS4s may demonstrate that their discharges are not causing the exceedances in the receiving waters by providing data from their discharge points to the receiving waters, by providing data collected at jurisdictional boundaries, and/or by using other methods accepted by the San Diego Water Board. Otherwise, at the end of the wet weather TMDL compliance schedule, the municipal Phase I MS4s will be held responsible and considered out of compliance unless other information or evidence indicates another controllable or uncontrollable source is responsible for the exceedances in the receiving waters. If controllable sources other than discharges from the municipal Phase I MS4s are

[97] Defined as days with a storm with at least 0.2 inches of rainfall and the 72 hour period after the storm event

identified before or after the end of the wet weather TMDL Compliance Schedules as causing the exceedances, those controllable sources will be responsible for reducing their bacteria loads and/or demonstrating that discharges from those sources are not causing the exceedances. The San Diego Water Board shall implement additional actions (e.g., issue enforcement actions, amend existing NPDES requirements or conditional waivers), as needed, to bring all those controllable sources into compliance with the wet weather TMDLs.

Between the effective date of these TMDLs and the end of the TMDL Compliance Schedules, monitoring is also required to demonstrate progress toward achieving and complying with the TMDLs, WLAs, and LAs. Progress can be demonstrated with reductions in exceedance frequencies in the receiving waters until the allowable exceedance frequencies ultimately are achieved at the end of the TMDL Compliance Schedules. Demonstrating progress toward attaining the TMDLs in the receiving waters will be assessed differently for dry weather and wet weather as follows:

1. *Measuring Progress Toward Attaining Dry Weather TMDLs*: For the dry weather TMDLs, available historical monitoring data from the year 2002 to the effective date of these TMDLs should be used to calculate the "existing" dry weather exceedance frequency of the 30-day geometric mean REC-1 WQOs for each watershed. "Existing" dry weather exceedance frequencies may be calculated separately for each impaired waterbody listed, or an "existing" dry weather exceedance frequency may be calculated that is applicable to the entire watershed.

   The "existing" dry weather exceedance frequencies should be reduced until the final allowable dry weather exceedance frequency is achieved by the end of the dry weather TMDL Compliance Schedule. If the TMDL Compliance Schedules include interim milestones that must be achieved to demonstrate progress toward attaining the dry weather TMDLs, reductions in the exceedance frequencies in the receiving water may be used. For example, if the "existing" dry weather exceedance frequency is 60 percent, the final dry weather exceedance frequency is 0 percent, and an interim milestone requires a 50 percent reduction, the exceedance frequency in the receiving water should be 30 percent or less by the interim milestone date. By the end of the dry weather TMDL Compliance Schedule, the final allowable dry weather exceedance frequency of the 30-day geometric mean REC-1 WQOs is 0 percent in the receiving waters for both beaches and creeks.

2. *Measuring Progress Toward Attaining Wet Weather TMDLs*: For the wet weather TMDLs, the number of wet days and number of wet exceedance days during the critical wet year from the wet weather model were used to calculate the "existing" wet weather exceedance frequency that needs to be reduced to the allowable wet weather exceedance frequency. For example, if a watershed had 69 wet weather days during the critical wet year, and the wet weather model predicted that all the subwatersheds had an average of 41 wet weather exceedance days during the critical wet year, the "existing" wet weather exceedance frequency is 41/69=59%. For the watershed addressed by these TMDLs, the number of wet weather exceedance days for each indicator bacteria predicted by the wet weather model for the critical wet year are summarized below in Table11-3:

Table 11-3. "Existing" Wet Weather Exceedance Frequencies by Watershed

Watershed	Number of Wet Days in Critical Wet Year	"Existing" Wet Weather Exceedance Frequency of Single Sample Maximum REC-1 WQO [a]		
		Fecal Coliform	Total Coliform	Enterococcus
San Joaquin Hills HSA/ Laguna Beach HSA	69	52%	54%	55%
Aliso HSA	69	59%	59%	62% (62%) [b]
Dana Point HSA	69	50%	50%	50%
Lower San Juan HSA	76	66%	66%	74% (72%) [b]
San Clemente HA	73	47%	47%	50%
San Luis Rey HU	90	68%	66%	76%
San Marcos HA	49	57%	57%	59%
San Dieguito HU	98	43%	44%	49%
Miramar Reservoir HA	94	30%	30%	30%
Scripps HA	57	52%	52%	52%
Tecolote HA	57	75%	75%	81% (79%) [b]
Mission San Diego HSA/ Santee HSA	86	70%	63%	79% (76%) [b]
Chollas HSA	65	60%	60%	63% (63%) [b]

a. Calculated by taking the average number of wet days that are predicted by the wet weather model to exceed the single sample maximum REC-1 water quality objective (400 MPN/100mL for fecal coliform, 10,000 MPN/100mL for total coliform, and 61 or 104 MPN/100mL) divided by the total number of wet days in the critical wet year (1993).
b. Allowable exceedance frequency calculated based on an *Enterococcus* single sample maximum REC-1 water quality objective of 61 MPN/100mL. Allowable exceedance frequency in parenthesis calculated based on an Enterococcus single sample maximum REC-1 water quality objective of 104 MPN/100mL, which may be applicable if the usage frequency of the creeks in these watersheds are designated as "moderately to lightly used area" or less frequent usage frequency in the Basin Plan.

The "existing" wet weather exceedance frequencies should be reduced until the final allowable wet weather exceedance frequency is achieved by the end of the wet weather TMDL Compliance Schedule. If the TMDL Compliance Schedules include interim milestones that must be achieved to demonstrate progress toward attaining the wet weather TMDLs, reductions in the exceedance frequencies in the receiving water may be used. For example, if the "existing" wet weather exceedance frequency is 59 percent, the final wet weather exceedance frequency is 22 percent, and an interim milestone requires a 50 percent reduction, the exceedance frequency in the receiving water should be 41 percent or less by the interim milestone date. By the end of the wet weather TMDL Compliance Schedule, the allowable wet weather exceedance frequency is 22 percent in the receiving waters for both beaches and creeks.

The specific receiving waters (i.e., specific beaches and creek segments) identified on the 2002 303(d) List are shown in section 11.5. Because the REC-1 WQOs must be met throughout the 20 waterbodies addressed by these bacteria TMDLs, monitoring data from these locations and any other beach segments and/or creek monitoring points in the watersheds addressed by these TMDLs may be used to determine compliance.

Because the municipal MS4s are the most significant controllable sources of bacteria and the Phase I MS4s often discharge directly to the receiving waters addressed by these TMDLs, the municipal Phase I MS4s will be primarily responsible for conducting the monitoring. Additional monitoring locations and frequency may be required to identify sources that need additional controls to reduce bacteria loads. While this TMDL Implementation Plan recommends monitoring at one or two locations for each waterbody, monitoring only one or two locations in the receiving waters may not provide the data to differentiate between and locate sources of bacteria in the watershed. Therefore, the municipal Phase I MS4s may wish to establish additional monitoring locations at key jurisdictional boundaries as part of their monitoring programs, especially in watersheds where Caltrans and Agriculture have been identified as sources contributing bacteria loads to the receiving waters.

Investigative orders, enforcement actions, WDRs, or conditional waiver of WDRs issued by the San Diego Water Board should require monitoring program plans that include, as applicable, the minimum monitoring locations and frequencies outlined above, but also provide the dischargers an opportunity to propose additional or alternative monitoring locations and frequency of monitoring events. The San Diego Water Board may also issue investigative orders, enforcement actions, WDRs, or conditional waiver of WDRs that specify additional or alternative monitoring, monitoring locations, and/or frequency of monitoring events.

The San Diego Water Board will coordinate, to the extent possible, the monitoring that is required by the dischargers, to minimize the monitoring resources required and maximize the temporal and spatial coverage of the data collection.

~~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.[98] 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 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 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*

[98] The dry and wet weather wasteload allocation for discharges from wastewater treatment facilities, also know as publicly owned treatment works (POTWs), is zero. The only exception is Padre Dam whose discharge to the San Diego River is regulated by the San Diego Waterboard and must meet REC-1 permit requirements. Therefore Padre Dam received a wasteload allocation which is based on the effluent limitations of its WDRs, and is included in addition to these TMDLs which are based on urban runoff. Please see section 8.1.5 for further discussion.

	~~*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*~~

~~*11.3.2Nonpoint 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. Therefore, although LAs have 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.~~

~~*11.3.3Lead 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 Based On the 2002 Clean Water Act Section 303(d) List

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	City of Laguna Beach **County of Orange** Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
		at Heisler Park – North		
Laguna Beach HSA (901.12)	Pacific Ocean Shoreline	at Main Laguna Beach	City of Aliso Viejo **County of Orange** City of Laguna Beach City of Laguna Woods Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
		Laguna Beach at Ocean Avenue		
		Laguna Beach at Laguna Avenue		
		Laguna Beach at Cleo Street		
		Arch Cove at Bluebird Canyon Road		
		Laguna Beach at Dumond Drive		
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	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
		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		

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
		Salt Creek Beach at Dana Strand Road		
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 Caltrans Owners/operators of small MS4s*	N
	San Juan Creek	Lower 1 mile		
San Clemente HA (901.30)		Poche Beach	City of San Clemente **County of Orange** Orange County Flood Control District Dana Point Caltrans Owners/operators of small MS4s*	N
		Ole Hanson Beach Club Beach at Pico Drain		
		San Clemente City Beach at El Portal Street Stairs		
		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		
San Luis Rey HU (903.00)	Pacific Ocean Shoreline	at San Luis Rey River Mouth	**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	C

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
			County of San Diego Caltrans Owners/operators of small MS4s* Controllable nonpoint sources	
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
Scripps HA (906.30)	Pacific Ocean Shoreline	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 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.	**City of San Diego** Owners/operators of small MS4s*	S
Santee HSA (907.12)	Forrester Creek	Lower 1 mile	**City of El Cajon** City of La Mesa City of Santee County of San Diego Caltrans Owners/operators of small MS4s*	S

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
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 San Diego City of Santee County of San Diego Caltrans Owners/operators of small MS4s* Padre Dam Water Treatment Facility	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.
** Based on the 2002 Clean Water Act Section 303(d) List

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, 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;
- 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 Based On the 2002 Clean Water Act Section 303(d) List

Watershed	Waterbody	Segment or Area[b]	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 At creek mouth		3
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
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

Watershed	Waterbody	Segment or Area[b]	Priority
San Luis Rey HU (903.00)	Pacific Ocean Shoreline	at San Luis Rey River Mouth	2
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	La Jolla Shores Beach at El Paseo Grande[a]	1
		La Jolla Shores Beach at Caminito Del Oro[a]	1
		La Jolla Shores Beach at Vallecitos[a]	1
		La Jolla Shores Beach at Ave de la Playa[a]	1
		at Casa Beach, Children's Pool	1
		South Casa Beach at Coast Blvd.[a]	1
		Whispering Sands Beach at Ravina Street[a]	1
		Windansea Beach at Vista de la Playa[a]	1
		Windansea Beach at Bonair Street[a]	1
		Windansea Beach at Playa del Norte[a]	1
		Windansea Beach at Palomar Ave.[a]	1
		at Tourmaline Surf Park[a]	1
		Pacific Beach at Grand Ave.[a]	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 removed these beach segments from the 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments.
[b] Based on the 2002 Clean Water Act Section 303(d) List

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 Interim Wet Weather TMDLs and Final Dry Weather TMDLs

The dry and wet weather compliance schedule (Tables 11-4 and 11-5 respectively) for implementing the wasteload and load reductions required under these TMDLs is structured in a phased manner, with 100 percent of interim wet weather reductions, and 100 percent of final dry weather reductions necessary 10 years after the effective date of this TMDL Basin Plan amendment. All of these reductions are aimed at restoring water quality to a level that supports REC-1 uses in the ocean shoreline and in impaired creeks. These reductions required by the compliance schedule vary on the timeline based on the priority scheme described in section 11.4.1. Intermediate milestone reductions in bacteria wasteloads are required sooner in the higher priority waters.

Compliance Schedule for Meeting Final Wet Weather TMDLs

Many of the dischargers requested a longer compliance schedule because of the expense of implementing the TMDLs, and because the final wet weather TMDLs for all indicator bacteria are so stringent. Based on these comments, the length of the compliance schedule for final wet weather TMDLs is 20 years from the effective date of the TMDL Basin Plan amendment.

Keep in mind that the San Diego Water Board intends to revise the final wet weather enterococci, fecal coliform, and total coliform TMDLs for REC-1 using the reference system approach, and will revise the compliance schedule for meeting those final wet weather TMDLs as well. The revised final wet weather enterococci, fecal coliform, and total coliform TMDLs will likely be similar to the interim TMDLs. Thus, the revised final compliance schedule for these TMDLs likely will not be longer than 10 years. The reference system/natural sources exclusion approach Basin Plan amendment is described in more detail in section 11.5.7.

The dischargers expressed a legitimate concern regarding planning and implementing costly controls for the final wet weather TMDLs as the San Diego Water Board has every intention of revising them. Thus, the dischargers will not be required to submit Bacteria Load Reduction Plans (discussed in sections 11.5.2 and 11.5.3) or Comprehensive Load Reduction Plans for the final wet weather TMDLs until after the San Diego Water Board has considered the reference system/natural sources exclusion approach Basin Plan amendment, and considered revisions to those TMDLs. The San Diego Water Board will commit to considering the Basin Plan amendment and revisions to the TMDLs within one year of the effective date of this TMDL Basin Plan amendment.

Table 11-4. Dry Weather Compliance Schedule and Milestones for Achieving Wasteload Reductions

Compliance Year (year after OAL approval)	Required Wasteload Reduction		
	Priority 1	Priority 2	Priority 3
5	50% (All Final Dry ENT, FC and TC)		
6		50% (All Final Dry ENT, FC and TC)	
7			50% (All Final Dry ENT, FC and TC)
10	100% (All Final Dry ENT, FC and TC)	100% (All Final Dry ENT, FC and TC)	100% (All Final Dry ENT, FC and TC)

Table 11-5. Wet Weather Compliance Schedule and Milestones for Achieving Wasteload Reductions

Compliance Year (year after OAL approval)	Required Wasteload Reduction		
	Priority 1	Priority 2	Priority 3
5	50% (All Interim Wet Weather)		
6		50% (All Interim Wet Weather)	
7			50% (All Interim Wet Weather)
10	100% (All Interim Wet Weather)	100% (All Interim Wet Weather)	100% (All Interim Wet Weather)
20	100% (Final Wet Weather)	100% (Final Wet Weather)	100% (Final Wet Weather)

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 11-6 apply.

Table 11-6. Compliance Schedule Including Interim Milestones – Chollas Creek

Compliance Year (year after OAL approval)	Wasteload Reduction Milestone
7	50% final for dry weather
10	100% final for dry weather, 50% interim for wet weather
20	100% for final wet weather

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*.

Likewise, dischargers in other bacteria-impaired watersheds may also find that undertaking concurrent load reduction programs for other pollutant constituents (e.g. metals, pesticides, trash, nutrients, sediment, etc.) together with the bacteria load reduction requirements in these TMDLs, is more cost effective, and has fewer potential environmental impacts from structural BMP construction. In these cases, the dischargers have the option to submit a Comprehensive Load Reduction Plan (CLRP) for all constituents of concern in lieu of the Bacteria Load Reduction Plan, and to propose an appropriately tailored comprehensive compliance schedule (CCS). CCSs tailored under this provision may not extend beyond 20 years. The San Diego Water Board may issue investigative orders to confirm items in the CLRPs. The CLRPs must be capable of achieving the WLAs for the bacteria TMDLs, achieving the water quality objectives in receiving waters for other impairing pollutants in the watershed,[99] and achieving the goals and objectives of any other water quality improvement projects included in the CLRPs within the time frame of the CCS. Additionally, CLRPs must meet the performance standards as outlined in sections 11.5.2 and 11.5.3 below. If appropriate, proposed alternative compliance schedules will be incorporated into the various TMDL implementing orders, such as the municipal stormwater NPDES requirements, in lieu of the schedules in Tables 11-4 and 11-5.

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

[99] In this case, achieving the "water quality objectives for other impairing pollutants" means that Municipal dischargers and Caltrans must meet the Receiving Water Limitations requirements of their NPDES Stormwater WDRs. These Receiving Water Limitations include an iterative process requiring implementation of increasingly stringent BMPs that will result in achievement of water quality objectives. Municipal discharger and Caltrans NPDES Stormwater WDRs also contain monitoring requirements, which can be adapted to monitor, document, and assess BMP implementation. All proposals for CLRPs must include achievement of water quality objectives in receiving waters for all impairing pollutants, by meeting NPDES Receiving Water Limitations as verified through NPDES monitoring requirements, within the CCS timeframe.

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.[100] 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 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.[101]

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

[100] 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.
[101] *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program*, SWRCB, May 20, 2004.

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[102] 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 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.

[102] 40 CFR section 122.44(d)(1)(vii)(B).

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, 11-4 and 11-5. At a minimum, WQBELs shall include a BMP program of expanded or better-tailored BMPs to attain the WLAs in accordance with the compliance schedules in Tables 11.4 and 11-5.

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 (BLRPs) or a Comprehensive Load Reduction Plan (CLRPs). Bacteria Load Reduction Plans or Comprehensive 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.

To provide guidance to Caltrans in preparing BLRPs and CLRPs, the following bullets describe components that should be considered for incorporation in the BLRPs and CLRPs.

The BLRPs should include the following components:

Comprehensive Watershed Approach

- Dischargers should identify the Lead Watershed Contact for their BLRPs. The Lead Watershed Contact should serve as liaison between all other common watershed dischargers and the San Diego Water Board, where appropriate.

- Dischargers should describe a program for encouraging collaborative, watershed-based, land-use planning in their jurisdictional planning departments.

- Dischargers should develop and periodically update a map of the BLRP watershed, to facilitate planning, assessment, and collaborative decision-making. As appropriate, the map should include features such as receiving waters (including the Pacific Ocean); Clean Water Act section 303(d) impaired receiving waters; water quality projects; land uses; MS4s; major highways; jurisdictional boundaries; and inventoried commercial, industrial, and municipal sites.

- Dischargers should annually assess the water quality of impaired water body in their BLRPs in order to identify all water quality problems within the impaired water body. This assessment should use applicable water quality data, reports, and analysis generated in accordance with the requirements of the applicable NPDES MS4 monitoring and reporting programs, as well as applicable information available from other public and private organizations.

- Dischargers should develop and implement a collective watershed BLRP strategy to meet the bacteria TMDL. The strategy should guide dischargers in developing a Bacteria Compliance Schedule (BCS) which includes BMP planning and scheduling as outlined below.

- Dischargers should collaborate to develop and implement the BLRPs. The BLRP should include a proposal for frequent regularly scheduled meetings among the dischargers in the impaired watershed.

- Each BLRP and BCS should be reviewed annually to identify needed modifications and improvements. The dischargers should develop and implement a plan and schedule, included in the BCS, to address the identified modifications and improvements. All updates to the BLRP should be documented in the BLRP, and submitted to the San Diego Water Board. Individual dischargers should also review and modify their jurisdictional ordinances and activities as necessary so that they are consistent with the requirements of the BLRP.

Bacteria Compliance Schedule - BMP Planning and Scheduling

The BCS should identify the BMPs/water quality projects that are planned for implementation and provide an implementation schedule for each BMP/water quality project. The BCS should demonstrate how the BMPs/water quality projects will address all the bacteria TMDLs. The BCS, at a minimum, should include scheduling for the following:

Non-structural BMP phasing:

- Initial Non-Structural BMP Analysis - Watershed data should be analyzed to identify effective non-structural BMPs for implementation. This should be completed and included in the BCS.
- Scheduled Annual Non-structural BMP Implementation – The above analysis should be used to identify BMPs that will be implemented and to develop an aggressive non-structural BMP implementation schedule. The BCS should include a schedule of the current BMP staffing for each impaired area, and provide a discussion on adjustments to staff scheduling to meet new non-structural BMP demands. Schedules should be realistic and justifiable.
- Scheduled Annual BMP Assessment and Optimizing Adjustments - As the nonstructural BMPs are being implemented, a scheduled in-depth assessment of the nonstructural BMPs' performance should follow. Non-structural BMPs that are found to be ineffective should be modified to incorporate optimizing adjustments to improve performance or be replaced by other effective non-structural BMPs. The results from this assessment should also be used to determine structural BMP selection and the schedule for structural BMP implementation. The BCS should include an annual schedule for in-depth non-structural BMP assessment and optimizing adjustments.
- Scheduled Continuous Budget and Funding Efforts- Securing budget and funding for non-structural BMP staffing and equipment should be scheduled early and continue until the bacteria TMDLs are met. The BCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for non-structural BMP implementation.

Structural BMP phasing:

- Scheduled Initial Structural BMP Analysis- Structural BMP analysis should utilize all available information, including the non-structural BMP assessment, to identify, locate, design and build structural BMPs, or a train of BMPs, to meet the these Bacteria TMDLs. The BCS should include a schedule for structural BMP analysis.
- Scheduled Annual BMP Construction - The BCS should include a projected general construction schedule with a realistic and justifiable timeline for BMP construction.

- Scheduled Annual BMP Assessment, Optimization Adjustments, and Maintenance - Assessment for structural BMPs should begin immediately upon initial BMP completion, followed by continuously scheduled BMP assessment, optimization adjustments, and maintenance, to both the individual structural BMPs and the structural BMP program as a whole. The BCS should include an annual schedule for in-depth structural BMP assessment.
- Scheduled Continuous Budget and Funding Effort - Securing budget and funding for structural BMPs and additional maintenance staff should be scheduled early and continue until the bacteria TMDLs are met. The BCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for structural BMP implementation.

Comprehensive Load Reduction Plans should include the following components:

Comprehensive Watershed and Pollutant Approach

- Dischargers should identify the Lead Watershed Contact for their CLRPs. The Lead Watershed Contact should serve as liaison between all other common watershed dischargers and the San Diego Water Board, where appropriate.

- Dischargers should describe a program for encouraging collaborative, watershed-based, land-use planning in their jurisdictional planning departments.

- Dischargers should develop and periodically update a map of the CLRP watershed, to facilitate planning, assessment, and collaborative decision-making. As appropriate, the map should include features such as receiving waters (including the Pacific Ocean); Clean Water Act section 303(d) impaired receiving waters; water quality projects; land uses; MS4s; major highways; jurisdictional boundaries; and inventoried commercial, industrial, and municipal sites.

- Dischargers should annually assess the water quality of impaired water body in their CLRPs in order to identify all water quality problems within the impaired water body. This assessment should use applicable water quality data, reports, and analysis generated in accordance with the requirements of the applicable NPDES MS4 monitoring and reporting programs, as well as applicable information available from other public and private organizations.

- Identified water quality problems in the impaired water body to be addressed by the CLRP should include, in addition to bacteria, all CWA section 303(d) listings, persistent violations of water quality standards, toxicity, impacts to beneficial uses, water quality conditions for which water quality improvement projects are currently being implemented, and any other pertinent conditions. All impaired waters should be included. Impaired water bodies where bacteria is the only impairing pollutant are not eligible to submit a CLRP.

- Dischargers should develop and implement a collective watershed CLRP strategy to meet the bacteria TMDL and all other receiving water quality standards for all other pollutants being addressed in the CLRPs. The strategy should guide dischargers in developing a Comprehensive Compliance Schedule (CCS) which includes BMP planning and scheduling as outlined below.

- Dischargers should collaborate to develop and implement the CLRPs. The CLRP should include a proposal for frequent regularly scheduled meetings among the dischargers in the impaired watershed.

- Each CLRP and CCS should be reviewed annually to identify needed modifications and improvements. The dischargers should develop and implement a plan and schedule, included in the CCS, to address the identified modifications and improvements. All updates to the CLRP should be documented in the CLRP, and submitted to the San Diego Water Board. Individual dischargers should also review and modify their jurisdictional ordinances and activities as necessary so that they are consistent with the requirements of the CLRP.

Comprehensive Compliance Schedule - BMP Planning and Scheduling

The CCS should identify the BMPs/water quality projects that are planned for implementation and provide an implementation schedule for each BMP/water quality project. The CCS should demonstrate how the BMPs/water quality projects will address all water quality problems in the impaired water body and result in achievement of water quality standards. It should also demonstrate how comprehensive treatment of all the pollutants together justifies a longer compliance schedule for the bacteria TMDLs. The CCS, at a minimum, should include scheduling for the following:

Non-structural BMP phasing:

- Initial Non-Structural BMP Analysis - After identifying and listing all the 303(d) listed impairing pollutants and other water quality problems in an impaired water body, the water body and data should be analyzed to identify effective non-structural BMPs for implementation. This should be completed and included in the CCS.
- Scheduled Annual Non-structural BMP Implementation – The above analysis should be used to identify BMPs that will be implemented and to develop an aggressive non-structural BMP implementation schedule. The CCS should include a schedule of the current BMP staffing for each impaired area, and provide a discussion on adjustments to staff scheduling to meet new non-structural BMP demands. Schedules should be realistic and justifiable.
- Scheduled Annual BMP Assessment and Optimizing Adjustments - As the nonstructural BMPs are being implemented, a scheduled in-depth assessment of the nonstructural BMPs' performance should follow. Non-structural BMPs that are found to be ineffective should be modified to incorporate optimizing

adjustments to improve performance or be replaced by other effective non-structural BMPs. The results from this assessment should also be used to determine structural BMP selection and the schedule for structural BMP implementation. The CCS should include an annual schedule for in-depth non-structural BMP assessment and optimizing adjustments.

- Scheduled Continuous Budget and Funding Efforts- Securing budget and funding for non-structural BMP staffing and equipment should be scheduled early and continue until the bacteria TMDLs are met, water quality objectives for other impairing pollutants are achieved, and the goals and objectives of other water quality improvement projects are met.[103] The CCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for non-structural BMP implementation.

Structural BMP phasing:

- Scheduled Initial Structural BMP Analysis - Structural BMP analysis should utilize all available information, including the non-structural BMP assessment, to identify, locate, design and build structural BMPs, or a train of BMPs, that restore water quality for all the 303(d) listed impairing pollutants and other water quality problems in an impaired water body. The CCS should include a schedule for structural BMP analysis.
- Scheduled Annual BMP Construction - The CCS should include a projected general construction schedule with a realistic and justifiable timeline for BMP construction.
- Scheduled Annual BMP Assessment, Optimization Adjustments, and Maintenance - Assessment for structural BMPs should begin immediately upon initial BMP completion, followed by continuously scheduled BMP assessment, optimization adjustments, and maintenance, to both the individual structural BMPs and the structural BMP program as a whole. The CCS should include an annual schedule for in-depth structural BMP assessment.
- Scheduled Continuous Budget and Funding Effort - Securing budget and funding for structural BMPs and additional maintenance staff should be scheduled early and continue until the bacteria TMDLs are met, water quality objectives for other impairing pollutants are achieved, and the goals and objectives of other water quality improvement projects are met.[104] The CCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for structural BMP implementation.

[103] In this case, achieving the "water quality objectives for other impairing pollutants" means that Municipal dischargers must meet the Receiving Water Limitations requirements of their NPDES Stormwater WDRs. These Receiving Water Limitations include an iterative process requiring implementation of increasingly stringent BMPs that will result in achievement of water quality objectives. Municipal discharger NPDES Stormwater WDRs also contain monitoring requirements, which can be adapted to monitor, document, and assess BMP implementation. All proposals for CLRPs must include achievement of water quality objectives in receiving waters for all impairing pollutants, by meeting NPDES Receiving Water Limitations as verified through NPDES monitoring requirements, within the CCS timeframe.

[104] Please see footnote immediately above.

Economic Justifications

- The dischargers should show how the estimated cost of the structural BMPs, and the opportunity to tailor BMP implementation to include all the 303(d) listed impaired water bodies, and/or other water quality improvement projects in an affected area, will require more time to fund and schedule. Cost estimates for the construction of potential structural BMPs, while general at this stage in planning, should be realistic and justifiable.

Subsequent reports should assess and describe the effectiveness of implementing the Bacteria Load Reduction Plan or Comprehensive Load Reduction Plan. Effectiveness assessments should be based on a program effectiveness assessment framework, such as the one developed by the California Stormwater Quality Association (CASQA, no date). Using the CASQA framework as an example, the assessments should address the framework's outcome levels 1-5 on an annual basis, and outcome level 6 once every five years.[105] 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 load-based 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.

The Bacteria Load Reduction Plans or Comprehensive Load Reduction Plans are Caltrans' opportunity to propose methods for assessing compliance with WQBELs that implement the TMDLs. The monitoring components included in its Bacteria Load Reduction Plans should be formulated according to particular compliance assessment strategies. The monitoring components are expected to be consistent with, and support whichever compliance assessment methods are proposed. The San Diego Water Board will coordinate with Caltrans during the development of the proposed monitoring components and associated compliance assessment methods.

The dischargers will not be required to submit Bacteria Load Reduction Plans for the final wet weather TMDLs until after the San Diego Water Board has considered the reference

[105] Outcome level 1 assesses compliance with activity-based permit requirements. Outcome level 2 assesses changes in attitudes, knowledge, and awareness. Outcome level 3 assesses behavioral change and BMP implementation. Outcome level 4 assess pollutant load reductions. Outcome level 5 assesses changes in urban runoff and discharge water quality. Outcome level 6 assesses changes in receiving water quality. See CASQA "An Introduction to Stormwater Program Effectiveness Assessment."

system/natural sources exclusion approach Basin Plan amendment, and considered revisions to those TMDLs.

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[106] 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

[106] 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."

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."[107] 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, 11-4 and 11-5. 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 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 (BLRPs) or Comprehensive Load Reduction Plan (CLRPs). Bacteria Load Reduction Plans or Comprehensive 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.

To provide guidance to the dischargers in preparing BLRPs and CLRPs, the following bullets describe components that should be considered for incorporation in the BLRPs and CLRPs.

Bacteria Load Reduction Plans should include the following components:

Comprehensive Watershed Approach

- Dischargers should identify the Lead Watershed Contact for their BLRPs. The Lead Watershed Contact should serve as liaison between all other common watershed dischargers and the San Diego Water Board, where appropriate.

- Dischargers should describe a program for encouraging collaborative, watershed-based, land-use planning in their jurisdictional planning departments.

[107] 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.

- Dischargers should develop and periodically update a map of the BLRP watershed, to facilitate planning, assessment, and collaborative decision-making. As appropriate, the map should include features such as receiving waters (including the Pacific Ocean); Clean Water Act section 303(d) impaired receiving waters; water quality projects; land uses; MS4s; major highways; jurisdictional boundaries; and inventoried commercial, industrial, and municipal sites.

- Dischargers should annually assess the water quality of impaired water body in their BLRPs in order to identify all water quality problems within the impaired water body. This assessment should use applicable water quality data, reports, and analysis generated in accordance with the requirements of the applicable NPDES MS4 monitoring and reporting programs, as well as applicable information available from other public and private organizations.

- Dischargers should develop and implement a collective watershed BLRP strategy to meet the bacteria TMDL. The strategy should guide dischargers in developing a Bacteria Compliance Schedule (BCS) which includes BMP planning and scheduling as outlined below.

- Dischargers should collaborate to develop and implement the BLRPs. The BLRP should include a proposal for frequent regularly scheduled meetings among the dischargers in the impaired watershed.

- Each BLRP and BCS should be reviewed annually to identify needed modifications and improvements. The dischargers should develop and implement a plan and schedule, included in the BCS, to address the identified modifications and improvements. All updates to the BLRP should be documented in the BLRP, and submitted to the San Diego Water Board. Individual dischargers should also review and modify their jurisdictional ordinances and activities as necessary so that they are consistent with the requirements of the BLRP.

Bacteria Compliance Schedule - BMP Planning and Scheduling

The BCS should identify the BMPs/water quality projects that are planned for implementation and provide an implementation schedule for each BMP/water quality project. The BCS should demonstrate how the BMPs/water quality projects will address all the bacteria TMDLs. The BCS, at a minimum, should include scheduling for the following:

Non-structural BMP phasing:

- Initial Non-Structural BMP Analysis - Watershed data should be analyzed to identify effective non-structural BMPs for implementation. This should be completed and included in the BCS.

- Scheduled Annual Non-structural BMP Implementation – The above analysis should be used to identify BMPs that will be implemented and to develop an aggressive non-structural BMP implementation schedule. The BCS should include a schedule of the current BMP staffing for each impaired area, and provide a discussion on adjustments to staff scheduling to meet new non-structural BMP demands. Schedules should be realistic and justifiable.

- Scheduled Annual BMP Assessment and Optimizing Adjustments - As the nonstructural BMPs are being implemented, a scheduled in-depth assessment of the nonstructural BMPs' performance should follow. Non-structural BMPs that are found to be ineffective should be modified to incorporate optimizing adjustments to improve performance or be replaced by other effective non-structural BMPs. The results from this assessment should also be used to determine structural BMP selection and the schedule for structural BMP implementation. The BCS should include an annual schedule for in-depth non-structural BMP assessment and optimizing adjustments.

- Scheduled Continuous Budget and Funding Efforts- Securing budget and funding for non-structural BMP staffing and equipment should be scheduled early and continue until the bacteria TMDLs are met. The BCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for non-structural BMP implementation.

Structural BMP phasing:

- Scheduled Initial Structural BMP Analysis– Structural BMP analysis should utilize all available information, including the non-structural BMP assessment, to identify, locate, design and build structural BMPs, or a train of BMPs, to meet the these Bacteria TMDLs. The BCS should include a schedule for structural BMP analysis.

- Scheduled Annual BMP Construction - The BCS should include a projected general construction schedule with a realistic and justifiable timeline for BMP construction.

- Scheduled Annual BMP Assessment, Optimization Adjustments, and Maintenance - Assessment for structural BMPs should begin immediately upon initial BMP completion, followed by continuously scheduled BMP assessment, optimization adjustments, and maintenance, to both the individual structural BMPs and the structural BMP program as a whole. The BCS should include an annual schedule for in-depth structural BMP assessment.

- Scheduled Continuous Budget and Funding Effort – Securing budget and funding for structural BMPs and additional maintenance staff should be scheduled early and continue until the bacteria TMDLs are met. The BCS should include a

~~schedule for staff time, including position and job description, authorized for securing budget and funding for structural BMP implementation.~~

~~Comprehensive Load Reduction Plans should include the following components:~~

~~Comprehensive Watershed and Pollutant Approach~~

- ~~Dischargers should identify the Lead Watershed Contact for their CLRPs. The Lead Watershed Contact should serve as liaison between all other common watershed dischargers and the San Diego Water Board, where appropriate.~~

- ~~Dischargers should describe a program for encouraging collaborative, watershed-based, land-use planning in their jurisdictional planning departments.~~

- ~~Dischargers should develop and periodically update a map of the CLRP watershed, to facilitate planning, assessment, and collaborative decision-making. As appropriate, the map should include features such as receiving waters (including the Pacific Ocean); Clean Water Act section 303(d) impaired receiving waters; water quality projects; land uses; MS4s; major highways; jurisdictional boundaries; and inventoried commercial, industrial, and municipal sites.~~

- ~~Dischargers should annually assess the water quality of impaired water body in their CLRPs in order to identify all water quality problems within the impaired water body. This assessment should use applicable water quality data, reports, and analysis generated in accordance with the requirements of the applicable NPDES MS4 monitoring and reporting programs, as well as applicable information available from other public and private organizations.~~

- ~~Identified water quality problems in the impaired water body to be addressed by the CLRP should include, in addition to bacteria, all CWA section 303(d) listings, persistent violations of water quality standards, toxicity, impacts to beneficial uses, water quality conditions for which water quality improvement projects are currently being implemented, and any other pertinent conditions. All impaired waters should be included. Impaired water bodies where bacteria is the only impairing pollutant are not eligible to submit a CLRP.~~

- ~~Dischargers should develop and implement a collective watershed CLRP strategy to meet the bacteria TMDL and all other receiving water quality standards for all other pollutants being addressed in the CLRPs. The strategy should guide dischargers in developing a Comprehensive Compliance Schedule (CCS) which includes BMP planning and scheduling as outlined below.~~

- Dischargers should collaborate to develop and implement the CLRPs. The CLRP should include a proposal for frequent regularly scheduled meetings among the dischargers in the impaired watershed.

- Each CLRP and CCS should be reviewed annually to identify needed modifications and improvements. The dischargers should develop and implement a plan and schedule, included in the CCS, to address the identified modifications and improvements. All updates to the CLRP should be documented in the CLRP, and submitted to the San Diego Water Board. Individual dischargers should also review and modify their jurisdictional ordinances and activities as necessary so that they are consistent with the requirements of the CLRP.

Comprehensive Compliance Schedule - BMP Planning and Scheduling

The CCS should identify the BMPs/water quality projects that are planned for implementation and provide an implementation schedule for each BMP/water quality project. The CCS should demonstrate how the BMPs/water quality projects will address all water quality problems in the impaired water body and result in achievement of water quality standards. It should also demonstrate how comprehensive treatment of all the pollutants together justifies a longer compliance schedule for the bacteria TMDLs. The CCS, at a minimum, should include scheduling for the following:

Non-structural BMP phasing:

- Initial Non-Structural BMP Analysis - After identifying and listing all the 303(d) listed impairing pollutants and other water quality problems in an impaired water body, the water body and data should be analyzed to identify effective non-structural BMPs for implementation. This should be completed and included in the CCS.

- Scheduled Annual Non-structural BMP Implementation – The above analysis should be used to identify BMPs that will be implemented and to develop an aggressive non-structural BMP implementation schedule. The CCS should include a schedule of the current BMP staffing for each impaired area, and provide a discussion on adjustments to staff scheduling to meet new non-structural BMP demands. Schedules should be realistic and justifiable.

- Scheduled Annual BMP Assessment and Optimizing Adjustments - As the nonstructural BMPs are being implemented, a scheduled in-depth assessment of the nonstructural BMPs' performance should follow. Non-structural BMPs that are found to be ineffective should be modified to incorporate optimizing adjustments to improve performance or be replaced by other effective non-structural BMPs. The results from this assessment should also be used to determine structural BMP selection and the schedule for structural BMP implementation. The CCS should include an annual schedule for in-depth non-structural BMP assessment and optimizing adjustments.

- Scheduled Continuous Budget and Funding Efforts- Securing budget and funding for non-structural BMP staffing and equipment should be scheduled early and continue until the bacteria TMDLs are met, water quality objectives for other impairing pollutants are achieved, and the goals and objectives of other water quality improvement projects are met.[108] The CCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for non-structural BMP implementation.

Structural BMP phasing:

- Scheduled Initial Structural BMP Analysis- Structural BMP analysis should utilize all available information, including the non-structural BMP assessment, to identify, locate, design and build structural BMPs, or a train of BMPs, that restore water quality for all the 303(d) listed impairing pollutants and other water quality problems in an impaired water body. The CCS should include a schedule for structural BMP analysis.

- Scheduled Annual BMP Construction - The CCS should include a projected general construction schedule with a realistic and justifiable timeline for BMP construction.

- Scheduled Annual BMP Assessment, Optimization Adjustments, and Maintenance - Assessment for structural BMPs should begin immediately upon initial BMP completion, followed by continuously scheduled BMP assessment, optimization adjustments, and maintenance, to both the individual structural BMPs and the structural BMP program as a whole. The CCS should include an annual schedule for in-depth structural BMP assessment.

- Scheduled Continuous Budget and Funding Effort – Securing budget and funding for structural BMPs and additional maintenance staff should be scheduled early and continue until the bacteria TMDLs are met, water quality objectives for other impairing pollutants are achieved, and the goals and objectives of other water quality improvement projects are met.[109] The CCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for structural BMP implementation.

[108] In this case, achieving the "water quality objectives for other impairing pollutants" means that Caltrans must meet the Receiving Water Limitations requirements of their NPDES Stormwater WDRs. These Receiving Water Limitations include an iterative process requiring implementation of increasingly stringent BMPs that will result in achievement of water quality objectives. Caltrans NPDES Stormwater WDRs also contain monitoring requirements, which can be adapted to monitor, document, and assess BMP implementation. All proposals for CLRPs must include achievement of water quality objectives in receiving waters for all impairing pollutants, by meeting NPDES Receiving Water Limitations as verified through NPDES monitoring requirements, within the CCS timeframe.
[109] Please see footnote immediately above.

Economic Justifications

- The dischargers should show how the estimated cost of the structural BMPs, and the opportunity to tailor BMP implementation to include all the 303(d) listed impaired water bodies, and/or other water quality improvement projects in an affected area, will require more time to fund and schedule. Cost estimates for the construction of potential structural BMPs, while general at this stage in planning, should be realistic and justifiable.

Subsequent reports should assess and describe the effectiveness of implementing the Bacteria Load Reduction Plan or Comprehensive Load Reduction Plan. Effectiveness assessments should be based on a program effectiveness assessment framework, such as the one developed by the California Stormwater Quality Association (CASQA, no date). Using the CASQA framework as an example, the assessments should address the framework's outcome levels 1-5 on an annual basis, and outcome level 6 once every five years.[110] 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 load-based numerical WQBELs are included in the NPDES requirements, the monitoring requirements should include flow and bacteria density measurements to determine if bacteria loads in effluent are in compliance with WQBELs.

The Bacteria Load Reduction Plans or Comprehensive Load Reduction Plans are the municipal dischargers' opportunity to propose methods for assessing compliance with WQBELs that implement TMDLs. The monitoring components included in the Bacteria Load Reduction Plans or Comprehensive Load Reduction Plans should be formulated according to particular compliance assessment strategies. The monitoring components are expected to be consistent with, and support whichever compliance assessment methods are proposed. The San Diego Water Board will coordinate with the municipal dischargers during the development of their proposed monitoring components and associated compliance assessment methods.

The dischargers will not be required to submit Bacteria Load Reduction Plans or Comprehensive Load Reduction Plans for the final wet weather TMDLs until after the San Diego Water Board

[110] Outcome level 1 assesses compliance with activity-based permit requirements. Outcome level 2 assesses changes in attitudes, knowledge, and awareness. Outcome level 3 assesses behavioral change and BMP implementation. Outcome level 4 assesses pollutant load reductions. Outcome level 5 assesses changes in urban runoff and discharge water quality. Outcome level 6 assesses changes in receiving water quality. See CASQA "An Introduction to Stormwater Program Effectiveness Assessment."

has considered the reference system/natural sources exclusion approach Basin Plan amendment, and considered revisions to those TMDLs.

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 program reports in adherence to performance measures described above.

The Bacteria Load Reduction Plans or Comprehensive 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.

All of the beach segments in the Miramar Reservoir hydrologic area, and all the beaches except Casa Beach Children's Pool in the Scripps hydrologic area were removed from the List of Water Quality Limited Segments in the 2006 update of the list. However, the data sets evaluated by the SWRCB for the 2006 list update consisted of mostly dry weather sampling results. Based on the reevaluation of indicator bacteria water quality data from beaches within the Scripps and Miramar Reservoir Hydrologic Areas, both hydrologic areas are expected to be included in the 2008 list update as water quality limited segments. The data assessment in Appendix T demonstrates that several beaches within the hydrologic areas do not meet water quality standards.

Since the Scripps and Miramar Reservoir Hydrologic Areas include a mix of impaired and unimpaired beaches, as well as beaches with inadequate data to make an impairment status determination, implementation of the TMDL within these hydrologic areas will vary based on the water quality conditions of the particular beach being addressed.
For example, bacteria load reduction plans for these hydrologic areas can address beaches with different water quality conditions by using different implementation approaches. Beaches that are impaired during dry and wet weather will need to be fully addressed by bacteria load reduction plans, including proposals for BMP implementation targeting both dry and wet weather conditions. However, bacteria load reduction plans for beaches that are only impaired during wet weather need not include dry weather load reduction BMPs. In such cases, new BMPs will only be necessary for wet weather conditions, while existing BMPs will need to be maintained for dry weather conditions. Likewise, for those beaches not impaired during dry weather but lacking sufficient data to make an impairment determination for wet weather conditions (such as Anderson Canyon beach in the Miramar Reservoir Hydrologic Area), an assessment of the wet weather water quality condition will be needed in order to determine if wet weather load reduction BMPs are necessary at that beach. Wet weather BMP implementation in such cases will only be necessary after confirmation of impairment during wet weather conditions. Finally, the bacteria load reduction plans for the Scripps and Miramar Reservoir Hydrologic Areas can address beaches that are unimpaired during dry and wet weather simply by requiring the continued implementation of existing BMPs. This will also be true for any beaches removed from the list in the 2008 update since the 2008 update is likely to be adopted by the

SWRCB before the bacteria load reduction plans are due to the San Diego Water Board. Under all of these scenarios, monitoring will be necessary to demonstrate effectiveness of new and pre-existing BMPs to achieve the requirements of the TMDLs.

11.5.4 Actions with respect to discharges from POTWs

The San Diego Water Board will conduct surveillance of and enforce the provisions of SWRCB Order No. 2006-0003-DWQ, and San Diego Water Board Order No. R9-2007-0005 to ensure that collection systems for waste water treatment plants do not overflow, leak, or otherwise discharge into MS4s or surface waters. If need be, Order No. R9-2007-0005 can be revised to require more aggressive collection system monitoring, maintenance and repair schedules.

The San Diego Water Board will conduct surveillance of and enforce the provisions of Order No. R9-2003-0179 to ensure that the Padre Dam facility complies with its wasteload allocations.

11.5.5Actions 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[111] to comply with the requirements of Order No. 2003-0005-DWQ immediately after adoption of these TMDLs. 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.

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

11.5.6Actions 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, 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.

11.5.7Additional 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,[112] as necessary, against any

[112] 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

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 stormwater monitoring under the statewide Industrial Stormwater 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 stormwater monitoring but do not test for bacteria.

MSW landfills contain waste-metabolizing 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 may contain waste-metabolizing bacteria that are actively degrading wastes within the waste management unit.

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

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.

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 indicator bacteria discharges to surface waters. MSW landfills, as a source of surface water bacteria, should be investigated using the following recommended approach:

- An investigative Order (under authority of Water Code section 13267) will be issued to the owners and operators of 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 stormwater discharges from industrial facilities, including active MSW landfills; and

- Issue general NPDES requirements that require regular monitoring of stormwater discharges for bacteria. The general NPDES requirements would allow the San Diego Water Board to enroll any stormwater 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[113] 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.

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

Within one year of the effective date of the Basin Plan amendment for these bacteria TMDLs, the San Diego Water Board will consider a Basin Plan amendment authorizing the reference system/natural sources exclusion approach for interpreting water quality objectives for indicator bacteria in the context of a TMDL. The San Diego Water Board will also consider final wet weather TMDLs and dry weather total coliform TMDLs revised pursuant to this Basin Plan amendment within one year of the effective date of the TMDL Basin Plan amendment. This basin planning project is Issue No. 7 on the *Prioritized List of Basin Plan Issues for Investigation Between September 2004 and September 2007*. 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 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,[114] 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.

The natural sources exclusion approach will allow the San Diego Water Board to develop TMDLs that result in exceedances of WQOs for both REC-1 and REC-2 uses, as long as all bacteria sources associated with human and domesticated animal wastes are controlled. Under

[113] 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.

[114] 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.

the natural sources exclusion approach, after all such sources of bacteria are controlled, a certain frequency of exceedance of the WQOs can be authorized based on the residual exceedance frequency in the specific water body. The residual exceedance frequency can be used to calculate an allowable exceedance load for the purpose of a TMDL. Alternatively, a TMDL could also be calculated directly, without an allowable exceedance frequency, based on the existing bacteria loading in the waterbody after anthropogenic sources have been adequately controlled.

11.611.4 Topics for Additional InvestigationCoordination and Execution of Special Studies

The San Diego Water Board recognizes that there ares several topics or areas of study that may require additional investigation by the regulated community and/or other interested persons which could result in improved TMDL implementation, or modification of the requirements and/or provisions for implementing these TMDLs. The topics discussed in this section are not a comprehensive list, but data needs that have been identified by the San Diego Water Board and others that could be useful in the TMDL implementation. 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.

11.4.1 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 stormwater monitoring under the statewide Industrial Stormwater 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 stormwater monitoring but do not test for bacteria.

MSW landfills contain waste-metabolizing 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 may contain waste-metabolizing bacteria that are actively degrading wastes within the waste management unit.

Active landfills may contribute discharges of stormwater containing waste-metabolizing bacteria to the beaches and creeks because their waste management operations are not fully capped and therefore may result in stormwater discharges. Closed and inactive landfills (not closed 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 indicator bacteria discharges to surface waters. If studies provided to the San Diego Water Board indicate that discharges from MSW landfills are a significant source of bacteria, an investigative order (under authority of Water Code section 13267) can be issued to the owners and operators of all active MSW landfills to determine if the active MSW landfills are contributing bacteria via pathways that affect beaches and creeks.

~~11.6.1~~11.4.2 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 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. Models that are specifically developed for a watershed can help to target the areas or specific sources are that the most likely cause of impairments. ~~Either the San Diego Water Board or a stakeholder, through a Memorandum of Understanding (MOU), could update the watershed models. Once modified, TMDLs would need to be updated through the Basin Planning process. A description of procedural requirements for third-party led TMDLs is available in the USEPA's draft guidance for third-party led TMDLs.~~

~~11.6.2~~11.4.3 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.[115] 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:

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[115] An epidemiology study looking at the health effects associated with urban runoff is scheduled for 2007 at Doheny Beach, located in the City of Dana Point.

- 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 can be useful in identifying and implementing 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.

11.6.311.4.4 *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.

11.4.5 Identification of Region-wide or Watershed-Specific Allowable Exceedance Frequencies

The San Diego Water Board utilized the reference system approach in the calculation of the wet weather TMDLs to account for the natural, and largely uncontrollable sources of bacteria generated in the watersheds and at the beaches that can, by themselves, cause exceedances of WQOs. The reference system and anti-degradation approach (RSAA) is utilized in the TMDLs by allowing a 22 percent exceedance frequency of the REC-1 single sample maximum WQOs for wet weather, and a 0 percent allowable exceedance frequency of the REC-1 geometric mean WQOs for dry weather. The allowable exceedance frequencies were based on measurements from a reference system in Los Angeles County.

For the wet weather TMDLs, the San Diego Water Board chose to apply the 22 percent exceedance frequency determined for Leo Carillo Beach in Los Angeles County because, at the time of model development, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. Since then, additional data were collected and analyzed for five other reference beaches by SCCWRP (Schiff, et al., 2006).

The study conducted by SCCWRP occurred over only two wet seasons (2004-2005 and 2005-2006). The data collected and analyzed by SCCWRP indicate that the flux of indicator bacteria from undeveloped watersheds and the resulting frequency of water quality threshold exceedences at reference beaches during wet weather can be correlated to watershed size, storm size, and early versus late season storms. Exceedance frequencies ranged from zero percent to 30 percent for an exceedance of any bacteria indicator.

Two of the reference beaches included in the study were from the San Diego Region (San Onofre State Beach at the mouth of San Onofre Creek and San Mateo State Beach at the mouth of San

Mateo Creek). Both reference beaches had the highest exceedance frequencies during wet weather, but were also the largest watersheds in the study. The exceedance frequencies for these two San Diego Region watersheds may not be appropriate for every watershed addressed by these TMDLs. Additional data are required to determine appropriate watershed specific exceedance frequencies for indicator bacteria TMDLs in the San Diego Region.

11.4.6 Identification of Natural Versus Anthropogenic Sources of Bacteria

Recently, the San Diego Water Board adopted a Basin Plan amendment that authorizes the use of the Natural Sources Exclusion Approach (NSEA) to allow for exceedances of bacteria WQOs due solely to natural sources within the context of a TMDL. Under the NSEA, all anthropogenic sources of indicator bacteria to the waterbodies subject to an indicator bacteria TMDL must be controlled. Dischargers must also demonstrate that all anthropogenic sources of indicator bacteria to the target waterbody are controlled and that residual indicator bacteria densities do not indicate a health risk.

Once control of all anthropogenic sources and demonstration of appropriate health risk levels have been achieved, the residual indicator bacteria loads in the waterbodies attributable to uncontrollable sources can be identified and measured. Likewise, the frequency that uncontrollable sources cause exceedances of indicator bacteria water quality objectives in the waterbody can be identified. The information can be used to establish an allowable indicator bacteria WQO exceedance frequency in the impaired waterbody based upon the residual exceedance frequency observed. This information can then be used to recalculate the TMDLs, WLAs, and LAs.

The use of the NSEA is contingent upon demonstration of control of all anthropogenic sources of indicator bacteria to the waterbodies subject to an indicator bacteria TMDL. Since this task is likely to be formidable, use of the NSEA is not expected to occur immediately. Rather, the NSEA would be used to recalculate TMDLs at some point after their initial adoption, following demonstration of control of all anthropogenic sources.

~~11.7~~11.5 TMDL Compliance Schedule and Implementation Milestones

The purpose of these TMDLs is to restore the impaired beneficial uses of the waterbodies addressed through mandated reductions of bacteria from controllable point and nonpoint sources discharging to impaired waters. The requirements of these TMDLs mandate that the San Diego Water Board require dischargers improve water quality conditions in impaired waters by achieving the assigned WLAs and LAs. After the controllable sources achieve their assigned WLAs and LAs, the TMDLs in the receiving waters will be met and beneficial uses restored.

Until the dischargers achieve their assigned WLAs and LAs, the beneficial uses of the waterbodies addressed by this project will likely remain impaired, and the dischargers will continue violating one or more Basin Plan waste discharge prohibitions. The San Diego Water Board recognizes that restoring the beneficial uses of the waterbodies impaired by elevated bacteria levels will require time and multiple approaches to implement. Therefore, the bacteria TMDLs are expected to be implemented in a phased approach with a monitoring component to identify bacteria sources, determine the effectiveness of each phase, and guide the selection of

BMPs, as outlined in the BMP programs proposed in the BLRPs or CLRPs that are accepted by the San Diego Water Board.

11.5.1 Prioritization of Waterbodies

"Impaired" waters were prioritized based on several factors, because the waterbodies included in these TMDLs are numerous and diverse in terms of geographic location, swimmer accessibility and use, 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. The prioritization scheme is largely based on the following criteria:

- Level of beach (marine or freshwater) swimmer usage;
- 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 these TMDLs. 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 these TMDLs. 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 these TMDLs. Table 11-4 shows the dischargers in each of the three groups.

Table 11-4. 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	City of Laguna Beach **County of Orange** Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
		at Heisler Park – North		
	Pacific Ocean Shoreline	at Main Laguna Beach	City of Aliso Viejo **County of Orange** City of Laguna Beach City of Laguna Woods Orange County Flood Control District Caltrans Owners/operators of small MS4s*	
		Laguna Beach at Ocean Avenue		
		Laguna Beach at Laguna Avenue		
		Laguna Beach at Cleo Street		
		Arch Cove at Bluebird Canyon Road		
		Laguna Beach at Dumond Drive		
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		
	Aliso Creek (mouth)	At creek mouth		
Dana Point HSA (901.14)	Pacific Ocean Shoreline	Aliso Beach at West Street	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
		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		

Table 11-4. Responsible Municipalities and Lead Jurisdictions† (Cont'd)

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
Lower San Juan HSA (901.27)	Pacific Ocean Shoreline	At San Juan Creek	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 Caltrans Owners/operators of small MS4s*	N
	San Juan Creek	Lower 1 mile		
	San Juan Creek (mouth)	At creek mouth		
San Clemente HA (901.30)	Pacific Ocean Shoreline	Poche Beach	City of San Clemente **County of Orange** Orange County Flood Control District Dana Point Caltrans Owners/operators of small MS4s*	N
		Ole Hanson Beach Club Beach at Pico Drain		
		San Clemente City Beach at El Portal Street Stairs		
		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		
San Luis Rey HU (903.00)	Pacific Ocean Shoreline	at San Luis Rey River Mouth	**City of Oceanside** City of Vista County of San Diego Caltrans Owners/operators of small MS4s* Controllable nonpoint sources	C

Table 11-4. Responsible Municipalities and Lead Jurisdictions[†] (Cont'd)

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
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
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.		

Table 11-4. Responsible Municipalities and Lead Jurisdictions[†] *(Cont'd)*

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
Tecolote HA (906.50)	Tecolote Creek	Tecolote Creek	**City of San Diego** Owners/operators of small MS4s*	S
Mission San Diego HSA (907.11) & Santee HSA (907.12)	Forrester Creek	Lower 1 mile	**City of El Cajon** City of La Mesa City of Santee County of San Diego Caltrans Owners/operators of small MS4s*	S
	San Diego River, Lower	Lower 6 miles	**City of El Cajon** City of La Mesa City of San Diego City of Santee County of San Diego Caltrans Owners/operators of small MS4s* Padre Dam Water Treatment Facility	S
	Pacific Ocean Shoreline	At San Diego River Mouth at 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

[†] Developed based on the 2002 Clean Water Act Section 303(d) List
*Owners/operators of small MS4s are listed in Appendix Q.
** As listed on the 2002 Clean Water Act Section 303(d) List

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. Priority schemes are designated within watersheds. A prioritized list of impaired beaches and creeks included in this project is shown in Table 11-5.

Table 11-5. Prioritized List of Impaired Waters for TMDL Implementation †

Watershed	**Waterbody**	**Segment or Area**[a]	**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
	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	The entire reach (7.2 miles) and associated tributaries Aliso Hills Channel, English Canyon Creek, Dairy Fork Creek, Sulphur Creek, and Wood Canyon Creek	3
	Aliso Creek (mouth)	At creek mouth	3
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 San Juan Creek	1
	San Juan Creek	Lower 1 mile	3
	San Juan Creek (mouth)	At creek mouth	1

Table 11-5. Prioritized List of Impaired Waters for TMDL Implementation † (Cont'd)

Watershed	**Waterbody**	**Segment or Area[a]**	**Priority**
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
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	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
Tecolote HA (906.10)	Tecolote Creek	The entire reach and associated tributaries	1

Table 11-5. Prioritized List of Impaired Waters for TMDL Implementation † (Cont'd)

Watershed	Waterbody	Segment or Area[a]	Priority
Mission San Diego HSA (907.11) & Santee HSA (907.12)	San Diego River, Lower	Lower 6 miles	3
	Pacific Ocean Shoreline	At San Diego River Mouth at Dog Beach	3
	Forrester Creek	Lower 1 mile	3
Chollas HSA (908.22)	Chollas Creek	Bottom 1.2 miles	3

† Developed based on the 2002 Clean Water Act Section 303(d) List
a As listed on the 2002 Clean Water Act Section 303(d) List

Beginning with the 2008 303(d) List, specific beach segments of the Pacific Ocean shoreline are listed individually, and may not be identified in the same way as those segments listed in the table above. Several of the segments or areas in the list above have been delisted or redefined in the 2008 303(d) List. In addition, other segments or areas have been added to the Pacific Ocean shorelines listed above. The TMDLs that address the Pacific Ocean shorelines identified in the 2002 303(d) List are assumed to be applicable to all the beaches located on the shorelines of the hydrologic subareas (HSAs), hydrologic areas (HAs), and hydrologic units (HUs) listed above, or as listed individually in the 2008 and future 303(d) Lists.

The prioritized list above recognizes that there are segments or areas where bacterial water quality improvements are most likely to occur first (Priority 1), and segments or areas where bacterial water quality improvements are most likely to require more time to achieve (Priority 3). In some cases, receiving water limitations are already being met, resulting in the delisting of those segments or areas from the 2006 and/or 2008 303(d) Lists. The protection of the REC-1 beneficial use of those delisted segments or areas, however, must also be maintained, and those segments or areas must remain off future iterations of the 303(d) List.

The BLRPs or CLRPs that are developed are expected to focus on implementing BMP programs to reduce bacteria loads to those segments or areas where exceedances of the receiving water limitations continue to occur. The BMP programs that are included in the BLRPs or CLRPs should include short-term and long-term implementation strategies. The short-term strategies should be able to result in bacteria load reductions that can result in achieving the TMDLs in the receiving waters of Priority 1 segments or areas. The long-term strategies should be able to result in bacteria load reductions that will result in achieving the TMDLs in the receiving waters of all segments or areas by the end of the TMDL compliance schedules and maintain the protection of the REC-1 beneficial use after the end of the TMDL compliance schedules.

In the segments or areas where the receiving water limitations are being met, the BLRPs or CLRPs also need to include a monitoring component to ensure that protection of the REC-1 beneficial use is maintained. If receiving water limitations are exceeded in the future in those locations, the BLRPs or CLRPs must include the implementation of a BMP program that will ensure that the TMDLs will be achieved by the end of the TMDL compliance schedules.

11.5.2 Compliance Schedule

Full implementation of the TMDLs for indicator bacteria shall be completed as soon as possible, but no later than 10 years[116] from the effective date[117] for both the dry weather and wet weather TMDLs.

The San Diego Water Board will require the Phase I MS4s to submit Bacteria Load Reduction Plan (BLRPs) outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the bacteria TMDLs in the receiving waters, acceptable to the Regional Board within 18 months after the effective date of these TMDLs. The Phase I MS4 BLRPs should be incorporated into their Watershed Runoff Management Programs. Caltrans will also be required to develop and submit BLRPs outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the TMDLs in the receiving waters, acceptable to the Regional Board, within 18 months after the effective date of these TMDLs. To the extent possible, the Phase I MS4s and Caltrans should develop and coordinate the elements of their BLRPs together. The BLRPs will allow the Phase I MS4s and Caltrans to propose a compliance schedule for WQBELs that implement the bacteria TMDLs. The compliance schedule for the Phase I MS4s and Caltrans to attain their respective WLAs and the TMDLs in the receiving waters will be based on the BMP program proposed in the BLRPs.

If the Phase I MS4s and Caltrans choose to submit BLRPs that address only bacteria, the proposed schedule for compliance with the wet weather and dry weather TMDLs cannot extend beyond 10 years from the effective date, and must include at least a milestone for achieving a 50 percent exceedance frequency reduction. Additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent) are encouraged, but may also be required by the Regional Board. If the BLRPs do not include a proposed compliance schedule that is acceptable to the Regional Board, the compliance schedule will be as follows.

The compliance schedule for achieving the dry weather and wet weather bacteria TMDLs (Tables 11-6 and 11-7, respectively) are structured in a phased manner, with 100 percent of dry weather exceedance frequency reductions, and 100 percent of wet weather exceedance frequency reductions within 10 years from the effective date. At the end of the dry weather TMDL compliance schedule, the receiving waters must not exceed the 30-day geometric mean REC-1 WQOs more than 0 percent of the time. At the end of the wet weather TMDL compliance schedule, the receiving waters must not exceed the single sample maximum REC-1 WQOs more than the wet weather allowable exceedance frequency. All of these reductions are aimed at restoring water quality to a level that supports REC-1 beneficial uses in the ocean shoreline and in impaired creeks. These reductions required by the compliance schedule vary on the timeline based on the priority scheme described in Table 11-5. Intermediate milestone reductions in bacteria wasteloads are required sooner in the higher priority waters.

[116] If a Comprehensive Load Reduction Plan (CLRP) is developed to address several pollutants, including bacteria, the implementation of the wet weather bacteria TMDLs shall be completed as soon as possible, but no later than 20 years from the effective date. See Alternative Compliance Schedules under section (j)(3).
[117] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.

Table 11-6. Dry Weather Compliance Schedule and Milestones for Achieving Exceedance Frequency Reductions

Compliance Year (year after OAL approval)	**Required Exceedance Frequency Reduction**		
	Priority 1	**Priority 2**	**Priority 3**
5	50% (All Dry Weather)		
6		50% (All Dry Weather)	
7			50% (All Dry Weather)
10+	100% (All Dry Weather)	100% (All Dry Weather)	100% (All Dry Weather)

Table 11-7. Wet Weather Compliance Schedule and Milestones for Achieving Exceedance Frequency Reductions

Compliance Year (year after OAL approval)	**Required Exceedance Frequency Reduction**		
	Priority 1	**Priority 2**	**Priority 3**
5	50% (All Wet Weather)		
6		50% (All Wet Weather)	
7			50% (All Wet Weather)
10+	100% (All Wet Weather)	100% (All Wet Weather)	100% (All Wet Weather)

The first four years of the compliance schedules above do not require any exceedance frequency 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 exceedance frequencies of the REC-1 WQOs in the impaired beaches and creeks. The Regional Board may also include additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent).

If appropriate and acceptable to the San Diego Water Board, the proposed compliance schedules included in the BLRPs will be incorporated into the various TMDL implementing orders, such as the municipal Phase I MS4 stormwater WDRs and NPDES requirements. Otherwise, the compliance schedules given above will be implemented.

11.5.3 Alternative Compliance Schedules

The dischargers to Chollas Creek in the Chollas HSA watershed will have to address reductions from multiple water quality improvement projects in addition to bacteria, namely TMDLs for copper, lead, zinc, and diazinon,[118] and a trash reduction program. Addressing multiple pollutants (in addition to bacteria) will require the development and submittal of a

[118] As described in *Total Maximum Daily Loads for Dissolved Copper, Lead, and Zinc in Chollas Creek, Tributary to San Diego Bay*, adopted under Resolution No. R9-2007-0043, and *Total Maximum Daily Load for Diazinon in Chollas Creek Watershed, San Diego County*, adopted under Resolution No. R9-2002-0123.

Comprehensive Load Reduction Plan (CLRP) by the Phase I MS4s and Caltrans. The CLRP will allow the Phase I MS4s and Caltrans to propose a compliance schedule to address impairments due to loads from multiple pollutants, including bacteria.

Full implementation of the TMDLs for indicator bacteria included under the CLRP for the Chollas HSA watershed shall be completed as soon as possible, but cannot extend beyond 10 years for the dry weather bacteria TMDLs and 20 years for the wet weather bacteria TMDLs. The proposed compliance schedules for the bacteria TMDLs included under the CLRP must include at least a milestone for achieving a 50 percent exceedance frequency reduction. Additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent) are encouraged. If the CLRP for the Chollas HSA watershed does not include a proposed compliance schedule, specifically for bacteria, the compliance schedule will be as given in Table 11-8.

Table 11-8. *Alternative Compliance Schedule for Chollas Creek*

Compliance Year*	Exceedance Frequency Reduction Milestone**
7	50% for dry weather
10	100% for dry weather 50% for wet weather
20	100% for wet weather

* Year after effective date for the TMDL that initiated the development of the CLRP.
** The Regional Board may also include additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent).

Likewise, dischargers in other bacteria-impaired watersheds may also find that undertaking concurrent load reduction programs for other pollutant constituents (e.g. metals, pesticides, trash, nutrients, sediment, etc.) together with the bacteria load reduction requirements in these TMDLs, is more cost effective, and has fewer potential environmental impacts from structural BMP construction. In these cases, the dischargers may develop and submit a CLRP for all constituents of concern in lieu of the BLRP, and to propose an appropriately tailored alternative compliance schedule. Proposed alternative compliance schedules tailored under this provision may not extend beyond 10 years for the dry weather bacteria TMDLs and 20 years for the wet weather bacteria TMDLs from the effective date, and must include at least a milestone for achieving a 50 percent exceedance frequency reduction. Additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent) are encouraged, but may also be required by the Regional Board.

If appropriate and acceptable to the Regional Board, the proposed alternative compliance schedules included in the CLRPs will be incorporated into the various TMDL implementing orders. Otherwise, the alternative compliance schedule given above as an example for Chollas Creek will be implemented for a CLRP that is developed for any other watershed.

11.5.4 Implementation Milestones

Accomplishing the goals of the implementation plan will be achieved by cooperative participation from all responsible parties, including the San Diego Water Board. Major milestones are described in Table 11-9 11-7.

Table 11-9. *TMDL Implementation Milestones*

Item	Implementation Action	Responsible Parties	Date
1	Obtain approval of Beaches and Creeks Indicator Bacteria TMDLs from the State Water Board, OAL, and USEPA.	San Diego Water Board	Effective date[a]
2	Issue investigative orders to Phase I MS4s and Caltrans requiring the development and submittal of BLRPs or CLRPs acceptable to the Regional Board within 18 months of effective date	San Diego Water Board	As soon as possible (if necessary)
3	Issue, reissue, or revise general WDRs and NPDES requirements for the Phase I MS4s to incorporate the requirements for complying with the TMDLs and MS4 WLAs.	San Diego Water Board	Within 5 years of effective date[b]
4	Issue, reissue, or revise general WDRs and NPDES requirements for Caltrans to incorporate the requirements for complying with the TMDLs and Caltrans WLAs.	San Diego Water Board, State Water Board	Within 5 years of effective date[b]
5	Issue, reissue, or revise the WDRs and NPDES requirements for POTWs and wastewater collection systems to incorporate new requirements for sewer line surveillance and maintenance, consistent with the zero WLA.	San Diego Water Board	Within 5 years of effective date[b]
6	Meet 50% Dry Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 1 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	5 years after effective date[b]
7	Meet 50% Wet Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 1 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	5 years after effective date[b]
8	Meet 50% Dry Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 2 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	6 years after effective date[b]
9	Meet 50% Wet Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 2 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	6 years after effective date[b]
10	Meet 50% Dry Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 3 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	7 years after effective date[b]
11	Meet 50% Wet Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 3 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	7 years after effective date[b]
12	Meet 100% Dry Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in all watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	10 years after effective date[b,c]

Item	Implementation Action	Responsible Parties	Date
13	Meet 100% Wet Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in all watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	10 to 20 years after effective date[b,c]
14	Amend discharge conditions of appropriate waivers to be consistent with the requirements for complying with the TMDLs and Agriculture LAs.	San Diego Water Board	As needed after effective date
15	Issue individual or general WDRs or Basin Plan prohibitions consistent with the TMDLs and LAs for controllable nonpoint source discharges not eligible conditional waivers.	San Diego Water Board	As needed after effective date
16	Submit BLRP or CLRP Progress Reports to San Diego Water Board	Phase I MS4s, Caltrans	In accordance with BLRPs or CLRPs accepted by the Regional Board
17	Enroll Phase II MS4s identified as significant sources of bacteria to receiving waters under State Water Board general WDRs and NPDES requirements.	San Diego Water Board	As needed after effective date
18	Issue individual or general WDRs and NPDES requirements consistent with the TMDLs and WLAs for specific Phase II MS4s or category of Phase II MS4s.	San Diego Water Board	As needed after effective date
19	Take enforcement actions against controllable point sources and nonpoint sources to attain compliance with the WLAs and LAs.	San Diego Water Board	As needed after effective date
20	Recommend TMDL-related projects as high priority for grant funds.	San Diego Water Board	As needed after effective date
21	Amend the Basin Plan and/or provisions of these TMDLs (e.g., usage frequency or creeks or watershed-specific allowable exceedance frequency) based on evidence provided by dischargers and/or other entities	San Diego Water Board, Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	As needed after effective date

[a] Effective date = date of approval by OAL
[b] May defer to alternative compliance schedule proposed in BLRPs or CLRPs that have been incorporated into implementing orders (e.g., WDRs, cleanup and abatement orders)
[c] Compliance schedules for dry weather and wet weather TMDLs proposed in BLRPs cannot extend beyond 10 years from the effective date. Compliance schedules proposed in CLRPs for dry weather TMDLs cannot extend beyond 10 years and for wet weather TMDLs cannot extend beyond 20 years from the effective date.

Table 11-7. TMDL Implementation Milestones

Item	Implementation Action	Responsible Parties	Date
1	Effective date of Beaches and Creeks Indicator Bacteria TMDL Waste Load Allocations.	San Diego Water Board, Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	Effective date[a]

Item	Implementation Action	Responsible Parties	Date
2	Consider adoption of Reference System/Natural Sources Exclusion Approach Basin Plan amendment and revise final wet weather TMDLs and dry weather total coliform TMDLs.	San Diego Water Board	Within 1 year of effective date
3	Issue, reissue, or revise Phase I Municipal NPDES WDRs to include WQBELs consistent with the WLAs.	San Diego Water Board	Within 5 years of effective date
4	Issue, reissue, or revise Caltrans NPDES WDRs to include WQBELs consistent with the WLAs.	State Water Board	Within 5 years of effective date
5	Issue, reissue, or revise POTW NPDES WDRs, to incorporate new requirements for sewer line surveillance and maintenance, consistent with the zero bacteria WLA and with the TMDL compliance schedule.	San Diego Water Board	Within 5 years of effective date
6	Meet 50% Final Dry Weather WLA reductions in Priority 1 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers[b]	5 years after effective date
7	Meet 50% Interim Wet Weather WLA reductions in Priority 1 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers[b]	5 years after effective date
8	Meet 50% Final Dry Weather WLA reductions in Priority 2 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers[b]	6 years after effective date
9	Meet 50% Interim Wet Weather WLA reductions in Priority 2 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers[b]	6 years after effective date
10	Meet 50% Final Dry Weather WLA reductions in Priority 3 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers[b]	7 years after effective date
11	Meet 50% Interim Wet Weather WLA reductions in Priority 3 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers[b]	7 years after effective date
12	Meet 100% Final Dry Weather WLA reductions in all watersheds by meeting all geometric mean & and single sample WQOs for REC-1.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers[b]	10 years after effective date
13	Meet 100% Interim Wet Weather WLA reductions in all watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers[b]	10 years after effective date
14	Meet 100% Final Wet Weather WLA reductions in all watersheds by meeting all single sample WQOs for REC-1.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	20 years after effective date[c]
15	Amend discharge conditions of appropriate waivers to be consistent with the WLAs.	San Diego Water Board	As needed after effective date

Item	Implementation Action	Responsible Parties	Date
16	Issue WDRs or Basin Plan prohibitions consistent with the WLAs for controllable nonpoint source discharges not covered by the Waiver Policy.	San Diego Water Board	As needed after effective date
17	Submit annual Progress Report to San Diego Water Board due April 1 of each year.	Caltrans	Annually after reissue of NPDES WDRs
18	Submit annual Progress Report to San Diego Water Board due January 31 of each year.	Phase I Municipal Dischargers	Annually after reissue of NPDES WDRs
19	Require Phase II Municipal Dischargers to enroll in Order No. 2003-0005-DWQ (or superseding renewal orders).	San Diego Water Board	Immediately after effective date
20	Take enforcement actions to attain compliance with the WLAs.	San Diego Water Board	As needed after effective date
21	Investigate landfills as a potential bacteria source.	Municipal Dischargers	Immediately after effective date
22	Recommend TMDL-related projects as high priority for grant funds.	San Diego Water Board	As needed after effective date
23	Coordination and execution of special studies.	San Diego Water Board, Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	As needed after effective date

[a] Effective date = date of approval by OAL
[b] Agriculture/Livestock Dischargers in the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds must only meet interim TMDLs.
[c] Final WLA reduction milestone will be revised upon adoption of revised final TMDLs.

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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 environmental impacts of the reasonably foreseeable methods of compliance with the proposed TMDLs were evaluated as part of Bacteria TMDLs Project I, which was adopted by the San Diego Water Board on December 12, 2007. Because there have been no fundamental changes to the technical approach or reasonably foreseeable methods of compliance with the proposed TMDLs, the environmental analysis, environmental analysis, and economic factors from Bacteria TMDLs Project I also apply to Revised Bacteria TMDLs Project I..

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)~~ State Water Board's 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~~ State Water Board'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~~ State Water Board 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~~,~~ and 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.

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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~~ State Water Board must include in its submittal to the OAL a summary of the necessity[119] 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~~ State Water Board 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~~ State Water Board 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 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)],

[119] "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)].

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 first public review
January 11, 2006	Public Workshop
February 8, 2006	1st 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
June 25, 2007	Draft Documents released for fourth public review
December 12, 2007	3rd Public Hearing and Adoption.
June 3, 2009	SAG Meeting
Month Day, 2009	SAG Meeting
November 16, 2009	Revised Draft Documents released for public review
February 10, 2010	Public Hearing and Adoption

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APPENDIX A

PEER REVIEW COMMENTS AND RESPONSES

The technical portions of the proposed Basin Plan amendment to incorporate TMDLs for indicator bacteria were peer reviewed by Professor Patricia Holden of the Donald Bren School of Environmental Science & Management, University of California, Santa Barbara, and by Professor Kara Nelson of the Department of Civil and Environmental Engineering, University of California, Berkeley. External scientific peer review of the technical portion of a proposed rule (in this case, the proposed Basin Plan amendment) is mandated by Health and Safety Code section 57004. This statute states that the reviewer's responsibility is to determine whether the scientific portion of the proposed rule is based upon sound scientific knowledge, methods, and practices. The San Diego Water Board provided the peer reviewers with the draft Technical Report, the draft Basin Plan amendment, and a list of key issues with discussion for the peer reviewers to address. The list of key issues with discussion provided to the peer reviewers is given below in the first section of this appendix. The peer reviewers' comments and the San Diego Water Board's responses follow in subsequent sections.

Issues for Peer Review

1. **Use of land use composition to quantify bacteria sources from all watersheds to affected beaches and creeks in the San Diego Region.**
   Bacteria are ubiquitous in the environment, as there are numerous sources including both controllable and non-controllable. Controllable sources include sewage related sources (spills, leaking sewer lines), trash, farm animal waste, and pet waste. Noncontrollable sources include aquatic and terrestrial wildlife, decaying matter, and soil. To manage this abundance of sources and quantify them in a useful way, land-use types were identified in the San Diego Region and quantified in terms of bacteria generation.

   Various bacteria sources are present across different land-use categories. For example, wildlife can be present in both urbanized and non-urbanized areas. Despite this source variability, loading can be highly correlated with land use practices. For this reason, it was decided to quantify the bacteria load coming from each land use type rather than quantify the sources directly. This approach was applied to both wet weather and dry weather conditions.

2. **Use of wet weather model to simulate fate and transport of bacteria, and to calculate TMDLs, to affected beaches and creeks.**
   A regional watershed-based approach (model study) was developed to simulate the build-up and wash-off of bacteria, and the hydrologic and hydraulic processes that affect delivery of bacteria to the impaired waters. In this approach, bacteria re-growth is assumed to be zero.

   This approach was based on the application of the U.S. Environmental Protection Agency's (USEPA) Loading Simulation Program in C++ (LSPC) to estimate bacteria loading from streams and assimilation within the waterbody to determine existing bacteria loads, as well as total maximum daily loads, to receiving waters. LSPC integrates a geographical information system (GIS), comprehensive data storage and management capabilities, a dynamic watershed model (a re-coded version of EPA's Hydrological Simulation Program—FORTRAN [HSPF]), and a data analysis/post-processing system into a convenient PC-based windows interface that dictates no software requirements. Please comment on the use of this modeling system for the purpose of calculating TMDLs to impaired waters during wet weather.

3. **Selection of a Los Angeles watershed as a "reference" for background loading of bacteria in the San Diego Region during wet weather.**
The interim numeric target for the TMDL calculations is based on the use of a "reference watershed approach," a concept that was introduced by the Los Angeles Regional Water Quality Control Board in the Santa Monica Bay Beaches TMDL (Los Angeles Water Board, 2002). In this approach, a certain amount of exceedances of the single sample maximum water quality objectives are allowed, based on the frequency of exceedances expected in a relatively pristine, or "reference," watershed. Since there are natural sources of bacteria in a reference watershed, a certain amount of exceedances of the water quality objectives are expected. It is assumed that these exceedances are not from anthropogenic origin. This exceedance frequency is incorporated into the waste load allocations that were calculated for all urbanized watersheds. However, if water quality is better than that of the reference watershed in a particular location, no degradation of existing bacteriological water quality is permitted. This approach ensures no further bacteriological degradation of water quality where existing conditions are better than that of the reference watershed.

In the San Diego Region, candidate watersheds for use as a "reference" for TMDL development have been identified. However, to date, these candidate watersheds do not have sufficient data needed for characterization. In lieu of suitable data originating from the San Diego Region, the exceedance frequency of the reference watershed used for TMDL development in Los Angeles, the Arroyo Sequit watershed, were used. Specifically, the allowance frequency of 22 percent was used in the calculation of the interim TMDLs. Final TMDLs for wet weather were calculated using the single sample maximum water quality objectives (no allowable frequency of exceedance).

4. **Use of single-sample maximum objectives for wet weather numeric targets.**
Bacteria water quality objectives have two temporal components: single sample maximum values and 30-day geometric mean values. As a conservative measure for wet weather analyses, the single sample maximum values were chosen as TMDL numeric targets.

Wet weather events, and subsequent high bacterial counts, are sporadic and episodic. Wet weather runoff and flows contain elevated bacteria densities, but have a quick time of travel. Thus, bacteria densities remain elevated for relatively short time periods following storm flows. Storm events do not typically result in an exceedance of the 30-day geometric mean bacteria densities, even though single sample densities are very high. Therefore, the single sample maximum values were used as numeric targets for the wet weather simulations.

5. **Reasonableness of assumptions (described in Appendix L) for wet weather modeling.**
Several assumptions are relevant to the LSPC model developed to simulate the fate and transport of wet weather sources of bacteria in the Region. This model was used to estimate

both existing bacteria loads and total maximum daily loads. Please comment on the validity of these assumptions.

6. **Use of wet weather modeling parameters to simulate build-up/wash-off of bacteria from a similar study in Los Angeles (Los Angeles Water Board, 2002).**
   As explained earlier, sources of bacteria are quantified by correlating land use types to bacteria loading.

   Land use data was classified into 13 distinct categories. Each category had a unique parameter describing the amount of bacteria loading directly to the *critical point* (defined as the culmination point at the bottom of each affected watershed). These unique parameters were obtained by using those that were previously defined in the TMDL for Santa Monica Bay (Los Angeles Water Board, 2002). This includes land-use-specific accumulation rates and build-up limits. Using these values assumes that land use characteristics for all categories in the San Diego Region are sufficiently similar to characteristics of all land use categories in the Los Angeles Region. This assumption was validated through evaluation of model results with local water quality data. Please comment on the application of modeling parameters derived in the Los Angeles Region to the San Diego Region.

7. **Use of dry weather model to simulate fate and transport of bacteria, and to calculate TMDLs, to affected beaches and creeks.**
   During dry weather conditions, bacteria levels are highly variable and not predicted well using standard modeling techniques, such as the LSPC model developed for wet weather. To account for this variability, empirical equations were developed to represent water quantity and quality associated with dry weather runoff from various land uses. Concentrations of fecal coliform were developed using regression analysis as a function of total area and land use composition in each subwatershed. Concentrations of total coliform and enterococci were developed as functions of fecal coliform concentrations.

   The predictive model represents the streams as a series of plug-flow reactors, with each reactor having a constant source of flow and bacteria. Although it is understood that dry weather flows and bacteria densities vary over time for any given stream, for prediction of average conditions in the stream, flows and concentrations are assumed to be in steady state. Bacteria re-growth is assumed to be zero.

8. **Use of data from Aliso, San Juan, Rose, and Tecolote Creeks to characterize dry weather source loading in the entire San Diego Region.**
   Data from Aliso Creek, San Juan Creek (Orange County), Rose Creek, and Tecolote Creek (San Diego County) were used for characterization of dry weather flows and water quality because the data sets associated with these creeks are assumed sufficient in size. Data from these four creeks were used to generate regression equations describing flow and water quality as functions of land use composition and watershed size. Conditions in these four creeks are assumed representative of conditions throughout the Region.

9. **Use of geometric mean objectives for dry weather numeric targets.**
   Bacteria water quality objectives have two temporal components: single sample maximum

values and 30-day geometric mean values. For dry weather analyses, the geometric mean values were chosen as TMDL numeric targets. This is because the dry weather model simulates steady state flow for predictions of average conditions in the creeks. To compare the conditions of these average flows to water quality objectives, the geometric mean is more appropriate since this value likewise represents average conditions over 30 days.

10. **Reasonableness of assumptions (described in Appendix L) for dry weather modeling.**
    Several assumptions are relevant to the empirical model developed to simulate the fate and transport of bacteria during dry weather in the Region. Please comment on the validity of these assumptions.

11. **Location of *critical points* for TMDL calculation.**
    The *critical point* for loading assessment is defined as the culmination point at the bottom of the watershed, before inter-tidal mixing takes place. Both current loading and total maximum daily loading is calculated at the critical point for each watershed having an impaired waterbody. High bacteria loading is predicted at the critical point, and is therefore considered a conservative location for TMDL calculation. TMDL calculations were determined at the critical point in both wet and dry weather.

12. **Use of conservative assumptions to comprise an implicit Margin of Safety.**
    Rather than incorporating an explicit margin of safety (MOS) to TMDL calculation, the conservative assumptions built into both the wet weather and dry weather models are considered sufficient to account for any uncertainties. The implicit MOS was thus generated by incorporating a series of conservative assumptions regarding current source loading of bacteria from the watersheds, as well as assumptions regarding the assimilation of bacteria into the waterbodies and surrounding environment.

Overarching Questions
Reviewers were not limited to addressing only the specific issues presented above, and were asked to contemplate the following “big picture” questions.

(a) In reading the Technical Report and proposed implementation language, are there any additional scientific issues that are part of the scientific basis of the proposed rule (the Basin Plan amendment) not described above? If so, please comment with respect to the statute language given above.

(b) Taken as a whole, is the scientific portion of the proposed rule based upon sound scientific knowledge, methods, and practices?

Reviewers were asked to note that some proposed actions may rely significantly on professional judgment where available scientific data are not as extensive as desired to support the statute requirement for absolute scientific rigor. In these situations, the proposed course of action is favored over no action.

Comments from Professor Holden

1. Use of land use composition to quantify bacteria sources from all watersheds to affected beaches and creeks in the San Diego region.

Comment: In concept, this seems fine. However, as per the regression model on page K-6, not all land uses correlated with indicator bacteria discharge during dry weather. There were 13 land use categories overall, and eight are listed on page K-6. Perhaps comments are being requested for only the wet weather calculations (this review point only).

As for the wet weather usage, how current are land use data from 2000 (page J-4)? Has development in the region been so rapid as to make these land use data obsolete in some areas?

Response: For the dry weather analyses, eight of thirteen land uses were determined to have statistical significance for prediction of fecal coliform concentrations. The remaining land uses do not have statistical significance for prediction of fecal coliform concentrations.

Development or changes in stormwater management resulting from land uses may have changed since 2000 when spatial coverages were compiled. However, these were the most recent datasets available at the time of TMDL development. Should these datasets be updated in the future that confirm significant changes in land use, the models can be updated and TMDLs can be revised.

2. Use of wet weather model to simulate fate and transport of bacteria, and to calculate TMDLs, to affected beaches and creeks.

Comment: Few details about the model are provided, but the methods appear to be well-referenced. The model simulations (e.g. Figure N-3) of concentration appear to fit the real data well (where there are data). However, for some of the figures (e.g. N-1, N-2) it is not possible to tell how well the simulations worked because of the density of the simulated data.

Response: To improve visualization of results, Figure N-1 was divided into 3 figures (Figures N-1-A, N-1-B, and N-1-C) representing different periods of record, and Figure N-2 was edited and confined to the period with the most observed data (1997-1999).

3. Selection of a Los Angeles watershed as a "reference" for background loading of bacteria in the San Diego Region during wet weather.

Comment: In the absence of a sufficiently characterized "reference" (i.e. relatively undeveloped) watershed in the San Diego region, designating a nearby, well-characterized, similarly undeveloped watershed in the Los Angeles region as a "reference" watershed seems fine. However, the use of the "reference" watershed as a concept or decision tool is not clear. The document refers to a 22 percent exceedance frequency in the Arroyo Sequit Watershed (in Los Angeles) and this compares similarly to two undeveloped watersheds in San Diego (Tables 4-1 and 4-5, San Mateo Creek and San Onofre State Beach). However, on page 15[1] (section 4.1) of the document it is stated there is no "reference watershed implementation policy" which seems to imply that the use of a "reference watershed" concept is not allowed. This is confusing and it is suggested that it be clarified by either moving this reference watershed discussion to a later point in the document (i.e. implementation) or more clearly stating how it is used at this point in the TMDL process**.**

The "reference" watershed concept inherently assumes that all indicator bacteria are created equal. That is, indicator organisms from an urbanized area are just as problematic as those from an undeveloped watershed. This may not be the case. If false positive results on indicator organism assays frequently occur at the outlets of undeveloped watersheds, this would imply that natural lands discharge bacteria but few pathogens. Transferring an allowable exceedance from an undeveloped watershed to a developed one may inadvertently "allow" the discharge of more pathogens from developed watersheds because it is more likely that microbes discharged from developed watersheds will include pathogens.

Response: The Technical Report has been updated to clarify how the allowable exceedance frequency was used to calculate interim TMDLs, and also why the allowable exceedance frequency was applied to interim, not final, TMDLs. Specifically, the allowable exceedance frequency of 22 percent was used to calculate "interim TMDLs" and accounts for bacteria loads from natural sources. The 22 percent exceedance frequency originates from studies in the Arroyo Sequit watershed in Los Angeles County. The Los Angeles Regional Water Quality Control Board (Los Angeles Water Board) adopted "reference watershed implementation provisions" to incorporate the allowable exceedance frequency as a formal Basin Plan amendment. The Los Angeles Water Board was then able to use the exceedance frequency to calculate TMDLs.

In contrast, the San Diego Water Board has not adopted a Basin Plan amendment to incorporate reference watershed implementation provisions to allow exceedances of the WQOs. Therefore, ultimately, TMDLs must be calculated using existing WQOs in the Basin Plan. As an interim goal, however, interim TMDLs were calculated based on the 22 percent allowable exceedance frequency, as established by the Los Angeles Water Board.

Since the TMDL Report was first made available to peer reviewers on February 7, 2005, a new study has been completed which characterizes a reference watershed in the San Diego Region. The study (Schiff et al., 2005) found that four reference watersheds in Southern California (Ventura, Orange, and San Diego counties) had an average exceedance frequency of 25 percent during wet weather. The San Diego Water Board is currently working on an amendment to the Basin Plan to incorporate reference watershed implementation provisions using this new information. When this occurs, the TMDLs developed in this project can be re-visited to reflect these provisions. Consequently, TMDLs will no longer be distinguished into "interim" and "final" TMDLs; only final TMDLs will be relevant, and will take into account loads due to natural sources.

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[1] The reviewer is referring to page 15 of the draft Technical Report that she received. The "reference watershed implementation policy" is referred to as the "reference system approach" in the draft Technical Report dated December 9, 2005.

In calculating interim TMDLs, the San Diego Water Board did assume that indicator bacteria, whether from an undeveloped watershed or an urbanized watershed, behave similarly. In other words, an exceedance frequency developed in an undeveloped watershed is the same as the exceedance frequency in an urbanized watershed. The San Diego Water Board assumed that bacteria loading from natural sources is present in all watersheds, and that this loading occurs in identical quantities.

4. Use of single-sample maximum objectives for wet weather numeric targets.

Comment: The use of single sample maximum objectives for wet weather seems fine. However, given that rainfall events subject the watersheds to more variability in flow and load, the use of a geometric mean for wet weather seems more practical. This is discussed again for the dry weather assumptions.

Response: The analysis used in this Technical Report was divided into wet weather and dry weather approaches specifically to address the variability between the two scenarios. The dry weather model makes use of the geometric mean and assumes a steady state base flow. The wet weather model analyzes bacteria loads during conditions of high flows and loads, as the commenter suggests. The single sample maximum WQOs are designed to protect human health risk at short intervals, including peak loads. The geometric mean value does not evaluate peak loads at short intervals because values are calculated over several-week's time. Because the model used for wet weather analyzes high flow and loads, which are short-term events, the numeric target must likewise characterize risk from short-term events. Therefore the single sample maximum WQOs were used.

5. Reasonableness of assumptions (described in Appendix L) for wet weather modeling.

Comment: In Section 8.1.1, it is stated that the "92nd percentile" was used as the critical condition for wet weather years. Other than SCCWRP used a 90th percentile previously, what is the scientific justification for this? Was 1993 an El Nino year? Is there an accepted process, similar to flood frequency estimations used in treatment facility designs, for selecting a storm frequency for this process?

Response: Storm frequency analyses can be used for selection of critical wet periods for TMDL calculation. However, a critical wet 'year' was selected for TMDL calculation, which incorporates multiple storms that can occur during the period. Evaluation of a wet year is often reported as a frequency of occurrence (e.g., 1 in 10 years). Based on the data compiled for this study, the 92nd percentile (1 out of 12 years) was determined adequate for identification of the critical wet year. This year corresponded to 1993, which was also identified by SCCWRP as the critical wet year for indicator bacteria loading to Santa Monica Bay beaches. 1993 is considered an El Nino period.

6. Use of wet weather modeling parameters to simulate build-up/wash-off of bacteria from a similar study in Los Angeles (Los Angeles Water Board, 2002).

Comment: There is insufficient information in the report for this to be evaluated. The idea of simulating build up and wash off is logical and sound. But the modeling parameters are not detailed sufficiently for comment. The Santa Monica Bay TMDL used the same approach, but the report provided does not contain detailed information on the modeling.

Response: The modeling parameters referred to in this comment have been incorporated into Appendix J. The item was not meant to solicit opinion about the parameters themselves, but rather the idea of using values identical to parameters that describe the Los Angeles area.

7. Use of dry weather model to simulate fate and transport of bacteria, and to calculate TMDLs, to affected beaches and creeks.

Comment: The model on page K-3 is a simple first order decay model. The derivation of a correct and appropriate model based on mass balance principles, within the context of the assumption of a plug flow reactor, should be provided. Even if each reach is modeled as a complete mix reactor, the resultant equation will not be what is given on page K-3. It should also be stated that bacteria are assumed to be discrete particles that don't settle unless "die off" refers to the combined processes of settling of particle-associated bacteria and death.

The dry weather flow rate of 15 cubic feet per second (cfs) is stated as an assumption (page K-4) but the justification is not provided.

The significances (p values) for regressions (beginning on page K-4) are important. If they are greater than 0.05 (assuming 95 percent confidence intervals for these estimates) then the use of the correlations should be further justified.

Response: The plug flow equation can be derived from the following materials balance equation:

$$QC_{in} - QC_{out} + rV_R = V_R \frac{dC_{out}}{dt}$$

where, $Q = Q_t + Q_r$
V_R = reactor volume
r = rate of change in C
t = time

For simplicity, infiltration losses (I) were not considered. Assuming plug flow with $dC_{out}/dt = 0$ (steady-state), and dividing both sides by V_R,

$$-\frac{dC}{dt} + r = 0$$

With $r = -kC$ (first order loss), and $t = x/u$, the above equation can be determined.

The context of the 15 cfs dry weather flow criterion on page K-4 was specific to screening of regional flows for determination of physical stream dimensions for the model. All flow data for 53 USGS stations in the region were screened so that equations could be developed for prediction of stream cross-sectional area and width as a function of low flows. The purpose for limiting to 15 cfs was to ensure that coefficients of equations 4 and 5 (Appendix K), derived through regression analyses, were not controlled by high wet-weather flows when width verses flow relationships can vary. The 15 cfs assumption was not, of itself, used in development of equations, and therefore does not require justification.

For the multivariable regression analysis performed for dry-weather flows and fecal coliform concentrations (equations 6 and 7), p-values were evaluated for each variable to test statistical significance. Section K.4 was edited to present p-values of each variable. All p-values were below 0.05 cfs, with the exception of the equation 7 variable representing the percentage of subwatershed land use assigned to open recreation, which only slightly exceeded at 0.067.

8. Use of data from Aliso, San Juan, Rose, and Tecolote Creeks to characterize dry weather source loading in the entire San Diego Region.

Comment:Again (as above), the significance (p value) of the derived correlation should be provided. Otherwise, it is hard to know that the equation is valid for predictions (page K-6). It is interesting, and somewhat curious, that the correlation is to so many factors (land uses and watershed size). How this analysis was performed would be important to convey in the document.

If the p value is high for the equation on page K-6, this would suggest that monitoring of the other watersheds should occur. Even if the p value is high, however, the lack of data would suggest that little knowledge exists regarding the need for TMDL extrapolation to the other watersheds, and that data should be collected to refine the process.

Response: P-values and further explanation of the multivariable regression analyses procedure was added to the text.

The San Diego Water Board agrees that as additional data are collected in the region to further characterize dry-weather flows and indicator bacteria concentrations, methods for bacteria load estimation and calculation of TMDLs should be refined in the future.

9. Use of geometric mean objectives for dry weather numeric targets.

Comment: The use of a geometric mean for dry weather numeric targets should be discussed in light of monitoring activities at beaches and how convenient this will be for making posting and closure decisions. A single sample-basis target is potentially more useful (for decision making) regarding beach closures. Also, dry weather conditions are likely to be less variable as compared to wet weather conditions.

Response: The use of geometric means for numeric targets for TMDL calculations is distinct from making posting and closure decisions at public beaches. The decision to post or close a beach is determined by single sample measurements of bacteria, and an immediate response is required if a measurement exceeds the bacteria WQOs for any of the three indicator bacteria for marine waters (total coliform, fecal coliform, or enterococci). This protocol is described and mandated by Health and Safety Code section 115880.

In contrast, TMDL projects are long-term strategies for achieving water quality. Numeric targets are used to calculate the assimilative capacity, and hence the TMDL, of a waterbody. Once the TMDL for a waterbody has been determined for a given pollutant, the required load and waste load reductions are calculated and the method(s) of enforcement determined. The use of a geometric mean for dry weather numeric targets is used for calculating TMDLs, and not proposed for making posting and closure decisions. The San Diego Water Board agrees that dry weather conditions are likely to be less variable than wet weather conditions. For this reason, the geometric mean was used as dry weather numeric targets, since this modeling platform assumes a steady state base flow.

10. Reasonableness of assumptions (described in Appendix L) for dry weather modeling.

Comment: The assumptions appear to be sound. As above, the plug flow modeling probably needs to be shown more completely and double-checked. The multivariate regression analyses should be double checked for significance (p values) and significances reported.

Response: Appendix K has been modified to provide further explanation of the multivariable regression analysis. P values have also been provided.

11. Location of critical points for TMDL calculation.

Comment: The locations of critical points (mouths and bottom of creeks and watersheds) are reasonable for protecting beach water quality. The impact of the watershed at this point is fully integrated from up to downstream. However, where small estuaries or lagoons separate the creek mouth from the coastal ocean, they should also be considered in this process. Lagoons and estuaries can accumulate and discharge fecal coliform-laden sediments during low and high flow conditions, respectively.

Response: The San Diego Water Board recognizes that small estuaries and lagoons provide habitat for wildlife, and therefore can be significant sources of bacteria. For this reason, systems with estuaries or lagoons were not analyzed in this project. Impaired waters having lagoon-like characteristics will be addressed in a subsequent TMDL project, *Bacteria-Impaired Waters TMDLs for Lagoons in the San Diego Region*. The models used in this project are suitable for simulating the unique dynamics of lagoon systems.

12. Use of conservative assumptions to comprise an implicit Margin of Safety.

Comment: In this reviewer's mind, a "margin of safety" is an explicit add-on to a limit. It is really difficult to tell what are the "conservative assumptions". For example, in wet weather modeling, it might not be conservative to make the creek mouth the critical point if there is a lagoon or estuary. On the other hand, most of these discharges do not have lagoons or estuaries downstream of the creek mouth. In any event, the Assumptions in Appendix L don't explicitly describe the "implicit' conservative assumptions, and the only real text devoted to the margin of safety issue appears to be in Section 8.1.7 rather than in the modeling appendices (J and K). It would be worthwhile to add some text to the document that more explicitly outlines where the "implicit" margin of safety is built in to each model.

Response: The location of the critical point at the creek mouth as an assumption is conservative because all watersheds included in this analysis did not include an adjacent lagoon or estuary (see response to comment 11). The discussion regarding the implicit margin of safety and how it was utilized was expanded in section 8.1.7.

Overarching Questions:

(a) Are there any other issues with the scientific basis of the proposed rule?

Comment: The mixed use of REC-1 and SHELL criteria for water quality targets at the same location may introduce some difficulty to water quality managers. The SHELL criteria are more stringent, so the mixed use of these results in a total coliform criteria that is lower than fecal coliform. Practically, this is difficult to achieve since fecal coliform are, in concept and practically, a subset of total coliform. How will total coliform levels ever be lower than fecal coliform levels at the same location? See Table 4-2 for the summary. It appears that this is only a problem at beaches.

Section 10 on Implementation is nonexistent. The impression from the placeholder paragraph is that dischargers may amend the TMDLs and that the timescale for implementation is unknown. If more data are to be collected for more study of the watersheds, and the resulting impact is delayed or uncertain implementation, this would delay protection of the coastal water quality in the San Diego Region. Implementation measures are the translation of the science into effective water quality management. The degree to which the science can be implemented adds to its validity in the TMDL process. Therefore, an additional comment on this document is that the presentation of implementation strategies and monitoring plans should be part of the TMDL document. One aspect of implementation will be flow measurement. As stated in Appendix K, few flow measures are available, yet to comply with the TMDLs these will have to be made.

Response: Table 4-2 has been modified for clarity. The San Diego Water Board recognizes that 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.

Since the Technical Report was made available to the peer reviewers on February 7, 2005, the San Diego Water Board, in consultation with the Stakeholder Advisory Group, has developed an Implementation Plan that outlines the strategy for achieving compliance with WLAs developed in the technical analysis. 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 and submission of annual water quality monitoring reports. Reporting shall continue until the bacteria WQOs are attained and maintained in impaired beaches and creeks.

(b) Is the scientific portion of the proposed rule based upon sound scientific knowledge, methods and practice?

Comment: In Appendix C-1, a small editorial recommendation is to remove the word "species" from the first line of page C-1. This is because "total coliform" and "fecal coliform" are empirically-defined groups of bacteria and are not "species" per se. While many taxonomic groups make up the total and fecal coliform, these indicator organism classifications are not derived from any accepted taxonomy.

Overall, it is great to see the development of and use of simulation tools for modeling bacterial discharge under two seasonal regimes as the basis for TMDL development. However, as with all TMDLs, there is a need to demonstrate a relationship between indicator bacteria and threat to swimmers and fishers. Increasingly, DNA-based metrics of human-waste associated *Bacteriodes* or *Enterococcus* are used to make a more robust link between the presence of bacteria in coastal waters and the presence of human waste. Better yet, these methods are increasingly becoming quantitative with the availability of real-time or quantitative polymerase chain reaction (QPCR). At the time of this review, there is a reasonable amount of evidence in the peer-reviewed scientific literature that DNA-based markers of human waste can be used to more definitively understand the presence of human waste. At the very least, new TMDL programs, as part of the monitoring portion of implementation, should strive to gather a better understanding of the real presence of human waste using DNA-based evidence from sampling and analysis in conjunction of standard indicator organism assays.

Response: The word "species" has been removed from the first line of page C-1.

The San Diego Water Board agrees that there is a need to demonstrate a relationship between indicator bacteria and threat to swimmers and fishers, and that this is an area of uncertainty. Furthermore the San Diego Water Board recognizes that there is an increasing amount of research being done to establish this link using innovative methods.

The required monitoring portions described in the Implementation Plan consist of monitoring for indicator bacteria. As part of source identification, responsible persons can monitor for DNA markers, or use other innovative methods as appropriate.

Comments from Professor Nelson

Comment: My overall assessment is that the approach used to determine interim TMDLs is technically sound, with the exception of the concerns raised below regarding the dry-weather model. I believe that implementation of the Interim TMDLs will result in a significant improvement in water quality, and is far preferable to postponing action until remaining sources of uncertainty can be addressed. However, there is an opportunity to learn more about the fundamental processes that contribute fecal indicator bacteria to the surface waters in the San Diego region through the monitoring that will be required to document compliance with Interim (and Final) TMDLs. I strongly recommend that the San Diego Water Board, in preparing the Implementation Plan, ensure that the monitoring data are collected in a manner that maximizes the amount of information that can be learned, including gaining more insight into the fundamental source, fate, and transport processes.

Response: Comment noted. The San Diego Water Board agrees that insight into the sources, fate, and transport processes for bacteria is valuable for designing strategies for abatement. The Implementation Plan outlines monitoring efforts that will be required from responsible persons, including receiving water monitoring and identification of bacteria sources.

1. Use of land use composition to quantify bacteria sources from all watersheds to affected beaches and creeks in the San Diego Region.

Comment: This is a reasonable approach.

Response: Comment noted.

2. **Use of wet weather model to simulate fate and transport of bacteria, and to calculate TMDLs, to affected beaches and creeks**.

Comment: In general, the approach used for the wet weather model seems reasonable given the limited existing data. The method for calibrating and validating the model is presented well. Although the model results agreed fairly well with the observed concentration for the high flows (especially above 60 percent unit area flow, as reported in Appendix N Figures 12-25), at low flows the model often underestimated the concentrations. In the text on p. J-11 it is stated that these flows may be better modeled as dry flows. However, since the flow on these days was defined as a wet flow, it is not clear to me that these loadings are being appropriately incorporated into the TMDLs. It may be necessary to redefine the classification of wet flows. In addition, as the science describing the sources of fecal pollution and their transport mechanisms improves, the model will need to be improved and TMDLs reevaluated. For example, the resuspension and erosion of sediments in water channels during storm events may be an important source of indicator bacteria that is not accounted for in the current model.

Specific comments on Appendix J:

a. (p.J-4) Please provide a table of the percent (%) impervious for each land-use category.

b. (p.J-6) I don't believe atmospheric deposition of fecal indicator bacteria is a potential source, unless you mean deposition from birds.

c. (p.J-12) I would not characterize the model and observed data as "extremely" well. I would say "fairly" well.

Additional comments on Appendix M:

d. It is difficult to see the curves for the observed and modeled daily rainfall on the calibration and validation graphs because the peaks are so sharp and the lines so thin. Since this graph is the only one presented for the validation, I suggest changing it to monthly rainfall rather than daily rainfall (as was done for the calibration).

e. The legend for the validation curves is incorrect (states monthly instead of daily rainfall).

Response: Wet and dry periods were identical to San Diego County Department of Environmental Health'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, and the timeframes for these advisories are designated as 72 hours after 0.2 inch or more of rain. For each watershed, rainfall data from the nearest rain gage was analyzed for identification of wet and dry days based on these criteria. The general nature of this approach may have resulted in selection of wet days that are not representative of wet conditions. This was shown in calibration results that illustrated under-prediction of bacteria concentrations during lower flow ranges that were categorized, based on the methodology above, as wet conditions. However, the impact of this under-prediction is minimal on overall wet-weather TMDL calculations because the required load reductions were dominated by higher flow conditions (loadings during wet weather were multiple orders of magnitude above dry - see Appendices O and P). If better methods are determined for defining criteria for selection of wet and dry conditions impacting beaches and creeks, the TMDLs can be reevaluated in the future.

The San Diego Water Board agrees that an improved understanding of bacteria sources and transport from the watersheds may require future updates of the wet-weather model and reevaluation of TMDLs. The association of bacteria to sediments in the stream channels and processes of settling and resuspension are important considerations, and the LSPC model includes capabilities for simulation of these processes if data becomes available to define modeling assumptions or facilitate model calibration.

Specific comments addressed in Appendices J and M were as follows:

a. Table J-2 was added to Appendix J that lists percent imperviousness for each of the urban land uses, based on assumptions from the National Resources Conservation Service's (formerly known as the Soil Conservation Service) TR-55 manual.

b. The San Diego Water Board agrees that atmospheric deposition is not a potential source of bacteria. This discussion was removed from the text on page J-6 of Appendix J.

c. The text on page J-12 of Appendix J was changed to state that the model and observed data matched "fairly" instead of "extremely" well.

d & e. All daily hydrology calibration and validation results reported in Appendix M show daily rainfall, although the plots were mislabeled as "Avg Monthly Rainfall." The plots were edited to correctly label rainfall as "Daily Rainfall." Daily results are more appropriate for these plots so that impacts on daily flows can be observed. Monthly rainfall would not show this relationship with the same resolution as daily results.

3. Selection of a Los Angeles watershed as a "reference" for background loading of bacteria in the San Diego Region during wet weather.

Comment: Given that sufficient data do not exist for a reference watershed in the San Diego Region, it is reasonable to use a reference watershed in Los Angeles. However, the Implementation Plan should require that one or more appropriate reference watersheds are identified and characterized for the San Diego region, and that these data are used to determine the final TMDLs.

Response: The San Diego Water Board agrees that an appropriate reference watershed(s) should be identified and characterized in the San Diego Region. The San Diego Water Board is actively participating in a workgroup chaired by the Southern California Coastal Water Research Project (SCCWRP) that has 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 land. 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 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,[2] 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

[2] 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.

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.

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.

4. Use of single-sample maximum objectives for wet weather numeric targets.
Comment: The use of single-sample maximums for the wet weather targets is a reasonable approach.

Response: Comment noted.

5. Reasonableness of assumptions (described in Appendix L) for wet weather modeling.
Comment: The assumptions are reasonable, except please clarify that the first-order die-off rate is an "apparent" rate, not an actual rate.

Response: The first order die-off assumed in the wet-weather model was an "apparent" rate assumed based on model sensitivity analyses performed in similar studies in Southern California.

6. Use of wet weather modeling parameters to simulate build-up/wash-off of bacteria from a similar study in Los Angeles (Los Angeles Water Board, 2002).
Comment: The use of data from L.A. is reasonable given that no local data exist. However, the starting values taken from the Los Angeles Water Board should be reported in Appendix J, or in a separate Appendix.

Response: Comment noted. The values for the modeling parameters have been incorporated into Appendix J.

7. Use of dry weather model to simulate fate and transport of bacteria, and to calculate TMDLs, to affected beaches and creeks.

Comment: The assumption of plug-flow hydraulics to describe the creek flows, and the empirical approach used to model the bacterial concentrations appears to be an acceptable approach given the limited data that are available. However, I have some significant concerns about how the empirical relationships were developed. Appendix K is poorly written, and it is possible that most of my concerns could be addressed if the methods were explained more clearly and in more detail.

Response: The comment regarding the clarity of Appendix K was noted. Appendix K was revised to more clearly explain the development of the dry weather model.

Comment continued: My specific concerns are the following (many of these items are interrelated):

a. Please number each of the equations.

Response: All equations were numbered.

b. Please explain how the functional form (linear, exponential, etc.) and best fit (quantitative or qualitative?) for each of the equations in Appendix K was determined. In particular, how were the multiplication factors (constants) determined in the equations on p. K-5 and K-6? In the equation on p. K-6, why isn't A (total watershed area) multiplied by the rest of the equation? It seems to me that the fecal coliform concentration should increase or decrease proportionally (although not necessarily linearly) with the watershed area.

Response: Additional explanation of the multivariable regression equations developed to estimate dry weather flows and fecal coliform concentration was provided in Section K.3 and K.4 of Appendix K. These discussions describe the method for regression analyses, the justification for structure of the equations, and tests performed for evaluation of statistical significance of variables.

c. How are infiltration and evaporation incorporated into the flow mass balance (equation at top of p. K-4)?

Response: Infiltration and evaporation are not included in the mass balance (equation 2) since this equation is specific to calculation of the bacterial concentration of the *inflow* to the reach (C_{in}) that includes local watershed drainage as well as upstream reach flows. The infiltration/evaporation assumptions only apply for calculation of the flow at the bottom of the reach (see added explanation in text). This flow at the bottom of the reach is then multiplied by the concentration determined by equation 1 for determination of the loading from the reach.

d. (p.K-3) My understanding is that in the model for bacterial loading, the loading for the drainage area for each segment is added at the bottom of that segment (which is the top of the next segment). If this is the case, it is a conservative approach, because the decay of any bacteria that actually enter the watershed upstream of that point is not considered. This assumption should be discussed, and its contribution to the "Margin of Safety" should also be stated.

Response: The commentor's definition of the watershed loading input to a stream reach is correct. Also correct is the comment that bacterial decay is not considered explicitly upstream of the point where a watershed is assumed to discharge to the reach. However, the "total area of watershed" variable in equation 7 is also implicitly representative of additional die-off that may occur in the watershed prior to discharge to the reach (see added explanation in text). As a result, we consider the two bacterial die-off formulations to be acceptable and not overly conservative, and therefore not necessary to mention in the Margin of Safety.

e. I have some major concerns about how the empirical equations for the bacterial loadings and die-off rates were developed. It seems that first the Equation on p. K-6 was developed by regression analysis. Then, using the same data set, die-off rates were incorporated and their values adjusted until the "best fit" was achieved between the modeled and observed (geometric mean) values at each sampling station. Thus, the die-off rates are just accounting for the inability of the regression equation to describe the observed data. If this is the case, the die-off rates are just fitting parameters but there is no reason to believe that what is being modeled is actually die-off. Furthermore, I do not understand how the die-off rates for total coliform bacteria and enterococci were determined independently from the multiplication ratios (on p.K-7), nor how the regression equations were evaluated for best fit. For example, in Figure K-11 the results are presented for the calibrated enterococci model, but the observed concentrations are significantly lower than the modeled concentrations. Thus, it does not seem that the model was calibrated correctly. In addition, it is not clear to me what parameter would be adjusted to achieve a better fit – increase the die-off rate, or decrease the multiplication factor?

Response: Several stations used in development of the regression analysis for prediction of watershed of bacteria concentration (equation 7) and the calibration and validation of in-stream bacterial die-off were the same. As many stations as possible were used in the regression analysis due to a general lack of watershed data in the region and a need for a robust dataset to provide statistical significance. Effects of bacteria die-off that may be implicitly incorporated in the regression equations (e.g., negative correlation of bacteria concentration to watershed size suggests effects of bacteria die-off in equation 7) were not considered duplicated in the reach assumptions. Model configuration of multiple subwatersheds and reaches differed from single representative watersheds used in regression analyses, and required incorporation of assumptions for reach infiltration and bacterial die-off to account for losses occurring during transport. Each model subwatershed used the regression equations to estimate flow and bacterial concentration that were routed through a network of stream reaches that ultimately met locations corresponding to monitoring stations used for calibration. However, watersheds used for regression analyses represented a single watershed for the same area, with no stream routing. Hence, the die-off rates developed for the reaches were not consistent with errors associated with regression equations applied to the entire watershed without reach routing and losses considered. To further prove the independence of the calibration procedure from the regression analyses, data from five additional in-stream monitoring stations that were not used for regression analyses were also used for calibration. Bacterial die-off rates were also validated for fifteen stations on Tecolote Creek and San Juan Creek, of which eight of these stations were not used in development of the regression equation 7.

The process for calibration of die-off rates for total coliform and enterococci were consistent with the procedure used for fecal coliform. The die-off rates were calibrated to minimize the difference between observed in-stream bacteria levels and model predictions. Upon review of Figure K.11 that showed calibration results for the enterococci die-off rate, an error in the plot was discovered that resulted in depiction of modeled concentrations that were higher than those actually modeled. (All other calibration and validation plots were correct). The plot was fixed and replaced in the text. The modeled enterococci concentrations were well within the ranges of observed concentrations.

f. Other limitations to the empirical approach are evidenced by the fact that equations relating total coliform bacteria and enterococcus concentrations to land use could not be developed. I expect that the use of multipliers to determine the concentrations of these indicators as a function of fecal coliform concentrations is a major source of error in the model, because different sources of fecal waste may have different ratios; furthermore, the rates of removal and inactivation in the environment may differ for the different bacteria. The variation in the fecal coliform: enterococci ratio is expected to be particularly large, since it is known to range from a ratio of less than one in human waste to greater than 40 in some animals wastes. Thus, although there was fairly good agreement for the creek segments used to validate the model, I expect these assumptions to introduce significant amount of error for other creek segments (those that were not used for model calibration.)

Response: The San Diego Water Board agrees that there are limitations to the empirical approach that are evidenced by the inability to derive equations for total coliform and enterococci as a function of land use. Furthermore, the method for prediction of total coliform and enterococci based on fecal coliform introduces additional potential error in the technical approach. However, the San Diego Water Board feels that given the limited data in the region to define dry weather loading, and the proven ability of the model to calibrate and validate fairly well to data in multiple watersheds representative of environments in the north and south of the region, the empirical methods are sufficient for calculation of TMDLs. However, as more data are collected in the watersheds in the region, the empirical methods can be refined, retested, or even substituted with more robust methods developed through further study.

g. Some of my concerns with the empirical approach used to develop the equation on p.K-6 may be addressed if the explanation was better. Section K.4 needs significant improvement:
   i. In addition to the number of sampling stations for each Creek, please also report the number of samples for each station.
   ii. Clearly large data sets are better than small data sets, but was the number of samples at each station taken into account for the regression analysis? Was the data from some stations not used?
   iii. How is it known that 40 data points is enough to adequately represent the range of conditions at one sampling station?
   iv. Please explain exactly how the regression analysis was performed. How did the regression analysis of the data at each station result in the final equation?

Response: Tables K-1 and K-2 were added to the text to list the monitoring stations and number of measurements available for calculation of the average flows and geometric mean of indicator bacteria concentrations used in development of the regression equations.

Large datasets were preferred in the analyses of indicator bacteria data, but were not "required" as the original text had mistakenly reported. Many of the stations in the Aliso Creek study had 40 measurements for analyses. The number of measurements at stations in the other creeks varied. No criteria were developed for selection of stations based on the number of samples for representative geometric mean calculations. Rather, station selection included qualitative evaluation for consideration in the analyses. Specific stations of Rose Creek, Tecolote Creek, and San Juan Creek were selected for analyses even though few samples were available at these locations for geometric mean calculations. These stations were selected for multiple reasons, including the relatively low indicator bacteria concentrations observed (see Figure K-4), strategic locations of watersheds to provide an expanded spatial coverage for analyses, size of the watershed, or representation of key land uses. Since some of these stations were representative of subwatershed runoff that is less urban than other locations in the Aliso Creek watershed, and geometric means of concentrations were less than those for more urban areas, their inclusion in the analyses was determined useful regardless of the smaller datasets. Use of these lower concentrations also expands the applicability of regression equations for prediction of concentrations that fall within the range of values used in their development.

The accuracy of the regression equation 7 appears to be impacted by the amount of data used in the geometric mean calculation. It is evident from results shown in Figure K-4 that the model performs better for those stations that had many data points for geometric mean calculation. Prediction of lower concentrations for San Juan Creek, Rose Creek, and Tecolote Creek were less accurate, although the equation successfully predicted concentrations lower than what was observed in Aliso Creek. So, the general trend was captured for lower concentration ranges (based on geometric means of smaller datasets), but the exactness of the equation could be improved or evaluated better if more data was available at these stations.

Some stations were not used in the analyses because there was no information regarding the subwatershed draining to the station location (particularly in Aliso Creek that had many small, urbanized subwatersheds). Other stations were within the creek mainstem and were reserved for calibration or validation of the model's reach formulations. Other stations had no data.

Section K.4 was expanded to improve explanation of the method for regression analyses and how the final variables and associated coefficients were developed for equation 7.

8. Use of data from Aliso, San Juan, Rose, and Tecolote Creeks to characterize dry weather source loading in the entire San Diego Region.

Comment:It is difficult to assess whether these three creeks are representative of the rest of the watersheds in terms of runoff and bacterial densities. I suggest including a paragraph with a short description of these three watersheds and a discussion of how they compare to others. In the Implementation Plan, a strategy should be outlined for incorporating data from additional watersheds into the development of final TMDLs.

Response: A short description of the watersheds and their relevant characteristics was added to section K.1.

In terms of implementation, see response to comment 3. The Regional Board anticipates development of final TMDLs that are based on exceedances frequencies calculated from additional reference watersheds.

9. Use of geometric mean objectives for dry weather numeric targets.

Comment: The use of the geometric mean seems to be an appropriate water quality objective if the assumption that dry weather concentrations are fairly constant is correct. However, if future monitoring efforts identify high episodic concentrations, this approach may need to be reevaluated because health impacts are likely to result from exposure to the high episodic concentrations, which may not be adequately represented (and therefore regulated) by geometric means.

Response: The San Diego Water Board recognizes that dry weather concentrations are not constant and are likely to vary significantly during a 30-day period. However, accounting for this variability in TMDL calculation has proven to be complex due to difficulty in predicting the variability for watersheds where data are limited. Therefore, the San Diego Water Board believes that the method used in this prediction of bacteria loads for this TMDL analysis is adequate. As more data are collected to provide further study and development of improved methods for estimation of bacteria loading, TMDL calculations can be revisited in the future.

10. Reasonableness of assumptions (described in Appendix L) for dry weather modeling.

Comment: Most of the assumptions are reasonable, except:

a. Please clarify that the first-order die-off rate is an “apparent” rate, not an actual rate. Also, I agree that given the lack of data on the occurrence of bacterial regrowth in the Southern California region, it is not possible include regrowth in the model for dry weather flows. However, regrowth has been demonstrated in tidally-influenced river sediments in Florida (e.g. Desmarais, T. R., Solo-Gabriele, H. M., and Palmer, C. J. 2002. "Influence of soil on fecal indicator organisms in a tidally influenced subtropical environment." Applied and Environmental Microbiology, 68(3), 1165-1172.) Thus, regrowth should be recognized as a potential source of error, and should regrowth be documented in the region in the future, it may need to be incorporated into the modeling framework.

b. There is a typographical error in the "regrowth" assumption – it says "wet" instead of "dry".

Response: The first order die-off assumed in the wet weather model was an "apparent" rate assumed based on model sensitivity analyses performed in similar studies in Southern California. The San Diego Water Board recognizes that other factors such as bacteria regrowth may play a role in impaired streams, but presently there are no data to verify or quantify these factors. Therefore, the apparent rate of bacteria die-off may be representative of multiple factors that ultimately result in a net loss in bacteria over time. Should regrowth be documented and quantified in the future, model assumptions for re-growth and die-off can be redefined and TMDLs can be revised.

The typographical error has been corrected.

11. Location of critical points for TMDL calculation.

Comment: The location of the critical points is appropriate.

Response: Comment noted.

12. Use of conservative assumptions to comprise an implicit Margin of Safety.

Comment: The use of conservative assumptions rather than an explicit Margin of Safety is appropriate. Also see comment 7d above.

Response: Comment noted.

***Editorial Comment*:** Several of the references to Appendices, Tables and Figures were incorrect, as documented below. (The entire document should be checked).

- (p.7) Reference to Appendix G is incorrect (should be Appendix H?)
- (p.K-2) Reference to Sections J.2.2. and J.2.3. incorrect?
- (p.K-13) Should be Figures K-13 through K-15 (not J)
- (p.J-10) Should be Tables J-3 through J-5 (not F-3 through F-5)
- (p.J-11) Should be Tables J-3 through J-5 (not F-3 through F-5)
- (p.L-1) Should be Appendices J, M and N (not J, O and P)

Response: Comment noted. The Technical Report has been modified to correct the text, as noted above, and the entire report checked for consistency.

Appendix B

Tentative Resolution
And Draft Basin Plan Amendment

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Please see

Tentative Resolution No. R9-2010-0001

and

Attachment A to Tentative Resolution No. R9-2010-0001

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APPENDIX C

WHAT ARE INDICATOR BACTERIA?

Indicator bacteria are surrogates used to measure the potential presence of fecal material and associated fecal pathogens. Indicator bacteria such as fecal coliform and enterococcus are part of the intestinal flora of warm-blooded animals.

Indicator organisms have been long used to protect bathers from illnesses that may be contracted from recreational activities in surface waters contaminated by fecal pollution. These organisms often do not cause illness directly, but have demonstrated characteristics that make them good indicators of harmful pathogens in waterbodies. A direct link has been established between human illness and recreating near the outfalls of urban storm drains (San Diego Water Board, 2001, and 2002a).

Microorganisms are ubiquitous in all terrestrial and aquatic ecosystems. Of the vast number of species, only a small subset are human pathogens, capable of causing varying degrees of illness in humans. The source of these harmful organisms is usually the feces or other wastes of humans and various warm-blooded animals. The pathogens most commonly identified and associated with waterborne diseases can be grouped into the three general categories: bacteria, viruses and protozoa.

The detection and enumeration of all pathogens of concern is impractical in most circumstances due to the potential for many different pathogens to reside in a single waterbody, lack of readily available and affordable methods of detection, and the variation in pathogen concentrations. The use of indicators provides a means to ascertain the likelihood that human pathogens may be present in recreational waters.

More information on indicator bacteria and USEPA guidance for implementation of water quality criteria can be found at:

http://www.epa.gov/waterscience/criteria/bacteria/

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Appendix D

Bacteria-Impaired Waterbodies Addressed in the TMDLs

(Based on the 2002 Clean Water Act Section 303(d) List)

	Hydrologic Descriptor	Waterbody[c]	Segment or Area[~~d~~c]	Pollutant or Stressor[c]	Extent of Impairment[c]	Year Listed
	Beach Shoreline Listings (North to South)					
	~~Beach Shoreline Listings (North to South)~~					
1	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	Bacteria Indicators[b]	0.6 miles	1998
2	San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)	Pacific Ocean Shoreline	at Main Laguna Beach Laguna Beach at Ocean Avenue Laguna Beach at Laguna Avenue Laguna Beach at Cleo Street Arch Cove at Bluebird Canyon Road Laguna Beach at Dumond Drive	Bacteria Indicators[b]	1.8 miles	1998
3	Aliso HSA (901.13)	Pacific Ocean Shoreline	Laguna Beach at Lagunita Place/Blue Lagoon Place at Aliso Beach	Bacteria Indicators[b]	0.7 miles	1998
4	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	Bacteria Indicators[b]	1.9 miles	1998
5	Lower San Juan HSA~~S~~ (901.27)	Pacific Ocean Shoreline	At San Juan Creek beach	Bacteria Indicators[b]	1.2 miles	1998

Beach Shoreline Listings (North to South) (Cont'd)						
	Hydrologic Descriptor	Waterbody[c]	Segment or Area[c]	Pollutant or Stressor[c]	Extent of Impairment[c]	Year Listed
6	San Clemente HA (901.30)	Pacific Ocean Shoreline	at Poche Beach (large outlet) Ole Hanson Beach Club Beach at Pico Drain San Clemente City Beach at El Portal Street Stairs 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	Bacteria Indicators[b]	3.4 miles	1998
7	San Marcos HA (904.50)	Pacific Ocean Shoreline	at Moonlight State Beach	Bacteria Indicators[b]	0.4 miles	1998
8	Miramar Reservoir HA (906.10)	Pacific Ocean Shoreline[a]	Torrey Pines State Beach at Del Mar (Anderson Canyon)	Bacteria Indicators[b]	0.4 miles	2002

	Beach Shoreline Listings (North to South) (Cont'd)					
	Hydrologic Descriptor	**Waterbody[c]**	**Segment or Area[c]**	**Pollutant or Stressor[c]**	**Extent of Impairment[c]**	**Year Listed**
9	Scripps HA (906.30)	Pacific Ocean Shoreline	La Jolla Shores Beach at El Paseo Grande[a]	Bacteria Indicators[b]	3.9 miles	1998
			La Jolla Shores Beach at Caminito Del Oro[a]			
			La Jolla Shores Beach at Vallecitos[a]			
			La Jolla Shores Beach at Ave de la Playa[a]			
			at Casa Beach, Children's Pool			
			South Casa Beach at Coast Blvd. [a]			
			Whispering Sands Beach at Ravina Street[a]			
			Windansea Beach at Vista de la Playa[a]			
			Windansea Beach at Bonair Street[a]			
			Windansea Beach at Playa del Norte[a]			
			Windansea Beach at Palomar Ave. [a]			
			at Tourmaline Surf Park[a]			
			Pacific Beach at Grand Ave. [a]			

Creek Listings						
	Hydrologic Descriptor	Waterbody[c]	Segment or Area[c]	Pollutant or Stressor[c]	Extent of Impairment[c]	Year Listed
1	Aliso HSA (901.13)	Aliso Creek	See Footnote cb	Enterococci, *E. coli*, Fecal Coliform	See footnote c	1998
2	Lower San Juan HSA (901.27)	San Juan Creek		Bacteria Indicators[b]	1 mile	1998
3	Tecolote HA (906.50)	Tecolote Creek		Bacteria Indicators[b]	6.6 miles	1998
43	Santee HSA (907.12)	Forrester Creek		Fecal coliform	lower 1 mile	2002
54	Mission San Diego HSA (907.11) & Santee HSA (907.12)	San Diego River, Lower		Fecal coliform	lower 6 miles	2002
65	Chollas HSA (908.22)	Chollas Creek		Bacteria Indicators[b]	1.2 miles	1998

Creek/Lagoon Mouths Listings						
	Hydrologic Descriptor	Waterbody[c]	Segment or Area[c]	Pollutant or Stressor[c]	Extent of Impairment[c]	Year Listed
1	Aliso HSA (901.13)	Aliso Creek	at creek mouth	Bacteria Indicators[c]	0.29 acres	1996
2	Lower San Juan HSA~~S~~ (901.27)	San Juan Creek	at creek mouth	Bacteria Indicators[c]	6.3 acres	1998
3	San Luis Rey HU (903.00)	Pacific Ocean Shoreline	at San Luis Rey River Mouth	Bacteria Indicators[b]	0.49 miles	1996
4	San Dieguito HU (905.00)	Pacific Ocean Shoreline	at San Dieguito Lagoon Mouth	Bacteria Indicators[b]	0.86 miles	1996
5	Mission San Diego HSA (907.11)	Pacific Ocean Shoreline	at San Diego River Mouth (aka Dog Beach)	Bacteria Indicators[b]	0.37 miles	1996

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

[a~~b~~]In 1998 and previously, bacteria indicators implies that impairment was due to total coliforms, fecal coliforms, or both. In 2002 impairment may have also been caused by enterococci.

[b~~c~~] The entire reach (7.2 miles) is listed for enterococci, *E. coli* and fecal coliforms. In addition, Aliso Hills Channel, English Canyon Creek, Dairy Fork Creek, Sulphur Creek, and Wood Canyon Creek are listed for enterococci and *E. coli*.

[c~~d~~] Based on the 2002 Clean Water Act Section 303(d) List. Beginning with the 2008 303(d) List, specific beach segments of the Pacific Ocean shoreline are listed individually, and may not be identified in the same way as those segments listed in the table above. Several of the segments or areas in the list above have been delisted or redefined in the 2008 303(d) List. In addition, other segments or areas have been added to the Pacific Ocean shorelines listed above. The TMDLs that address the Pacific Ocean shorelines identified in the 2002 303(d) List are assumed to be applicable to all the beaches located on the shorelines of the hydrologic subareas (HSAs), hydrologic areas (HAs), and hydrologic units (HUs) listed above.

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Appendix E

Maps of Impaired Watersheds

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Maps of Impaired Watersheds

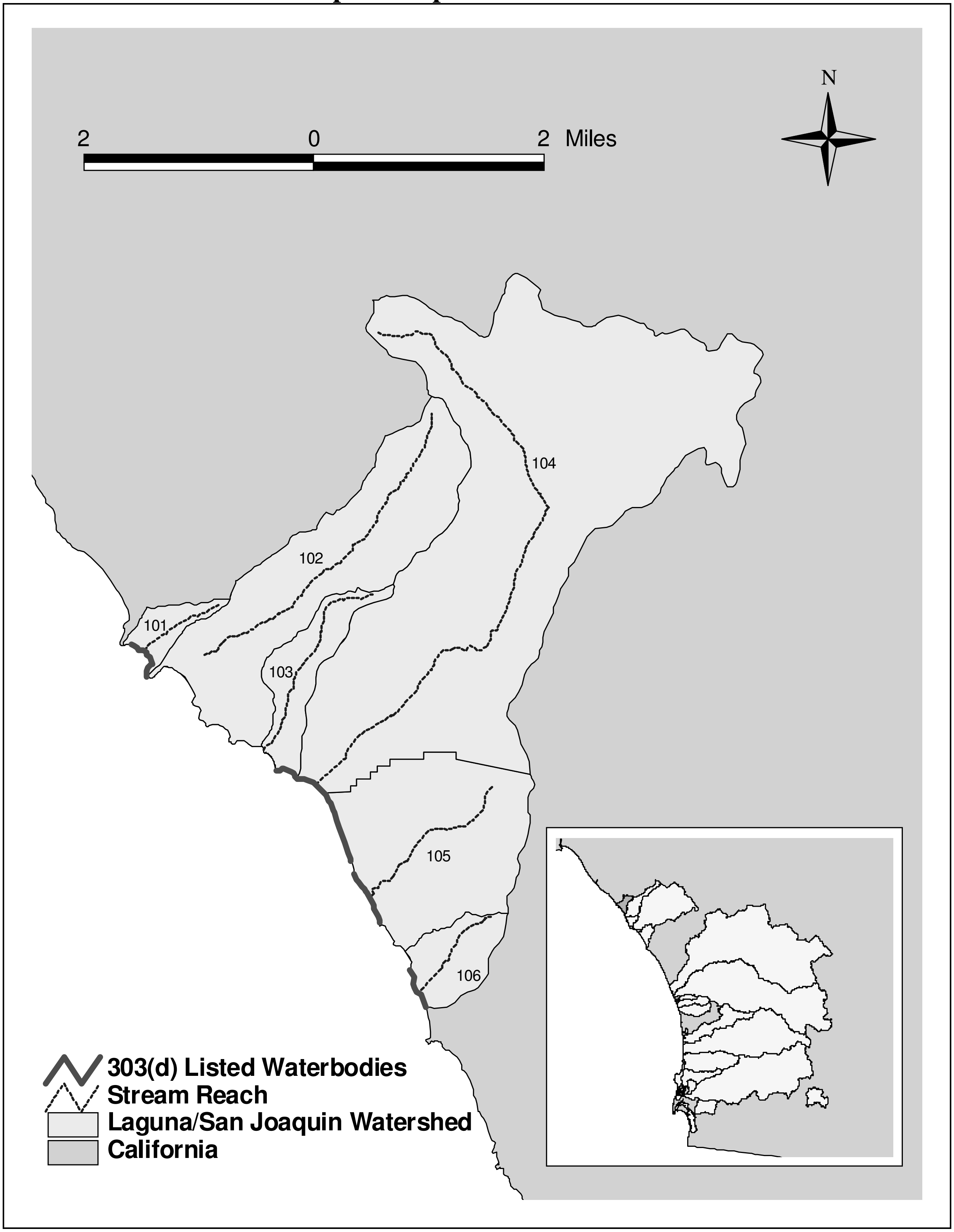

Figure E-1. ~~Laguna/~~San Joaquin HSA /Laguna Beach HSA Watershed

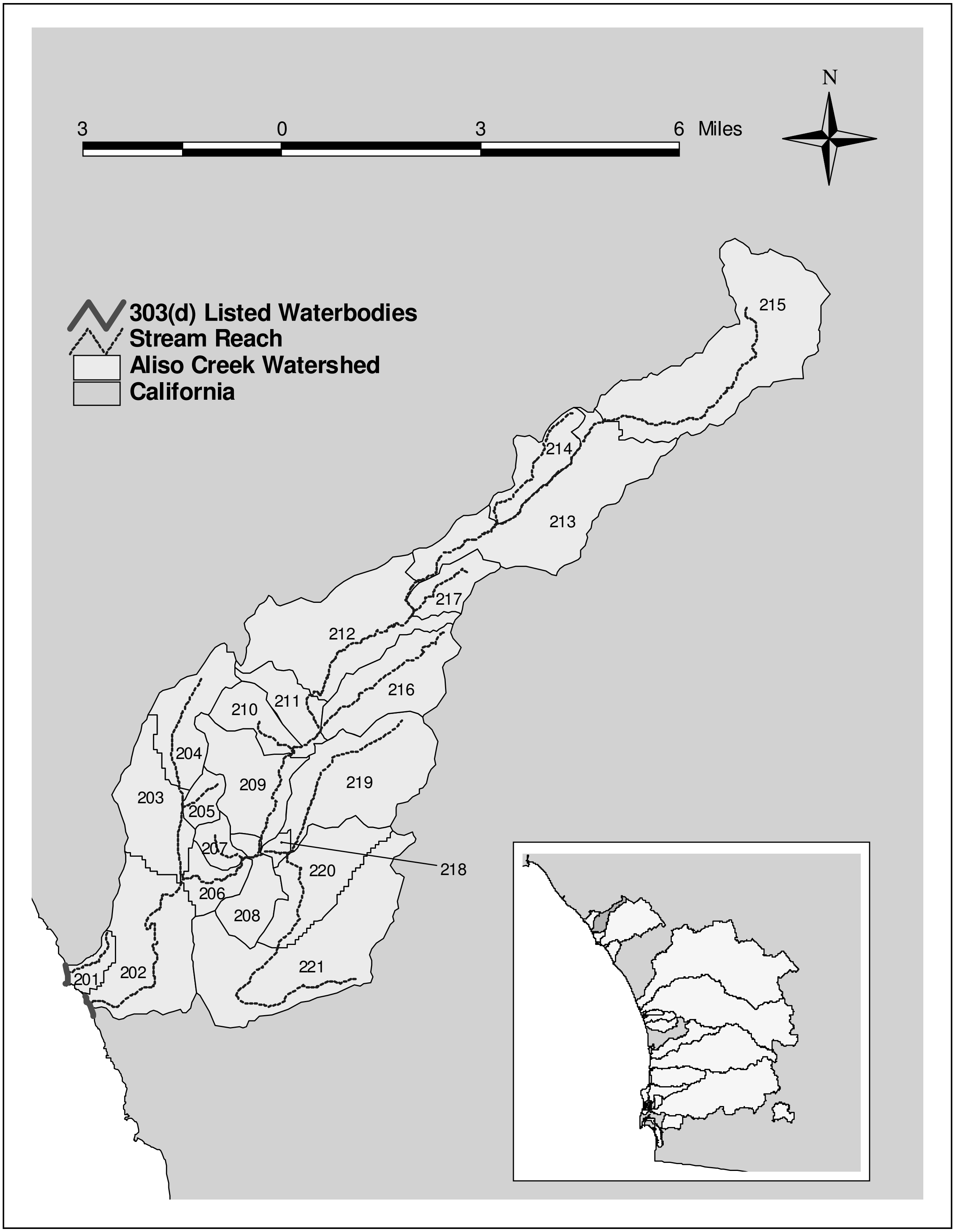

Figure E-2. Aliso ~~Creek~~ HSA Watershed

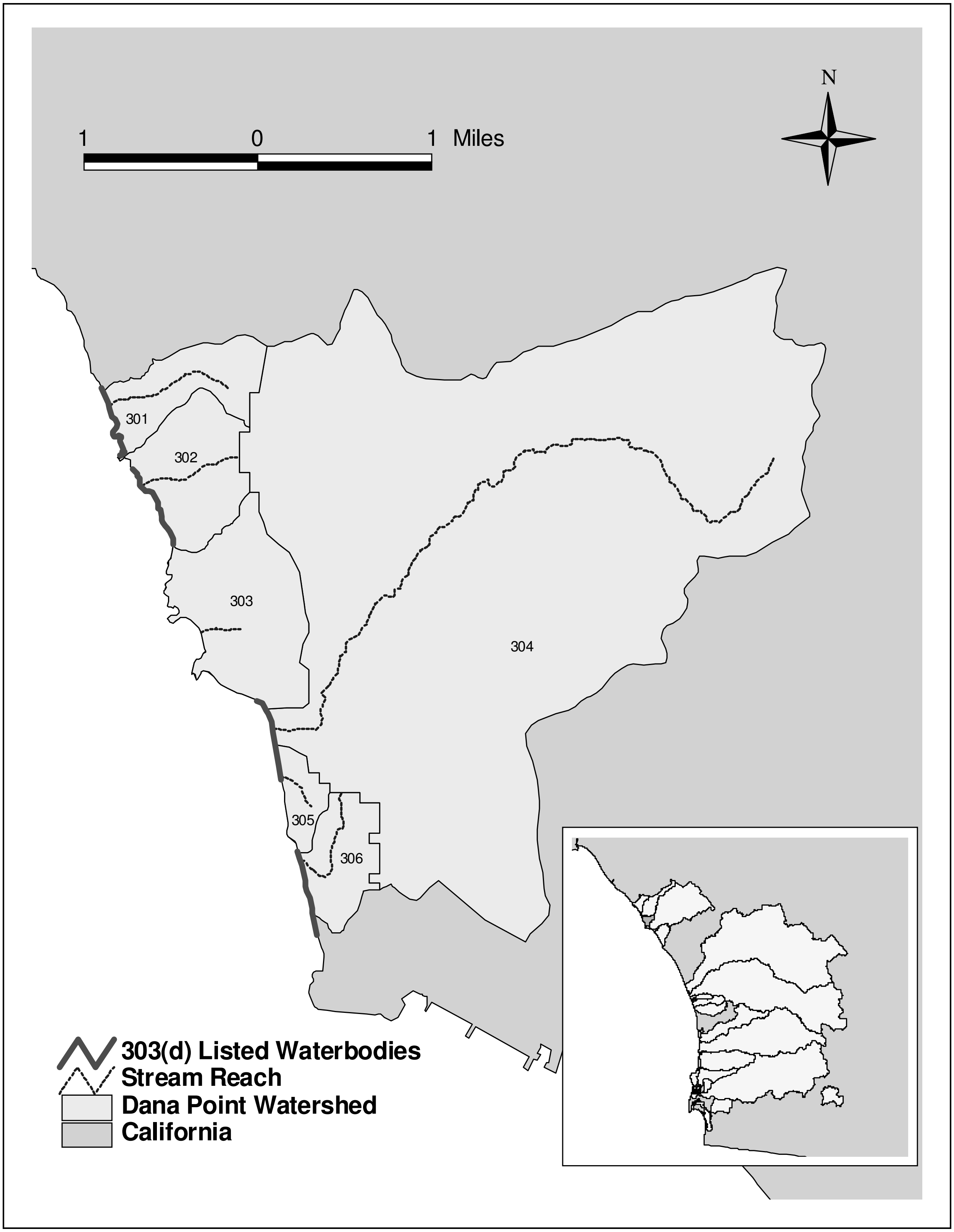

Figure E-3. Dana Point HSA Watershed

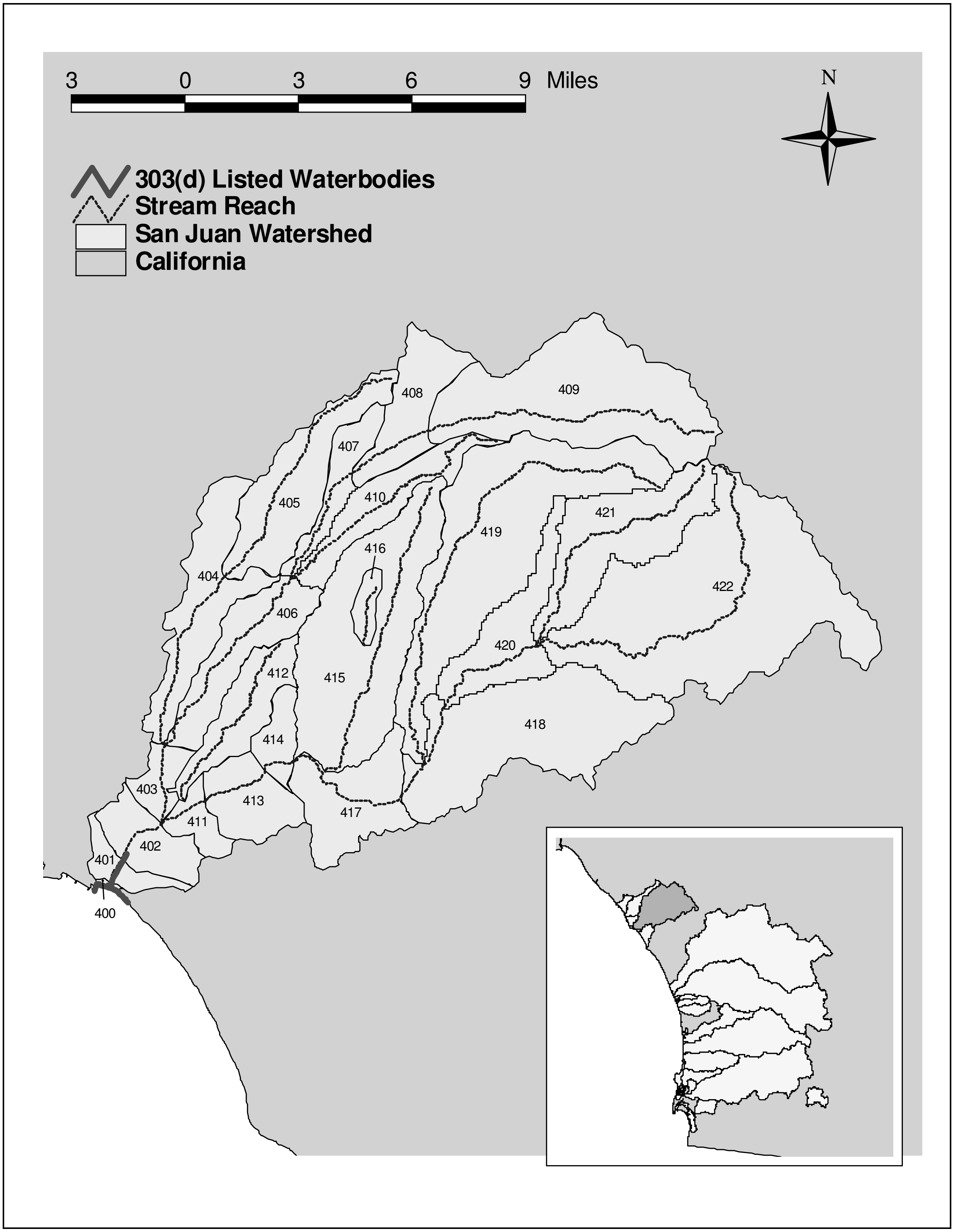

Figure E-4. Lower San Juan HSA~~Creek~~ Watershed

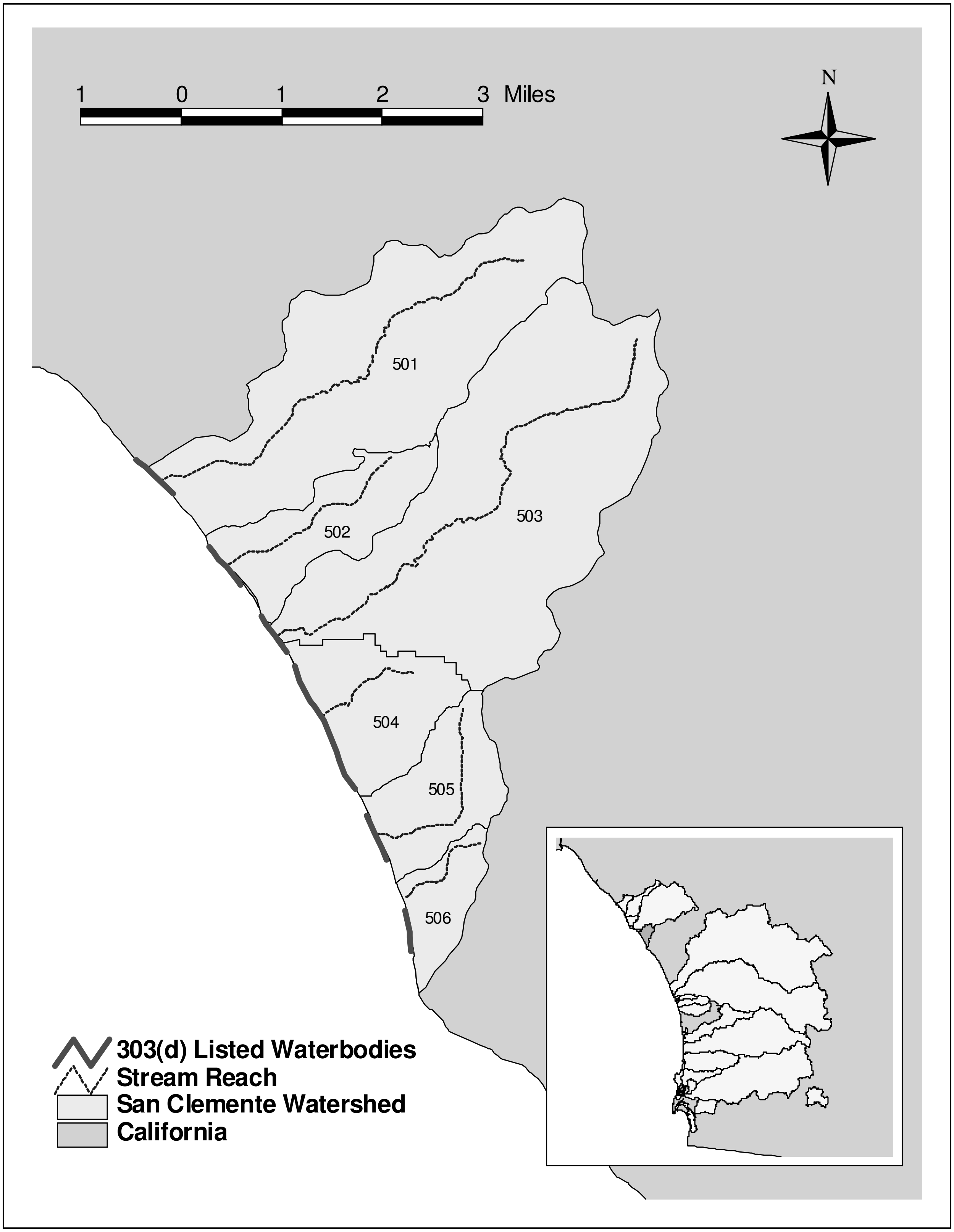

Figure E-5. San Clemente HA Watershed

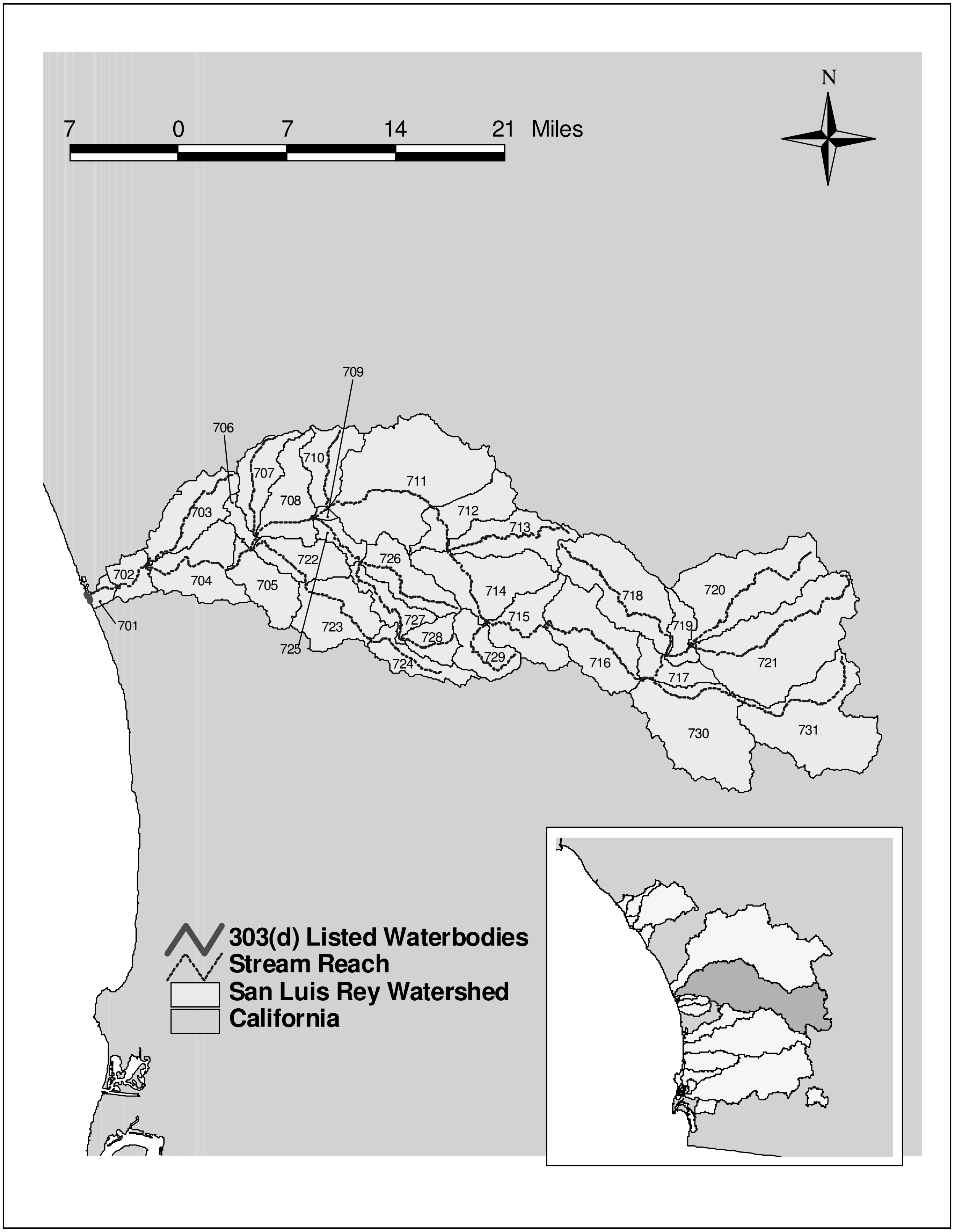

Figure E-6. San Luis Rey HU Watershed

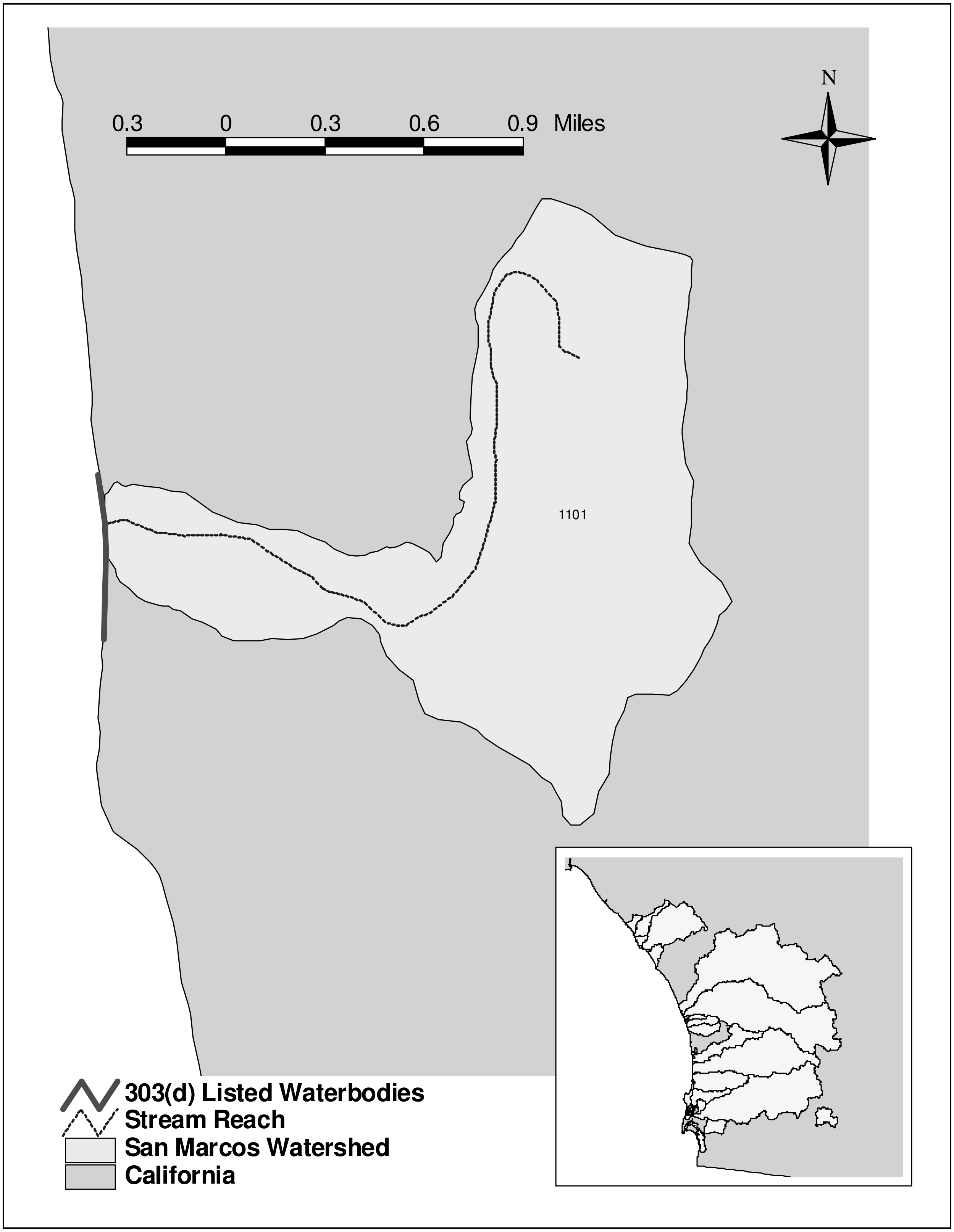

Figure E-7. San Marcos HA Watershed

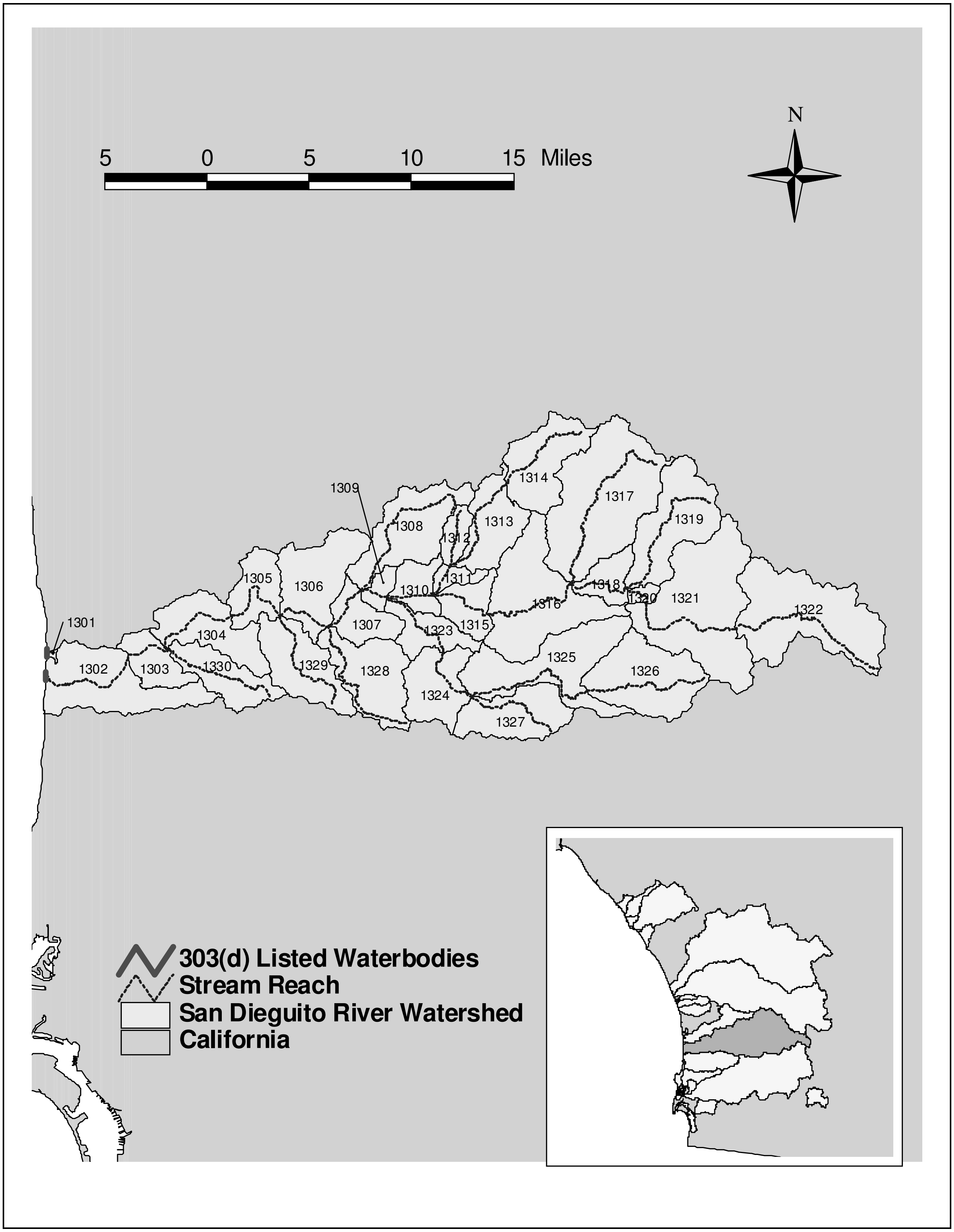

Figure E-8. San Dieguito HU Watershed

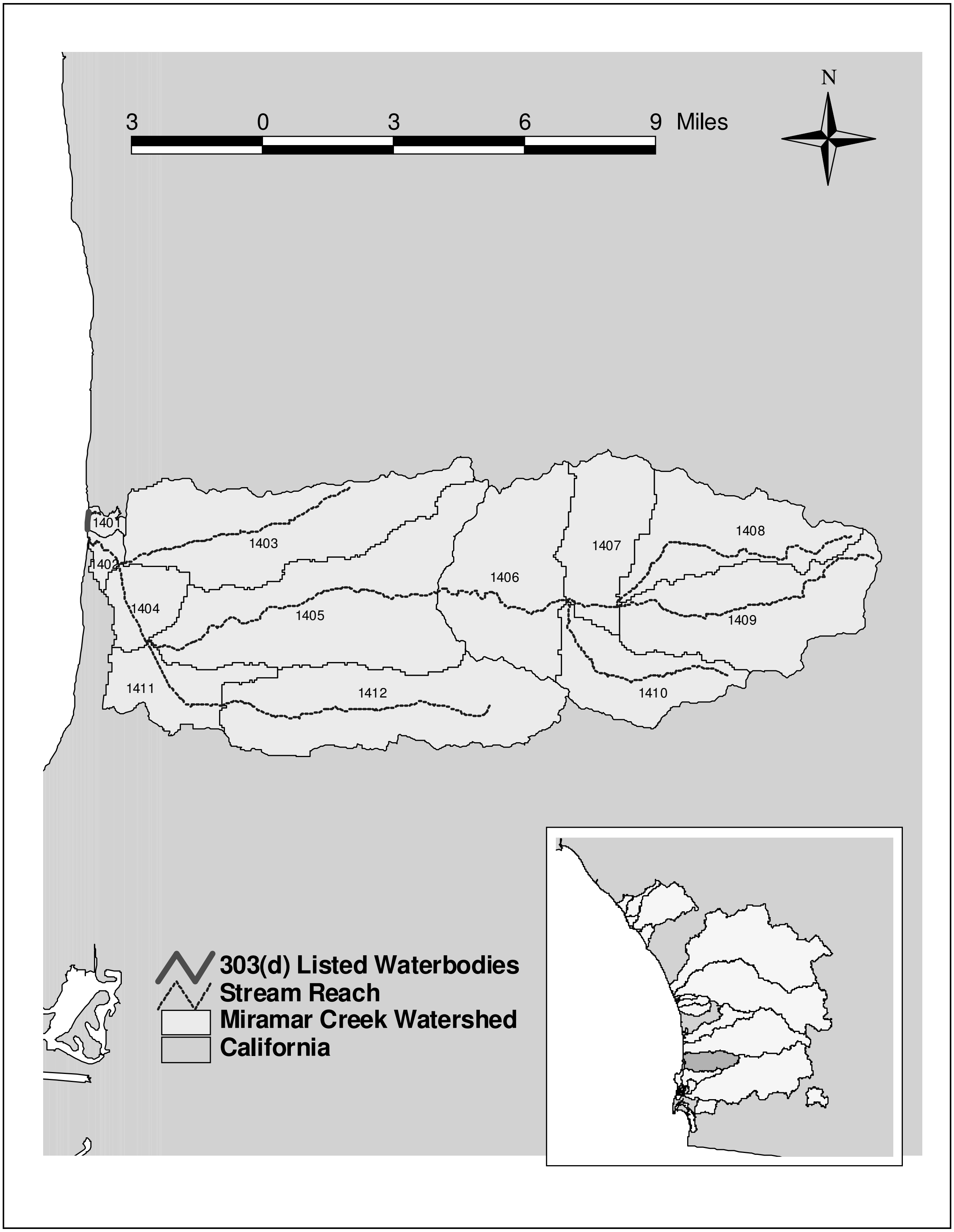

Figure E-9. Miramar Reservoir HA Watershed

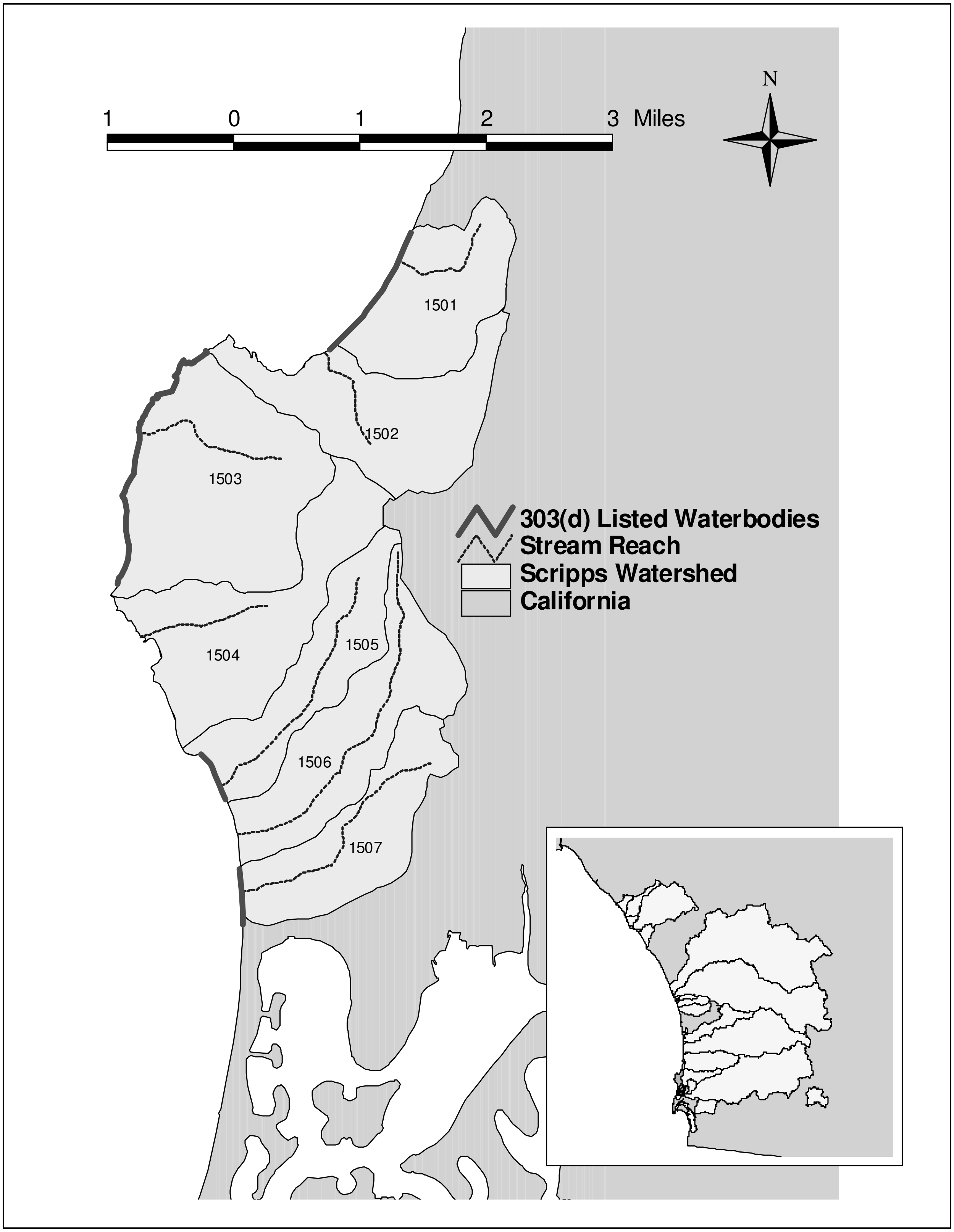

Figure E-10. Scripps HA Watershed

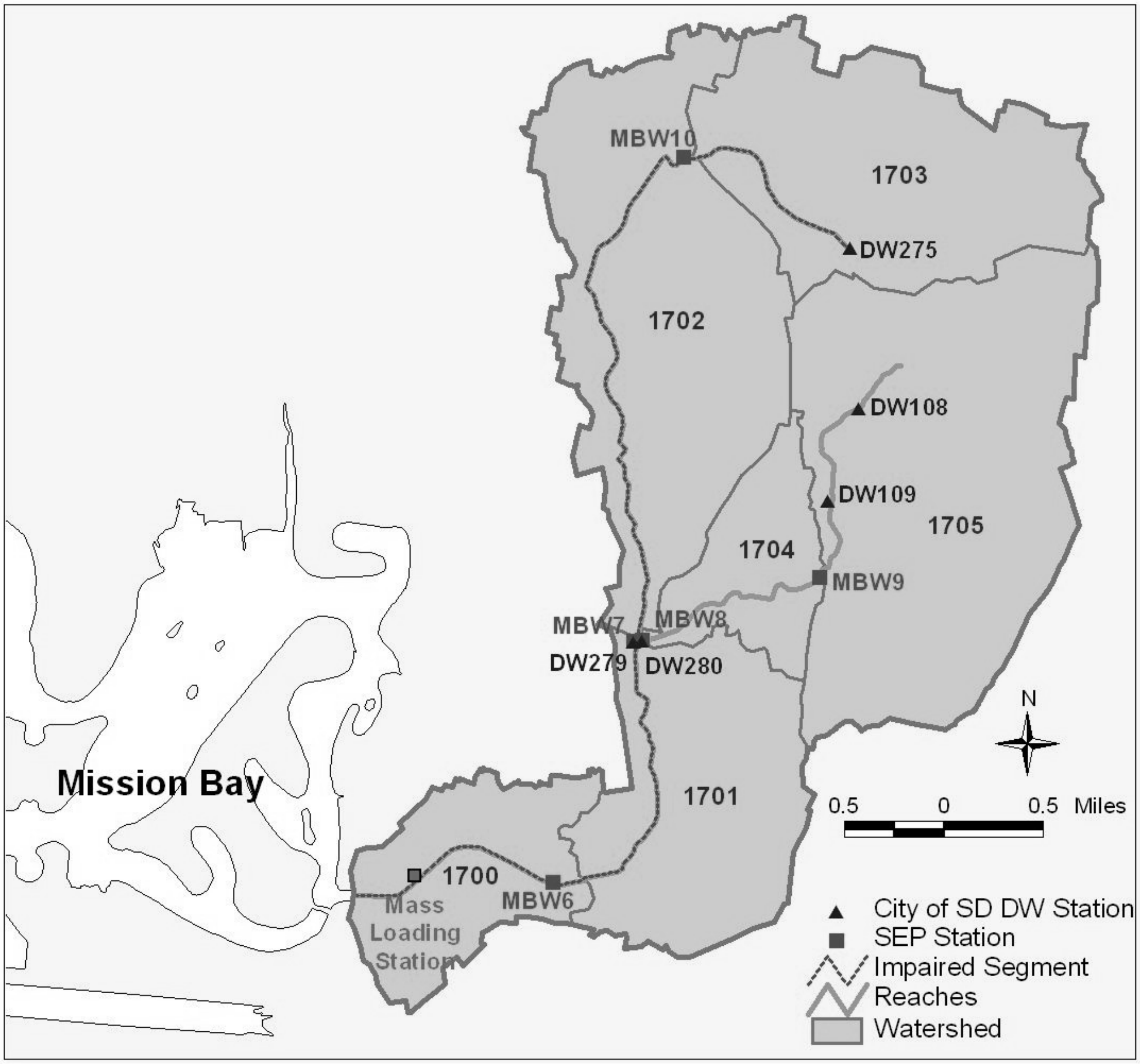

Figure E-11. Tecolote HA Watershed

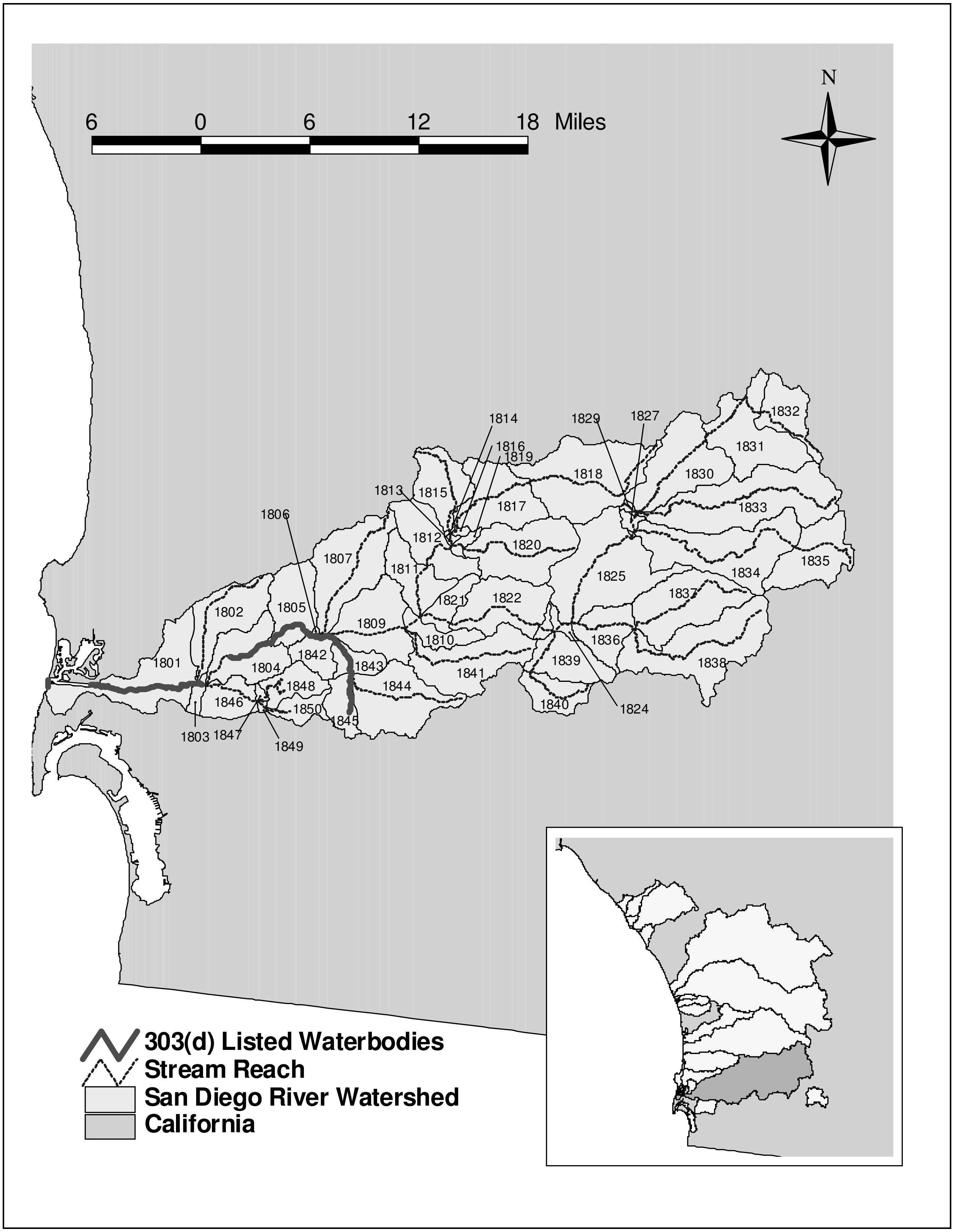

Figure E-12~~1~~. Mission San Diego HSA / Santee HSA~~River~~ Watershed

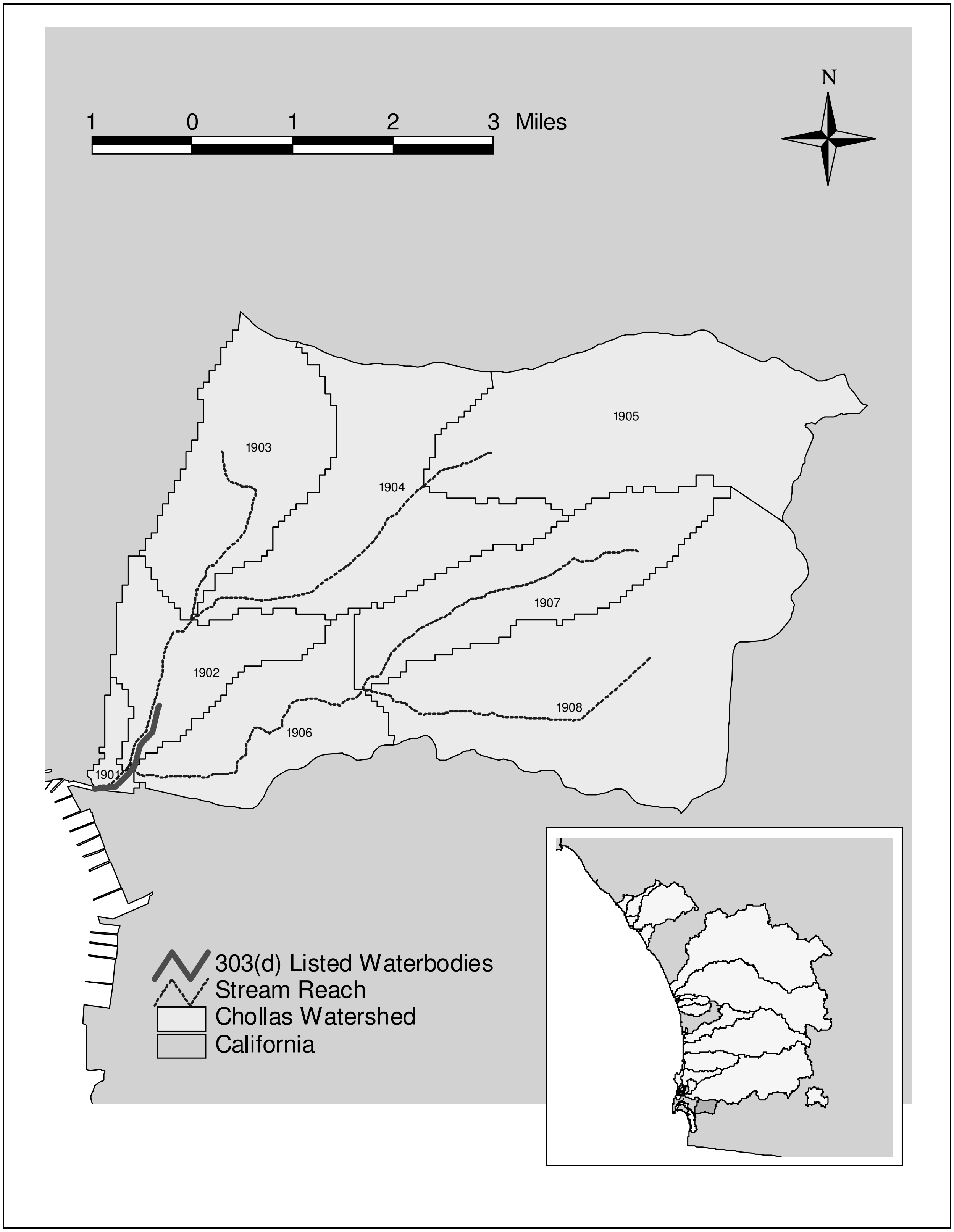

Figure E-13~~2~~. Chollas HSA Watershed

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APPENDIX F

WATER QUALITY OBJECTIVES FOR INDICATOR BACTERIA

Under section 304(a) of the Clean Water Act, the USEPA is required to publish water quality criteria accurately reflecting the latest scientific knowledge for the protection of human health and aquatic life. Prior to 1986, the USEPA recommended bacteria criteria based on fecal coliforms to protect human health.[1] In 1986, the USEPA recommended the use of criteria based on *Escherichia coli* (*E. coli*) for fresh waters and enterococci for fresh and marine waters rather than the use of criteria based on fecal coliform.[2] The USEPA recommended this change in the use of bacteria indicator organisms because the USEPA studies demonstrated that *E. coli* and enteroccococi are better predictors of the presence of gastrointestinal illness-causing pathogens than fecal and total coliforms and hence provide a better means of protecting human health. Subsequent supporting research led the USEPA to reaffirm these findings in 2002.[3] The USEPA strongly recommends the replacement of water quality objectives based on fecal or total coliforms with objectives based on enterococci and *E. coli*.

In January 2005 the State Water Resources Control Board (SWRCB) adopted an amendment to the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) that maintained the total and fecal coliform water quality objectives. Additionally, the SWRCB added provisions that required additional monitoring if the single sample maximum water quality objectives are exceeded. Water quality objectives for enterococci were also added to the Ocean Plan at this time.

As described below, the Basin Plan for the San Diego Region contains objectives based on fecal and total coliform as well as enterococci and *E. coli* for inland surface waters, enclosed bays and estuaries and coastal lagoons.

I. REC-1 Water Quality Objectives in the San Diego Region

The REC-1 water quality objectives for bacterial indicators applicable in the San Diego Region are contained in the Ocean Plan and in the San Diego Water Board's Basin Plan. The objectives contained in both are derived from water quality criteria promulgated by the USEPA in 1976 and 1986. The Ocean Plan currently contains REC-1 objectives for total and fecal coliforms and enterococci. The Basin Plan currently contains REC-1 objectives for total coliform, fecal coliform, enterococci and *E. coli* as shown below.

[1] Quality Criteria for Water. USEPA 1976
[2] Ambient Water Quality Criteria for Bacteria. USEPA 1986
[3] Implementation Guidance for Ambient Water Quality Criteria for Bacteria. May 2002 DRAFT.

REC-1
Ocean Waters (from Ocean Plan)

Within a zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline, and in areas outside this zone used for water contact sports, as determined by the Regional Board (i.e., waters designated as REC-1), but including all kelp beds, the following bacterial objectives shall be maintained throughout the water column:

30-day Geometic Mean – The following standards are based on the geometric mean of the five most recent samples from each site:

i. **Total coliform** density shall not exceed **1,000** per 100 ml;
ii. **Fecal coliform** density shall not exceed **200** per 100 ml; and
iii. **Enterococci** density shall not exceed **35** per 100 ml.

Single Sample Maximum:

i. **Total coliform** density shall not exceed **10,000** per 100 ml;
ii. **Fecal coliform** density shall not exceed **400** per 100 ml;
iii. **Enterococci** density shall not exceed **104** per 100 ml; and
iv. **Total coliform** density shall not exceed **1,000** per 100 ml when the fecal coliform/total coliform ratio exceeds 0.1.

REC-1
Inland Surface Waters, Enclosed Bays and Estuaries and Coastal Lagoons (from Basin Plan)

Fecal Coliform Water Quality Objective for Contact Recreation:

The fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 organisms per 100 ml.

In addition, the fecal coliform concentration shall not exceed 400 organisms per 100 ml for more than 10 percent of the total samples during any 30-day period.

Enterococci and E. Coli Water Quality Objectives for Contact Recreation:

The USEPA published E. coli and enterococci bacteriological criteria applicable to waters designated for contact recreation (REC-1) in the Federal Register, Vol. 51, No. 45, Friday, March 7, 1986, 8012-8016.

USEPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION
(in colonies per 100 ml)

	Freshwater		Saltwater
	Enterococci	**E. coli**	**Enterococci**
Steady State			
(all areas)	33	126	35
Maximum			
(designated beach)	61	235	104
(moderately or lightly used area)	108	406	276
(infrequently used area)	151	576	500

Total Coliform Water Quality Objective for Contact Recreation for Bays and Estuaries:

In bays and estuaries, the most probable number of total coliform organisms in the upper 60 feet of the water column shall be less than 1,000 organisms per 100 ml (10 organisms per ml); provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 organisms per 100 ml (10 per ml); and provided further that no single sample as described below is exceeded.

The most probable number of total coliform organisms in the upper 60 feet of the water column in no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 organisms per 100 ml (100 organisms per ml).

Fecal Coliform / Fresh or Marine Waters: Fecal coliform concentration, based on a minimum of not less than five samples for any **30-day period**, shall not exceed a **log mean of 200** per 100 ml, nor shall more than **10 percent** of total samples during any **30-day period** exceed **400** per 100 ml.

Total Coliform / Bays and Estuaries only: Coliform organisms shall be less than **1,000** per 100 ml (10 per ml); provided that not more than **20 percent** of the samples at any station, in any **30-day period**, may exceed **1,000 MPN** per 100 ml (10 per ml) and provided further that no **single sample** when verified by a repeat sample taken within 48 hours shall exceed **10,000 MPN** per 100 (100 per ml).

Enterococci / Fresh Waters: In fresh water, the **geometric mean** of enterococci shall not exceed **33** colonies per 100 ml. The single sample maximum allowable density in designated beach areas is **61** colonies per 100 ml, in moderately or lightly used areas is 108 colonies per 100 ml, in infrequently used areas is 151 colonies per 100 ml.

Enterococci / Marine Waters: In marine waters, the **geometric mean** of enterococci shall not exceed **35** colonies per 100 ml. The single sample maximum allowable density in designated beach areas is **104** colonies per 100 ml, in moderately or lightly used areas is 276 colonies per 100 ml, in infrequently used areas is 500 colonies per 100 ml.

***E. coli* / Fresh Waters:** In fresh water, the **geometric mean** of *E. coli* shall not exceed **126** colonies per 100 ml. The single sample maximum allowable density in designated beach areas is **235** colonies per 100 ml, in moderately or lightly used areas is 406 colonies per 100 ml, in infrequently used areas is 567 colonies per 100 ml.

II. REC- 2 Water Quality Objectives in the San Diego Region

The REC-2 water quality objectives for bacterial indicators applicable in the San Diego Region are contained in the Basin Plan and are derived from water quality criteria promulgated by the USEPA in 1976.

REC-2
Inland Surface Waters, Enclosed Bays and Estuaries and Coastal Lagoons (from Basin Plan)

Fecal Coliform Water Quality Objective for Non-contact Recreation:

Fecal Coliform / Fresh or Marine Waters: In waters designated for non-contact recreation (REC-2) and not designed for contact recreation (REC-1), the average fecal coliform concentrations for any **30-day period**, shall not exceed **2,000** organisms per 100 ml, nor shall more than **10 percent** of total samples collected during any **30-day period** exceed **4,000** organisms per 100 ml.

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Appendix G

Data Sources

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Table G-1. Monitoring Data Sources

Index	Data Source	Location	Station ID	Years Compiled	Purpose
Stream Flow					
1	Orange County Pubic Facilities and Resources Department[1]	Aliso Creek	J01P08, J01P06, J07P02, J07P01, J01P0, J01P05, J01P03, J1P04, J06, J05, J01P30, J01P28, J01P27, J01P33, J01P25, J0126, J01P24, J01P23, J01P22, J03P02, J01P21, J02P05, J02P08, J03P13, J03P05, J03P01, J04	4/2001-12/2002	Instantaneous flow measurements used for development of multi-variable regression equations for prediction of dry-weather streamflows
			J01P22, J01P23, J01P27, J01P28, J06, J01P05, J01P01, J01BN8, J04, J03P13, J03P01	4/2001-12/2002	Instantaneous flow measurements used for calibration of dry-weather modeled streamflows
2	City of San Diego[1]	Rose Creek and Tecolote Creek (Mission Bay Drainage)	MBW07	11/2001-4/2003	Instantaneous flow measurements used for development of multi-variable regression equations for prediction of dry-weather streamflows
			MBW09, MBW13, MBW16	7/2001-4/2003	
			MBW11	12/2001-4/2003	
			MBW13, MBW15, MBW17	7/2001-4/2003	Instantaneous flow measurements used for calibration of dry-weather modeled streamflows
			MBW20	11/2001-4/2003	
			MBW11	12/2001-4/2003	
			MBW24	12/2001-3/2003	
			MBW06, MBW10, MBW09	7/2001-4/2003	Instantaneous flow measurements used for validation of dry-weather modeled streamflows
			MBW07, MBW08	11/2001-4/2003	
3	United States Geological Survey (USGS)[2]	San Juan Creek	11047300	10/1970-1/2002	Average daily flows on dry days used for calibration of dry-weather modeled streamflows
		San Diego River	11022480	1/1991-12/2001	Average daily flows on wet days used for calibration and validation of wet-weather modeled streamflows
		San Diego River	11023000	1/1991-12/2001	
		Miramar	11023340	1/1991-12/2001	
		San Dieguito	11025500	1/1991-12/2001	
		San Dieguito	11028500	1/1991-12/2001	
		San Luis Rev	11042000	9/1993-5/2002	
		Santa Margarita	11042400	1/1991-12/2001	
		Santa Margarita	11044300	1/1991-12/2001	
		Santa Margarita	11046000	1/1991-12/1998	
		San Juan Creek	11046530	1/1991-12/2001	
		San Juan Creek	11047300	10/1995-4/2002	

Index	Data Source	Location	Station ID	Years Compiled	Purpose
		San Diego River	11022350	1/1991-9/1993	
		San Luis Rey	11039800	1/1991-12/1992	
Water Quality					
4	Orange County Pubic Facilities and Resources Department[1]	Aliso Creek	J01P08, J01P06, J07P02, J07P01, J01P01, J01P05, J01P03, J1P04, J06, J05, J01P30, J01P28, J01P27, J01P33, J01P25, J0126, J01P24, J01P23, J01P22, J03P02, J01P21, J02P05, J02P08, J03P13, J03P05, J03P01, J04	4/2001-12/2002	Development of multi-variable regression equations for prediction of dry-weather bacteria levels
			J01P22, J01P23, J01P27, J01P28, J06, J01P05, J01P01, J01BN8, J04, J03P13, J03P01	4/2001-12/2002	Calibration of dry-weather model for bacteria levels
5	City of San Diego[1]	Rose Creek and Tecolote Creek (Mission Bay Drainage)	MBW07, MBW08	11/2001-4/2003	Development of multi-variable regression equations for prediction of dry-weather bacteria levels
			MBW06, MBW09, MBW10, MBW13, MBW15, MBW16	7/2001-4/2003	
			MBW24	12/2001-3/2003	
			MBW13, MBW15, MBW17	7/2001-4/2003	Calibration of dry-weather model for bacteria levels
			MBW20	11/2001-4/2003	
			MBW11	12/2001-4/2003	
			MBW24	12/2001-3/2003	
			MBW06, MBW10, MBW09	7/2001-4/2003	Validation of dry-weather model for bacteria levels
			MBW07, MBW08	11/2001-4/2003	
6	Orange County Public Health Laboratory (SDRWQCB, 2002)	San Juan Creek	SJ13	4/2001-7/2001	Development of multi-variable regression equations for prediction of dry-weather bacteria levels
			SJ14, SJ15, SJ16, SJ19, SJ20, SJ21, SJ29, SJ32	5/2001-7/2001	
			SJ01, SJ04, SJ05, SJ24	4/2001-7/2001	Validation of dry-weather model for bacteria levels
			SJ15, SJ17, SJ18, SJ29	5/2001-7/2001	
7	Southwest Division Naval Facilities Engineering Command	Santa Margarita	501, 504, 508, 502, 503, 505, 506, 507	12/1997-2/1999	Validation of wet weather water quality predictions

Index	Data Source	Location	Station ID	Years Compiled	Purpose
8	Rancho California Water District	Santa Margarita River	Station #1 (Upstream from Santa Rosa Plant), Station #2 (Willow Glen), Station #3 (Deluz Crossing), Station #4 (Estuary)	12/1997-2/2001	
9	Camp Pendleton	Santa Margarita River	Plant #3 Upstream; Plant #13 Upstream	1/1995-3/2002	
10	The Orange County Public Facilities and Resources Department (OCPFRD)	Aliso creek	D/S J01/J02, J01 @ TP, U/S J01/J02, J02TBN1, D/S J01P21, U/S J01P21, J01P22, D/S J01/J03, U/S J01/J03, D/S J01P23, D/S J01P24, D/S J01P25, D/S J01P26, D/S J01P27, D/S J01P33, D/S J01TBN4, J01P28, U/S J01P23, U/S J01P24, U/S J01P25, U/S J01P26, U/S J01P27, U/S J01P33, U/S J01TBN4, D/S J01P30, U/S J01P30, D/S J06, U/S J06, D/S J01P04, D/S J01P05, D/S J01P32, D/S J01TBN2, D/S J01TBN3, J01P01, J07P01J07P02, U/S J01P04, U/S J01P05, U/S J01P32, U/S J01TBN2, U/S J01TBN3, D/S J01P08, D/S J01TBN8, J01P06, J02P08, U/S J01P08, U/S J01TBN8, D/S J05, U/S J05, J01P03, J04, U/S J04, J02P05, J03P02, J03P05, J03P13, J03P01, J03TBN1, J03TBN2	4/2001-11/2003	
11	Orange County Public Health Laboratory (SDRWQCB, 2002)	San Juan Creek	SJ02, SJ09, SJ10, SJ12, SJ13, SJ25, SJ30	5/2001-12/2001	

Index	Data Source	Location	Station ID	Years Compiled	Purpose
12	City of San Diego (2000)	Rose Creek and Tecolote Creek (Mission Bay Drainage)	MBW06, MBW07, MBW08, MBW09, MBW10, MBW11, MBW12, MBW13, MBW14, MBW15, MBW16, MBW17, MBW18, MBW19, MBW20, MBW21, MBW23, MBW24	11/2001-2/2002	
13	Padre Dam Municipal Water District	San Diego River	1, 2, 3, 4, 5, 6	3/1998-4/2002	
14	City of San Diego-Water Department, Cleveland National Forest Descanso Ranger District	Pine Valley Creek	NPC3A, NPC3C, NPC3D, PVC1A	2/1998-4/1998	
15	Orange County Environmental Health	Mouth of San Juan Creek	ODB02, ODB05	6/1999-10/2002	Analyzed to confirm the water quality impairment at beaches, provide an insight regarding the spatial extent of impairments, and assess the relationship with wet and dry conditions
		Mouth of Aliso Creek	OLB00		
		Dana Point	OSL25, BDP12, BDP13, BDP14, BDP15		
16	County of San Diego, Department of Health (DEH)	Mouth of Agua Hedionda Lagoon	EH-460	5/1999-10/2001	
		Scripps	EH-260	4/1999-9/2000	
		Scripps	EH-290	4/1999-11/2000	
		Mouth of San Luis Rey River	EH-490	4/1999-10/2001	
		Mouth of Agua Hedionda Lagoon	EH-440	4/1999-10/2001	
		Mouth of Agua Hedionda Lagoon	EN-030	1/1999-11/2001	
		Scripps	EH-250, EH-280	4/1999-10/2002	
		Scripps	EH-300	1/1999-10/2002	
		Scripps	EH-310	4/1999-9/2002	
		Buena Vista	EH-475	10/1999-10/2002	
		San Marcos	EH-420	4/1999-10/2002	
		San Dieguito	EH-380, EH-390	4/1999-10/2002	
		San Clemente	EH-510	8/1999-10-2002	
		San Clemente	EH-520	6/1999-10/2002	
		Scripps	EH-305	2/2001-10/2002	
		Agua Hedionda	EH-455	1/2001-10/2001	

Index	Data Source	Location	Station ID	Years Compiled	Purpose
17	South Orange County Wastewater Authority (SOCWA)	San Clemente and mouth of San Juan Creek Lagoon	S-0, S-1, S-3, S-5, S-7, S-11, S-13, S-15, S-17, S-19, S-23	3/2000-10/2002	
		Mouth of San Juan Creek Lagoon	S-2	1/1999-10/2002	
		Dana Point and mouth Aliso Creek	S01, S02, S04, S06, S07, S08, S09, S10	1/1999-10/2002	
		Laguna/mouth of San Joaquin	S11, S13, S15, S14, S16	1/1999-10/2002	
18	City of San Diego[1]	Miramar, Scripps and mouth of San Diego River	FM-010, FM-030, FM-080	1/1999-10/2002	
			FM-050	1/1999-9/2002	
19	City of Oceanside	Mouth of San Luis Rey River	OC-100	1/1999-10/2002	
		Mouth of Loma Alta Slough	OC-022		
20	City of Escondido	Mouth of Escondido Creek and San Dieguito Creek	SE-020, SE-010	1/1999-10/2002	
Meteorological Data					
21	National Oceanographic and Atmospheric Administration-National Climatic Data Center (NOAA-NCDC)	San Diego	COOP ID #047740	1990-2002	Hourly rainfall data used for hydrologic and water quality modeling for wet-weather conditions
		Laguna/San Joaquin, Aliso, Dana Point, San Juan, San Clemente	CA4650		
		Aliso Creek, San Juan Creek	CA8992		
		San Juan Creek	CA7837		
		Santa Margarita River	CA8844		
		Santa Margarita, San Luis Rey	CA6319		
		Santa Margarita, San Luis Rey, San Luis Rey, Loma Alta, Buena Vista, Agua Hedionda, San Marcos	CA6379		
		Pine Valley Creek	CA2239		
		Miramar, Scripps, Rose Creek, Tecolate, San Diego River, Chollas	CA7740		
22	California Irrigation Management Information System (CIMIS)	Escondido Creek, San Dieguito Creek, Miramar	CIMIS74	1990-2002	Hourly rainfall, Evaporation data used for hydrologic and water quality modeling for wet-weather conditions

23	Automatic Local Evaluation in Real-Time (ALERT) Flood Warning System	San Clemente	21	1990-2002	Hourly rainfall data used for hydrologic and water quality modeling for wet-weather conditions
		San Marcos, Escondido Creek, San Deigouito Creek, Miramar	22		
		San Dieguito Creek, Miramar, Rose Creek, San Diego River	24		
		Chollas	31		
		Santa Margarita, San Luis Rey, San Dieguito	52		
		San Luis Rey, San Dieguito, Miramar, San Diego	53		

[1] Not complete at the time of TMDL report development, Final report not available for study
[2] www.usgs.gov

Table G-2. GIS Data Sources

Index	Data Type	Data Source	Years Compiled	Purpose
24	Stream network	USGS -National Hydrography Dataset (NHD)	-	Determination of representative modeled stream for each sub-watershed
25	Land Use	USGS - Multi-Resolution Land Characteristics (MRLC)	1993	Designation of Land uses in the region
		San Diego's Regional Planning Agency (SANDAG)	2001	
		Southern California Association of Governments (SCAG)	2000	
26	Soils	USDA-NRCS (STATSGO)	1994	STATSGO soil data used for modeling
27	Topographic and digital elevation models (DEMs)	USEPA BASINS, USGS[2]	-	To derive streams and watershed boundaries

[2] www.usgs.gov

Appendix H

Shoreline Bacteria Data Water Quality Objectives Exceedance Analysis

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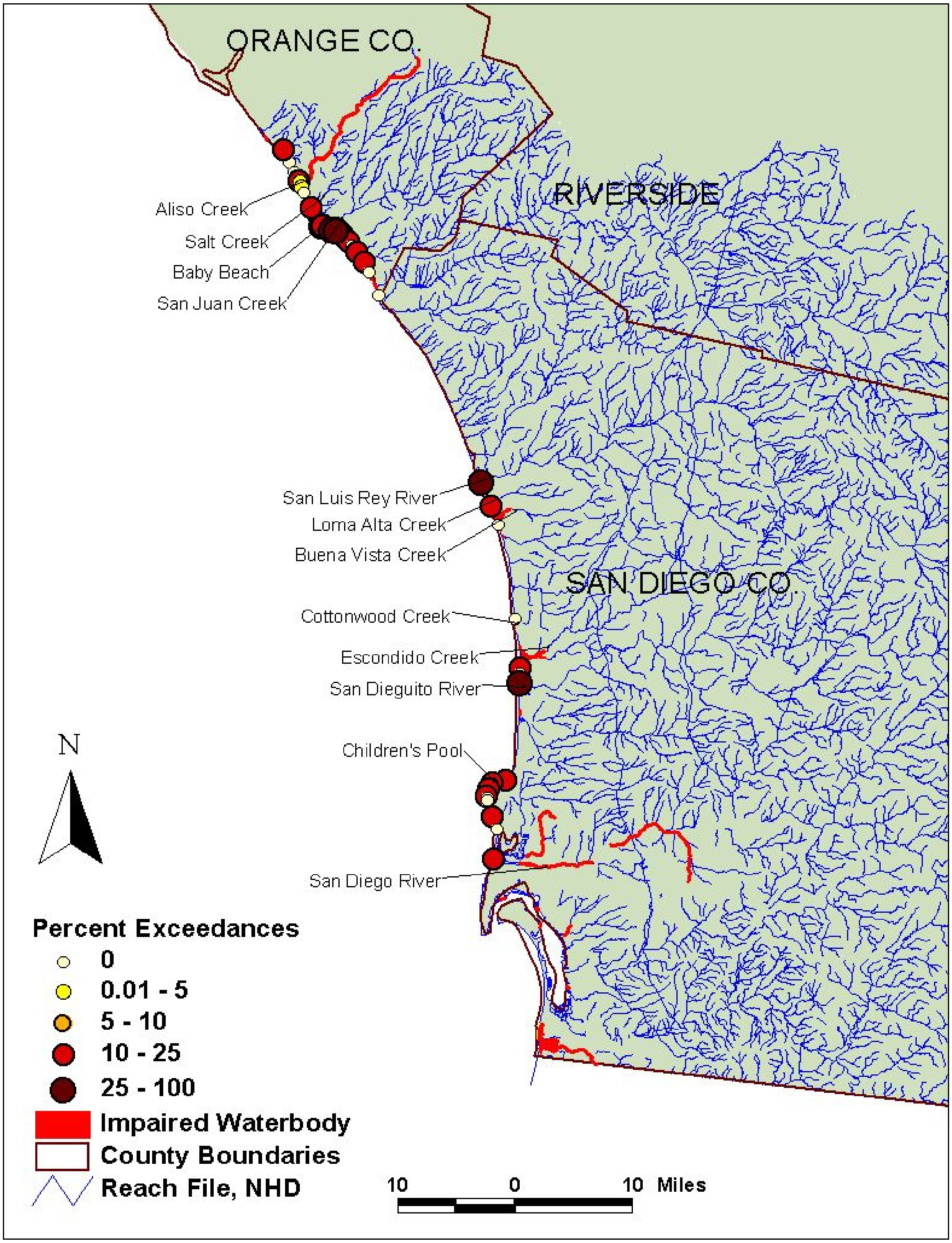


Figure H-1. Exceedances of Fecal Coliform Single Sample Objective (REC-1) During Wet Weather Conditions

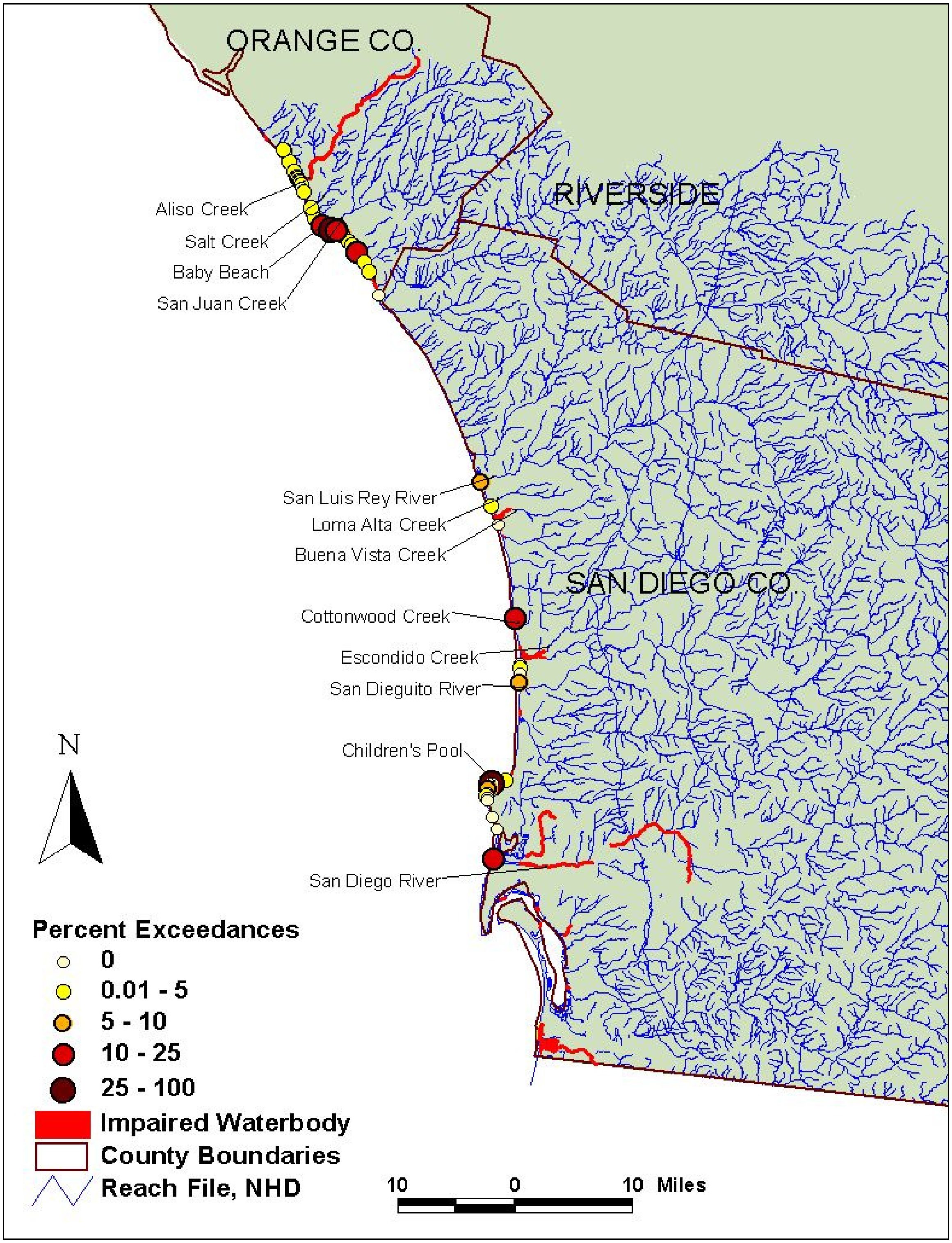


Figure H-2. Exceedances of Fecal Coliform Single Sample Objective (REC-1) During Dry Weather Conditions

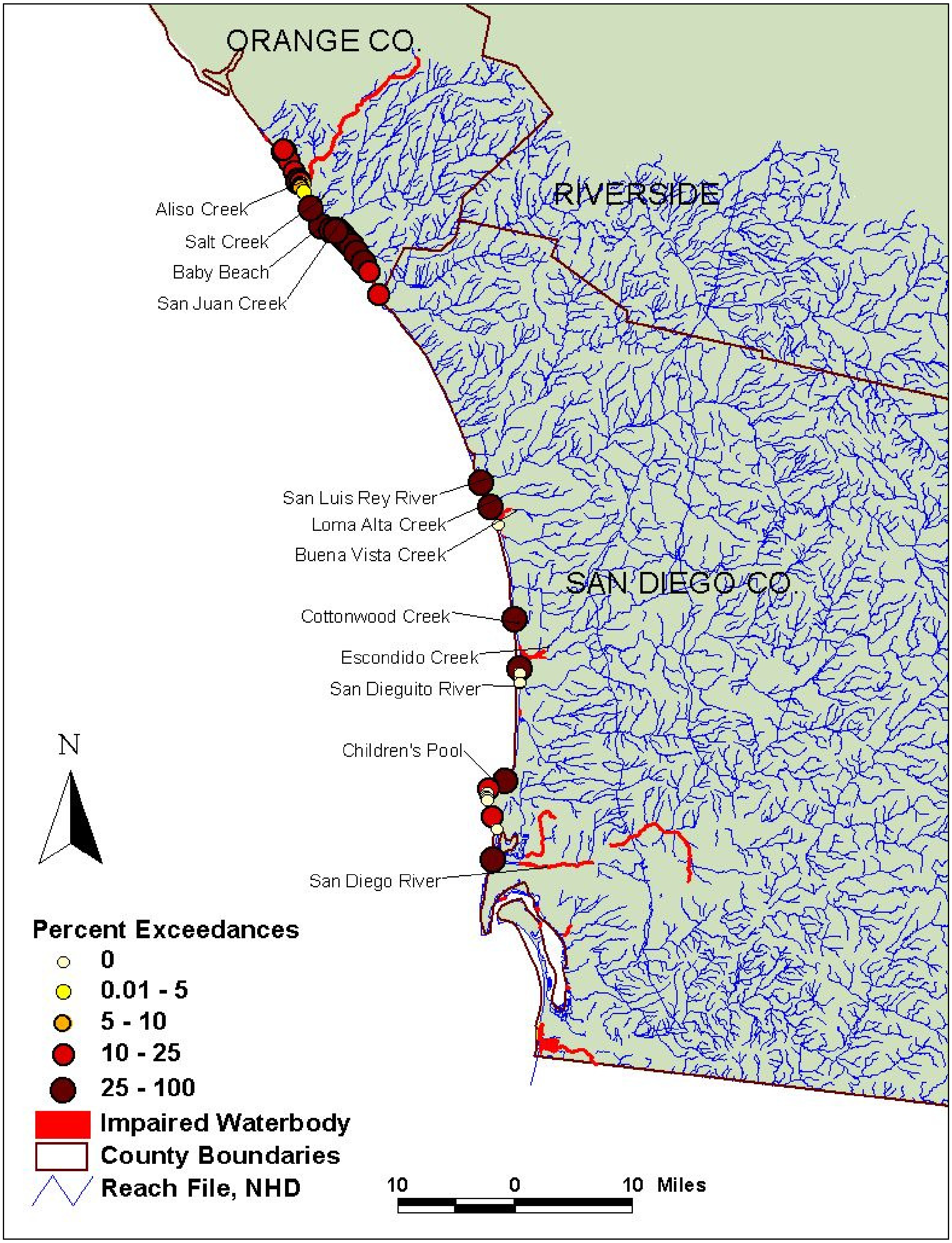


Figure H-3. Exceedances of Enterococcus Single Sample Objective (REC-1) During Wet Weather Conditions

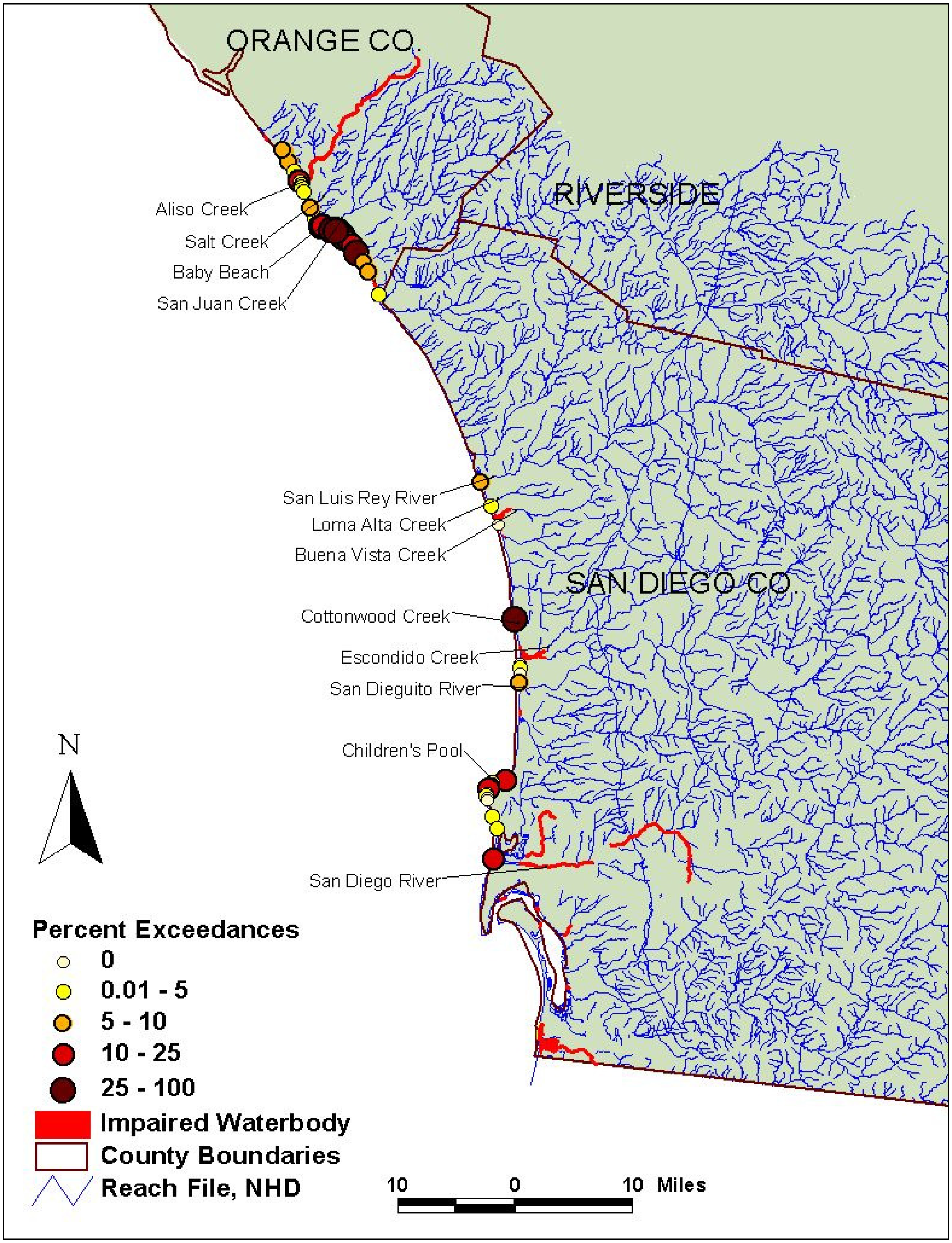


Figure H-4. Exceedances of Enterococcus Single Sample Objective (REC-1) During Dry Weather Conditions

APPENDIX I

METHODOLOGY FOR CALCULATING MASS-LOAD BASED TMDLs FOR IMPAIRED BEACHES AND CREEKS AND ALLOCATING ~~TMDLs~~ TO SOURCES

I.1 Introduction

This appendix describes the methodology for calculating the mass-load based Total Maximum Daily Loads (TMDLs) for impaired beaches and creeks and allocating the allowable bacteria loads to sources in each watershed. Calibrated and validated models were used to calculate “~~E~~existing” bacteria mass loads and “allowable” bacteria mass loads (i.e., TMDLs) ~~were first calculated~~ in each watershed ~~with the use of computer models~~ under a set of critical conditions. Because the climate in southern California has two distinct hydrological patterns (wet and dry), two modeling approaches were developed for estimating bacteria loads. ~~Additionally, TMDLs were calculated using interim and final phase numeric targets for both wet and dry weather.~~

In the San Diego Region, storms 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 modeling approach used for ~~TMDL~~ calculation of existing loads and TMDLs was USEPA’s Loading Simulation Program in C++ (LSPC). LSPC was used to estimate bacteria loading from streams and assimilation within the waterbodies, and specifically quantified loading during wet weather events, defined as 0.2 inches of rain and the 72 hours that follow.– LSPC is a recoded C++ version of the USEPA’s Hydrological Simulation Program–FORTRAN (HSPF) that relies on fundamental (and USEPA-approved) algorithms. A complete discussion of LSPC configuration, calibration, and application is provided in Appendix J.

In contrast, bacteria loading under dry weather conditions was found to be much smaller in magnitude, did not occur from all land use types, and exhibited less variability over time. 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 represented 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. In addition to estimating current loading, both models were used to estimate TMDLs for the two climate conditions for each watershed. Assumptions made for both wet weather and dry weather modeling can be found in Appendix L.

This appendix describes the methodology for calculating existing loads and TMDLs using the wet and dry weather modeling results~~, and using interim and final numeric targets~~. Section I.2 of this appendix describes the ~~interim and final~~ numeric targets that were used to calculate ~~both~~ wet weather and dry weather TMDLs. Section I.3 discusses the use of load-duration curves, which were instrumental in calculating wet weather TMDLs from model output. Section I.4 discusses the derivation of ~~interim~~ wet weather TMDLs and allocations. ~~Section I.5 discusses the~~

derivation of final wet weather TMDLs and allocations. Section I.56 discusses the derivation of interim and final dry weather TMDLs and allocations.

In all cases, bacteria sources were quantified by land-use type since bacteria loading can be highly correlated with land-use practices. For purposes of implementation, land use practices were grouped according to the most likely method of regulation by the San Diego Water Board of bacteria discharges from the land use type.

I.2 Numeric Target Selection for Wet Weather and Dry Weather TMDLs

When calculating TMDLs, numeric targets must be established selected to be able to meet water quality standards (i.e., water quality objectives (WQOs) and subsequentlythat ensure the protection of beneficial uses). The numeric targets used inselected for these TMDL calculations were equal to are based primarily on the numeric WQOs for bacteria for the REC-1 (water-contact recreation (REC-1) beneficial uses. Numeric targets applicable to beaches were also used for impaired creeks for the reasons discussed in section 4 of the Technical Report.

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 asincluded in the 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 asincluded in the 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 the allowable exceedance frequency of the WQO. that the wet weather TMDLs (during the interim period, only) are calculated The allowable exceedance frequency that is based on 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 included in the numeric target for the wet weather TMDL calculations by allowing a 22 percent exceedance frequency of the single sample WQOs for REC-1. Twenty-two percent is the frequency of exceedance of the single sample maximum WQOs measured in a reference system in Los Angeles County.[1] A reference system is a beach

[1] In the calculation of the wet weather TMDLs, the San Diego Regional Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. The 22 percent allowable exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Regional Board.

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 Water Quality Control Plan for the San Diego Basin (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[2] under a separate effort from this TMDL project.~~

In contrast to wet weather, ~~implementing~~ the dry weather numeric targets ~~with a reference system approach is not appropriate~~include an allowable exceedance frequency of zero percent. This is because available data show that exceedances of geometric mean WQOs in local reference systems during dry weather conditions are uncommon (see Technical Report, section 4.2). Furthermore, reference systems do not generate significant dry weather bacteria loads because flows are minimal. During dry weather, flow, and hence bacteria loads, are largely generated by ~~urban~~ non-storm water runoff, which is not a product of a reference system. Therefore, a zero percent allowable exceedance frequency is included in the numeric targets for the dry weather TMDL calculations.~~A reference system approach is not applicable to dry weather TMDL calculation 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.~~

I.3 Using Load Duration Curves to Calculate Wet Weather Mass-Load Based TMDLs

For the wet weather analysis, "existing" loads and TMDLs were calculated using output from the LSPC watershed model. The existing loads calculated by the LSPC model are the bacteria loads that are expected to be discharged from the watershed under ~~the~~ a set of critical conditions ~~that are currently causing the bacteria impairments~~ (i.e., worst case loading scenario). The TMDLs calculated by the LSPC model are the bacteria loads that can be discharged from the watershed and will not cause the numeric targets (numeric WQOs and allowable exceedance frequency) to be exceeded ~~on more than the allowable exceedance frequency of the wet days~~under the same set of critical conditions ~~and still meet the WQOs that are protective of the REC-1 beneficial use~~. The difference between the existing load and the TMDL is the bacteria load reduction that is required to restore the REC-1 beneficial use of an impaired waterbody and still account for natural, and largely uncontrollable sources of bacteria (e.g., bird and wildlife feces) in the wet weather loads.

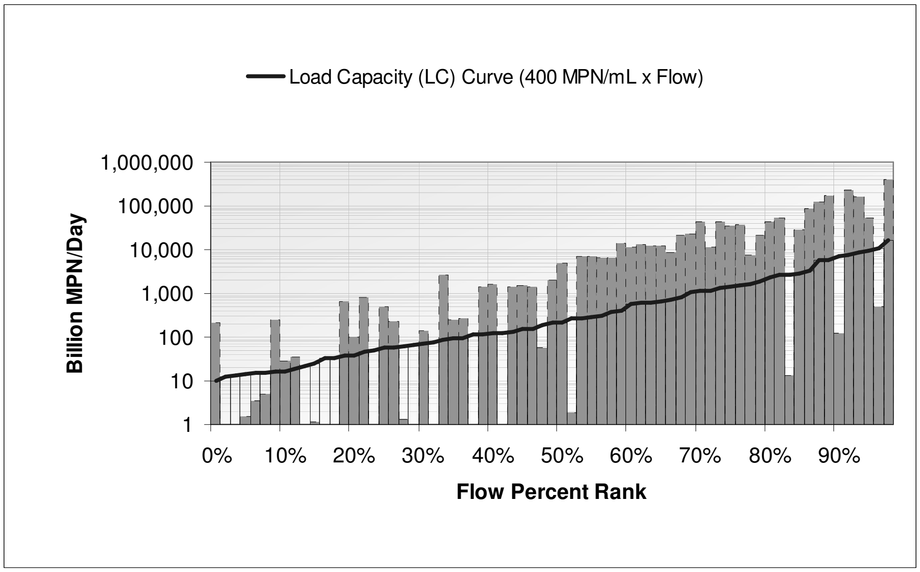
To ensure that ~~WQOs~~ the numeric targets are met in impaired waterbodies during wet weather events, a critical period associated with extreme wet conditions was selected for TMDL calculations. Extreme wet conditions have the highest wet weather flows and bacteria loads. The year 1993 was selected 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

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

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.

Model output was used to produce load-duration curves, such as the one shown in Figure I-1. Load-duration curves are bar graphs that display information for a specific watershed mouth (watersheds were delineated into smaller subwatersheds for loading analysis). In other words, each subwatershed has a unique load-duration curve. The y-axis shows the bacteria load (billion most-probable-number per day, or billion MPN/day) associated with the flow for a given day. Each daily wet weather load is represented by a bar. The bars are ranked across the x-axis according to the magnitude of the associated daily flow from lowest to highest. Appendixces O and P shows the load-duration curves for each modeled subwatershed, for each type of bacteria. Appendix O shows load-duration curves associated with interim numeric targets, which incorporate the reference system approach, while Appendix P shows load-duration curves associated with final numeric targets, which do not incorporate the reference system approach. Figure I-1 shows model-calculated fecal coliform loads for one of the Aliso Creek subwatersheds (identified as subwatershed number 202) in the Aliso HSA watershed (which consists of subwatersheds 201 and 202).

The Ddaily bacteria loads (each yellow blue bar) are is equal to the modeled average daily flow for the wet day times the average daily bacteria density for that day. The height of the blue bars indicates the most probable number of fecal coliform colonies corresponding to the flow on a given day. The dark line running across the bar graph (is referred to as the "load capacity curve" or "numeric target line." or "load capacity curve.") represents the applicable WQO. The y-value of the numeric target line at any point on the graph represents the total maximum bacteria load that would not result in an exceedance of the WQO for the flow on that day. The summation of the loads below the numeric target line represents the loading capacity of the waterbody on an annual basis that will not cause numeric targets to be exceeded.



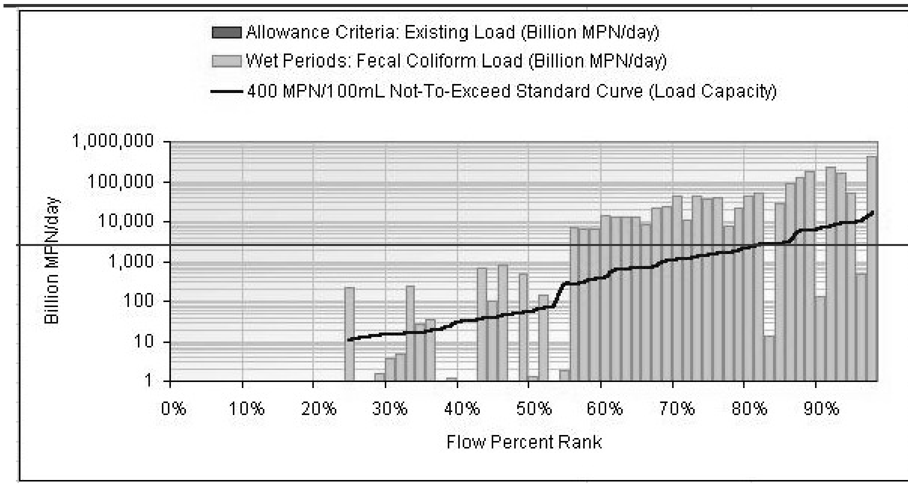


Figure I-1. Load Duration Curve for Aliso ~~Creek~~ HSA Subwatershed # 202

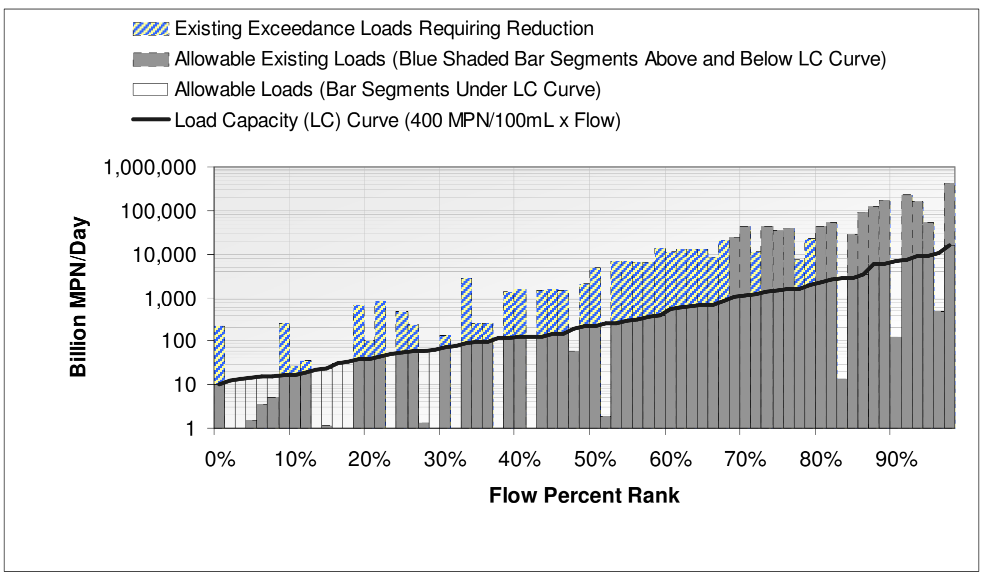
The y-value of the numeric target line at any point on the graph represents the total maximum bacteria load that would not result in an exceedance of the WQO for the flow on that day. The summation of the loads represented by the solid-line outlined bar segments below the numeric target line represents the loading capacity of the waterbody on an annual basis that will not cause numeric WQO to be exceeded. The dashed-line outlined bar segments above the numeric target line represent the bacteria load that is exceeding the load capacity based on the WQO on each wet day. For some wet days, the existing bacteria load (blue bar) is below the numeric target line, indicating the load on that day would not cause an exceedance in the WQO.

Load-duration curves are useful for quantifying the total load for existing conditions (during the critical period), and the allowable loads (TMDLs) that must not be exceeded in order to attain WQOs~~. The portions of the bars that exceed the numeric target line represent loads that are in excess of the TMDL, and must be reduced by dischargersto~~ and restore the REC-1 beneficial use of an impaired waterbody. Section I.4 shows how load-duration curves were used to calculate

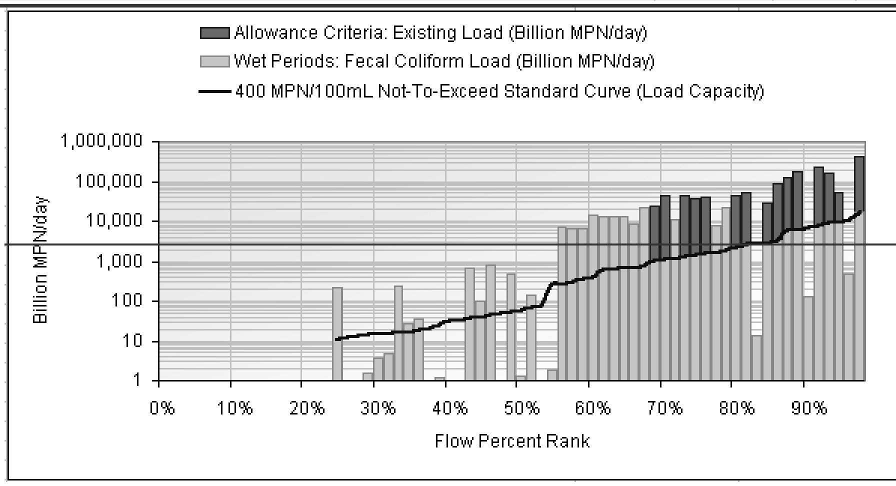
TMDLs using ~~interim~~ numeric targets (numeric WQOs and allowable exceedance frequencies)~~and section I.5 shows how load-duration curves were used to calculate TMDLs using final numeric targets~~~~the reference system approach~~. In ~~all~~ the wet weather analyses, existing loads and TMDLs are expressed on a yearly basis (billion MPN/year) because of the extremely high daily variability in storm flow magnitude and loading in the watersheds addressed by these TMDLs. The variability in the modeled daily loads is evident in the load duration curves in Appendix~~ces~~ O ~~and P~~.

I.4 Calculation of ~~Interim~~ Wet Weather Mass-Load Based TMDLs and Allocations

As mentioned previously, ~~interim~~ wet weather TMDLs for recreational uses incorporated the reference system approach. Since storm flow loading in reference watersheds causes exceedances of single sample maximum WQOs~~water quality objectives~~, TMDLs for urban watersheds should allow the single sample WQOs to be exceeded at the same frequency as in a similar reference system. Load duration curves were used to calculate allowable exceedance loads from allowable exceedance days for ~~interim~~ wet weather TMDLs. A load-duration curve showing the application of the reference system approach is shown in Figure I-2.



Subwatershed 202 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	49	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	34	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**1,732,709**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	83,999	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,478,595	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Lo	**1,562,594**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Lo	**170,116**	**Billion MPN/Year**



Fecal Coliform Loading Summary	Value	Units
Wet Day Exceedances	49	None
Allowable Wet Day Exceedances	15	None
Excess Wet Day Exceedances	34	None
Total Load for Existing Condition (Total Load)	1,732,709	Billion MPN/Year
Non-allowable Exceedance Load (Exceedance Load)	170,116	Billion MPN/Year
Allowable Load = (Total Load - Exceedance Load)	1,562,594	Billion MPN/Year
Percent Reduction Required from Existing Condition	**9.8%**	**Percentage**

Figure I-2. Load Duration Curve for Aliso ~~Creek~~ HSA Subwatershed #202 Using Reference ~~s~~System Approach

~~Allowable exceedance loads calculated using the reference system exceedance frequency of 22 percent are represented by the blue-shaded~~patterned ~~portions of the~~ blue ~~bars in the load-duration curve.~~ The methodology for calculating and allocating the wet weather TMDLs for each watershed using the reference system approach is described in the following steps:

Step 1. _Quantify Total Existing Wet Weather Loads~~Allowable Exceedance Loads~~;
Step 2. _Quantify Allowable Loads~~Existing Bacteria Loads and TMDLs~~;
Step 3. Quantify Allowable Exceedance Loads;
Step 4. Quantify Wet Weather TMDLs;
Step 5. Classify Land Use Types as Point and Nonpoint Sources, and Classify Nonpoint Sources as Controllable or Uncontrollable;
Step 6~~4~~._–Quantify Relative Contribution of Bacteria Loads From Each Land Use Type;
Step 7~~5~~._–Separate Caltrans Existing Loads from Loads Generated by Industrial/Transportation Land Use;

Step 86. –Combine Land Use Types Based on Method of Regulation by the San Diego Water Board; and
Step 97. -Distribute TMDL Among Four Discharger/Land Use Categories.

Step 1 shows the methodology used to account for allowable exceedance loads based on the frequency of exceedance of WQOs at a reference system. Step 2 shows how information from the load-duration curves is extracted to quantify current bacteria loads and TMDLs. Steps 3-5 show how existing loads are quantified from identified sources. Steps 6-7 show how the TMDLs are distributed among discharge categories.Steps 1 through 4 use the information provided by load-duration curves. Steps 5 through 9 are determined based on land use data. Descriptions of each step are provide below. Sample calculations are provided showing all the steps involved.

1. Quantify Total Existing Wet Weather Loads
As discussed in section I.3, the output from the LSPC model was used to predict bacteria loading from each watershed for the critical wet period in 1993. Model-predicted loads were used to construct load-duration curves for each of the three indicator bacteria. Figure I-1, above, is a sample load-duration curve that shows model-calculated fecal coliform loads for subwatershed 202 in the Aliso HSA watershed.

The load-duration curves are bar graphs that rank the modeled flows into percentiles, or groups arranged in increasing orders of magnitude. The height of the blue bars indicates the number of bacteria colonies corresponding to the flow volume on a given day. The summation of all the blue bar segments represents the total existing annual bacteria load for wet weather in the critical wet period of 1993.

2. Quantify Allowable Loads
The dark line running across the bar graph (referred to as the “numeric target line” or “load capacity curve”) in Figures I-1 and I-2 represents the total maximum bacteria load that would not result in an exceedance of the numeric WQO for the flow volume on that day. In the case for Figures I-1 and I-2, the wet weather numeric WQO is the single sample maximum REC-1 WQO for fecal coliform, which is 400 MPN/100mL (see section 4 of the Technical Report). The load capacity curve is calculated by multiplying the numeric WQO by the total flow volume for each day. So, if the daily flow volume increases, the target daily load will increase; but the numeric target stays constant.

The solid-line outlined bar segments below the numeric target line represent the loading capacity of the waterbody that will not cause the numeric WQO (i.e., REC-1 WQO) to be exceeded for each day. The summation of the solid-line outlined bar segments below the numeric target line is total allowable annual bacteria load for wet weather in the critical wet period of 1993, based only on the numeric WQOs.

3. Quantify Allowable Exceedance Loads
1.Quantify Allowable Exceedance Loads
Because 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 can, by themselves, cause exceedances of WQOs, allowable exceedance loads were calculated and incorporated into the

wet weather TMDLs. A Basin Plan amendment (Resolution No. R9-2008-0028) was adopted by the San Diego Water Board authorizing the development of indicator bacteria TMDLs that account for exceedances of bacteria WQOs due to bacteria loads from natural uncontrollable sources.[3]

The first step was to identify an appropriate allowable exceedance frequency. The allowable exceedance frequency is determined by identifying an appropriate reference system. A reference system is a beach and upstream watershed that are minimally impacted by anthropogenic activities, typically having at least 95 percent open space.. To be consistent with the Los Angeles Water Board, in the calculation of the wet weather TMDLs the San Diego Water Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County.[4]

The next step is to quantify the allowable exceedance load associated with a 22 percent exceedance frequencytly. The allowable exceedance frequency was converted into allowable exceedance days. The blue-colored portions of the bars (above the numeric target line) in Figure I-2 correspond to the 22 percent exceedance frequency allowed for loading from uncontrollable sources. The blue bars above the lines represent the reference system loading capacity of the waterbody on an annual basis that will not cause the numeric targets to be exceeded on more than 22 percent of the wet days (this was the observed exceedance frequency in the reference system). The portions of the bars below the numeric target line plus the blue portions of the bars above the numeric target line are equal to the allowable loads, or total maximum annual wet weather loads, for the subwatershed.

The number of allowable exceedance days for each subwatershed was calculated as follows. For each watershed, the number of wet days in 1993 was documented (Technical Report, Table 8-1). Wet days are defined as days with 0.2 inches or more of rainfall and the following 72 hours. For each watershed, the number of wet days in 1993 is presented Table I-1.

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

Watershed	Number of Wet Days in 1993
San Joaquin Hills HSA/Laguna Beach HSA	69
Aliso HSA	69
Dana Point HSA	69
Lower San Juan HSA	76
San Clemente HA	73
San Luis Rey HU	90

[3] Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL*, adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009.

[4] 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).

San Marcos HA	49
San Dieguito HU	98
Miramar Reservoir HA	94
Scripps HA	57
Tecolote HA	57
Mission San Diego HSA/Santee HSA	86
Chollas HSA	65

The number of days that exceedances of numeric targets are allowed for each particular watershed is obtained by multiplying the number of wet days by the exceedance frequency ~~(Table 8-2)~~. For example, the Aliso ~~Creek~~ HSA watershed had 69 wet days in 1993. The allowable exceedance frequency of the wet weather numeric targets under the reference system approach is 22 percent. Therefore, the number of allowable exceedance days for the Aliso ~~Creek~~ HSA watershed is:

69 Wet Days * 0.22 = 15 Allowable Exceedance Days

The number of allow exceedance days for each watershed is presented Table I-2.

Table I-2. Allowable Exceedance Days for Watersheds Affecting Impaired Waterbodies

Watershed	**Number of Allowable Exceedance Days**
San Joaquin Hills HSA/Laguna Beach HSA	15
Aliso HSA	15
Dana Point HSA	15
Lower San Juan HSA	17
San Clemente HA	16
San Luis Rey HU	20
San Marcos HA	11
San Dieguito HU	22
Miramar Reservoir HA	21
Scripps HA	13
Tecolote HA	13
Mission San Diego HSA/Santee HSA	19
Chollas HSA	14

~~The allowable exceedance load was calculated by summing the loads above the numeric target line for the allowable exceedance days. These loads are shown as blue portions of the bars above the numeric target line on the load-duration curves. The 15 days with the highest loads were chosen as the allowable exceedance days because the highest loads in most of the watersheds correspond to open space land uses where bacteria loads are generated from natural sources. The remaining orange portions of the bars with magnitudes above the numeric target line represent exceedance loads that must be reduced Using the chart associated with Figure I-2, the allowable load, or TMDL, is equal to the Total Load for Existing Conditions minus the Non-Allowable Exceedance Loads caused by anthropogenic sources (orange portions of the bars above the numeric target line). For this particular subwatershed, the Allowable Load is quantified in the chart associated with Figure I-2 as 1,562,594 billion MPN/year.~~

The days with the highest loads were chosen as the allowable exceedance days because the highest loads in most of the watersheds correspond to open space land uses where bacteria loads are generated from natural sources. The solid blue bar segments above the numeric target line shown on the example load-duration curve in Figure I-2 correspond to the 22 percent exceedance frequency allowed for loading from uncontrollable sources. The number of solid blue bar segments above the numeric target line is equal to the allowable exceedance days shown in Table I-2. For the Aliso HSA watershed, there are 15 allowable exceedance days, which correspond to the 15 solid blue bar segments above the numeric target line shown in Figure I-2.

The solid blue bar segments above the numeric target lines represent the reference system loading capacity of the waterbody that will not cause the numeric targets to be exceeded on more than 22 percent of the wet days. The summation of the solid blue bar segments above the numeric target line is the total allowable annual bacteria exceedance load for wet weather in the critical wet period of 1993.

4. Quantify Wet Weather TMDLs

The solid-line outlined bar segments below the numeric target line plus the solid blue bar segments above the numeric target line are equal to the total allowable bacteria loads, or total maximum annual wet weather bacteria loads, for the subwatershed. In other words, the sum of the allowable loads calculated under step 2 and the allowable exceedance loads calculated under step 3 is equal to the TMDL for the subwatershed.

The existing loads and TMDLs for each watershed are calculated by summing the existing loads and TMDLs of all the modeled subwatersheds in each watershed.

2. Quantify Existing Bacteria Loads and TMDLs

Just as the allowable exceedance loads were quantified in step 1, the total existing loads, including those from anthropogenic sources, can also be found from load-duration curves. An example showing the quantification of the existing fecal coliform load and TMDL for the Aliso Creek watershed is shown below.

For example, Tthe total existing bacteria load from the Aliso Creek HSA watershed is comprised of loads from subwatershed numbers 201 and 202 (these two subwatersheds are adjacent to the Pacific Ocean and are cumulative of the upstream watersheds). Numerical values were obtained from the charts associated with the load-duration curves for the Aliso Creek HSA watershed, specifically Tables O-16 and O-19 (Appendix O) for this example. The "Total Existing Load For Existing Condition" (Total Existing Load) and the TMDL for the Aliso Creek HSA watershed is the sum of the "Total Existing Load for Existing Conditions" for subwatersheds 201 and 202 from Tables O-16 and O-19, respectively. The "TMDL" for the Aliso Creek HSA watershed is the sum of the "Total Allowable Load [TMDL]" (Allowable Load) for subwatersheds 201 and 202 from Tables O-16 and O-19, respectively. The Total Load and the TMDL for the Aliso Creek HSA watershed are calculated in the following equations.

$$\text{Existing Load} = (\text{Existing Load})_{\text{Subwatershed 201}} + (\text{Existing Load})_{\text{Subwatershed 202}}$$
$$= 19{,}386 \text{ billion MPN/mL} + 1{,}732{,}709 \text{ billion MPN/mL}$$

= 1,752,095 billion MPN/mL

TMDL = (Allowable Load)$_{\text{Subwatershed 201}}$ + (Allowable Load)$_{\text{Subwatershed 202}}$

= 16,480 billion MPN/mL + 1,562,594 billion MPN/mL
= 1,579,074 billion MPN/mL

The same calculations were performed for each watershed by summing the "Total Existing Load for Existing Condition" and "Total Allowable Load [TMDL]," respectively, of all the modeled subwatersheds in each watershed. Table I-3~~1~~ shows the ~~interim~~ wet weather existing loads and TMDLs on an annual basis for all major watersheds included in this project for fecal coliform, total coliform, and enterococci bacteria, which were derived from the load-duration curves in Appendix -O.

Table I-3~~1~~. ~~Interim~~ Wet Weather Existing Loads and TMDLs (Billion MPN/Year)

Watershed	Fecal Coliform		Total Coliform		Enterococci	
	Existing	**TMDL**	**Existing**	**TMDL**	**Existing**	**TMDL**
San Joaquin Hills HSA/Laguna Beach HSA	705,015	664,634	8,221,901	7,445,649	852,649	782,799
Aliso HSA	1,752,095	1,579,073	23,210,774	20,190,798	2,230,206	1,950,964
Dana Point HSA	403,911	377,313	6,546,962	6,031,472	501,526	462,306
Lower San Juan HSA	15,304,790	14,714,833	130,258,863	122,879,189	12,980,098	12,152,446
San Clemente HA	1,441,723	1,378,931	16,236,606	15,147,603	1,663,100	1,563,187
San Luis Rey HU	33,120,012	32,444,242	231,598,677	224,150,535	18,439,920	17,463,618
San Marcos HA	20,886	17,224	515,278	425,083	40,558	32,966
San Dieguito HU	21,286,910	21,101,649	163,541,133	159,814,184	14,796,210	14,307,087
Miramar Reservoir HA	10,392	10,256	212,986	210,180	11,564	11,405
Scripps HA	204,057	176,907	5,029,519	4,356,973	377,839	324,032
Tecolote HA	261,966	229,322	7,395,789	6,379,770	708,256	603,761
Mission San Diego HSA/Santee HSA	4,932,380	4,680,838	72,757,569	66,105,222	7,255,759	6,590,966
Chollas HSA	603,863	520,440	15,390,608	13,247,626	1,371,972	1,152,645

~~Laguna/San Joaquin~~	~~664,634~~	~~7,445,650~~	~~782,798~~
~~Aliso Creek~~	~~1,579,074~~	~~20,190,798~~	~~1,950,980~~
~~Dana Point~~	~~377,313~~	~~6,031,472~~	~~462,306~~
~~San Juan Creek~~	~~14,714,833~~	~~122,879,189~~	~~12,152,446~~
~~San Clemente~~	~~1,378,930~~	~~15,147,590~~	~~1,563,186~~
~~San Luis Rey River~~	~~32,445,470~~	~~224,189,156~~	~~17,470,687~~
~~San Marcos~~	~~17,224~~	~~425,083~~	~~32,966~~
~~San Dieguito River~~	~~21,106,683~~	~~159,978,672~~	~~14,327,364~~
~~Miramar~~	~~10,256~~	~~210,182~~	~~11,405~~
~~Scripps~~	~~176,906~~	~~4,356,972~~	~~324,033~~
~~San Diego River~~	~~4,681,150~~	~~66,114,283~~	~~6,591,843~~
~~Chollas Creek~~	~~520,440~~	~~13,247,626~~	~~1,152,645~~

The difference between the existing load and TMDL is represented by the sum of the patterned bar segments above the numeric target line. The patterned bar segments above the numeric target line represent the bacteria loads that are in exceedance of the numeric target (i.e., REC-1 WQOs and allowable exceedance frequency) that must be reduced to meet the TMDL.

~~3.~~5. Classify Land Use Types as Point or Nonpoint Sources, and Classify Nonpoint Sources as Controllable or Uncontrollable

For purposes of TMDL allocation to sources, all land use types were classified based on whether or not they generated mainly point or nonpoint sources of bacteria. Nonpoint source land use categories were further divided into controllable or uncontrollable sources. The classification of a land use as generating either point or nonpoint sources was based on the likelihood that the land use was urban and would occur in an area drained by municipal separate storm sewer systems (MS4s), or was rural and outside of MS4 drained areas. The rationale for identifying specific responsible dischargers is discussed in the Technical Report, sections 10 and 11.

Point sources are defined as "any discernable, 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" [CWA section 502(6)].
Land use types considered urban and generating mostly point source loads from storm drain discharges were identified as:

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

Bacteria loads from these land use types were classified as point sources because, although they may be diffuse in origin, these land uses are typically found in urbanized areas, and the pollutant loading is transported and discharged to receiving waters through MS4s. MS4s are considered point sources because they discharge waste out of a discrete pipe. The principal MS4s contributing bacteria to receiving waters are owned or operated by either municipalities located throughout the watersheds or the California Department of Transportation (Caltrans). Municipal and Caltrans MS4 discharges are regulated separately under different NPDES requirements. For this reason, in each watershed, loads generated by Caltrans were separated from loads generated by Municipal MS4s.

Land use types considered rural and outside of areas drained by MS4s were identified as:

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

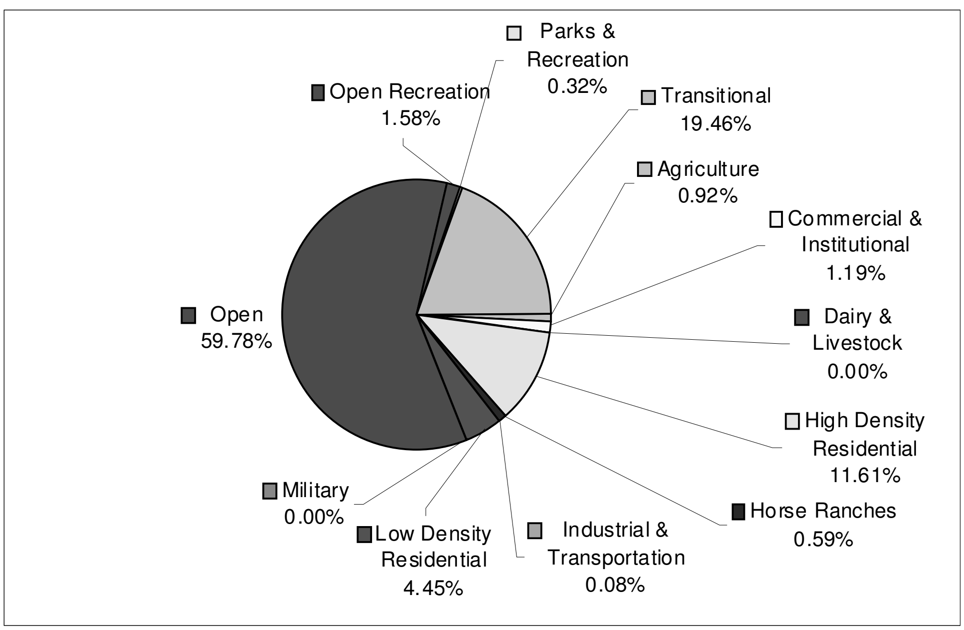
- Water.

Bacteria loads from these land use types were classified as nonpoint sources because bacteria-laden discharges from these land uses are diffuse in origin, and originate in areas without constructed (man-made) MS4s. Nonpoint sources were separated into controllable and uncontrollable categories. Controllable sources included 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 are recognized as originating from activities related to agriculture, livestock, and horse ranch facilities. For this reason, these types of discharges were given load allocations (LAs) and were required to reduce their bacteria loads if they constitute more than 5 percent of the total TMDL (see step 7 for methodology for calculating LAs).

Uncontrollable nonpoint sources include loads from Open Recreation, Open Space, and Water land uses. Loads from these areas were considered uncontrollable because they come from natural sources (e.g. bird and wildlife feces) rather than anthropogenic sources. LAs from these sources were developed, but there were no accompanying load reductions expected since these sources are natural, largely uncontrollable, and regulation is not warranted.

3. 6. Quantify Relative Contribution of Bacteria Loads From Each Land Use Type

The sum of all the shaded bars in the load-duration curves provides an estimate of the total load expected in each watershed during the critical condition (rainfall conditions documented in the critical period in 1993). The watershed model results were used to calculate the percent contribution from each of the 13 land use types to the total existing load (see Appendix J for discussion). Pie charts, like Figure I-3 below, shows these percentages for each watershed. Loads from each land use type were calculated by multiplying the existing load for the watershed by the percentages in the pie charts. Pie charts for each watershed are presented in Figures I-5 through I-40.



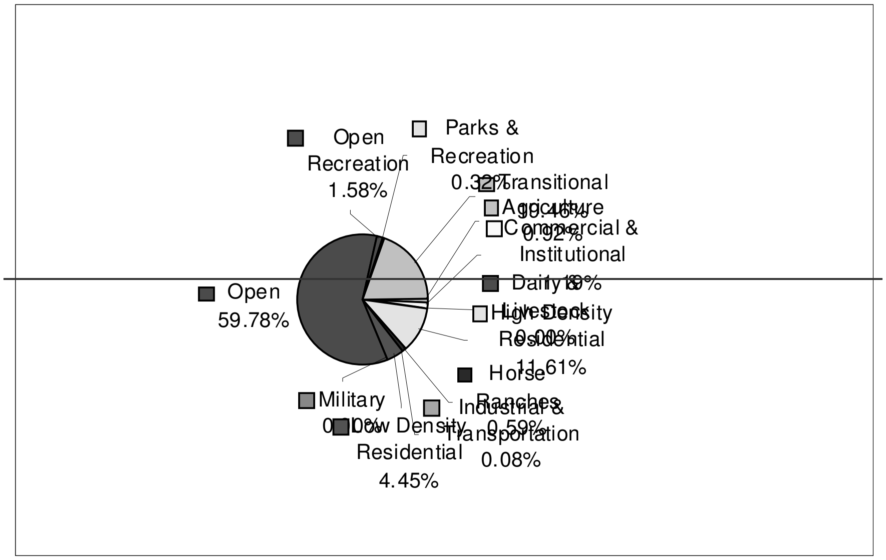


Figure I-3. Percent of Fecal Coliform Load Generated by Different Land Uses in the Aliso ~~Creek~~ HSA Watershed

For example, the existing load from all sources to the Aliso ~~Creek~~ HSA watershed is 1,752,095 billion MPN/year (Table O-16, O-19, Appendix O). The relative load from the High Density Residential land use can be calculated as follows:

Existing Load from High Density Residential	= 1,752,095 billion MPN/year * 11.61%
	= 203,418 billion MPN/year

Relative loads from all land use types, in all watersheds and each indicator bacteria are presented in Tables I-12 through I-14.

~~4.~~7. Separate Caltrans Existing Loads from Loads Generated by Industrial/Transportation Land Use

Highways owned by Caltrans are assumed to be ~~lumped into~~part of the industrial and transportation land use category. Bacteria loads generated from Caltrans highways need to be quantified separately from the Industrial/Transportation land use, since ultimately discharges from Caltrans highways are regulated under their own set of waste discharge requirements (WDRs) implementing National Pollutant Discharge Elimination System (NPDES) regulations. Caltrans land use areas were not delineated in the geographic information system (GIS) data used in the wet weather modeling analysis. Thus, relative loads contributed by Caltrans could not be extracted directly from the watershed model results. To calculate an existing load from Caltrans, the area occupied by impermeable Caltrans owned highway surfaces was expressed as a percent of the total area occupied by the Industrial/Transportation land use, for each watershed. The area occupied by Caltrans in each of the impaired watersheds was provided by Caltrans (Richard Watson, Caltrans, personal communication, September 23, 2005) as shown in Table I-4~~2~~.

Using this information, the existing loads associated with the Industrial/Transportation land use was divided into two sources; one generated by the Municipal MS4s and one generated by

Caltrans based on the percent of the total Industrial/Transportation land use area occupied by impermeable Caltrans' highways.

Table I-42. Caltrans Occupied Areas in Each Impaired Watershed

Watershed	Caltrans Occupied Area (sq miles)
San Joaquin Hills HSA/Laguna Beach HSA	0.19
Aliso HSA	0.17
Dana Point HSA	0.06
Lower San Juan HSA	0.73
San Clemente HA	0.18
San Luis Rey HU	1.17
San Marcos HA	0.01
San Dieguito HU	0.78
Miramar Reservoir HA	0.74
Scripps HA	0.00
Tecolote HA	0.24
Mission San Diego HSA/Santee HSA	1.94
Chollas HSA	0.57

An example calculation for the Aliso Creek HSA watershed is shown below.

Industrial/Transportation land use area = 0.89 sq miles (Table J-1 in Appendix J)

Caltrans occupied area = 0.17 sq miles (Table I-42)

The percent of the Industrial/Transportation land use area that is occupied by Caltrans is:

$$\frac{0.17\ sq\ miles}{0.89\ sq\ miles} = 0.191 = 19.1\%$$

The existing loads generated by Caltrans were obtained by multiplying the percent area occupied by Caltrans by the loads generated by the Industrial/Transportation land use (Table I-10):

Existing Fecal Coliform Load Generated by Caltrans = (Percent of land use occupied by Caltrans) * (Existing Fecal Coliform Load Generated by the Industrial/Transportation land use)
= 0.191 * 1,402 billion MPN/year
= 268 billion MPN/year

For three two watersheds, San Joaquin Hills HSA/Laguna Beach HSALaguna/San Joaquin, and Dana Point HSA, the Caltrans occupied area was reported as being larger than the area reported for the Industrial/Transportation land use. The Caltrans data are more current (2005) than the GIS land use data (2000), thus, the discrepancy is most likely due to new highway construction since 2000 by Caltrans in these watersheds. In these cases, the loads generated by the Industrial/ Transportation land use were attributed solely by Caltrans.

The loads generated by Caltrans calculated from the above methodology in the remaining watersheds are shown in Tables I-15 through I-17.

~~5.~~8.Combine Land Use Types Based on Method of Regulation by the San Diego Water Board

After the existing loads were calculated from each land use type (sources) in steps ~~4~~6 and ~~5~~7, the land use types were then combined into one of four discharge/land use categories. These categories were based on the manner in which discharges associated with these land uses are regulated by the San Diego Water Board. The land uses were grouped into the following four discharge categories:

Municipal MS4s	=	Sum of existing loads generated from Low Density Residential, High Density Residential, Commercial/Institutional, Industrial/Transportation (excluding Caltrans), Military, Parks/Recreation, and Transitional land uses
Caltrans	=	Existing load calculated from step 7~~5~~
Agriculture/Livestock Operations (Ag/Livestock)	=	Sum of existing loads from Agriculture, Dairy/Intensive Livestock, and Horse Ranches land uses
Undeveloped Land (Open Space)	=	Sum of existing loads from Open Recreation, Open Space, and Water land uses

Discharges from the various land use types were grouped into these four categories for implementation purposes. Section 11 of the Technical Report discusses implementation of the TMDLs.

~~6.~~9.Allocate TMDL to the Four Discharge/Land Use Categories

Once TMDLs were determined in step 4~~2~~, they were allocated to the four discharge/land use categories described in step 8~~6~~. Wasteload allocations (WLAs) were assigned to point source discharges and load allocations (LAs) were assigned to nonpoint source discharges. The wet weather TMDLs were distributed as follows:

$$TMDL = WLA(Municipal\,MS4s) + WLA(Caltrans) + LA(Ag\,/\,Livestock) + LA(Open\ Space)$$

where *TMDL* = Total Maximum Daily Load for entire watershed

WLA (Municipal MS4s) = Point source ~~W~~wasteload allocation for owners/operators of Municipal MS4s

WLA (Caltrans) = Point source ~~W~~wasteload allocation for Caltrans

LA (Ag/Livestock) = Nonpoint source ~~L~~load allocation for owners/operators of agriculture, livestock, and horse ranch facilities land uses

LA (Open Space) = Nonpoint source Lload allocation for uncontrollable sources of bacteria for open space, open recreation, and water land uses

Since loads from Open Space, Open Recreation, and Water land uses are uncontrollable, the LAs for this category cannot be lower than the existing loads. Therefore the LAs for this category are the same as the existing loads generated by uncontrollable sources, as calculated from step 64, and cannot be reduced (i.e., *Existing Load (Open Space) = LA (Open Space)*).

Similarly, for Caltrans, the WLAs are identical to the existing loads generated by Caltrans in each watershed. However, the reasoning for this determination is different than the reasoning described for loading from uncontrollable sources. Inspection of Figures I-5 through I-40 indicate that wet weather loading from the Industrial/Transportation land use is less than 1 percent of the total existing load in all watersheds. Furthermore, Caltrans occupies a portion of this land use (Tables I-15 through I-17). Since Caltrans is an insignificant bacteria source compared to other controllable sources, the San Diego Water Board shall not impose stricter regulation than what is already in place (see section 11.5.2 for a description of regulation of Caltrans with respect to these TMDLs). Therefore, no reductions are required for Caltrans. (i.e., *Existing Load (Caltrans) = WLA (Caltrans)*) The remaining portion of the TMDL is distributed between the Municipal MS4s and Ag/Livestock categories, as follows:

$$TMDL - WLA(Caltrans) - LA(Open\ Space) = WLA(Municipal MS4s) + LA(Ag / Livestock)$$

The methodology used for distributing the remaining portions of the TMDL between the Municipal MS4s and the Ag/Livestock categories depended on whether or not the relative bacteria loads contributed by agriculture, livestock, and horse ranch facilities (i.e., *Existing Load (Ag/Livestock)*) were significant compared to loads from urbanized areas. 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, such as publicly owned treatment works, not receiving an explicit allocation as described above is allowed a zero discharge of bacteria to the impaired beaches and creeks.

a) Methodology When Ag/Livestock Sources are an Insignificant Portion of the Total Existing Load

Figures I-5 through I-40 demonstrate that in the San Joaquin Hills HSA/, Laguna Beach HSA, Aliso CreekHSA, Dana Point HSA, San Clemente HA, Miramar Reservoir HA, Scripps HA, San Diego RiverMission San Diego HSA/Santee HSA, and Chollas CreekHSA watersheds, the proportion of the total existing load for all 3 indicator bacteria due to agriculture, livestock, and horse ranch facilities (loads associated with Agriculture, Dairy/Intensive Livestock, and Horse Ranches land uses) is less than 5 percent. For these watersheds, the LAs for agriculture, livestock, and horse ranch facilities are identical to existing loads calculated from these land uses. As with Caltrans and Open Space, LAs are given to agriculture, livestock, and horse ranch facilities; however no load reductions are required since these sources are insignificant compared to existing loads generated by urban sources in these watersheds (ie., *Existing Load (Ag/Livestock) = LA (Ag/Livestock)*). Therefore Municipal MS4s alone are required to reduce bacteria loads during wet weather events in these watersheds to meet the TMDLs.

WLAs for municipal MS4s are given by:

$$WLA(Municipal\ MS4s) = TMDL - WLA(Caltrans) - LA(Ag / Livestock) - LA(Open\ Space)$$

In the above equation, WLAs for Caltrans, LAs for agriculture, livestock, and horse ranch facilities, and LAs for uncontrollable sources are equal to existing loads from these sources as determined in steps 6~~4~~ and 7~~5~~. Using the Aliso ~~Creek~~ HSA watershed as an example, the WLA for Municipal MS4s can be calculated using Table I-12~~0~~. The WLA for fecal coliform for Municipal MS4s is

WLA (Municipal MS4s) = [1,579,073~~4~~ – 260~~8~~ – 26,508~~457~~ – 1,075,237~~085~~] billion MPN/year

= 477,069~~264~~ billion MPN/year

The percent reduction required for fecal coliform for the Municipal MS4s in the Aliso ~~Creek~~ HSA watershed is

$$Percent\ Reduction = \frac{(Existing\ Load\ From\ Municipal\ MS4s - WLA\ (Municipal\ MS4s))}{Existing\ Load\ From\ Municipal\ MS4s}$$

$$= \frac{(650{,}092\ billion\ MPN / year - 477{,}069\ billion\ MPN / year)}{650{,}092\ billion\ MPN / year}$$

= 0.2662
= 26.62%

b) *Methodology When Ag/Livestock Sources are a Significant Portion of the Total Existing Load*

In the Lower San Juan ~~Creek~~ HSA, San Luis Rey ~~River~~HU, San Marcos ~~Creek~~HA, and San Dieguito ~~River~~HU watersheds, the agriculture, livestock, and horse ranch facilities generate more than 5 percent of the total wet weather load for all three indicator bacteria. Table I-5~~3~~ shows the percent contribution of bacteria from agriculture, livestock, and horse ranch facilities to the total existing load in each watershed. This information is derived from the pie charts (Figures I-5 through I-40).

Table I-5~~3~~. Percent Contribution of Bacteria from Agriculture, Livestock, and Horse Ranch Facilities to the Total Existing Loads

Watershed	Percent of Existing Load		
	Fecal Coliform	Total Coliform	Enterococci
San Joaquin Hills HSA/Laguna Beach HSA	1.04%	0.62%	0.38%~~0.37~~
Aliso HSA	1.51%	0.77%	0.50%~~0.51~~
Dana Point HSA	0.00%	0.00%	0.00%
Lower San Juan HSA	**21.40%**	**14.20%**	**8.87%**
San Clemente HA	0.03%	0.01%	0.01%
San Luis Rey HU	**62.46%**	**50.67%**	**37.32%**
San Marcos HA	**53.62%**	**23.76%**	**19.29%**
San Dieguito HU	**55.77%**	**42.53%**	**29.90%**
Miramar Reservoir HA	0.00%	0.00%	0.00%
Scripps HA	0.00%	0.00%	0.00%
Tecolote HA	0.00%	0.00%	0.00%
Mission San Diego HSA/Santee HSA	8.41%	4.80%~~4.81~~	2.94%
Chollas HSA	0.00%	0.00%	0.00%

Similarly, the percent contribution from urbanized (i.e., municipal MS4) sources for each watershed is shown in Table I-6~~4~~.

Table I-6~~4~~. Percent Contribution of Bacteria from Urbanized Municipal MS4 Sources to the Total Existing Loads

Watershed	Percent of Existing Load		
	Fecal Coliform	Total Coliform	Enterococci
San Joaquin Hills HSA/Laguna Beach HSA	11.00%	20.15%	15.98%
Aliso HSA	37.10%	51.46%	45.50%
Dana Point HSA	44.33%	59.87%	51.59%
Lower San Juan HSA	8.67%	15.29%	14.64%
San Clemente HA	17.72%	28.13%	23.79%
San Luis Rey HU	2.85%	6.58%	7.98%
San Marcos HA	38.76%	71.03%	73.44%
San Dieguito HU	3.81%	10.64%	12.92%
Miramar Reservoir HA	65.81%	81.81%	71.50%
Scripps HA	62.93%	81.92%	75.65%
Tecolote HA	60.87%	83.19%	81.29%
Mission San Diego HSA/Santee HSA	9.58%	23.97%	21.44%
Chollas HSA	55.63%	78.12%	74.51%

Owners and operators of agriculture, livestock, and horse ranch facilities in the Lower San Juan ~~Creek~~HSA, San Luis Rey ~~River~~HU, San Marcos ~~Creek~~HA, and San Dieguito ~~River~~ HU watersheds are given required reductions that are proportional to the existing loads generated by these sources. The LAs for the Ag/Livestock category are calculated as follows:

$$LA(Ag\,/\,Livestock) = [TMDL - WLA(Caltrans) - LA(Open\ Space)] * \left[\frac{X}{Y}\right]$$

where X = _% Total Existing Load from Agriculture/Livestock/Horse land uses (Table I-3),

and

Y = _% Total Existing Load from Agriculture/Livestock/Horse land uses + % Total Existing Load from Urban land uses (summation of entries from Table I-5~~3~~ and I-6~~4~~)

In other words, the wasteload allocations for Caltrans and Open Space, which are equal to the existing loads for these categories and do not require reductions, are subtracted from the TMDL load. That difference ([*TMDL – WLA (Caltrans) – LA(Open Space*]) must be divided between the Ag/Livestock category and Municipal MS4 category. The ratio of the existing Ag/Livestock loading to the existing Municipal MS4 loading (the [X/Y] term in the equation) is the basis for splitting the difference between the two categories.

The variables *X* and *Y* are determined from Tables I-3 and I-4, which are in turn derived from the pie charts (Figures I-5 through I-40).

An example calculation for Lower San Juan ~~Creek~~ HSA watershed is shown below. The value for the TMDL is found in Table I-3~~1~~. The values for the WLA (Caltrans), LA (Open Space) are equal to existing loads and are found in Table I-12. All values are specific to the Lower San Juan ~~Creek~~ HSA watershed.

LA (Ag/Livestock) = [14,714,833 – 1,713~~541~~ – 10,701,131~~09~~] * $\left[\frac{21.4\%}{21.4\% + 8.67\%}\right]$

= 2,855,570~~361~~ billion MPN/year

The percent reduction required for fecal coliform for agriculture, livestock, and horse ranch facilities is

$$Percent\ Reduction = \frac{(Existing\ Load\ From\ Ag/Livestock - LA\,(Ag/Livestock))}{Existing\ Load\ From\ Ag/Livestock}$$

$$= \frac{(3{,}275{,}477\ billion\ MPN\,/\,year - 2{,}855{,}570\ billion\ MPN\,/\,year)}{3{,}275{,}477\ billion\ MPN\,/\,year}$$

= 0.1282

= 12.82%

Once WLAs for agriculture, livestock, and horse ranch facilities have been determined, the remaining portion of the TMDL is allocated to Municipal MS4s. The WLAs for Municipal MS4s are given by:

$$WLA(Municipal\ MS4s) = TMDL - WLA(Caltrans) - LA(Ag / Livestock) - LA(Open\ Space)$$

Using the value for *LA (Ag/Livestock)* calculated in the previous step, *WLA (Municipal MS4s)* can be determined for the Lower San Juan ~~Creek~~ HSA watershed.

WLA (Municipal MS4s) = [14,714,833 – 1,713~~541~~ – 10,701,131~~09~~ – 2,855,477~~6,361~~] billion MPN/year

= 1,156,419~~822~~ billion MPN/year

Note that the formula for determining WLAs for Municipal MS4s is the same as the one described in methodology a). An important point is that the difference between the two methodologies is that in watersheds where loads from Ag/Livestock are insignificant, the LAs for this category are identical to existing loads. However, in watersheds where loads from Ag/Livestock are significant, the LAs for this category are lower than existing loads.

Table I-7~~5~~ shows the WLAs, LAs, and percent reductions ~~using interim numeric targets~~ required for the Aliso ~~Creek~~ HSA and Lower San Juan ~~Creek~~ HSA watersheds using the methods outlined in this appendix. For the Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HU watershed, ~~T~~the Municipal MS4s and Ag/Livestock categories are required to reduce the bacteria loads in each watershed by the amount specified in ~~Figures I-41 through I-43~~Table I-18 through I-20.

Table I-7~~5~~. ~~Interim~~ WLAs and LAs (Billion MPN/Year) for Fecal Coliform in the Aliso Creek and San Juan Creek Watersheds

Watershed	TMDL	Point Sources				Nonpoint Sources				
		MS4		Caltrans*		Ag/Livestock			Open Space*	
		WLA	Reduction Required	WLA	Reduction Required	X / Y**	LA	Reduction Required	LA	Reduction Required
Aliso HSA	1,579,073	477,069	26.62%	260	0.00%	0.04	26,508	0.00%	1,075,237	0.00%
Lower San Juan HSA	14,714,833	1,156,419	12.82%	1,713	0.00%	0.71	2,855,570	12.82%	10,701,131	0.00%

* No reductions are required for Caltrans or Open Space
** X = % Total Existing Load from Agriculture/Livestock/Horse land uses, and Y = % Total Existing Load from Agriculture/Livestock/Horse land uses + % Total Existing Load from Municipal MS4 land uses

~~Watershed~~	~~TMDL~~	~~WLA (Municipal MS4)~~	~~% Reduction~~	~~WLA (Caltrans)~~[A]	$\frac{X}{Y}$ [B]	~~LA (Ag/Livestock)~~	~~% Reduction~~	~~LA (Open Space)~~[A]
~~Aliso Creek~~	~~1,579,074~~	~~477,264~~	~~27~~	~~268~~	~~0.04~~	~~26,457~~	~~0~~	~~1,075,085~~
~~San Juan Creek~~	~~14,714,833~~	~~1,155,872~~	~~13~~	~~1,541~~	~~0.71~~	~~2,856,311~~	~~13~~	~~10,701,109~~

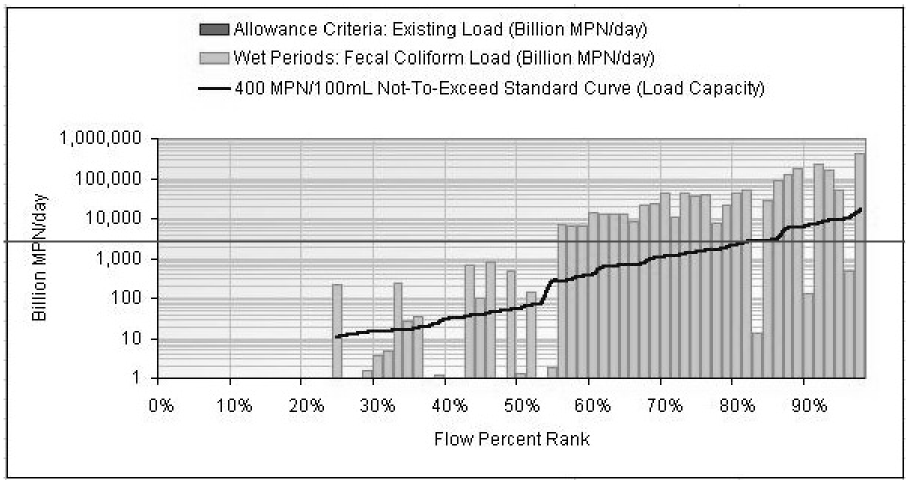
[A] ~~No reductions are required for Caltrans or Open Space~~
[B] ~~X = % Total Existing Load from Agriculture/Livestock/Horse land uses, and~~
~~Y = % Total Existing Load from Agriculture/Livestock/Horse land uses~~

~~+ % Total Existing Load from Urban land uses~~

The information in Table I-7~~5~~ (except for the values for X and Y) is available for the remaining watersheds, and for total coliform and enterococci, and is reported in Tables I-18 through I-20, as well as Tables 9-~~1~~2a, 9-42b, and 9-~~8~~2c in section 9 of the Technical Report.

~~I.5Calculation of TMDLs Using Final Numeric Targets for Wet Weather Analysis~~

~~The methodology for calculating TMDLs and allocations using final numeric targets is similar to the methodology for calculating allowable loads using interim numeric targets. The difference is that with final numeric targets, there is no application of the reference system approach, and therefore, no allowable exceedance loads. Figure I-4 shows the load-duration curve for fecal coliform for the Aliso Creek watershed, using the final numeric targets.~~



Fecal Coliform Loading Summary	Value	Units
Total Load for Existing Condition (Total Load)	1,732,709	Billion MPN/Year
~~Non-allowable Exceedance Load (Exceedance Load)~~	~~1,648,711~~	~~Billion MPN/Year~~
Allowable Load = (Total Load - Exceedance Load)	83,999	Billion MPN/Year
Percent Reduction Required from Existing Condition	**95.2%**	**Percentage**

~~*Figure I-4. Load Duration Curve for Aliso Creek Subwatershed #202 (No Reference System Approach)*~~

~~Inspection of Figures I-2 and I-4 reveal that the only difference in the graphs is that there are no allowable exceedance loads identified by blue bars. In contrast to the discussion in section I.4, all the loads in Figure I-4 with magnitudes above the numeric target line, are considered exceedance loads and must be reduced. The TMDL is now only the sum of the bars below the numeric target line.~~

~~Because the methodologies for calculating interim and final TMDLs and allocations are identical, the steps outlined in section I.4 are applicable to section I.5 and therefore not repeated. The steps shown below contain only results that differ from section I.4.~~

~~1.Quantify Existing Bacteria Loads and TMDLs~~

~~As with interim numeric targets, the loads from the entire watershed are derived from loads calculated from each subwatershed. In this case, the loads for Aliso Creek are derived from the~~

load-duration curves representing subwatersheds 201 and 202. Using values from load duration curves describing fecal coliform in Aliso Creek (Tables P-16 and P-19 in Appendix P),

$$\text{Total Load} = (\text{Total Load})_{\text{Subwatershed 201}} + (\text{Total Load})_{\text{Subwatershed 202}}$$
$$= 19{,}386 \text{ billion MPN/year} + 1{,}732{,}709 \text{ billion MPN/year}$$
$$= 1{,}752{,}095 \text{ billion MPN/year}$$

$$\text{TMDL} = (\text{Allowable Load})_{\text{Subwatershed 201}} + (\text{Allowable Load})_{\text{Subwatershed 202}}$$
$$= 563 \text{ billion MPN/year} + 83{,}999 \text{ billion MPN/year}$$
$$= 84{,}562 \text{ billion MPN/year}$$

TMDL calculations in all watersheds using final numeric targets are lower than TMDLs calculated using interim numeric targets. Final TMDLs for all watersheds are shown in Table I-6.

Table I-6. Final Wet Weather TMDLs (Billion MPN/Year)

Watershed	Fecal Coliform TMDLs	Total Coliform TMDLs	Enterococci TMDLs
Laguna/San Joaquin	16,042	401,049	4,175
Aliso Creek	84,562	2,109,599	13,704
Dana Point	14,894	372,327	3,875
San Juan Creek	358,410	8,947,114	56,119
San Clemente	36,481	911,982	9,492
San Luis Rey River	641,823	16,030,005	174,221
San Marcos	1,559	38,984	406
San Dieguito River	431,004	10,801,713	133,530
Miramar	312	7,811	81
Scripps	10,329	258,228	2,686
San Diego River	311,132	7,761,345	48,356
Chollas Creek	55,516	1,386,037	9,073

2. Calculate Percent Reduction Required Per Discharge Category

Comparing the final wet weather TMDLs to the loads from the uncontrollable sources (from the previous analysis) show that, in every watershed except for San Marcos, the loads from uncontrollable sources are greater than the TMDL. This indicates that the natural bacteria sources in these watersheds consume and exceed the assimilative capacity of the receiving waters, resulting in allocations of zero loads to all remaining sources, namely controllable point and nonpoint sources. San Marcos is the only exception and was therefore calculated according to the procedures set forth in section 1.4, without the 22 percent exceedance frequency given to interim targets.

For Municipal MS4s, the percent reduction required for the Aliso Creek watershed is:

$$Percent\ Reduction = \frac{(649{,}935\ billion\ MPN/mL - 0\ MPN/mL)}{649{,}935\ billion\ MPN/mL}$$

$$Percent\ Reduction = 1$$
$$= 100\%$$

Similarly, for agriculture, livestock, and horse ranch facilities in the San Juan watershed,

$$Percent\ Reduction = \frac{(3{,}275{,}225\ billion\ MPN/mL - 0\ MPN/mL)}{3{,}275{,}225\ billion\ MPN/mL}$$

$$Percent\ Reduction = 1$$
$$= 100\%$$

In order to meet the final numeric targets, the required reduction for each indicator bacteria from all controllable sources in all watersheds is 100 percent.

Table I-7 shows the WLAs, LAs, and percent reductions using final numeric targets for the Aliso and San Juan watersheds using the methods outlined in this appendix. This information is available for the remaining watersheds and is reported in Tables 9-2, 9-5, and 9-9 in section 9 of the Technical Report.

Table I-7. Final Wet Weather WLAs and LAs (Billion MPN/Year) for Fecal Coliform in the Aliso Creek and San Juan Creek Watersheds

Watershed	TMDL	WLA (Municipal MS4)	% Reduction	WLA (Caltrans)	% Reduction	LA (Ag/Livestock)	% Reduction	LA (Open Space)*
Aliso Creek	84,562	0	100	0	100	0	100	1,075,085
San Juan Creek	358,410	0	100	0	100	0	100	10,701,109

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

I.6I.5 Calculation of Dry Weather TMDLs and AllocationsUsing Interim and Final Numeric Targets for Dry Weather Analysis

Because the density of bacteria in receiving waters during dry weather is extremely variable in nature, a separate approach from the wet weather LSPC model was needed. An approach was developed that relied on detailed analysis of available data to better identify and characterize sources.

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. The development of the dry weather model is described in Appendix K.

The methodology for calculating and allocating the dry weather TMDLs for each watershed is described in the following steps:For the dry weather model, final numeric targets were used to calculate TMDLs, although in a different capacity than interim and final numeric targets for wet

~~weather TMDLs. Step 1 shows how numeric targets were used, and step 2 shows how TMDLs were allocated.~~

Step 1. Calculate Dry Weather Existing Loads and TMDLs;
Step 2. Distribute TMDL Among Four Discharge/Land Use Categories.

Descriptions of each step are provide below.

1. ~~Use of Final Numeric Targets~~Calculate Dry Weather Existing Loads and TMDLs

Unlike the wet weather modeling approach, the numeric targets used in the dry weather modeling approach ~~does not include the use of the reference system approach~~have a zero percent allowable exceedance frequency. This is because available data show that exceedances of WQOs in local reference systems during dry weather conditions are uncommon (see Technical Report, section 4.2). Furthermore, reference systems do not generate significant dry weather bacteria loads because flows are minimal. During dry weather, flow, and hence bacteria loads, are largely generated by urban runoff, which is not a product of a reference system. Thus, the dry weather TMDL calculations are based entirely on meeting the geometric mean REC-1 WQOs. ~~Therefore interim numeric targets for dry weather to incorporate a reference system are unnecessary.~~

~~Final numeric targets were utilized in a different capacity from the wet weather analysis. Final numeric targets were utilized for total coliform, for protection of the REC-1 beneficial uses. Final a~~A steady-state plug-flow reactor model was used to calculate dry weather existing loads and allowable loads. Total existing bacteria loads were calculated using the plug-flow reactor model predicted flow multiplied by the land-use-specific bacteria densities derived from regression analyses of bacteria water quality data from several regional watersheds. Allowable dry weather bacteria loads, ~~were calculated using the REC-1 WQOs as numeric targets. To calculate the~~or TMDLs, were calculated using the dry weather plug-flow reactor model predicted flow ~~was~~ multiplied by the applicable numeric target, which is the geometric mean REC-1 WQO (see section 4 of the Technical Report). Table~~s~~ I-10~~8~~ shows the ~~final~~ dry weather existing loads and TMDLs calculated for all watersheds.

Table I-10~~8~~. ~~Final~~ Dry Weather TMDLs (Billion MPN/Month)

	Fecal Coliform		**Total Coliform**		**Enterococci**	
Watershed	**Existing**	**TMDL**	**Existing**	**TMDL**	**Existing**	**TMDL**
San Joaquin Hills HSA/Laguna Beach HSA	2,741	227	13,791	1,134	2,321	41
Aliso HSA	5,470	242	26,639	1,208	4,614	40
Dana Point HSA	1,851	92	9,315	462	1,567	16
Lower San Juan HSA	6,455	1,665	30,846	8,342	5,433	275
San Clemente HA	3,327	192	16,743	958	2,817	33
San Luis Rey HU	1,737	1,058	8,549	5,289	1,466	185
San Marcos HA	149	26	751	129	126	5
San Dieguito HU	1,631	1,293	7,555	6,468	1,368	226
Miramar Reservoir HA	205	7	1,030	36	173	1
Scripps HA	3,320	119	16,707	594	2,811	21
Tecolote HA	4,329	234	21,349	1,171	3,657	39
Mission San Diego HSA/Santee HSA	4,928	1,506	28,988	7,529	4,106	248
Chollas HSA	5,068	398	25,080	1,991	4,283	66

1.2.TMDL Allocation

Unlike wet weather loading, which is caused by rain events, dry weather analysis showed that 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 and transport bacteria the the municipal MS4s into receiving waters. These types of nuisance flows are referred to as urban runoff. Urban runoff is non-storm water runoff.

Because urban runoff is overwhelmingly the main source of bacteria loading during dry weather, the TMDLs calculated from the mass balance model were allocated solely to Municipal MS4s. Allocations for nonpoint sources were unnecessary since land uses associated with these sources generally do not generate runoff to receiving water during dry weather conditions. Additionally, dry weather loads from Caltrans highways were assumed to be insignificant because during dry periods there is no significant urban runoff from Caltrans owned roadway surfaces. Because nonpoint sources and Caltrans are not expected to generate runoff during dry weather conditions, the dry weather TMDLs were distributed as follows:

$$TMDL = WLA(Municipal MS4s) + WLA(Caltrans) + LA(Ag / Livestock) + LA(Open\ Space)$$

where *TMDL* = Total Maximum Daily Load for entire watershed

WLA (Municipal MS4s) =	Point source wasteload allocation for owners/operators of Municipal MS4s		
WLA (Caltrans)	= 0	=	No point source wasteload allocation for Caltrans because no runoff expected
LA (Ag/Livestock)	= 0	=	No nonpoint source load allocation for owners/operators of agriculture, livestock, and horse ranch facilities/land uses because no runoff expected
LA (Open Space)	= 0	=	No nonpoint source load allocation for uncontrollable sources of bacteria for open space, open recreation, and water land uses because no runoff expected

In other words, dry weather discharges from any sources other than Municipal MS4s is not expected or allowed. Therefore, the dry weather TMDL is as follows:

$$TMDL = WLA(Municipal MS4s)$$

In other words, dry weather discharges from any sources other than Municipal MS4s is prohibited. Dry weather TMDLs are expressed on a monthly basis (MPN/month) because the numeric targets are equal to the 30-day geometric mean WQOs, and the dry weather model simulates average flows.

An example showing the total coliform TMDL allocation is shown using the Aliso Creek watershed as an example. For the Aliso Creek watershed, the existing total coliform load estimated by the model was approximately 26,639 billion MPN/month. The percent reduction required and the allocations are shown for the final period in Tables I-110.

Table I-110. Dry Weather Final WLAs and LAs (Billion MPN/Month) for Total Coliform in the Aliso Creek Watershed

Watershed	TMDL	Point Sources				Nonpoint Sources			
		MS4		Caltrans		Ag/Livestock		Open Space	
		WLA	Reduction Required	WLA	Reduction Required	LA	Reduction Required	LA	Reduction Required
Aliso HSA	1,208	1,208	95.9%	0	0.00%	0	0.00%	0	0.00%

Watershed	TMDL	WLA (Municipal MS4s)	% Reduction	WLA (Caltrans)	LA (Ag/Livestock)	LA (Open Space)
Aliso Creek	1,208	1,208	95.9	0	0	0

Similar information for the remaining watersheds is reported in Tables 9-34a, 9-4b7 and 9-4c10 in section 9 of the Technical Report.

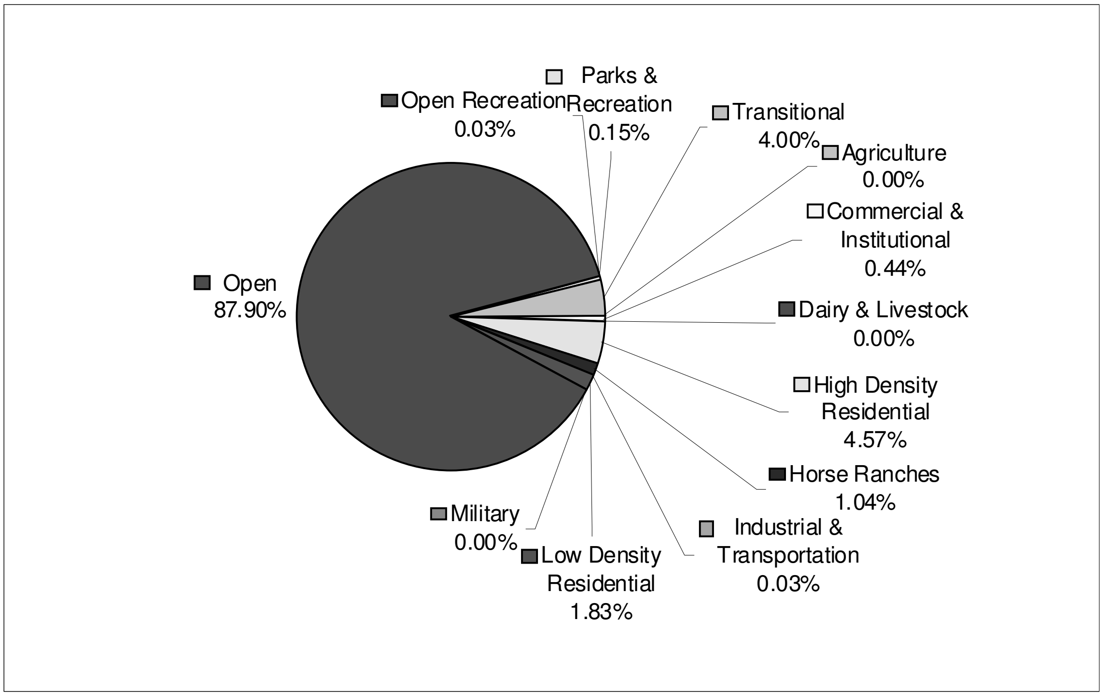


Figure I-5. Percent of Fecal Coliform Load Generated by Different Land Uses in the San Joaquin Hills HSA/Laguna Beach HSA Watershed

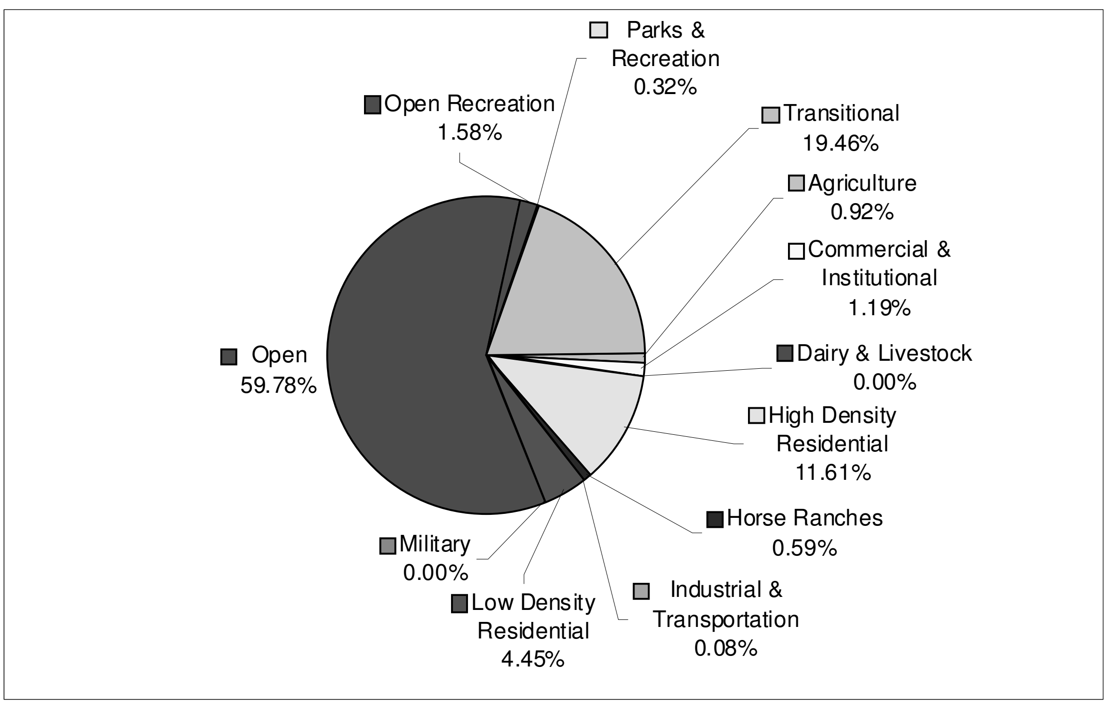


Figure I-6. Percent of Fecal Coliform Load Generated by Different Land Uses in the Aliso HSA Watershed

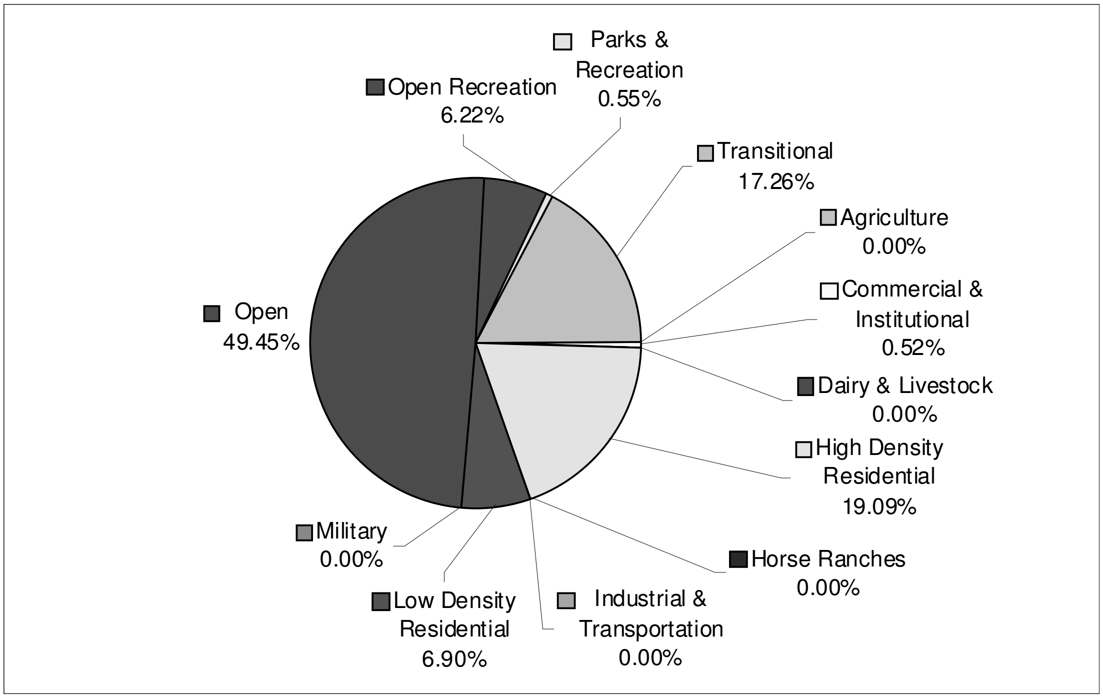


Figure I-7. Percent of Fecal Coliform Load Generated by Different Land Uses in the Dana Point HSA Watershed

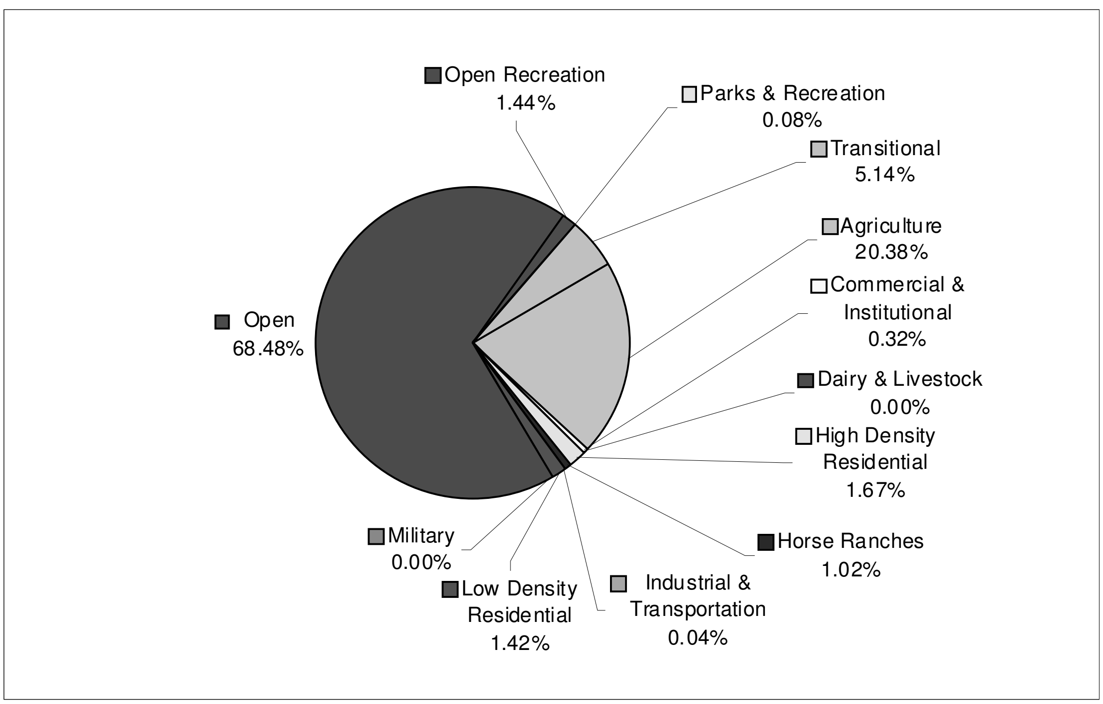


Figure I-8. Percent of Fecal Coliform Load Generated by Different Land Uses in the Lower San Juan HSA Watershed

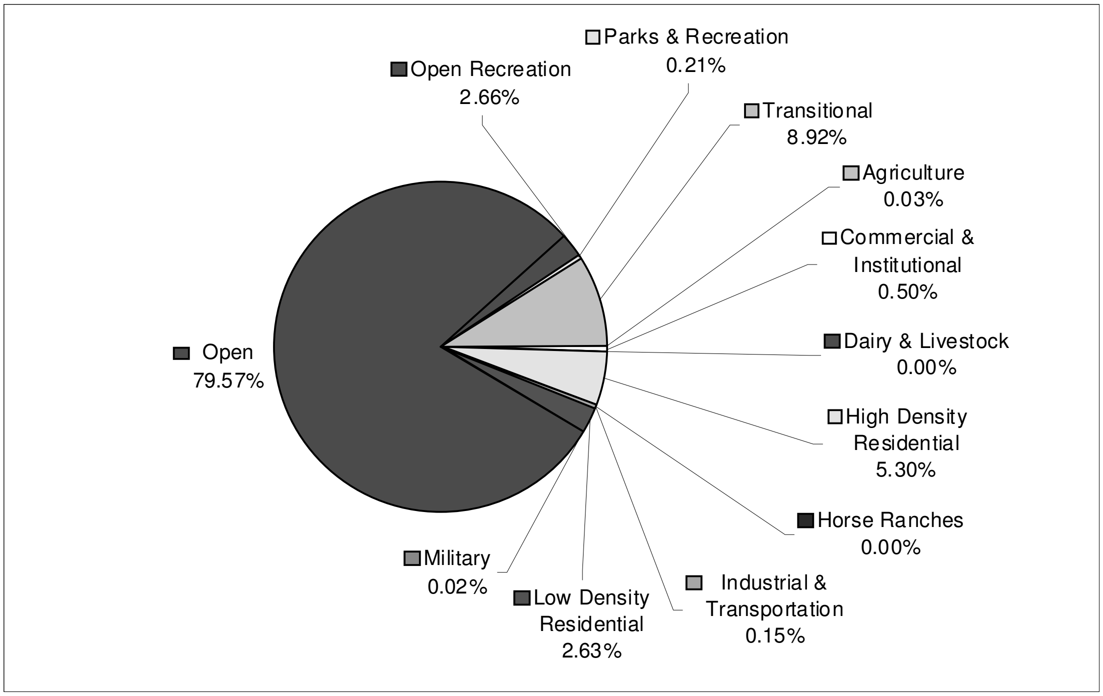


Figure I-9. Percent of Fecal Coliform Load Generated by Different Land Uses in the San Clemente HA Watershed

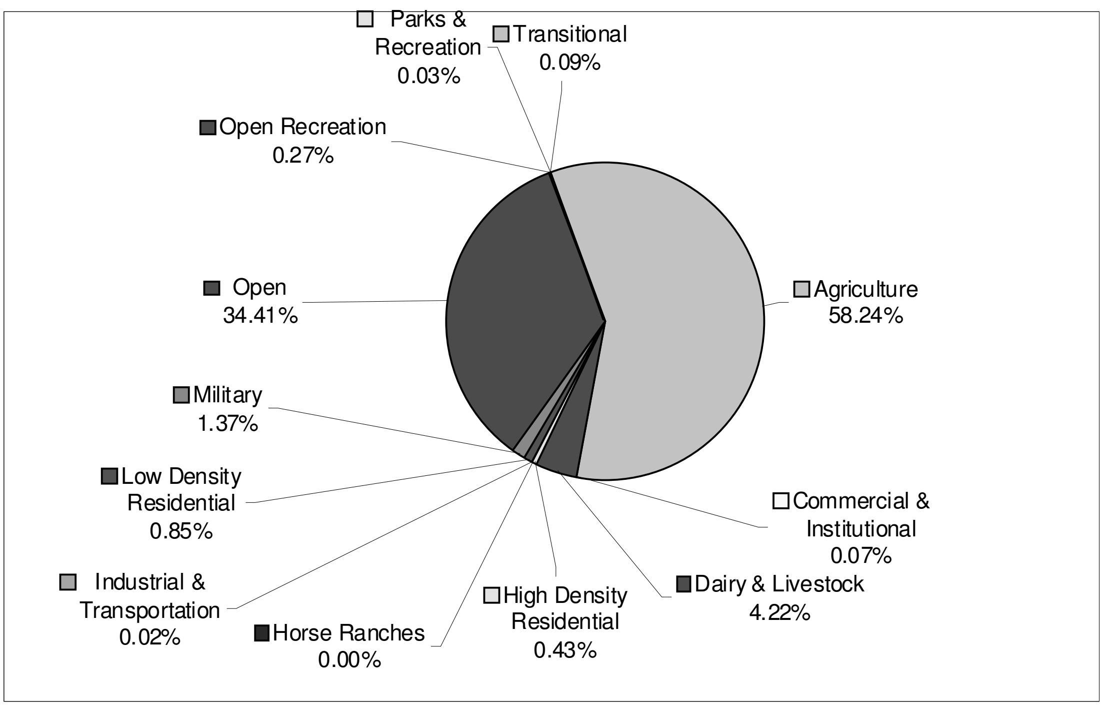


Figure I-10. Percent of Fecal Coliform Load Generated by Different Land Uses in the San Luis Rey HU Watershed

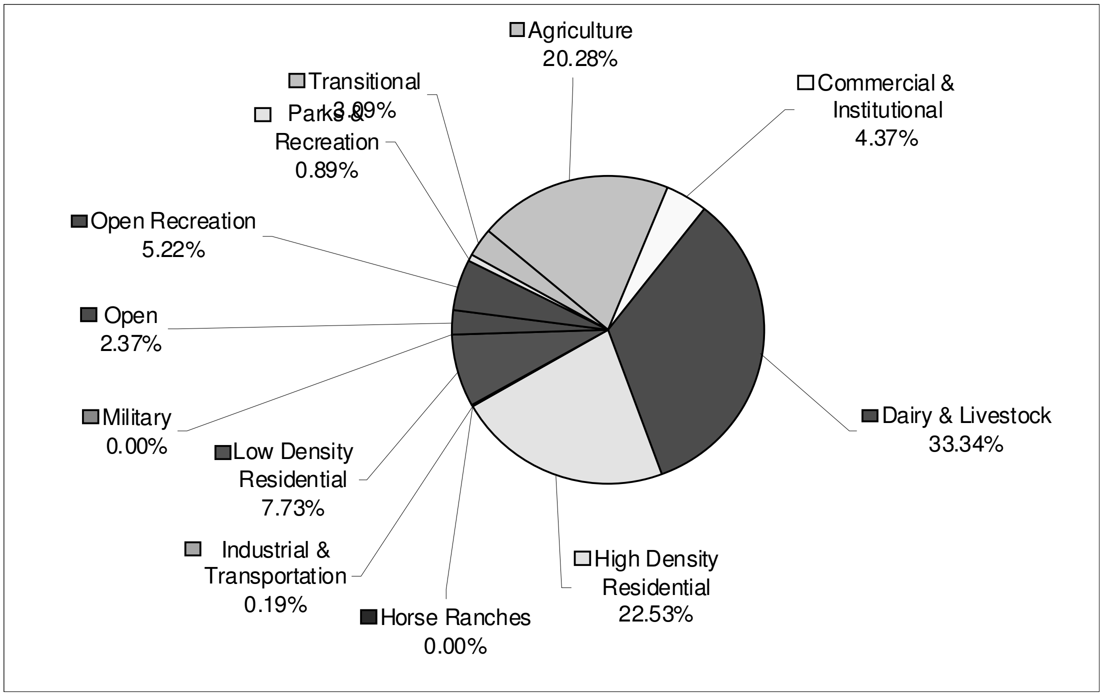


Figure I-11. Percent of Fecal Coliform Load Generated by Different Land Uses in the San Marcos HA Watershed

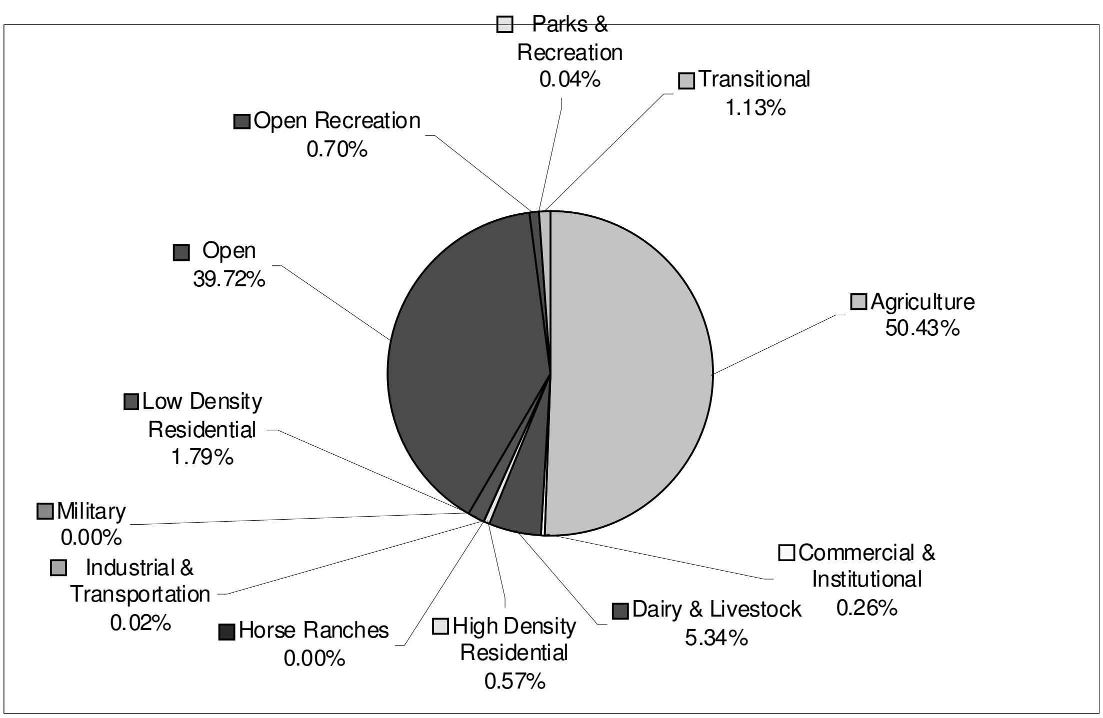


Figure I-12. Percent of Fecal Coliform Load Generated by Different Land Uses in the San Dieguito HU Watershed

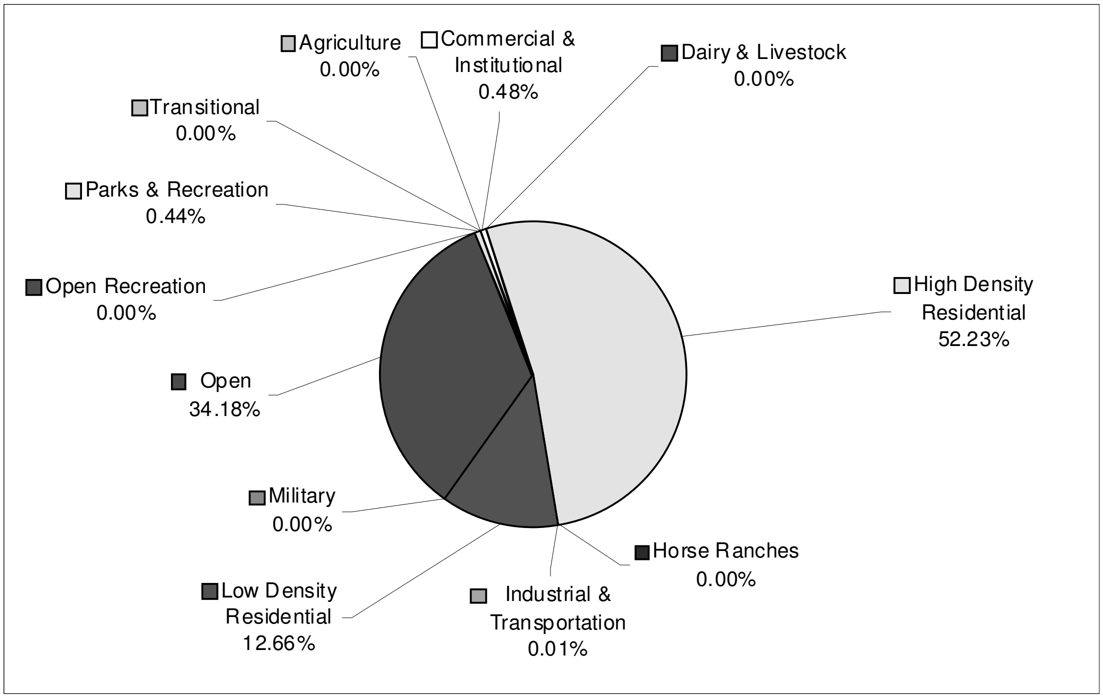


Figure I-13. Percent of Fecal Coliform Load Generated by Different Land Uses in the Miramar Reservoir HA Watershed

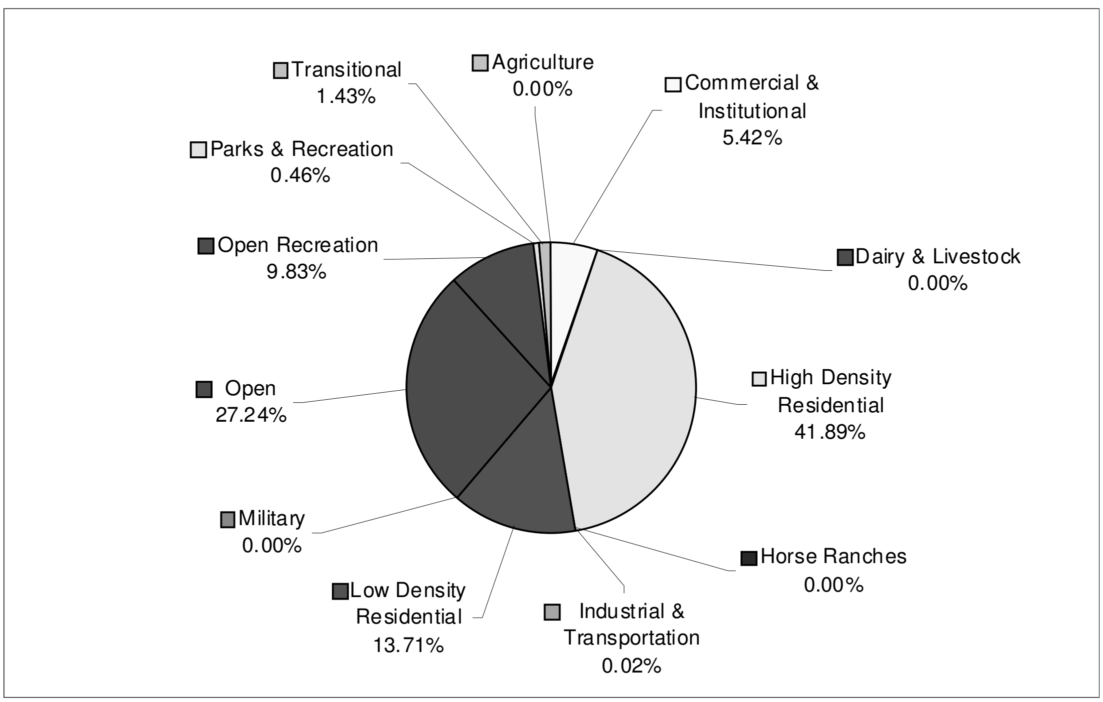


Figure I-14. Percent of Fecal Coliform Load Generated by Different Land Uses in the Scripps HA Watershed

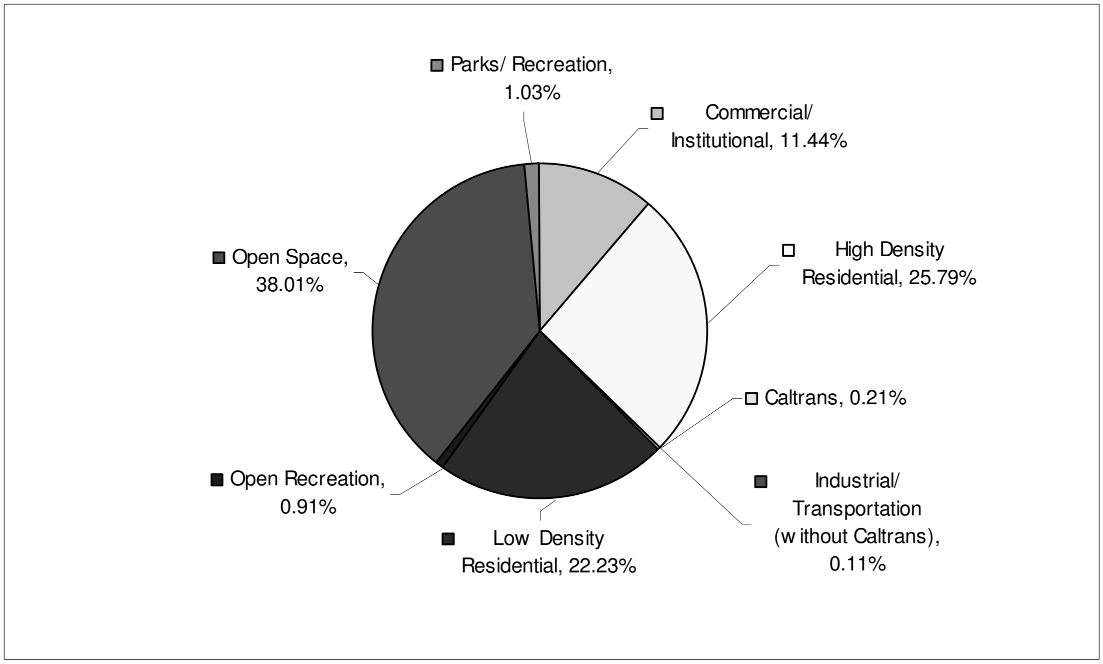


Figure I-15. Percent of Fecal Coliform Load Generated by Different Land Uses in the Tecolote HA Watershed

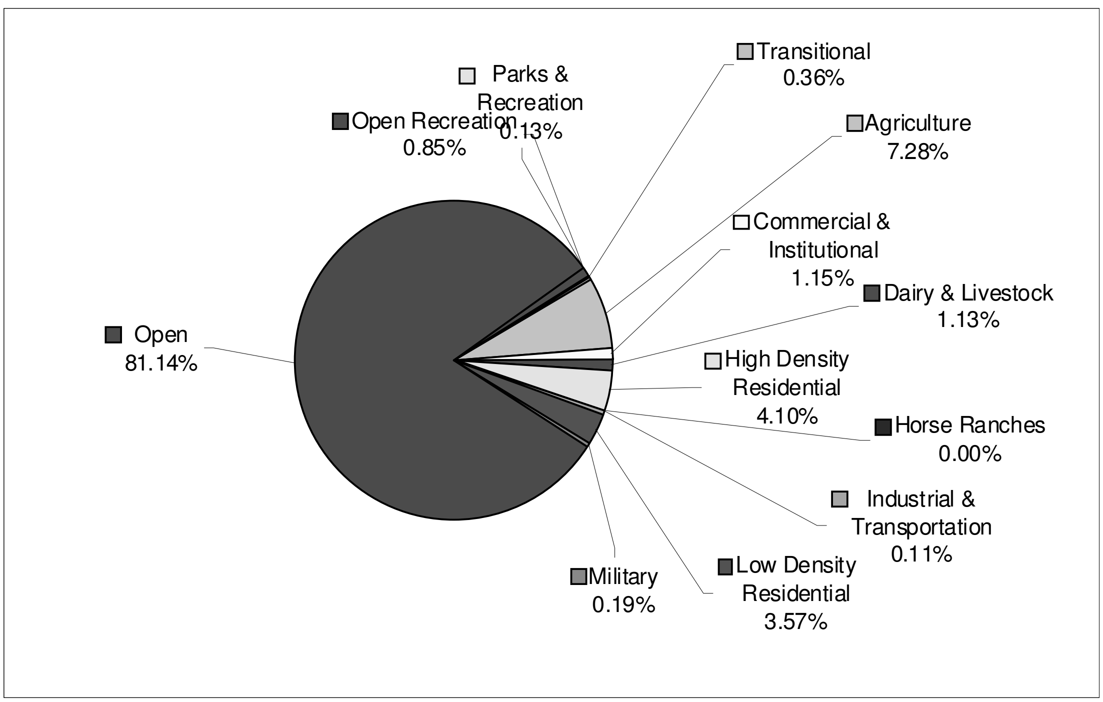


Figure I-16~~5~~. Percent of Fecal Coliform Load Generated by Different Land Uses in the Mission San Diego HSA/Santee HSA ~~River~~ Watershed

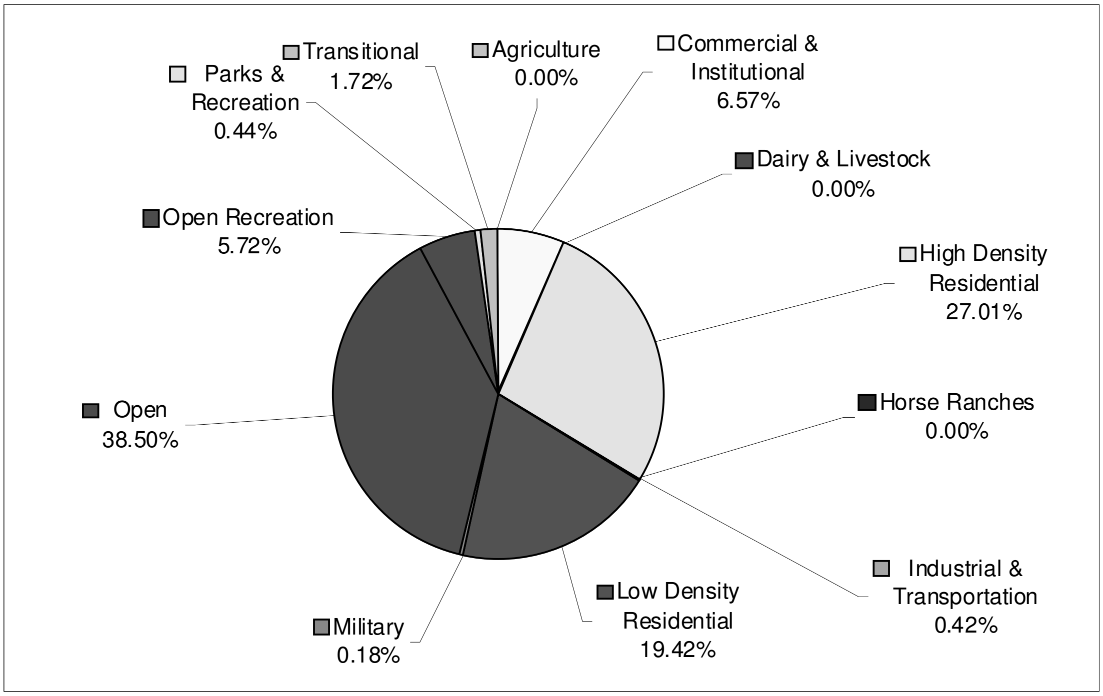


Figure I-17~~6~~. Percent of Fecal Coliform Load Generated by Different Land Uses in the Chollas HSA Watershed

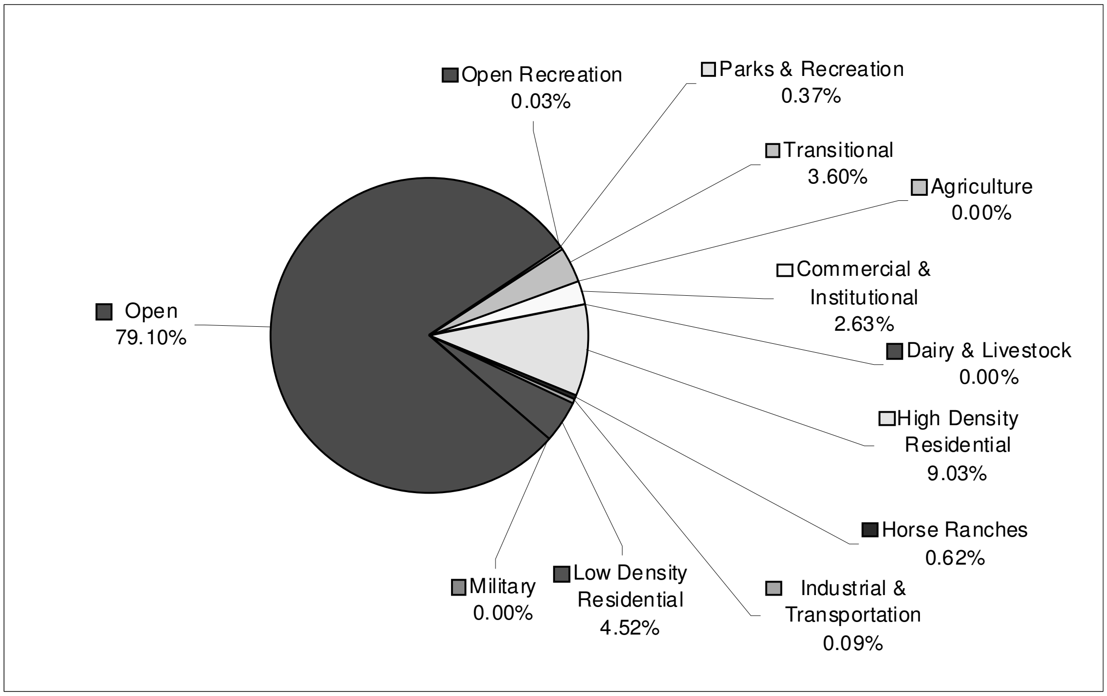


Figure I-18~~7~~. Percent of Total Coliform Load Generated by Different Land Uses in the San Joaquin Hills HSA/Laguna Beach HSA Watershed

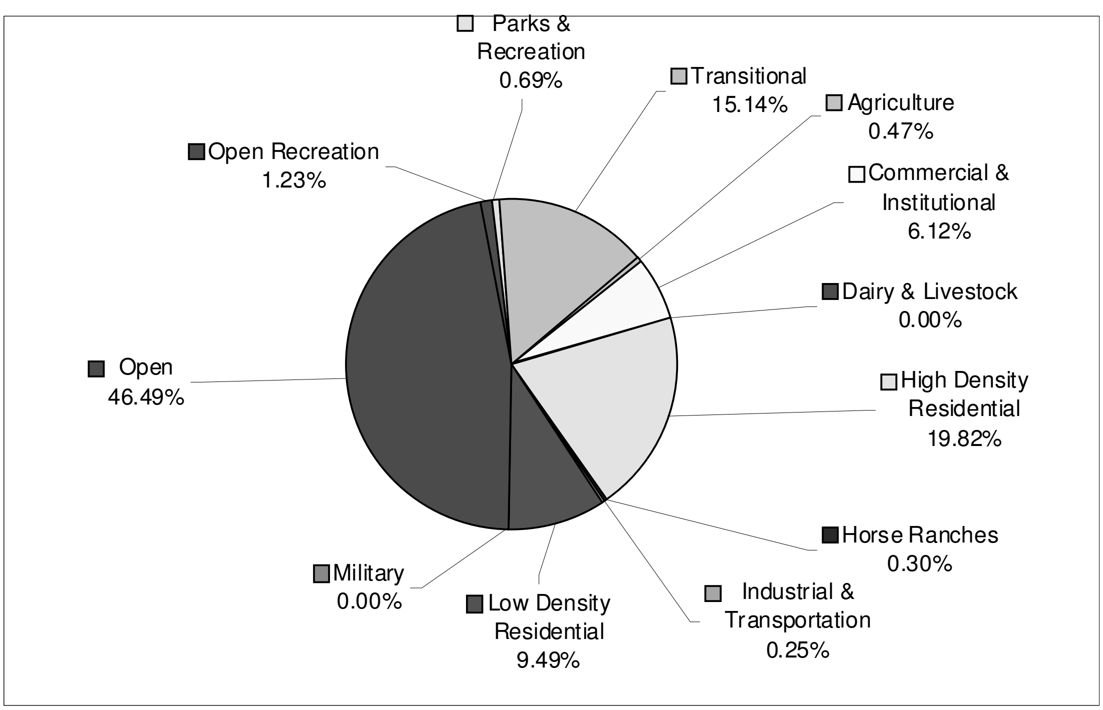


Figure I-19~~8~~. Percent of Total Coliform Load Generated by Different Land Uses in the Aliso HSA Watershed

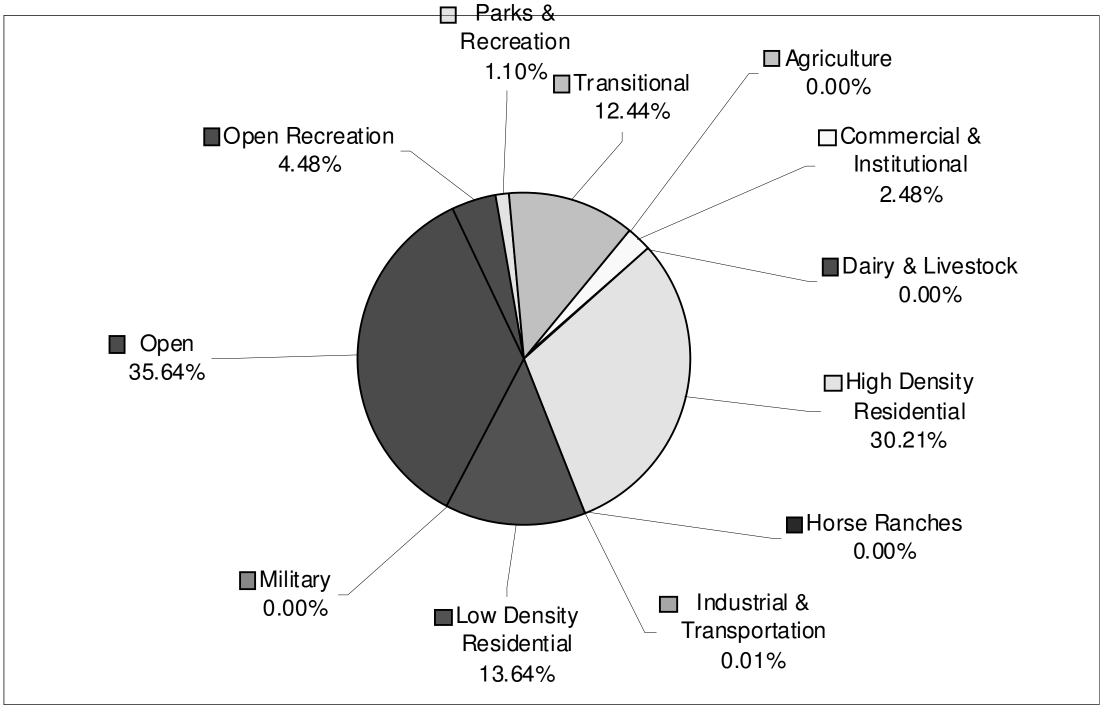


Figure I-20~~19~~. Percent of Total Coliform Load Generated by Different Land Uses in the Dana Point HSA Watershed

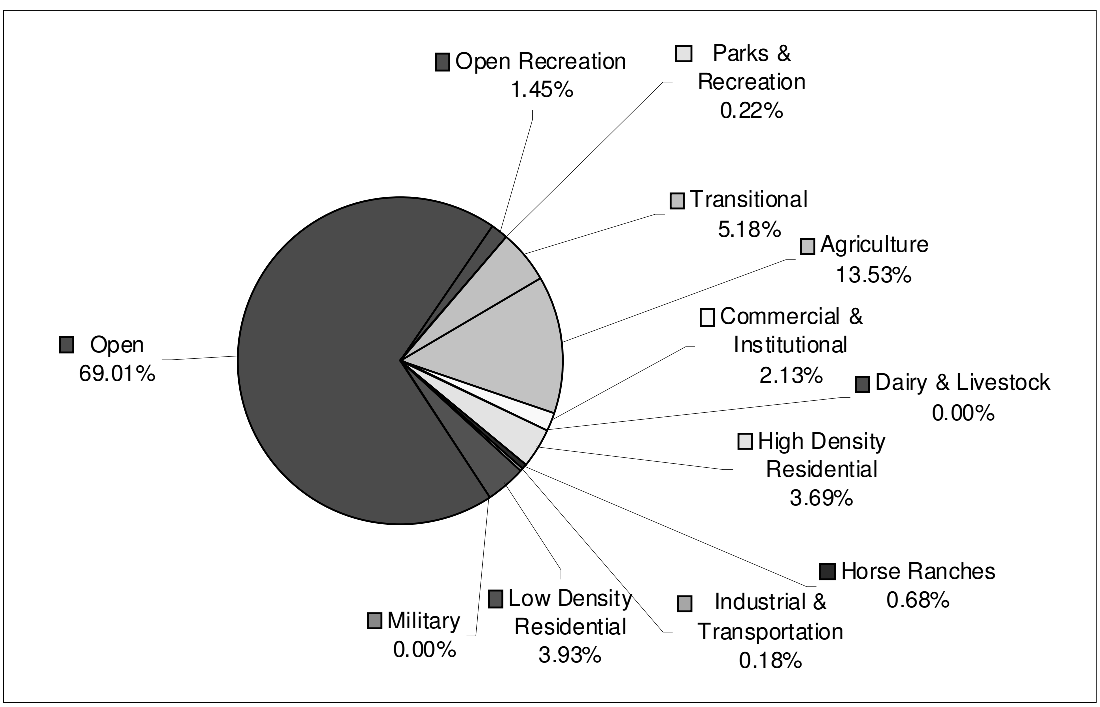


Figure I-21~~0~~. Percent of Total Coliform Load Generated by Different Land Uses in the Lower San Juan HSA Watershed

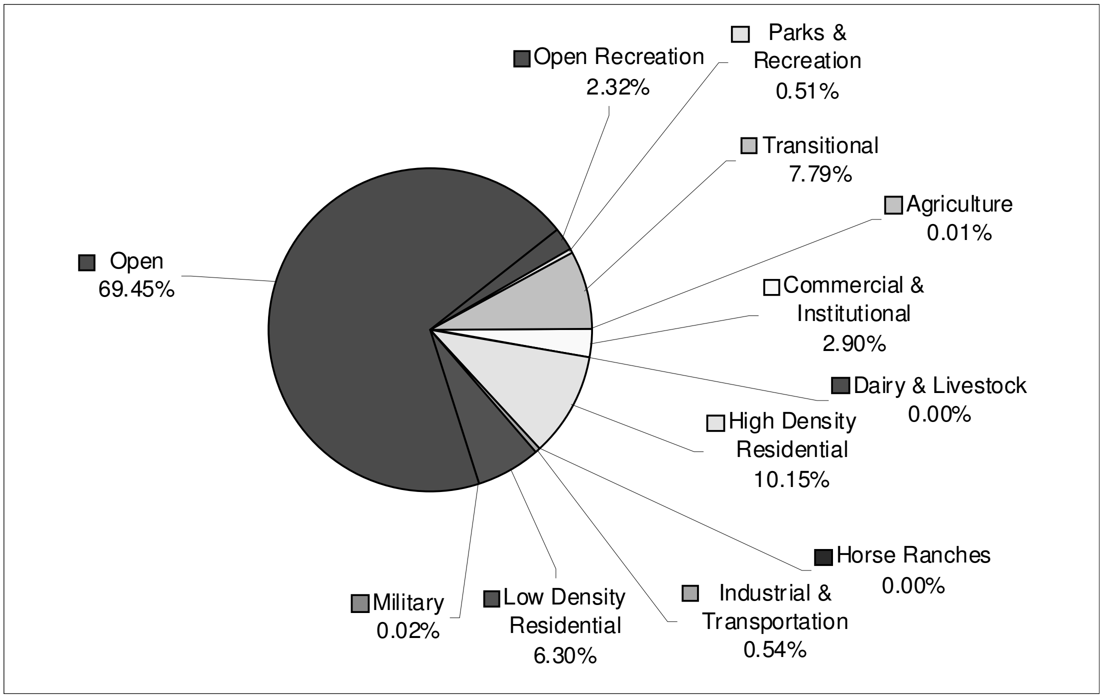


Figure I-22~~1~~. Percent of Total Coliform Load Generated by Different Land Uses in the San Clemente HA Watershed

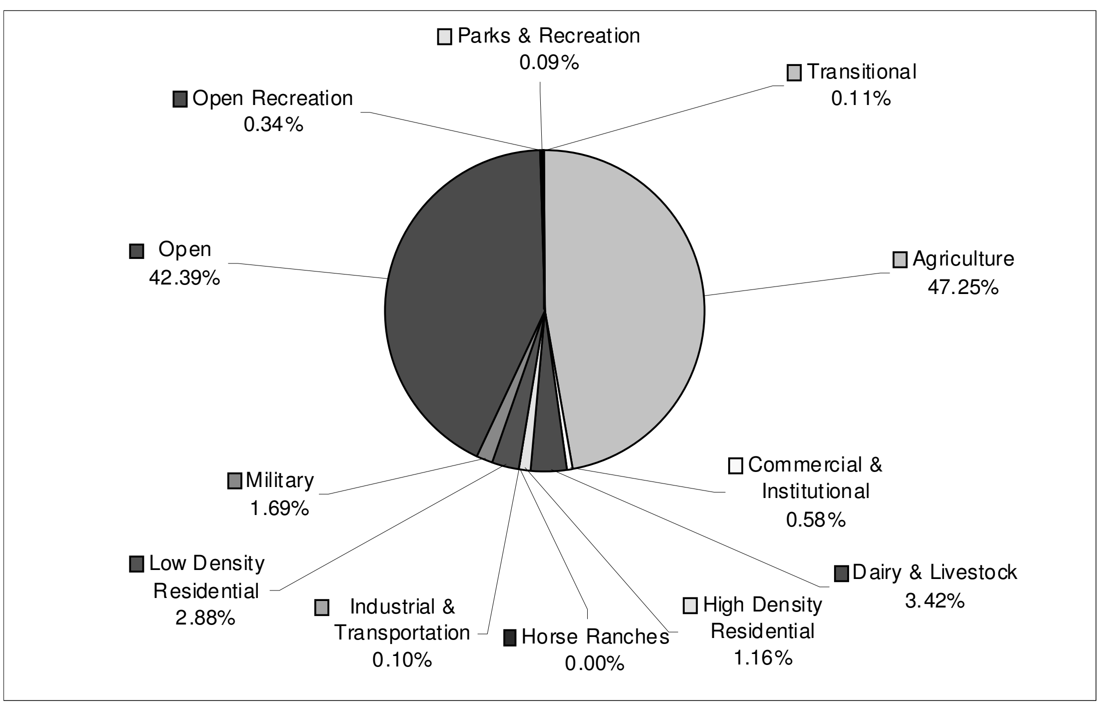


Figure I-23~~2~~. Percent of Total Coliform Load Generated by Different Land Uses in the San Luis Rey HU Watershed

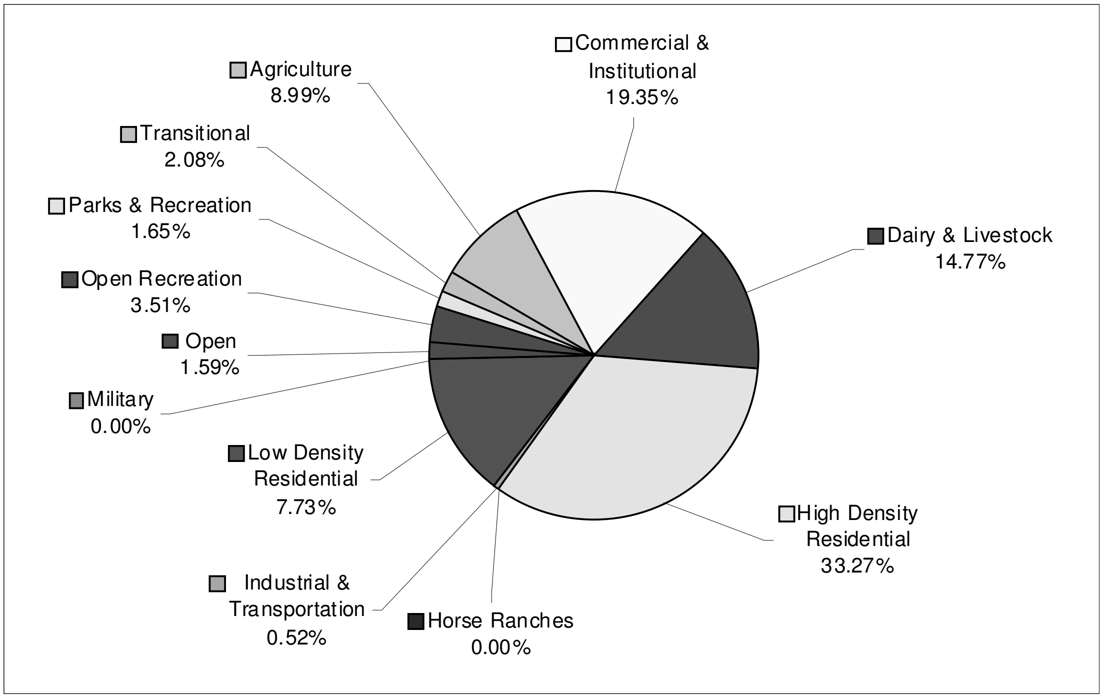


Figure I-24~~3~~. Percent of Total Coliform Load Generated by Different Land Uses in the San Marcos HA Watershed

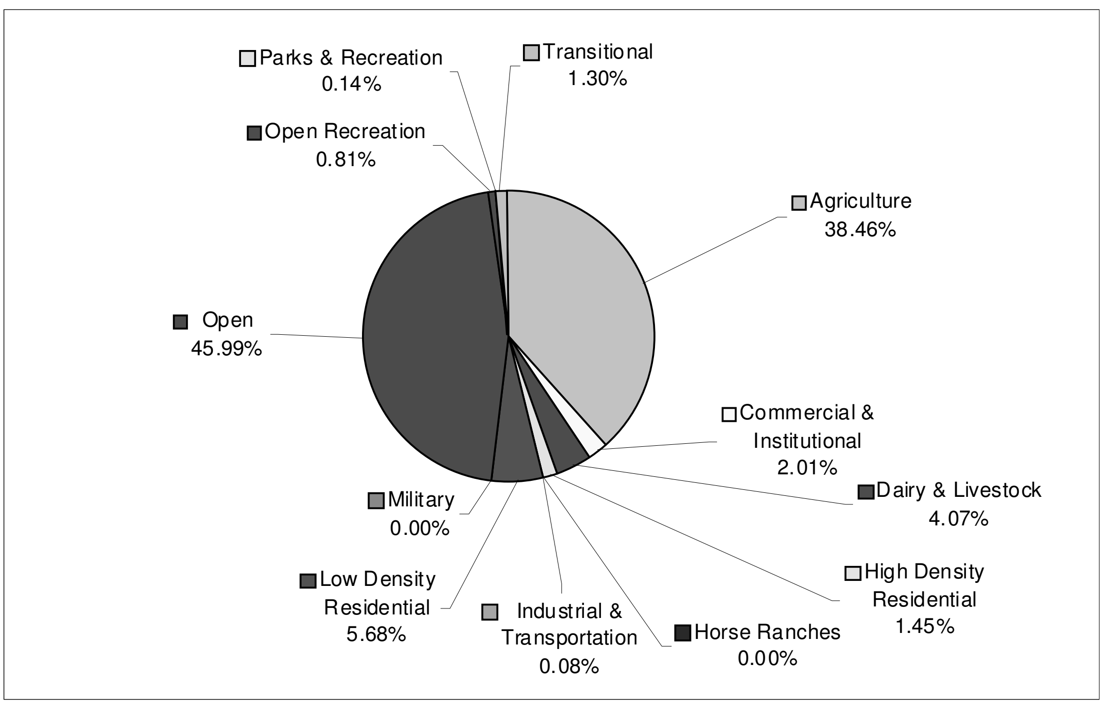


Figure I-25~~4~~. Percent of Total Coliform Load Generated by Different Land Uses in the San Dieguito HU Watershed

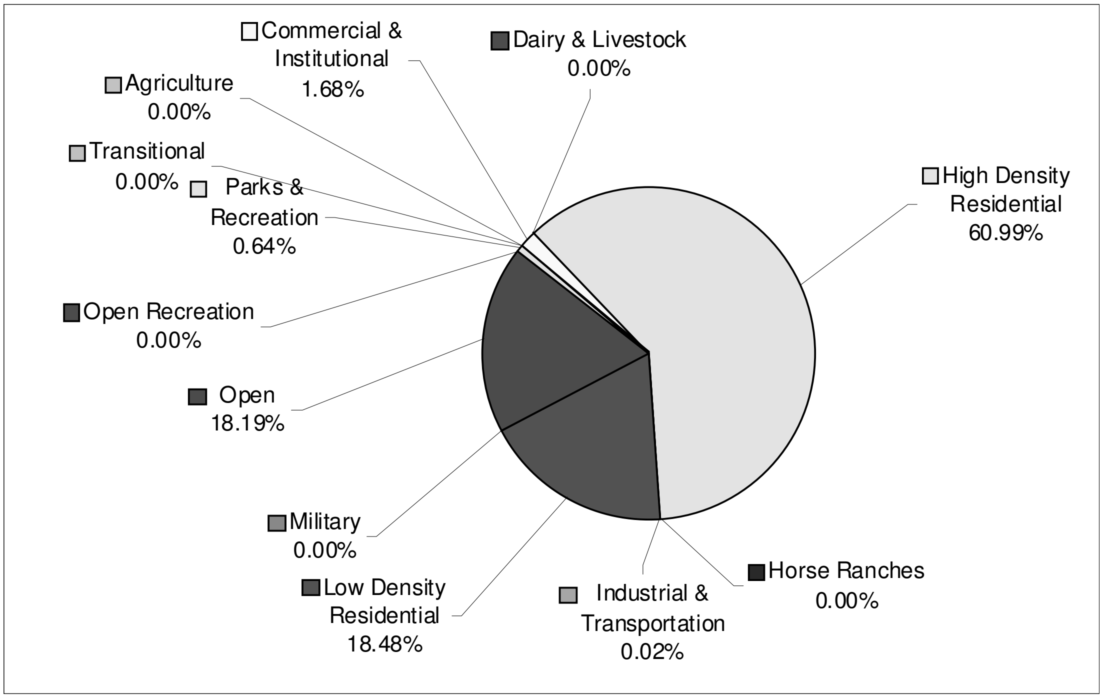


Figure I-26~~5~~. Percent of Total Coliform Load Generated by Different Land Uses in the Miramar Reservoir HA Watershed

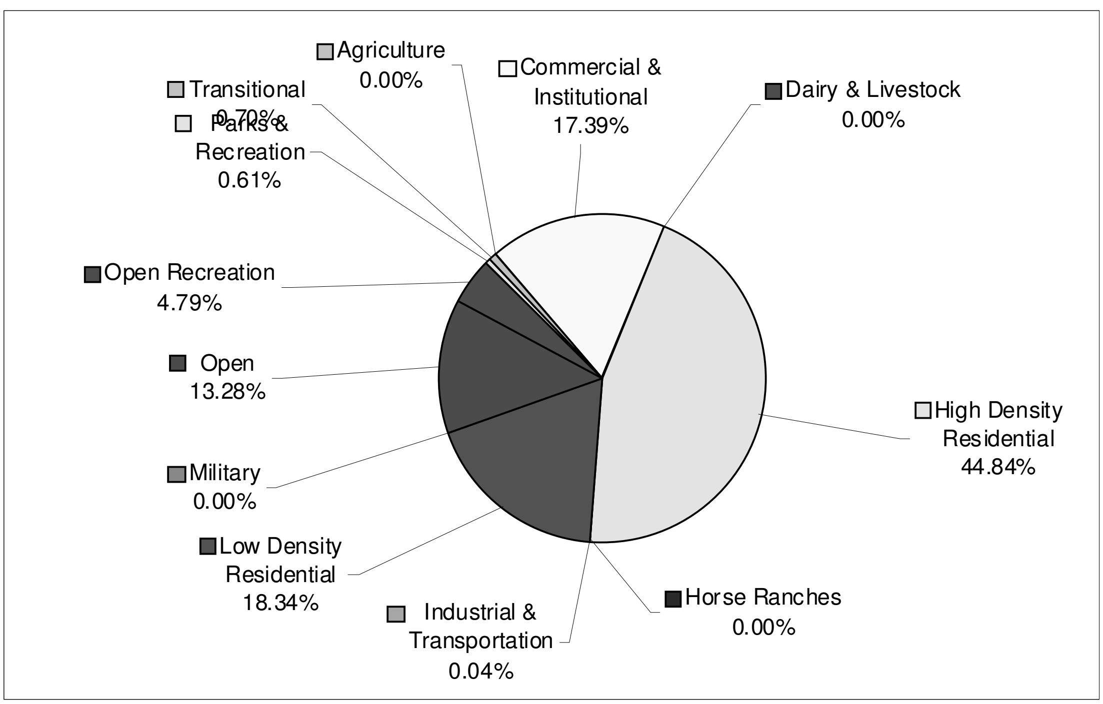


Figure I-27~~6~~. Percent of Total Coliform Load Generated by Different Land Uses in the Scripps HA Watershed

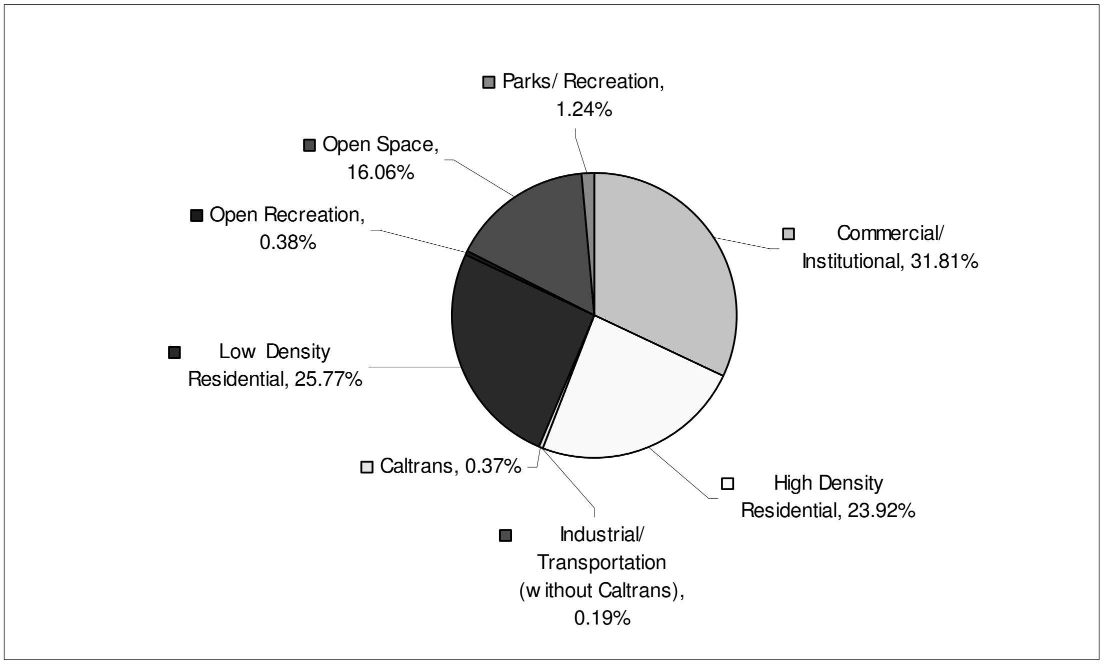


Figure I-28. Percent of Total Coliform Load Generated by Different Land Uses in the Tecolote HA Watershed

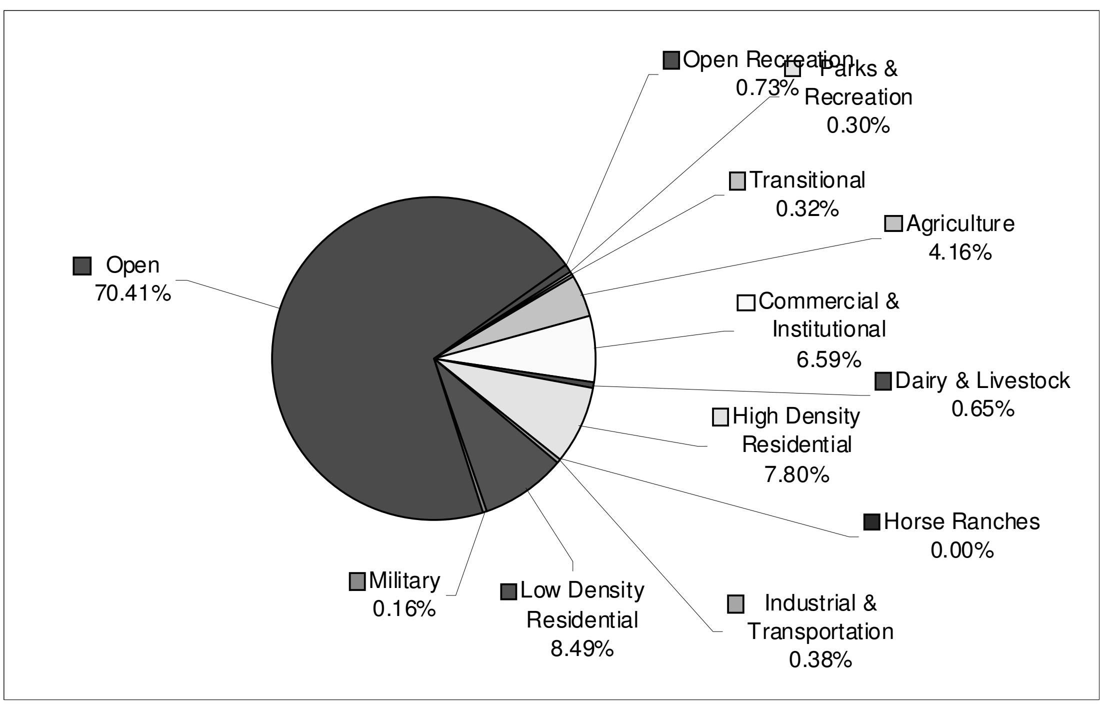


Figure I-29~~7~~. Percent of Total Coliform Load Generated by Different Land Uses in the Mission San Diego HSA/ Santee HSA ~~River~~ Watershed

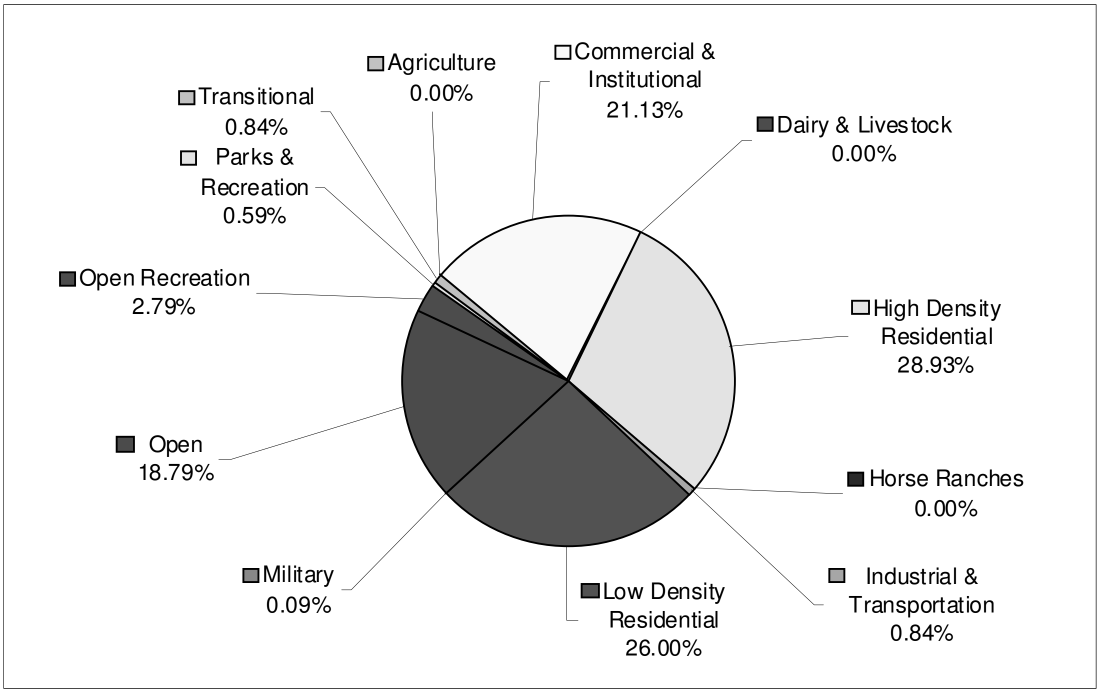


Figure I-3028. Percent of Total Coliform Load Generated by Different Land Uses in the Chollas HSA Watershed

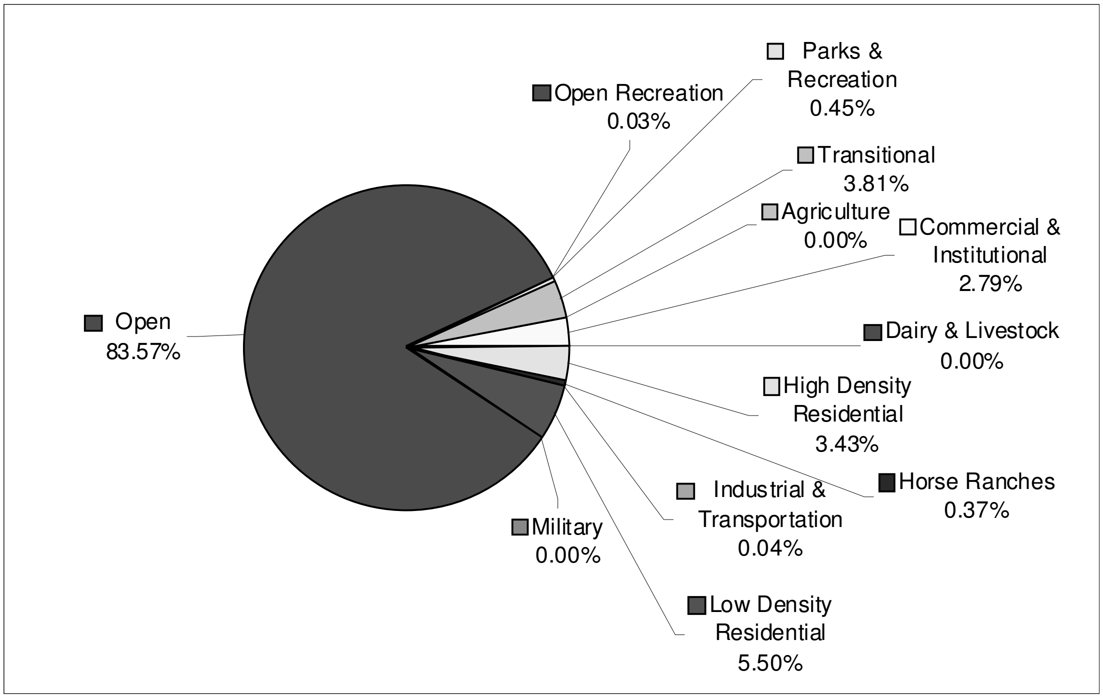


Figure I-31~~29~~. Percent of Enterococci Load Generated by Different Land Uses in the San Joaquin Hills HSA/Laguna Beach HSA Watershed

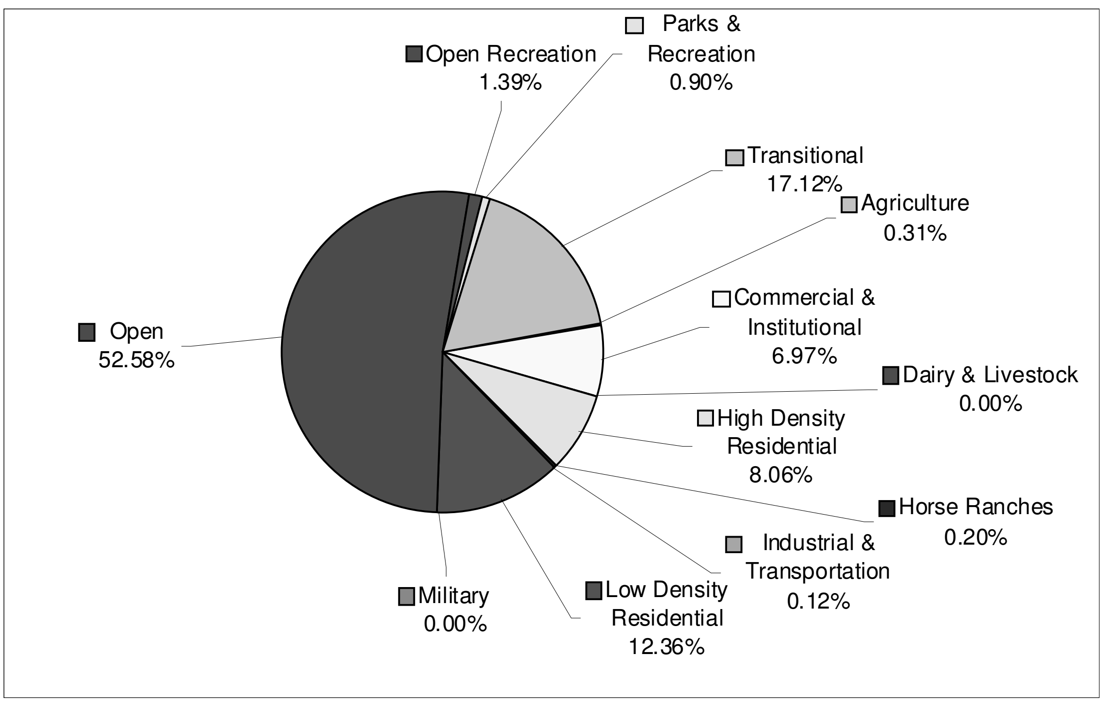


Figure I-32~~0~~. Percent of Enterococci Load Generated by Different Land Uses in the Aliso HSA Watershed

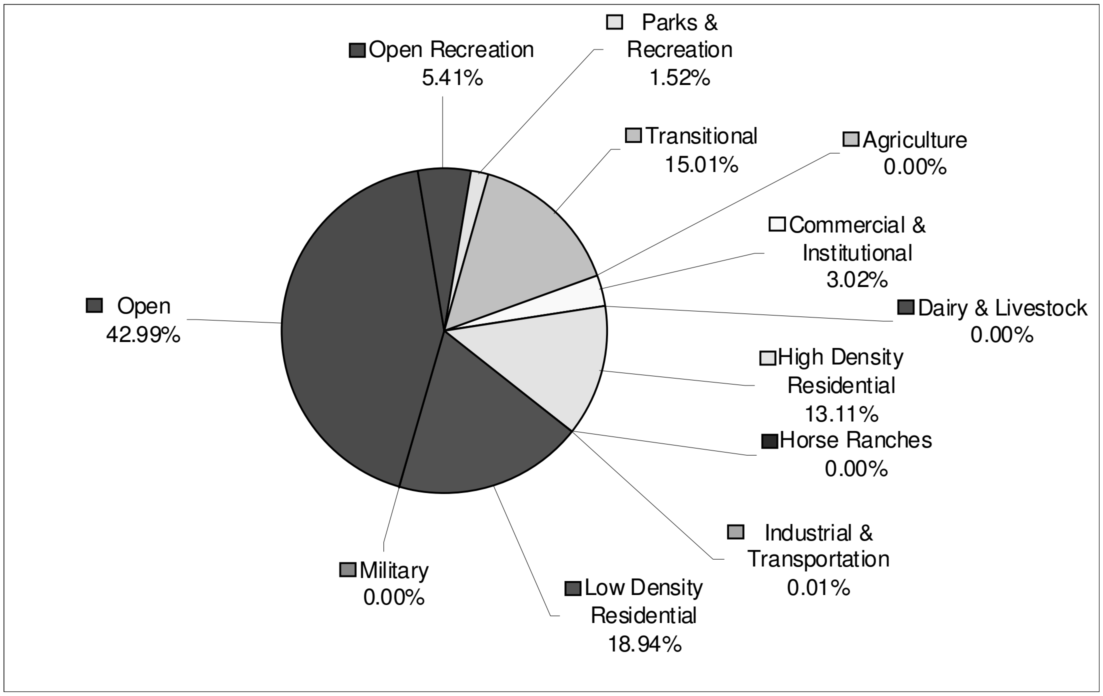


Figure I-33~~1~~. Percent of Enterococci Load Generated by Different Land Uses in the Dana Point HSA Watershed

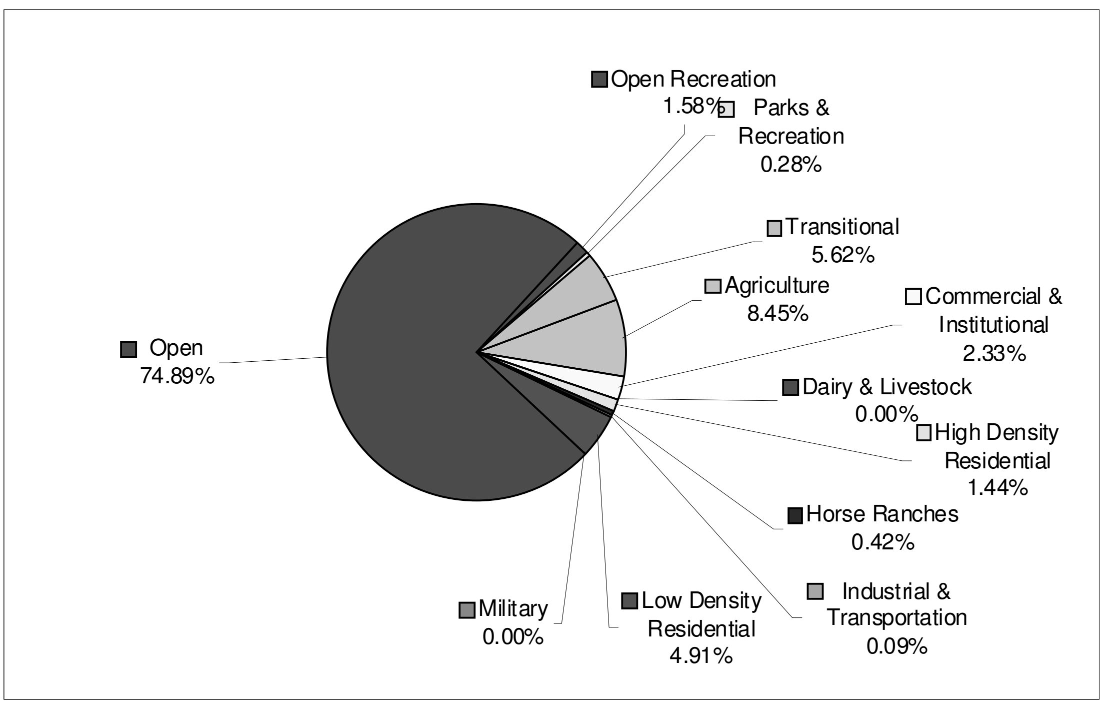


Figure I-34~~2~~. Percent of Enterococci Load Generated by Different Land Uses in the Lower San Juan HSA Watershed

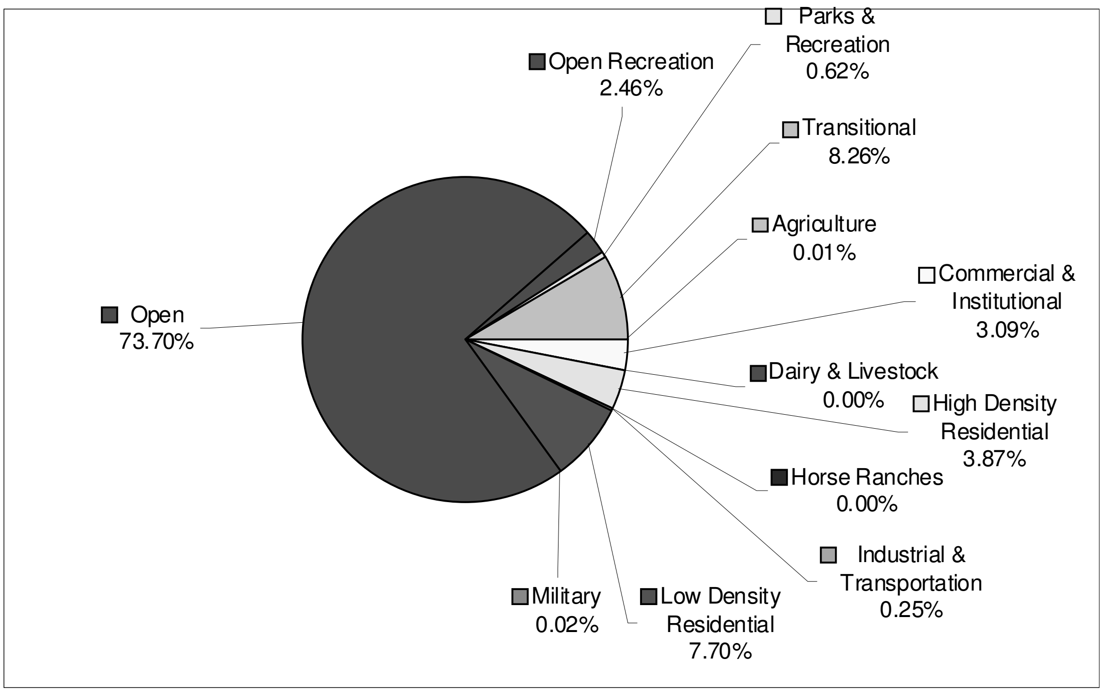


Figure I-35~~3~~. Percent of Enterococci Load Generated by Different Land Uses in the San Clemente HA Watershed

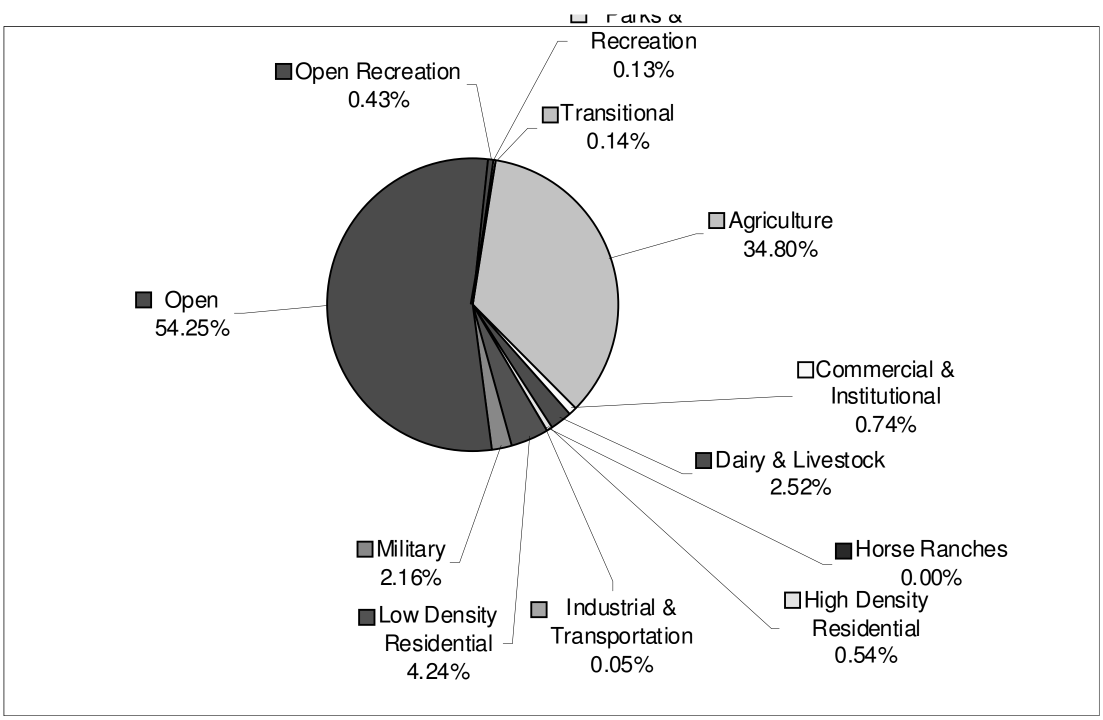


Figure I-36~~4~~. Percent of Enterococci Load Generated by Different Land Uses in the San Luis Rey HU Watershed

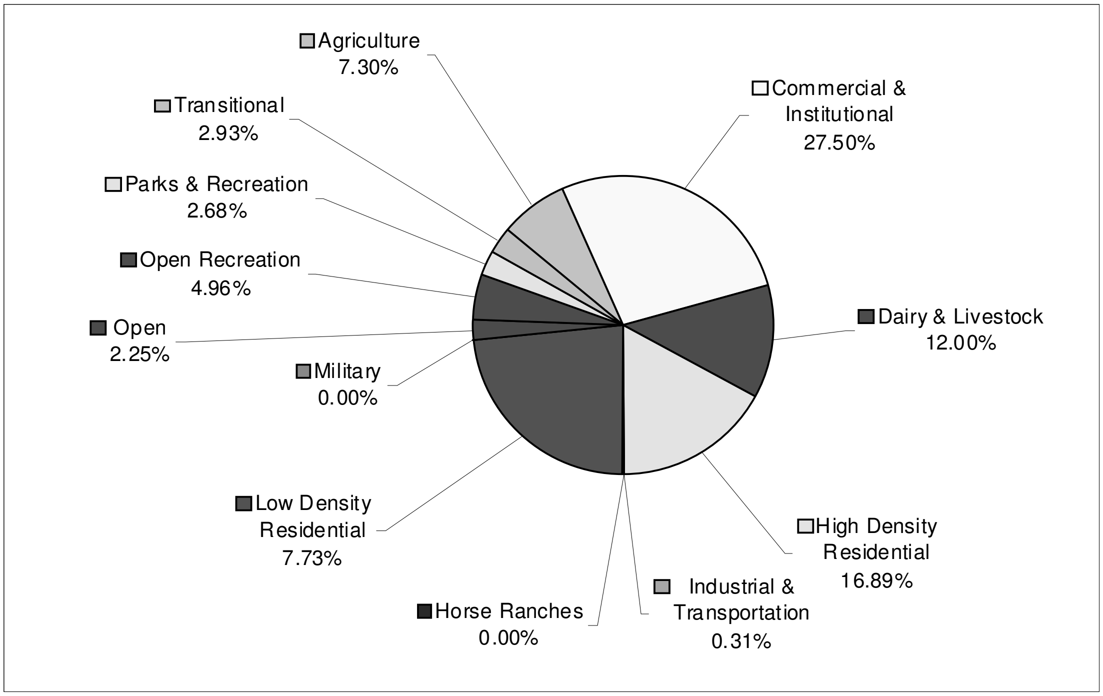


Figure I-37~~5~~. Percent of Enterococci Load Generated by Different Land Uses in the San Marcos HA Watershed

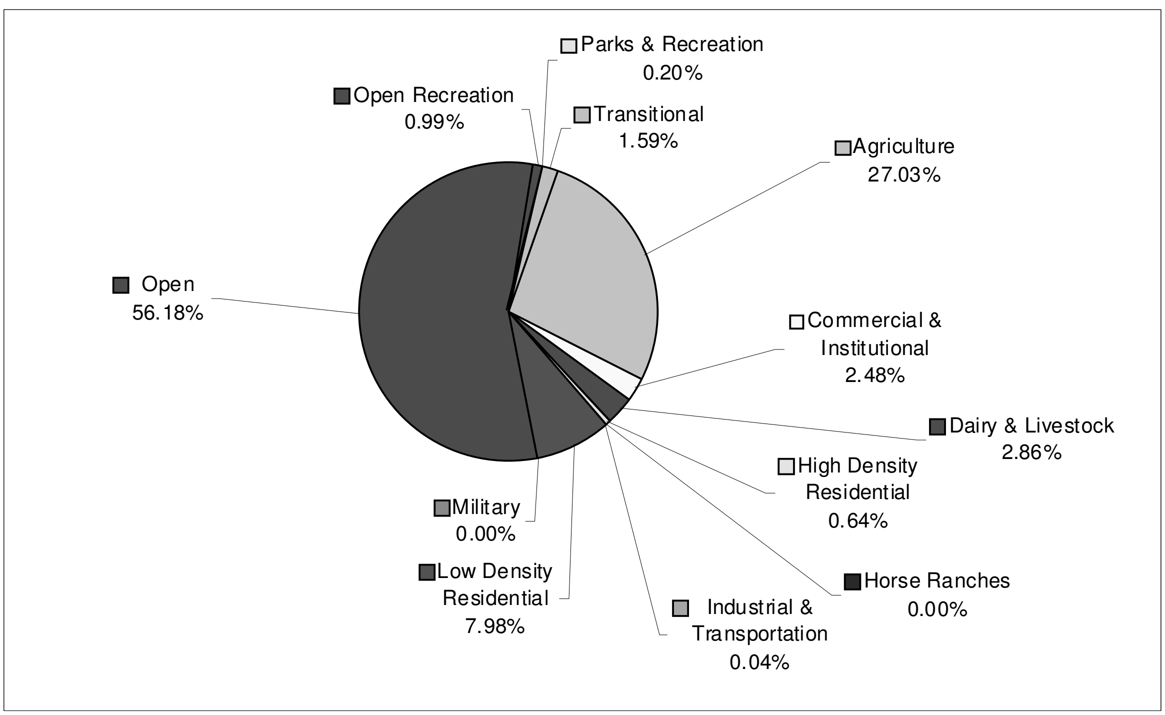


Figure I-38~~6~~. Percent of Enterococci Load Generated by Different Land Uses in the San Dieguito HU Watershed

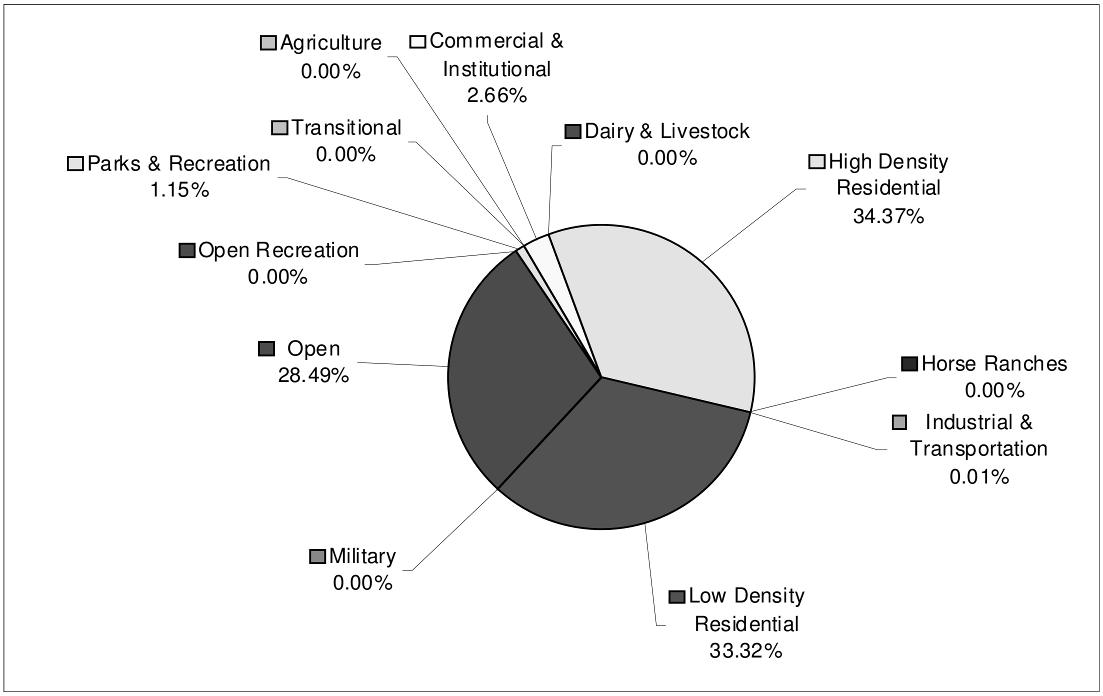


Figure I-39~~7~~. Percent of Enterococci Load Generated by Different Land Uses in the Miramar Reservoir HA Watershed

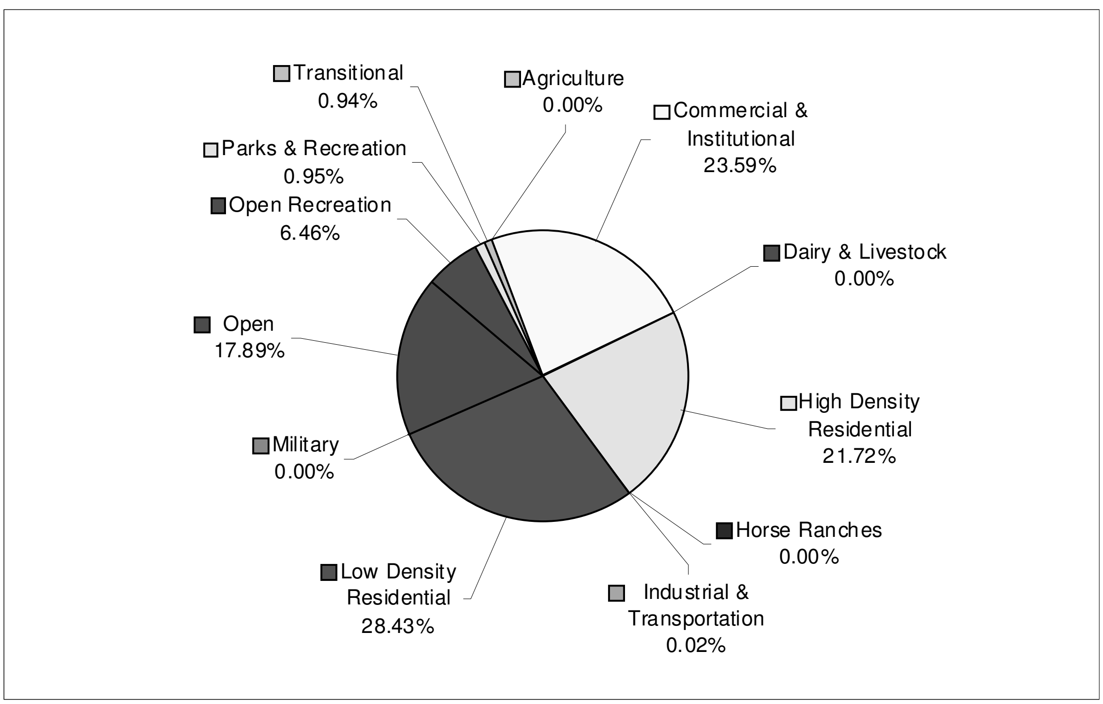


Figure I-40~~38~~. Percent of Enterococci Load Generated by Different Land Uses in the Scripps HA Watershed

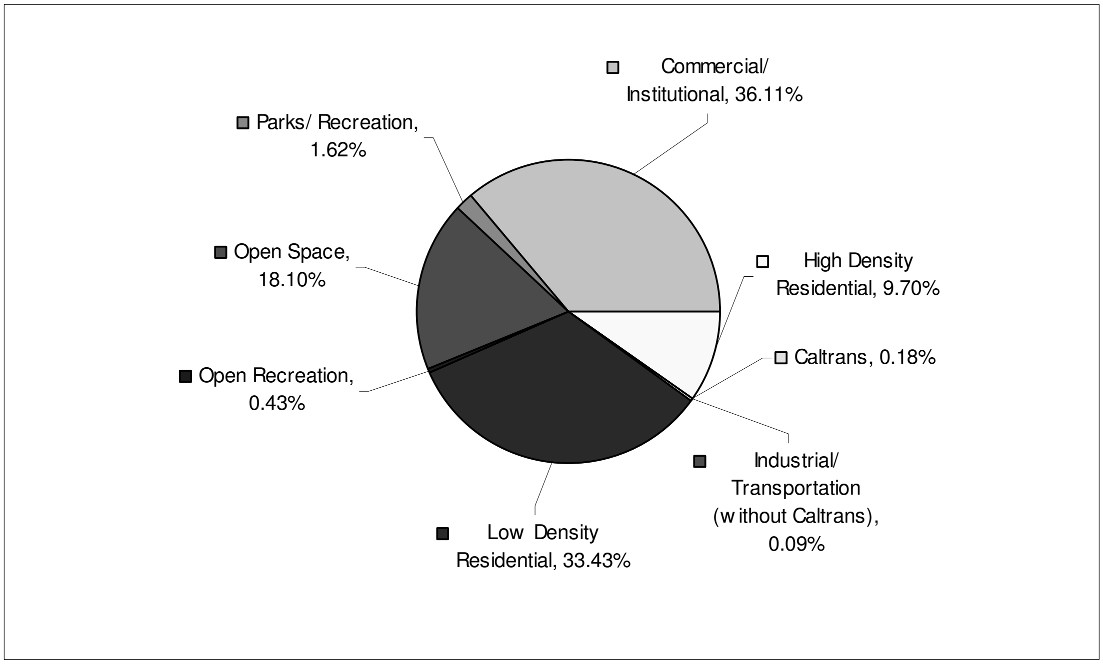


Figure I-41. Percent of Enterococci Load Generated by Different Land Uses in the Tecolote HA Watershed

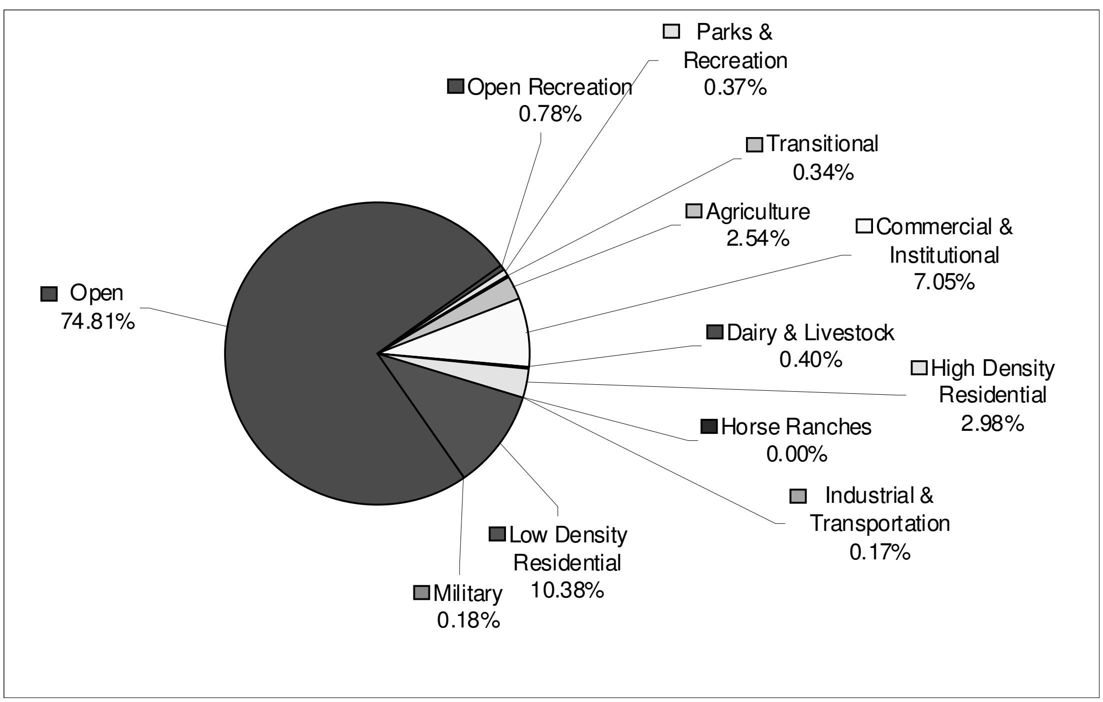


Figure I-4239. Percent of Enterococci Load Generated by Different Land Uses in the Mission San Diego HSA/Santee HSA River Watershed

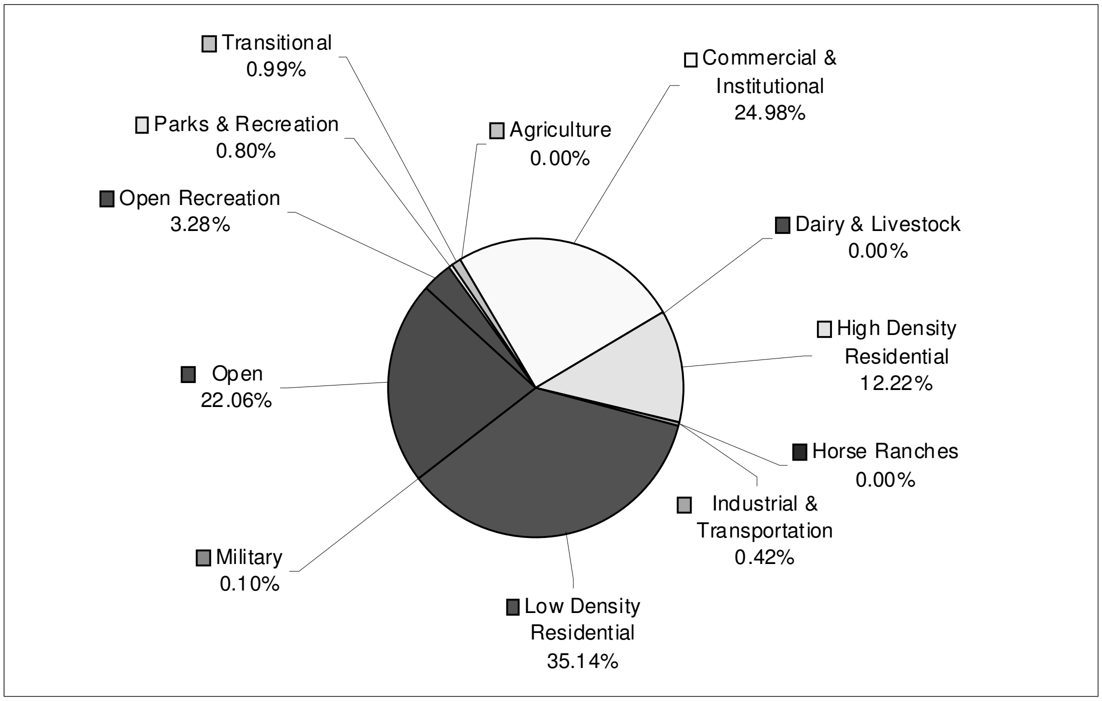


Figure I-43~~0~~. Percent of Enterococci Load Generated by Different Land Uses in the Chollas HSA Watershed

Table I-12. Fecal Coliform Loads (Billion MPN/year) Generated by Different Land Uses

	Municipal MS4								Agriculture/Livestock			Open Space			
Watershed	COMM/ INST	HIDEN RES	LODEN RES	PARK/ REC	MIL	TRANS	IND/ TRANS*	CAL TRANS*	AGRI	DAIRY/ LIVSTK	HORSE RANCH	OPEN SPACE	OPEN REC	WATER	TOTAL
San Joaquin Hills HSA/	3,123	32,219	12,911	1,065	0	28,229	0	179	12	0	7,334	619,697	245	0	705,015
Laguna Beach HSA	0.44%	4.57%	1.83%	0.15%	0.00%	4.00%	0.00%	0.03%	0.00%	0.00%	1.04%	87.90%	0.03%	0.00%	100.00%
Aliso HSA	20,935	203,419	77,956	5,649	0	341,034	1,099	260	16,124	0	10,384	1,047,472	27,765	0	1,752,096
	1.19%	11.61%	4.45%	0.32%	0.00%	19.46%	0.06%	0.01%	0.92%	0.00%	0.59%	59.78%	1.58%	0.00%	100.00%
Dana Point HSA	2,113	77,115	27,864	2,239	0	69,712	0	13	0	0	0	199,729	25,125	0	403,911
	0.52%	19.09%	6.90%	0.55%	0.00%	17.26%	0.00%	0.00%	0.00%	0.00%	0.00%	49.45%	6.22%	0.00%	100.00%
Lower San Juan HSA	49,127	255,357	217,489	12,231	0	787,171	5,093	1,713	3,119,750	0	155,727	10,480,603	220,528	0	15,304,790
	0.32%	1.67%	1.42%	0.08%	0.00%	5.14%	0.03%	0.01%	20.38%	0.00%	1.02%	68.48%	1.44%	0.00%	100.00%
San Clemente HA	7,263	76,380	37,951	3,079	310	128,621	1,840	335	366	0	0	1,147,224	38,354	0	1,441,723
	0.50%	5.30%	2.63%	0.21%	0.02%	8.92%	0.13%	0.02%	0.03%	0.00%	0.00%	79.57%	2.66%	0.00%	100.00%
San Luis Rey HU	23,591	142,670	281,805	8,795	453,236	28,477	4,927	1,537	19,290,677	1,397,277	0	11,396,020	90,999	0	33,120,012
	0.07%	0.43%	0.85%	0.03%	1.37%	0.09%	0.01%	0.00%	58.24%	4.22%	0.00%	34.41%	0.27%	0.00%	100.00%
San Marco HA	912	4,705	1,614	187	0	645	31	8	4,236	6,963	0	495	1,090	0	20,886
	4.37%	22.53%	7.73%	0.89%	0.00%	3.09%	0.15%	0.04%	20.28%	33.34%	0.00%	2.37%	5.22%	0.00%	100.00%
San Dieguito HU	56,175	121,831	380,242	9,559	0	239,782	2,419	1,310	10,735,210	1,137,030	0	8,454,478	148,874	0	21,286,910
	0.26%	0.57%	1.79%	0.04%	0.00%	1.13%	0.01%	0.01%	50.43%	5.34%	0.00%	39.72%	0.70%	0.00%	100.00%
Miramar Reservoir HA	50	5,428	1,315	46	0	0	1	0	0	0	0	3,552	0	0	10,392
	0.48%	52.23%	12.66%	0.44%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	34.18%	0.00%	0.00%	100.00%
Scripps HA	11,051	85,490	27,976	937	0	2,910	40	0	0	0	0	55,589	20,065	0	204,057
	5.42%	41.89%	13.71%	0.46%	0.00%	1.43%	0.02%	0.00%	0.00%	0.00%	0.00%	27.24%	9.83%	0.00%	100.00%
Tecolote HA	29,956	67,571	58,239	3,388	14	0	281	553	0	0	0	99,585	2,378	0	261,966
	11.44%	25.79%	22.23%	1.29%	0.01%	0.00%	0.11%	0.21%	0.00%	0.00%	0.00%	38.01%	0.91%	0.00%	100.00%
Mission San Diego HSA/	56,873	202,038	175,889	6,294	9,373	17,966	4,227	1,009	358,880	55,841	0	4,002,217	41,774	0	4,932,380
Santee HSA	1.15%	4.10%	3.57%	0.13%	0.19%	0.36%	0.09%	0.02%	7.28%	1.13%	0.00%	81.14%	0.85%	0.00%	100.00%
Chollas HSA	39,703	163,125	117,275	2,683	1,084	10,404	1,627	892	0	0	0	232,504	34,566	0	603,863
	6.57%	27.01%	19.42%	0.44%	0.18%	1.72%	0.27%	0.15%	0.00%	0.00%	0.00%	38.50%	5.72%	0.00%	100.00%

* See Table I-15 for how fecal coliform bacteria loads from Caltrans land use areas are separated from Industrial/Transportation land use areas

Watershed	Low Density Residential	High Density Residential	Commercial/ Institutional	Industrial/ Transport	Military	Parks/Rec	Transitional	Dairy/ Intensive Livestock	Agriculture	Horse Ranches	Open Rec	Open Space	Water	Total Existing Load
Laguna/San	12,902	32,219	3,102	212	0	1,058	28,201	0	0	7,332	212	619,708	0	705,015
Joaquin	1.83%	4.57%	0.44%	0.03%	0.00%	0.15%	4.00%	0.00%	0.00%	1.04%	0.03%	87.90%	0.00%	100%
Aliso Creek	77,968	203,418	20,850	1,402	0	5,607	340,958	0	16,119	10,337	27,683	1,047,402	0	1,752,095
-	4.45%	11.61%	1.19%	0.08%	0.00%	0.32%	19.46%	0.00%	0.92%	0.59%	1.58%	59.78%	0.00%	100%
Dana Point	27,870	77,107	2,100	0	0	2,222	69,715	0	0	0	25,123	199,734	0	403,911
-	6.90%	19.09%	0.52%	0.00%	0.00%	0.55%	17.26%	0.00%	0.00%	0.00%	6.22%	49.45%	0.00%	100%
San Juan	217,328	255,590	48,975	6,122	0	12,244	786,666	0	3,119,116	156,109	220,389	10,480,720	0	15,304,790
Creek	1.42%	1.67%	0.32%	0.04%	0.00%	0.08%	5.14%	0.00%	20.38%	1.02%	1.44%	68.48%	0.00%	100%
San	37,917	76,411	7,209	2,163	288	3,028	128,601	0	433	0	38,350	1,147,176	0	1,441,719
Clemente	2.63%	5.30%	0.50%	0.15%	0.02%	0.21%	8.92%	0.00%	0.03%	0.00%	2.66%	79.57%	0.00%	100%
San Luis Rey	281,520	142,416	23,184	6,624	453,744	9,936	29,808	1,397,665	19,289,095	0	89,424	11,396,596	0	33,120,012
River	0.85%	0.43%	0.07%	0.02%	1.37%	0.03%	0.09%	4.22%	58.24%	0.00%	0.27%	34.41%	0.00%	100%
San Marcos	1,614	4,706	913	40	0	186	645	6,963	4,236	0	1,090	495	0	20,886
-	7.73%	22.53%	4.37%	0.19%	0.00%	0.89%	3.09%	33.34%	20.28%	0.00%	5.22%	2.37%	0.00%	100%
San Dieguito	381,036	121,335	55,346	4,257	0	8,515	240,542	1,136,721	10,734,988	0	149,008	8,455,160	0	21,286,909
River	1.79%	0.57%	0.26%	0.02%	0.00%	0.04%	1.13%	5.34%	50.43%	0.00%	0.70%	39.72%	0.00%	100%
Miramar	1,316	5,428	50	1	0	46	0	0	0	0	0	3,552	0	10,392
-	12.66%	52.23%	0.48%	0.01%	0.00%	0.44%	0.00%	0.00%	0.00%	0.00%	0.00%	34.18%	0.00%	100%
Scripps	27,976	85,479	11,060	41	0	939	2,918	0	0	0	20,059	55,585	0	204,057
-	13.71%	41.89%	5.42%	0.02%	0.00%	0.46%	1.43%	0.00%	0.00%	0.00%	9.83%	27.24%	0.00%	100%
San Diego	176,086	202,228	56,722	5,426	9,372	6,412	17,757	55,736	359,077	0	41,925	4,002,133	0	4,932,380
River	3.57%	4.10%	1.15%	0.11%	0.19%	0.13%	0.36%	1.13%	7.28%	0.00%	0.85%	81.14%	0.00%	100%
Chollas	117,270	163,103	39,674	2,536	1,087	2,657	10,386	0	0	0	34,541	232,487	0	603,863
Creek	19.42%	27.01%	6.57%	0.42%	0.18%	0.44%	1.72%	0.00%	0.00%	0.00%	5.72%	38.50%	0.00%	100%

Table I-13. Total Coliform Loads (Billion MPN/year) Generated by Different Land Uses

Watershed	Municipal MS4								Agriculture/Livestock			Open Space			
	COMM/ INST	HIDEN RES	LODEN RES	PARK/ REC	MIL	TRANS	IND/ TRANS*	CAL TRANS*	AGRI	DAIRY/ LIVSTK	HORSE RANCH	OPEN SPACE	OPEN REC	WATER	TOTAL
San Joaquin Hills HSA/	215,853	742,277	371,822	30,674	0	296,278	0	7,722	86	0	50,688	6,503,925	2,576	0	8,221,901
Laguna Beach HSA	2.63%	9.03%	4.52%	0.37%	0.00%	3.60%	0.00%	0.09%	0.00%	0.00%	0.62%	79.10%	0.03%	0.00%	100.00%
Aliso HSA	1,420,213	4,599,980	2,203,565	159,674	0	3,513,206	46,603	11,003	109,385	0	70,443	10,790,677	286,025	0	23,210,774
	6.12%	19.82%	9.49%	0.69%	0.00%	15.14%	0.20%	0.05%	0.47%	0.00%	0.30%	46.49%	1.23%	0.00%	100.00%
Dana Point HSA	162,592	1,977,554	893,185	71,764	0	814,402	0	634	0	0	0	2,333,311	293,519	0	6,546,962
	2.48%	30.21%	13.64%	1.10%	0.00%	12.44%	0.00%	0.01%	0.00%	0.00%	0.00%	35.64%	4.48%	0.00%	100.00%
Lower San Juan HSA	2,774,700	4,807,521	5,118,237	287,838	0	6,751,244	179,782	60,480	17,620,337	0	879,547	89,887,797	1,891,381	0	130,258,863
	2.13%	3.69%	3.93%	0.22%	0.00%	5.18%	0.14%	0.05%	13.53%	0.00%	0.68%	69.01%	1.45%	0.00%	100.00%
San Clemente HA	470,171	1,648,096	1,023,612	83,059	3,051	1,264,318	74,436	13,534	2,370	0	0	11,276,953	377,008	0	16,236,606
	2.90%	10.15%	6.30%	0.51%	0.02%	7.79%	0.46%	0.08%	0.01%	0.00%	0.00%	69.45%	2.32%	0.00%	100.00%
San Luis Rey HU	1,338,298	2,697,850	6,661,047	207,883	3,904,364	245,311	174,704	54,508	109,434,181	7,926,619	0	98,170,007	783,906	0	231,598,677
	0.58%	1.16%	2.88%	0.09%	1.69%	0.11%	0.08%	0.02%	47.25%	3.42%	0.00%	42.39%	0.34%	0.00%	100.00%
San Marco HA	99,702	171,443	73,530	8,513	0	10,702	2,131	533	46,303	76,110	0	8,214	18,097	0	515,278
	19.35%	33.27%	14.27%	1.65%	0.00%	2.08%	0.41%	0.10%	8.99%	14.77%	0.00%	1.59%	3.51%	0.00%	100.00%
San Dieguito HU	3,290,924	2,379,081	9,281,579	233,330	0	2,133,097	88,558	47,969	62,890,325	6,661,091	0	75,210,801	1,324,377	0	163,541,133
	2.01%	1.45%	5.68%	0.14%	0.00%	1.30%	0.05%	0.03%	38.46%	4.07%	0.00%	45.99%	0.81%	0.00%	100.00%
Miramar Reservoir HA	3,586	129,908	39,357	1,362	0	0	30	9	0	0	0	38,734	0	0	212,986
	1.68%	60.99%	18.48%	0.64%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	18.19%	0.00%	0.00%	100.00%
Scripps HA	874,595	2,255,304	922,557	30,893	0	34,969	1,993	0	0	0	0	668,068	241,141	0	5,029,519
	17.39%	44.84%	18.34%	0.61%	0.00%	0.70%	0.04%	0.00%	0.00%	0.00%	0.00%	13.28%	4.79%	0.00%	100.00%
Tecolote HA	2,352,810	1,769,021	1,905,887	110,886	93	0	13,788	27,095	0	0	0	1,187,711	28,366	0	7,395,789
	31.81%	23.92%	25.77%	1.50%	0.00%	0.00%	0.19%	0.37%	0.00%	0.00%	0.00%	16.06%	0.38%	0.00%	100.00%
Mission San Diego HSA/	4,794,240	5,677,064	6,177,862	221,053	119,975	229,973	222,699	53,141	3,025,241	470,719	0	51,230,867	534,734	0	72,757,569
Santee HSA	6.59%	7.80%	8.49%	0.30%	0.16%	0.32%	0.31%	0.07%	4.16%	0.65%	0.00%	70.41%	0.73%	0.00%	100.00%
Chollas HSA	3,251,407	4,452,966	4,001,695	91,547	13,477	129,379	83,294	45,652	0	0	0	2,891,344	429,847	0	15,390,608
	21.13%	28.93%	26.00%	0.59%	0.09%	0.84%	0.54%	0.30%	0.00%	0.00%	0.00%	18.79%	2.79%	0.00%	100.00%

* See Table I-16 for how total coliform bacteria loads from Caltrans land use areas are separated from Industrial/Transportation land use areas

Watershed	Low Density Residential	High Density Residential	Commercial/ Institutional	Industrial/ Transport including CalTrans	Military	Parks/Rec	Transitional	Dairy/ Intensive Livestock	Agriculture	Horse Ranches	Open Rec	Open Space	Water	Total Existing Load
Laguna/San	371,630	742,438	216,236	7,400	0	30,421	295,988	0	0	50,976	2,467	6,503,524	0	8,221,902
Joaquin	4.52%	9.03%	2.63%	0.09%	0%	0.37%	3.60%	0%	0%	0.62%	0.03%	79.10%	0%	100%
Aliso Creek	2,202,702	4,600,375	1,420,499	58,027	0	160,154	3,514,111	0	109,091	69,632	285,493	10,790,689	0	23,210,774
-	9.49%	19.82%	6.12%	0.25%	0.00%	0.69%	15.14%	0.00%	0.47%	0.30%	1.23%	46.49%	0.00%	100%
Dana Point	893,006	1,977,837	162,365	655	0	72,017	814,442	0	0	0	293,304	2,333,337	0	6,546,962
-	13.64%	30.21%	2.48%	0.01%	0.00%	1.10%	12.44%	0.00%	0.00%	0.00%	4.48%	35.64%	0.00%	100%
San Juan	5,119,173	4,806,552	2,774,514	234,466	0	286,569	6,747,409	0	17,624,024	885,760	1,888,754	89,891,641	0	130,258,863
Creek	3.93%	3.69%	2.13%	0.18%	0.00%	0.22%	5.18%	0.00%	13.53%	0.68%	1.45%	69.01%	0.00%	100%
San	1,022,902	1,648,009	470,860	87,677	3,247	82,806	1,264,826	0	1,624	0	376,688	11,276,277	0	16,236,540
Clemente	6.30%	10.15%	2.90%	0.54%	0.02%	0.51%	7.79%	0.00%	0.01%	0.00%	2.32%	69.45%	0.00%	100%
San Luis Rey	6,670,042	2,686,545	1,343,272	231,599	3,914,018	208,439	254,759	7,920,675	109,430,375	0	787,436	98,174,679	0	231,598,677
River	2.88%	1.16%	0.58%	0.10%	1.69%	0.09%	0.11%	3.42%	47.25%	0.00%	0.34%	42.39%	0.00%	100%
San Marcos	73,530	171,433	99,706	2,679	0	8,502	10,718	76,107	46,323	0	18,086	8,193	0	515,278
-	14.27%	33.27%	19.35%	0.52%	0.00%	1.65%	2.08%	14.77%	8.99%	0.00%	3.51%	1.59%	0.00%	100%
San Dieguito	9,289,136	2,371,346	3,287,177	130,833	0	228,958	2,126,035	6,656,124	62,897,919	0	1,324,683	75,212,567	0	163,541,132
River	5.68%	1.45%	2.01%	0.08%	0.00%	0.14%	1.30%	4.07%	38.46%	0.00%	0.81%	45.99%	0.00%	100%
Miramar	39,360	129,900	3,578	43	0	1,363	0	0	0	0	0	38,742	0	212,986
-	18.48%	60.99%	1.68%	0.02%	0.00%	0.64%	0.00%	0.00%	0.00%	0.00%	0.00%	18.19%	0.00%	100%
Scripps	922,414	2,255,236	874,633	2,012	0	30,680	35,207	0	0	0	240,914	667,920	0	5,029,518
-	18.34%	44.84%	17.39%	0.04%	0.00%	0.61%	0.70%	0.00%	0.00%	0.00%	4.79%	13.28%	0.00%	100%
San Diego	6,177,118	5,675,090	4,794,724	276,479	116,412	218,273	232,824	472,924	3,026,715	0	531,130	51,228,604	0	72,757,569
River	8.49%	7.80%	6.59%	0.38%	0.16%	0.30%	0.32%	0.65%	4.16%	0.00%	0.73%	70.41%	0.00%	100%
Chollas	4,001,558	4,452,503	3,252,035	129,281	13,852	90,805	129,281	0	0	0	429,398	2,891,895	0	15,390,608
Creek	26.00%	28.93%	21.13%	0.84%	0.09%	0.59%	0.84%	0.00%	0.00%	0.00%	2.79%	18.79%	0.00%	100%

Table I-14. Enterococci Loads (Billion MPN/year) Generated by Different Land Uses

	Municipal MS4								Agriculture/Livestock			Open Space			
Watershed	COMM/ INST	HIDEN RES	LODEN RES	PARK/ REC	MIL	TRANS	IND/ TRANS*	CAL TRANS*	AGRI	DAIRY/ LIVSTK	HORSE RANCH	OPEN SPACE	OPEN REC	WATER	TOTAL
San Joaquin Hills HSA/	23,814	29,247	46,881	3,867	0	32,458	0	365	5	0	3,195	712,533	282	0	852,649
Laguna Beach HSA	2.79%	3.43%	5.50%	0.45%	0.00%	3.81%	0.00%	0.04%	0.00%	0.00%	0.37%	83.57%	0.03%	0.00%	100.00%
Aliso HSA	155,419	179,783	275,593	19,970	0	381,783	2,186	516	6,840	0	4,405	1,172,631	31,083	0	2,230,206
	6.97%	8.06%	12.36%	0.90%	0.00%	17.12%	0.10%	0.02%	0.31%	0.00%	0.20%	52.58%	1.39%	0.00%	100.00%
Dana Point HSA	15,131	65,726	94,996	7,633	0	75,261	0	25	0	0	0	215,628	27,125	0	501,526
	3.02%	13.11%	18.94%	1.52%	0.00%	15.01%	0.00%	0.01%	0.00%	0.00%	0.00%	42.99%	5.41%	0.00%	100.00%
Lower San Juan HSA	302,177	186,986	637,026	35,825	0	730,116	8,391	2,823	1,096,531	0	54,735	9,720,946	204,544	0	12,980,098
	2.33%	1.44%	4.91%	0.28%	0.00%	5.62%	0.06%	0.02%	8.45%	0.00%	0.42%	74.89%	1.58%	0.00%	100.00%
San Clemente HA	51,464	64,428	128,049	10,390	332	137,426	3,492	635	148	0	0	1,225,757	40,979	0	1,663,100
	3.09%	3.87%	7.70%	0.62%	0.02%	8.26%	0.21%	0.04%	0.01%	0.00%	0.00%	73.70%	2.46%	0.00%	100.00%
San Luis Rey HU	137,330	98,872	781,175	24,380	397,857	24,997	7,683	2,397	6,416,957	464,798	0	10,003,592	79,881	0	18,439,920
	0.74%	0.54%	4.24%	0.13%	2.16%	0.14%	0.04%	0.01%	34.80%	2.52%	0.00%	54.25%	0.43%	0.00%	100.00%
San Marco HA	11,154	6,850	9,401	1,088	0	1,189	102	26	2,960	4,865	0	912	2,010	0	40,558
	27.50%	16.89%	23.18%	2.68%	0.00%	2.93%	0.25%	0.06%	7.30%	12.00%	0.00%	2.25%	4.96%	0.00%	100.00%
San Dieguito HU	366,288	94,571	1,180,642	29,680	0	235,764	4,224	2,288	3,999,911	423,655	0	8,312,808	146,379	0	14,796,210
	2.48%	0.64%	7.98%	0.20%	0.00%	1.59%	0.03%	0.02%	27.03%	2.86%	0.00%	56.18%	0.99%	0.00%	100.00%
Miramar Reservoir HA	307	3,974	3,853	133	0	0	1	0	0	0	0	3,295	0	0	11,564
	2.66%	34.37%	33.32%	1.15%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	28.49%	0.00%	0.00%	100.00%
Scripps HA	89,116	82,072	107,432	3,597	0	3,538	87	0	0	0	0	67,598	24,399	0	377,839
	23.59%	21.72%	28.43%	0.95%	0.00%	0.94%	0.02%	0.00%	0.00%	0.00%	0.00%	17.89%	6.46%	0.00%	100.00%
Tecolote HA	255,786	68,685	236,798	13,777	18	0	644	1,266	0	0	0	128,222	3,062	0	708,256
	36.11%	9.70%	33.43%	1.95%	0.00%	0.00%	0.09%	0.18%	0.00%	0.00%	0.00%	18.10%	0.43%	0.00%	100.00%
Mission San Diego HSA/	511,533	216,332	753,328	26,955	12,712	24,367	10,183	2,430	184,449	28,700	0	5,428,113	56,657	0	7,255,759
Santee HSA	7.05%	2.98%	10.38%	0.37%	0.18%	0.34%	0.14%	0.03%	2.54%	0.40%	0.00%	74.81%	0.78%	0.00%	100.00%
Chollas HSA	342,748	167,647	482,103	11,029	1,411	13,544	3,763	2,062	0	0	0	302,668	44,997	0	1,371,972
	24.98%	12.22%	35.14%	0.80%	0.10%	0.99%	0.27%	0.15%	0.00%	0.00%	0.00%	22.06%	3.28%	0.00%	100.00%

* See Table I-17 for how *Entercocci* bacteria loads from Caltrans land use areas are separated from Industrial/Transportation land use areas

Watershed	Low Density Residential	High Density Residential	Commercial/ Institutional	Industrial/ Transport	Military	Parks/Rec	Transitional	Dairy/ Intensive Livestock	Agriculture	Horse Ranches	Open Rec	Open Space	Water	**Total Existing Load**
Laguna/San	46,896	29,246	23,789	341	0	3,837	32,571	0	0	3,155	256	712,559	0	852,649
Joaquin	5.50%	3.43%	2.79%	0.04%	0%	0.45%	3.82%	0%	0%	0.37%	0.03%	83.57%	0%	100%
Aliso Creek	275,653	179,755	155,445	2,676	0	20,072	381,811	0	6,914	4,460	31,000	1,172,642	0	2,230,206
-	12.36%	8.06%	6.97%	0.12%	0.00%	0.90%	17.12%	0.00%	0.31%	0.20%	1.39%	52.58%	0.00%	100%
Dana Point	94,989	65,750	15,146	50	0	7,623	75,229	0	0	0	27,133	215,606	0	501,525
-	18.94%	13.11%	3.02%	0.01%	0.00%	1.52%	15.00%	0.00%	0.00%	0.00%	5.41%	42.99%	0.00%	100%
San Juan	637,323	186,913	302,436	11,682	0	36,344	729,482	0	1,096,818	54,516	205,086	9,720,795	0	12,980,098
Creek	4.91%	1.44%	2.33%	0.09%	0.00%	0.28%	5.62%	0.00%	8.45%	0.42%	1.58%	74.89%	0.00%	100%
San	128,058	64,362	51,390	4,158	333	10,311	137,371	0	166	0	40,912	1,225,700	0	1,663,093
Clemente	7.70%	3.87%	3.09%	0.25%	0.02%	0.62%	8.26%	0.00%	0.01%	0.00%	2.46%	73.70%	0.00%	100%
San Luis Rey	781,853	99,576	136,455	9,220	398,302	23,972	25,816	464,686	6,417,092	0	79,292	10,003,657	0	18,439,920
River	4.24%	0.54%	0.74%	0.05%	2.16%	0.13%	0.14%	2.52%	34.80%	0.00%	0.43%	54.25%	0.00%	100%
San Marcos	9,401	6,850	11,153	126	0	1,087	1,188	4,867	2,961	0	2,012	913	0	40,558
-	23.18%	16.89%	27.50%	0.31%	0.00%	2.68%	2.93%	12.00%	7.30%	0.00%	4.96%	2.25%	0.00%	100%
San Dieguito	1,180,738	94,696	366,946	5,918	0	29,592	235,260	423,172	3,999,416	0	146,482	8,313,990	0	14,796,210
River	7.98%	0.64%	2.48%	0.04%	0.00%	0.20%	1.59%	2.86%	27.03%	0.00%	0.99%	56.19%	0.00%	100%
Miramar	3,853	3,975	308	1	0	133	0	0	0	0	0	3,295	0	11,564
-	33.32%	34.37%	2.66%	0.01%	0.00%	1.15%	0.00%	0.00%	0.00%	0.00%	0.00%	28.49%	0.00%	100%
Scripps	107,420	82,067	89,132	76	0	3,589	3,552	0	0	0	24,408	67,595	0	377,839
-	28.43%	21.72%	23.59%	0.02%	0.00%	0.95%	0.94%	0.00%	0.00%	0.00%	6.46%	17.89%	0.00%	100%
San Diego	753,148	216,222	511,531	12,335	13,060	26,846	24,670	29,023	184,296	0	56,595	5,428,033	0	7,255,759
River	10.38%	2.98%	7.05%	0.17%	0.18%	0.37%	0.34%	0.40%	2.54%	0.00%	0.78%	74.81%	0.00%	100%
Chollas	482,111	167,655	342,719	5,762	1,372	10,976	13,583	0	0	0	45,001	302,657	0	1,371,972
Creek	35.14%	12.22%	24.98%	0.42%	0.10%	0.80%	0.99%	0.00%	0.00%	0.00%	3.28%	22.06%	0.00%	100%

Table I-15. Loads Generated by Caltrans: Fecal Coliform

Watershed	IND/ TRANS Land Use Total Load [a] (Billion MPN/yr)	IND/TRANS GIS-Based Land Use Area [b] (sq mi)	CALTRANS Land Use Area [c] (sq mi)	IND/ TRANS Land Use w/o CALTRANS Land Use			IND/TRANS Land Use Occupied by CALTRANS Land Use		
				Land Use Area		Bacteria Load	Land Use Area		Bacteria Load
				(percent)	(sq mi)	(Billion MPN/yr)	(percent)	(sq mi)	(Billion MPN/yr)
San Joaquin Hills HSA/Laguna Beach HSA [d]	179	0.11	0.19	100.00%	0.11	179	0.00%	0	0
Aliso HSA	1,359	0.89	0.17	19.10%	0.17	260	80.90%	0.72	1,099
Dana Point HSA [ad]	13	0.01	0.06	100.00%	0.01	13	0.00%	0	0
Lower San Juan HSA	6,806	2.9	0.73	25.17%	0.73	1,713	74.83%	2.17	5,093
San Clemente HA	2,174	1.17	0.18	15.38%	0.18	335	84.62%	0.99	1,840
San Luis Rey HU	6,465	4.92	1.17	23.78%	1.17	1,537	76.22%	3.75	4,927
San Marcos HA	39	0.05	0.01	20.00%	0.01	8	80.00%	0.04	31
San Dieguito HU	3,729	2.22	0.78	35.14%	0.78	1,310	64.86%	1.44	2,419
Miramar Reservoir HA	1	3.28	0.74	22.56%	0.74	0	77.44%	2.54	1
Scripps HA	40	0.05	0	0.00%	0	0	100.00%	0.05	40
Tecolote HA	834	0.36	0.24	66.27%	0.24	553	33.73%	0.12	281
Mission San Diego HSA/Santee HSA	5,236	10.07	1.94	19.27%	1.94	1,009	80.73%	8.13	4,227
Chollas HSA	2,519	1.61	0.57	35.40%	0.57	892	64.60%	1.04	1,627

a. Total bacteria load generated by Industrial/Transportation land use area calculated by multiplying the total existing load (see Table I-3) by the percent load generated by Industrial & Transportation from Figures I-5 through I-40.
b. Total Industrial/Transportation land use area from GIS land use data (SANDAG 2000)
c. Total Caltrans land use area reported by Caltrans (Richard Watson, Caltrans, personal communication, September 23, 2005)
d. Caltrans reported area greater than GIS-based land use area in this watershed, therefore 100 percent of load was assumed to be generated by Caltrans land use area.

Watershed	Measure/Unit	Industrial/Transport including CalTrans	Industrial/ Transport excluding Caltrans	Caltrans

Laguna/San	Area (sq miles)		0.11	-	0.19
Joaquin	% Area of Ind./Trans	-		0.00%	-
-	Load (Billion MPN/Yr)		212	0	212
Aliso Creek	Area (sq miles)		0.89	0.72	0.17
-	% Area of Ind./Trans	-		80.90%	19.10%
-	Load (Billion MPN/Yr)		1,402	1,134	268
Dana Point	Area (sq miles)		0.01	-	0.06
-	% Area of Ind./Trans	-		0.00%	-
-	Load (Billion MPN/Yr)		0	0	0
San Juan	Area (sq miles)		2.9	2.17	0.73
Creek	% Area of Ind./Trans	-		74.83%	25.17%
-	Load (Billion MPN/Yr)		6,122	4,581	1,541
San	Area (sq miles)		1.17	0.99	0.18
Clemente	% Area of Ind./Trans	-		84.62%	15.38%
-	Load (Billion MPN/Yr)		2,163	1,830	333
San Luis Rey	Area (sq miles)		4.92	3.75	1.17
River	% Area of Ind./Trans	-		76.22%	23.78%
-	Load (Billion MPN/Yr)		6,624	5,049	1,575
San Marcos	Area (sq miles)		0.05	0.04	0.01
-	% Area of Ind./Trans	-		80.00%	20.00%
-	Load (Billion MPN/Yr)		40	32	8
San Dieguito	Area (sq miles)		2.22	1.44	0.78
River	% Area of Ind./Trans	-		64.86%	35.14%
-	Load (Billion MPN/Yr)		4,257	2,762	1,496
Miramar	Area (sq miles)		3.28	2.54	0.74
-	% Area of Ind./Trans	-		77.44%	22.56%
-	Load (Billion MPN/Yr)		1	1	0
Scripps	Area (sq miles)		0.05	0.05	0
-	% Area of Ind./Trans	-		100.00%	0.00%
-	Load (Billion MPN/Yr)		41	41	0
San Diego	Area (sq miles)		10.07	8.13	1.94
River	% Area of Ind./Trans	-		80.73%	19.27%

-	Load (Billion MPN/Yr)		5,426	4,380	1,045
Chollas	Area (sq miles)		1.61	1.04	0.57
Creek	% Area of Ind./Trans	-		64.60%	35.40%
-	Load (Billion MPN/Yr)		2,536	1,638	898

Table I-16. Loads Generated by Caltrans: Total Coliform

Watershed	IND/ TRANS Land Use Total Load [a] (Billion MPN/yr)	IND/TRANS GIS-Based Land Use Area [b] (sq mi)	CALTRANS Land Use Area [c] (sq mi)	IND/ TRANS Land Use w/o CALTRANS Land Use			IND/TRANS Land Use Occupied by CALTRANS Land Use		
				Land Use Area		Bacteria Load	Land Use Area		Bacteria Load
				(percent)	(sq mi)	(Billion MPN/yr)	(percent)	(sq mi)	(Billion MPN/yr)
San Joaquin Hills HSA/Laguna Beach HSA [d]	7,722	0.11	0.19	100.00%	0.11	7,722	0.00%	0	0
Aliso HSA	57,606	0.89	0.17	19.10%	0.17	11,003	80.90%	0.72	46,603
Dana Point HSA [d]	634	0.01	0.06	100.00%	0.01	634	0.00%	0	0
Lower San Juan HSA	240,261	2.9	0.73	25.17%	0.73	60,480	74.83%	2.17	179,782
San Clemente HA	87,970	1.17	0.18	15.38%	0.18	13,534	84.62%	0.99	74,436
San Luis Rey HU	229,211	4.92	1.17	23.78%	1.17	54,508	76.22%	3.75	174,704
San Marcos HA	2,664	0.05	0.01	20.00%	0.01	533	80.00%	0.04	2,131
San Dieguito HU	136,527	2.22	0.78	35.14%	0.78	47,969	64.86%	1.44	88,558
Miramar Reservoir HA	39	3.28	0.74	22.56%	0.74	9	77.44%	2.54	30
Scripps HA	1,993	0.05	0	0.00%	0	0	100.00%	0.05	1,993
Tecolote HA	40,883	0.36	0.24	66.27%	0.24	27,095	33.73%	0.12	13,788
Mission San Diego HSA/Santee HSA	275,840	10.07	1.94	19.27%	1.94	53,141	80.73%	8.13	222,699
Chollas HSA	128,945	1.61	0.57	35.40%	0.57	45,652	64.60%	1.04	83,294

a. Total bacteria load generated by Industrial/Transportation land use area calculated by multiplying the total existing load (see Table I-3) by the percent load generated by Industrial & Transportation from Figures I-5 through I-40.
b. Total Industrial/Transportation land use area from GIS land use data (SANDAG 2000)
c. Total Caltrans land use area reported by Caltrans (Richard Watson, Caltrans, personal communication, September 23, 2005)
d. Caltrans reported area greater than GIS-based land use area in this watershed, therefore 100 percent of load was assumed to be generated by Caltrans land use area.

~~Watershed~~	~~Measure/Unit~~	~~Industrial/ Transport~~	~~Industrial/ Transport excluding Caltrans~~	~~Caltrans~~

~~Laguna/San~~	~~Area (sq miles)~~	~~0.11~~		~~0.19~~
~~Joaquin~~	~~% Area of Ind./Trans~~	~~0.79%~~	~~0.00%~~	
-	~~Load (Billion MPN/Yr)~~	~~7,400~~	~~0~~	~~7,400~~
~~Aliso Creek~~	~~Area (sq miles)~~	~~0.89~~	~~0.72~~	~~0.17~~
-	~~% Area of Ind./Trans~~	~~2.49%~~	~~80.90%~~	~~19.10%~~
-	~~Load (Billion MPN/Yr)~~	~~58,027~~	~~46,943~~	~~11,084~~
~~Dana Point~~	~~Area (sq miles)~~	~~0.01~~		~~0.06~~
-	~~% Area of Ind./Trans~~	~~0.11%~~	~~0.00%~~	
-	~~Load (Billion MPN/Yr)~~	~~655~~	~~0~~	~~655~~
~~San Juan~~	~~Area (sq miles)~~	~~2.9~~	~~2.17~~	~~0.73~~
~~Creek~~	~~% Area of Ind./Trans~~	~~1.64%~~	~~74.83%~~	~~25.17%~~
-	~~Load (Billion MPN/Yr)~~	~~234,466~~	~~175,445~~	~~59,021~~
~~San~~	~~Area (sq miles)~~	~~1.17~~	~~0.99~~	~~0.18~~
~~Clemente~~	~~% Area of Ind./Trans~~	~~6.23%~~	~~84.62%~~	~~15.38%~~
-	~~Load (Billion MPN/Yr)~~	~~87,677~~	~~74,188~~	~~13,489~~
~~San Luis Rey~~	~~Area (sq miles)~~	~~4.92~~	~~3.75~~	~~1.17~~
~~River~~	~~% Area of Ind./Trans~~	~~0.88%~~	~~76.22%~~	~~23.78%~~
-	~~Load (Billion MPN/Yr)~~	~~231,599~~	~~176,523~~	~~55,075~~
~~San Marcos~~	~~Area (sq miles)~~	~~0.05~~	~~0.04~~	~~0.01~~
-	~~% Area of Ind./Trans~~	~~3.50%~~	~~80.00%~~	~~20.00%~~
-	~~Load (Billion MPN/Yr)~~	~~2,679~~	~~2,144~~	~~536~~
~~San Dieguito~~	~~Area (sq miles)~~	~~2.22~~	~~1.44~~	~~0.78~~
~~River~~	~~% Area of Ind./Trans~~	~~0.64%~~	~~64.86%~~	~~35.14%~~
-	~~Load (Billion MPN/Yr)~~	~~130,833~~	~~84,865~~	~~45,968~~
~~Miramar~~	~~Area (sq miles)~~	~~3.28~~	~~2.54~~	~~0.74~~
-	~~% Area of Ind./Trans~~	~~3.50%~~	~~77.44%~~	~~22.56%~~
-	~~Load (Billion MPN/Yr)~~	~~43~~	~~33~~	~~10~~
~~Scripps~~	~~Area (sq miles)~~	~~0.05~~	~~0.05~~	~~0~~
-	~~% Area of Ind./Trans~~	~~0.57%~~	~~100.00%~~	~~0.00%~~
-	~~Load (Billion MPN/Yr)~~	~~2,012~~	~~2,012~~	~~0~~
~~San Diego~~	~~Area (sq miles)~~	~~10.07~~	~~8.13~~	~~1.94~~
~~River~~	~~% Area of Ind./Trans~~	~~2.31%~~	~~80.73%~~	~~19.27%~~

-	Load (Billion MPN/Yr)	276,479	223,215	53,264
Chollas	Area (sq miles)	1.61	1.04	0.57
Creek	% Area of Ind./Trans	6.01%	64.60%	35.40%
-	Load (Billion MPN/Yr)	129,281	83,511	45,770

Table I-17. Loads Generated by Caltrans: Enterococci

Watershed	IND/ TRANS Land Use Total Load [a] (Billion MPN/yr)	IND/TRANS GIS-Based Land Use Area [b] (sq mi)	CALTRANS Land Use Area [c] (sq mi)	IND/ TRANS Land Use w/o CALTRANS Land Use			IND/TRANS Land Use Occupied by CALTRANS Land Use		
				Land Use Area		Bacteria Load	Land Use Area		Bacteria Load
				(percent)	(sq mi)	(Billion MPN/yr)	(percent)	(sq mi)	(Billion MPN/yr)
San Joaquin Hills HSA/Laguna Beach HSA [d]	365	0.11	0.19	100.00%	0.11	365	0.00%	0	0
Aliso HSA	2,702	0.89	0.17	19.10%	0.17	516	80.90%	0.72	2,186
Dana Point HSA [d]	25	0.01	0.06	100.00%	0.01	25	0.00%	0	0
Lower San Juan HSA	11,214	2.9	0.73	25.17%	0.73	2,823	74.83%	2.17	8,391
San Clemente HA	4,127	1.17	0.18	15.38%	0.18	635	84.62%	0.99	3,492
San Luis Rey HU	10,080	4.92	1.17	23.78%	1.17	2,397	76.22%	3.75	7,683
San Marcos HA	128	0.05	0.01	20.00%	0.01	26	80.00%	0.04	102
San Dieguito HU	6,512	2.22	0.78	35.14%	0.78	2,288	64.86%	1.44	4,224
Miramar Reservoir HA	1	3.28	0.74	22.56%	0.74	0	77.44%	2.54	1
Scripps HA	87	0.05	0	0.00%	0	0	100.00%	0.05	87
Tecolote HA	1,910	0.36	0.24	66.27%	0.24	1,266	33.73%	0.12	644
Mission San Diego HSA/Santee HSA	12,613	10.07	1.94	19.27%	1.94	2,430	80.73%	8.13	10,183
Chollas HSA	5,826	1.61	0.57	35.40%	0.57	2,062	64.60%	1.04	3,763

a. Total bacteria load generated by Industrial/Transportation land use area calculated by multiplying the total existing load (see Table I-3) by the percent load generated by Industrial & Transportation from Figures I-5 through I-40.
b. Total Industrial/Transportation land use area from GIS land use data (SANDAG 2000)
c. Total Caltrans land use area reported by Caltrans (Richard Watson, Caltrans, personal communication, September 23, 2005)
d. Caltrans reported area greater than GIS-based land use area in this watershed, therefore 100 percent of load was assumed to be generated by Caltrans land use area.

~~Watershed~~	~~Measure/Unit~~	~~Industrial/ Transport~~	~~Industrial/ Transport excluding Caltrans~~	~~Caltrans~~
~~Laguna/San~~	~~Area (sq miles)~~	~~0.11~~		~~0.19~~

~~Joaquin~~	~~% Area of Ind./Trans~~	-		~~0.00%~~ -	
-	~~Load (Billion MPN/Yr)~~		~~341~~	~~0~~	~~341~~
~~Aliso Creek~~	~~Area (sq miles)~~		~~0.89~~	~~0.72~~	~~0.17~~
-	~~% Area of Ind./Trans~~	-		~~80.90%~~	~~19.10%~~
-	~~Load (Billion MPN/Yr)~~		~~2,676~~	~~2,165~~	~~511~~
~~Dana Point~~	~~Area (sq miles)~~		~~0.01~~ -		~~0.06~~
-	~~% Area of Ind./Trans~~	-		~~0.00%~~ -	
-	~~Load (Billion MPN/Yr)~~		~~50~~	~~0~~	~~50~~
~~San Juan Creek~~	~~Area (sq miles)~~		~~2.9~~	~~2.17~~	~~0.73~~
	~~% Area of Ind./Trans~~	-		~~74.83%~~	~~25.17%~~
-	~~Load (Billion MPN/Yr)~~		~~11,682~~	~~8,741~~	~~2,941~~
~~San Clemente~~	~~Area (sq miles)~~		~~1.17~~	~~0.99~~	~~0.18~~
	~~% Area of Ind./Trans~~	-		~~84.62%~~	~~15.38%~~
-	~~Load (Billion MPN/Yr)~~		~~4,158~~	~~3,518~~	~~640~~
~~San Luis Rey River~~	~~Area (sq miles)~~		~~4.92~~	~~3.75~~	~~1.17~~
	~~% Area of Ind./Trans~~	-		~~76.22%~~	~~23.78%~~
-	~~Load (Billion MPN/Yr)~~		~~9,220~~	~~7,027~~	~~2,193~~
~~San Marcos~~	~~Area (sq miles)~~		~~0.05~~	~~0.04~~	~~0.01~~
-	~~% Area of Ind./Trans~~	-		~~80.00%~~	~~20.00%~~
-	~~Load (Billion MPN/Yr)~~		~~126~~	~~101~~	~~25~~
~~San Dieguito River~~	~~Area (sq miles)~~		~~2.22~~	~~1.44~~	~~0.78~~
	~~% Area of Ind./Trans~~	-		~~64.86%~~	~~35.14%~~
-	~~Load (Billion MPN/Yr)~~		~~5,918~~	~~3,839~~	~~2,079~~
~~Miramar~~	~~Area (sq miles)~~		~~3.28~~	~~2.54~~	~~0.74~~
-	~~% Area of Ind./Trans~~	-		~~77.44%~~	~~22.56%~~
-	~~Load (Billion MPN/Yr)~~		~~1~~	~~1~~	~~0~~
~~Scripps~~	~~Area (sq miles)~~		~~0.05~~	~~0.05~~	~~0~~
-	~~% Area of Ind./Trans~~	-		~~100.00%~~	~~0.00%~~
-	~~Load (Billion MPN/Yr)~~		~~76~~	~~76~~	~~0~~
~~San Diego River~~	~~Area (sq miles)~~		~~10.07~~	~~8.13~~	~~1.94~~
	~~% Area of Ind./Trans~~	-		~~80.73%~~	~~19.27%~~
-	~~Load (Billion MPN/Yr)~~		~~12,335~~	~~9,958~~	~~2,376~~

Chollas Creek	Area (sq miles)	1.61	1.04	0.57
	% Area of Ind./Trans		64.60%	35.40%
	Load (Billion MPN/Yr)	5,762	3,722	2,040

Table I-18. Wet Weather Fecal Coliform Loads: Percent Reduction Required to Meet Wet Weather TMDLs

	Total			Point Sources				Nonpoint Sources			
				MS4		Caltrans		Ag/Livestock		Open Space	
Watershed	Existing Load	TMDL	Reduction Required	WLA	Reduction Required	WLA	Reduction Required	LA	Reduction Required	LA	Reduction Required
San Joaquin Hills HSA/ Laguna Beach HSA [d]	705,015	664,634	5.73%	37,167	52.07%	179	0.00%	7,346	0.00%	619,942	0.00%
Aliso HSA	1,752,096	1,579,073	9.88%	477,069	26.62%	260	0.00%	26,508	0.00%	1,075,237	0.00%
Dana Point HSA [d]	403,911	377,313	6.59%	152,446	14.86%	13	0.00%	0	0.00%	224,854	0.00%
Lower San Juan HSA	15,304,790	14,714,833	3.85%	1,156,419	12.82%	1,713	0.00%	2,855,570	12.82%	10,701,131	0.00%
San Clemente HA	1,441,723	1,378,931	4.36%	192,653	24.58%	335	0.00%	366	0.00%	1,185,577	0.00%
San Luis Rey HU	33,120,012	32,444,242	2.04%	914,026	3.12%	1,537	0.00%	20,041,659	3.12%	11,487,019	0.00%
San Marcos HA	20,886	17,224	17.53%	6,558	18.98%	8	0.00%	9,073	18.98%	1,585	0.00%
San Dieguito HU	21,286,910	21,101,649	0.87%	798,175	1.46%	1,310	0.00%	11,698,811	1.46%	8,603,352	0.00%
Miramar Reservoir HA	10,392	10,256	1.31%	6,703	1.99%	0	0.00%	0	0.00%	3,552	0.00%
Scripps HA	204,057	176,907	13.31%	101,253	21.14%	0	0.00%	0	0.00%	75,654	0.00%
Tecolote HA	261,966	229,322	12.46%	126,806	20.47%	553	0.00%	0	0.00%	101,963	0.00%
Mission San Diego HSA/ Santee HSA	4,932,380	4,680,838	5.10%	221,117	53.22%	1,009	0.00%	414,721	0.00%	4,043,991	0.00%
Chollas HSA	603,863	520,440	13.81%	252,479	24.84%	892	0.00%	0	0.00%	267,070	0.00%

Table I-19. Wet Weather Total Coliform Loads: Percent Reduction Required to Meet Wet Weather TMDLs

	Total			Point Sources				Nonpoint Sources			
				MS4		Caltrans		Ag/Livestock		Open Space	
Watershed	Existing Load	TMDL	Reduction Required	WLA	Reduction Required	WLA	Reduction Required	LA	Reduction Required	LA	Reduction Required
San Joaquin Hills HSA/ Laguna Beach HSA [d]	8,221,901	7,445,649	9.44%	880,652	46.85%	7,722	0.00%	50,774	0.00%	6,506,501	0.00%
Aliso HSA	23,210,774	20,190,798	13.01%	8,923,264	25.29%	11,003	0.00%	179,828	0.00%	11,076,702	0.00%
Dana Point HSA [d]	6,546,962	6,031,472	7.87%	3,404,008	13.15%	634	0.00%	0	0.00%	2,626,830	0.00%
Lower San Juan HSA	130,258,863	122,879,189	5.67%	16,093,160	19.21%	60,480	0.00%	14,946,372	19.21%	91,779,178	0.00%
San Clemente HA	16,236,606	15,147,603	6.71%	3,477,739	23.85%	13,534	0.00%	2,370	0.00%	11,653,960	0.00%
San Luis Rey HU	231,598,677	224,150,535	3.22%	14,373,954	5.62%	54,508	0.00%	110,768,160	5.62%	98,953,913	0.00%
San Marcos HA	515,278	425,083	17.50%	298,430	18.47%	533	0.00%	99,809	18.47%	26,311	0.00%
San Dieguito HU	163,541,133	159,814,184	2.28%	16,660,538	4.29%	47,969	0.00%	66,570,499	4.29%	76,535,178	0.00%
Miramar Reservoir HA	212,986	210,180	1.32%	171,436	1.61%	9	0.00%	0	0.00%	38,734	0.00%
Scripps HA	5,029,519	4,356,973	13.37%	3,447,764	16.32%	0	0.00%	0	0.00%	909,209	0.00%
Tecolote HA	7,395,789	6,379,770	13.74%	5,136,598	16.51%	27,095	0.00%	0	0.00%	1,216,077	0.00%
Mission San Diego HSA/ Santee HSA	72,757,569	66,105,222	9.14%	10,790,520	38.14%	53,141	0.00%	3,495,960	0.00%	51,765,601	0.00%
Chollas HSA	15,390,608	13,247,626	13.92%	9,880,784	17.82%	45,652	0.00%	0	0.00%	3,321,191	0.00%

Table I-20. Wet Weather Enterococci Loads: Percent Reduction Required to Meet Wet Weather TMDLs

	Total			Point Sources				Nonpoint Sources			
				MS4		Caltrans		Ag/Livestock		Open Space	
Watershed	**Existing Load**	**TMDL**	**Reduction Required**	**WLA**	**Reduction Required**	**WLA**	**Reduction Required**	**LA**	**Reduction Required**	**LA**	**Reduction Required**
San Joaquin Hills HSA/ Laguna Beach HSA [d]	852,649	782,799	8.19%	66,417	51.26%	365	0.00%	3,201	0.00%	712,816	0.00%
Aliso HSA	2,230,206	1,950,964	12.52%	735,490	27.52%	516	0.00%	11,245	0.00%	1,203,713	0.00%
Dana Point HSA [d]	501,526	462,306	7.82%	219,528	15.16%	25	0.00%	0	0.00%	242,753	0.00%
Lower San Juan HSA	12,980,098	12,152,446	6.38%	1,385,094	27.12%	2,823	0.00%	839,040	27.12%	9,925,490	0.00%
San Clemente HA	1,663,100	1,563,187	6.01%	295,668	25.26%	635	0.00%	148	0.00%	1,266,736	0.00%
San Luis Rey HU	18,439,920	17,463,618	5.29%	1,300,235	11.69%	2,397	0.00%	6,077,514	11.69%	10,083,473	0.00%
San Marcos HA	40,558	32,966	18.72%	23,771	20.19%	26	0.00%	6,246	20.19%	2,923	0.00%
San Dieguito HU	14,796,210	14,307,087	3.31%	1,763,603	7.72%	2,288	0.00%	4,082,010	7.72%	8,459,187	0.00%
Miramar Reservoir HA	11,564	11,405	1.38%	8,109	1.93%	0	0.00%	0	0.00%	3,295	0.00%
Scripps HA	377,839	324,032	14.24%	232,035	18.82%	0	0.00%	0	0.00%	91,997	0.00%
Tecolote HA	708,256	603,761	14.75%	471,211	18.15%	1,266	0.00%	0	0.00%	131,284	0.00%
Mission San Diego HSA/ Santee HSA	7,255,759	6,590,966	9.16%	890,617	42.74%	2,430	0.00%	213,149	0.00%	5,484,770	0.00%
Chollas HSA	1,371,972	1,152,645	15.99%	802,918	21.46%	2,062	0.00%	0	0.00%	347,665	0.00%

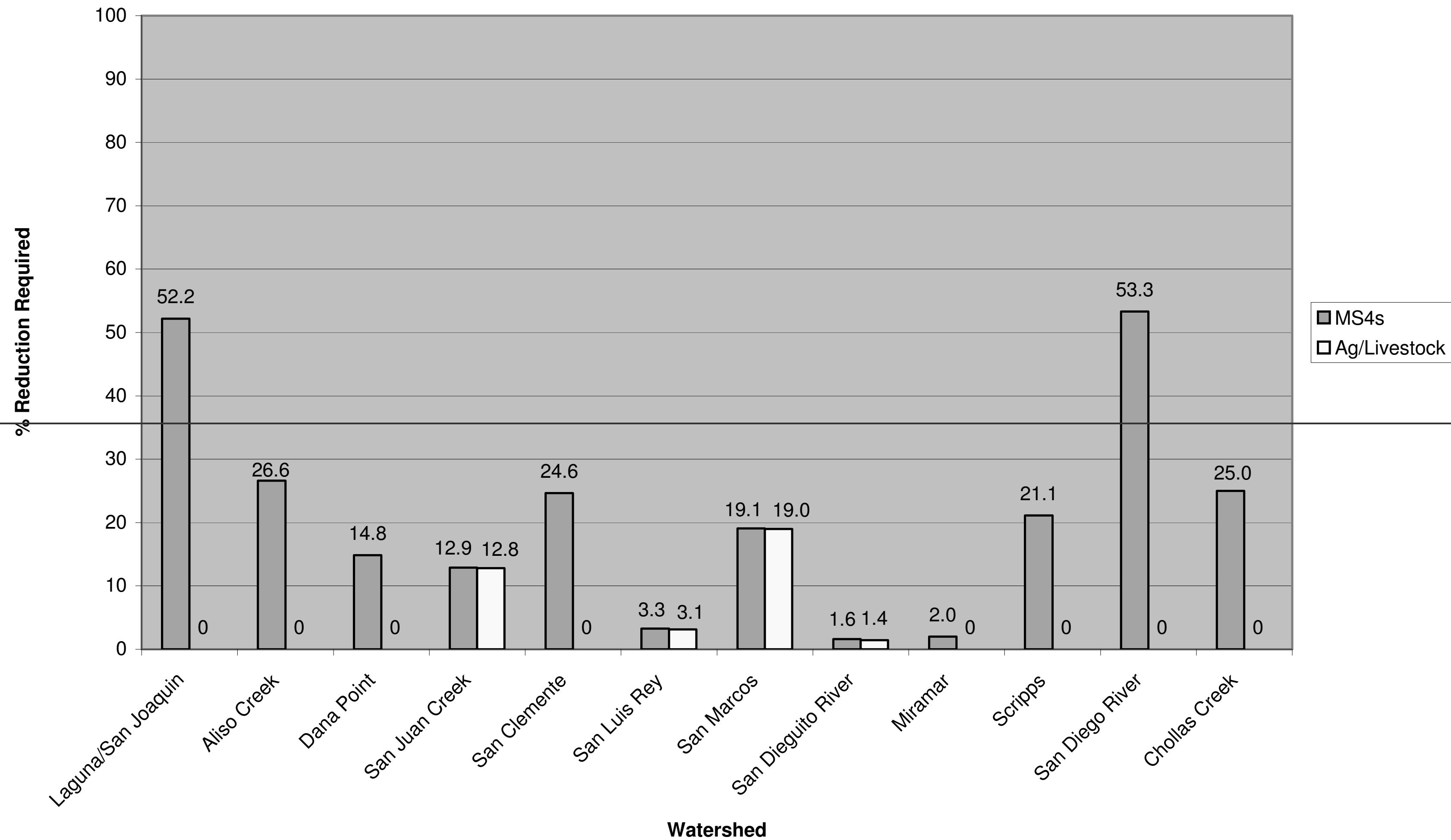
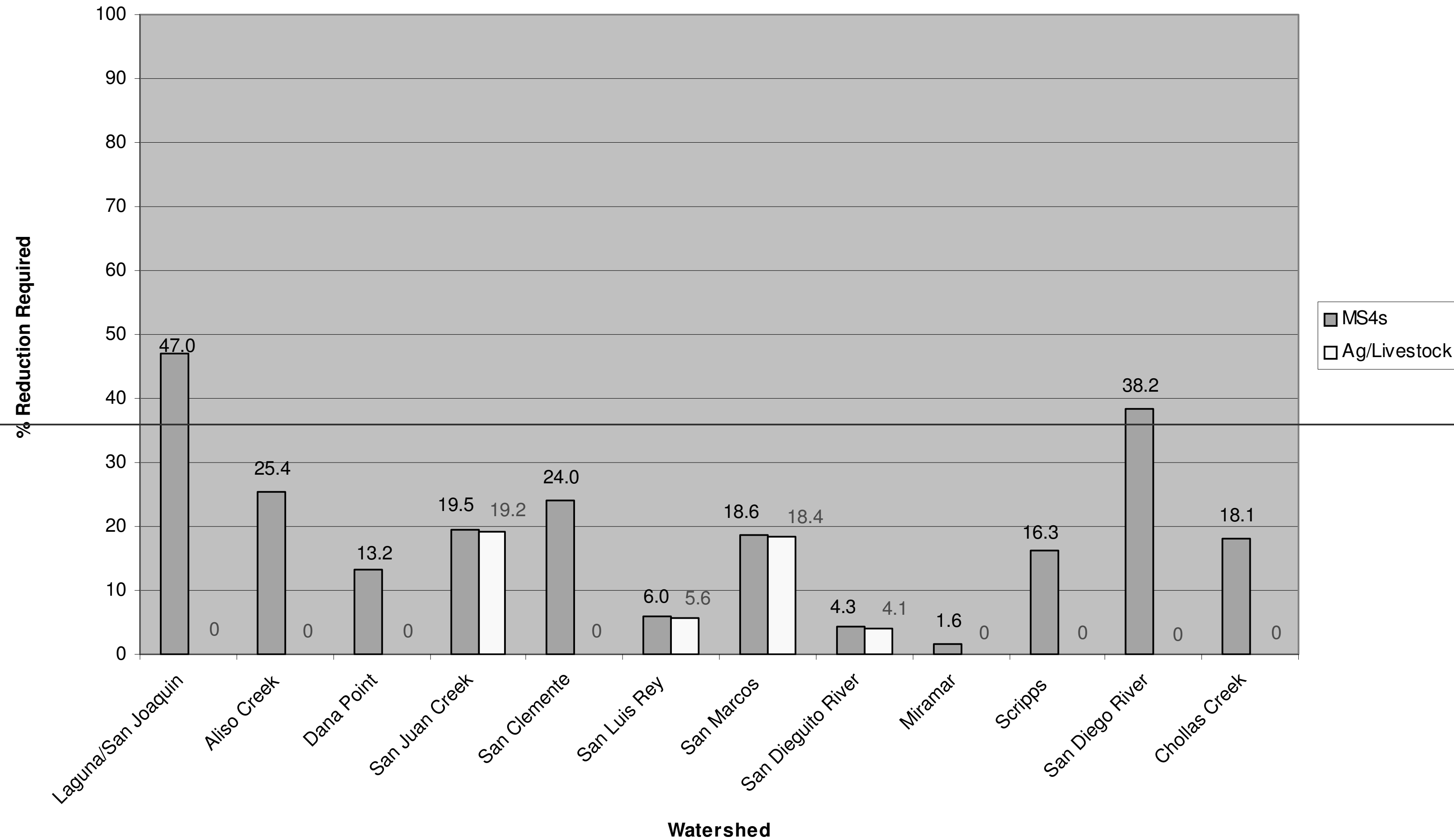
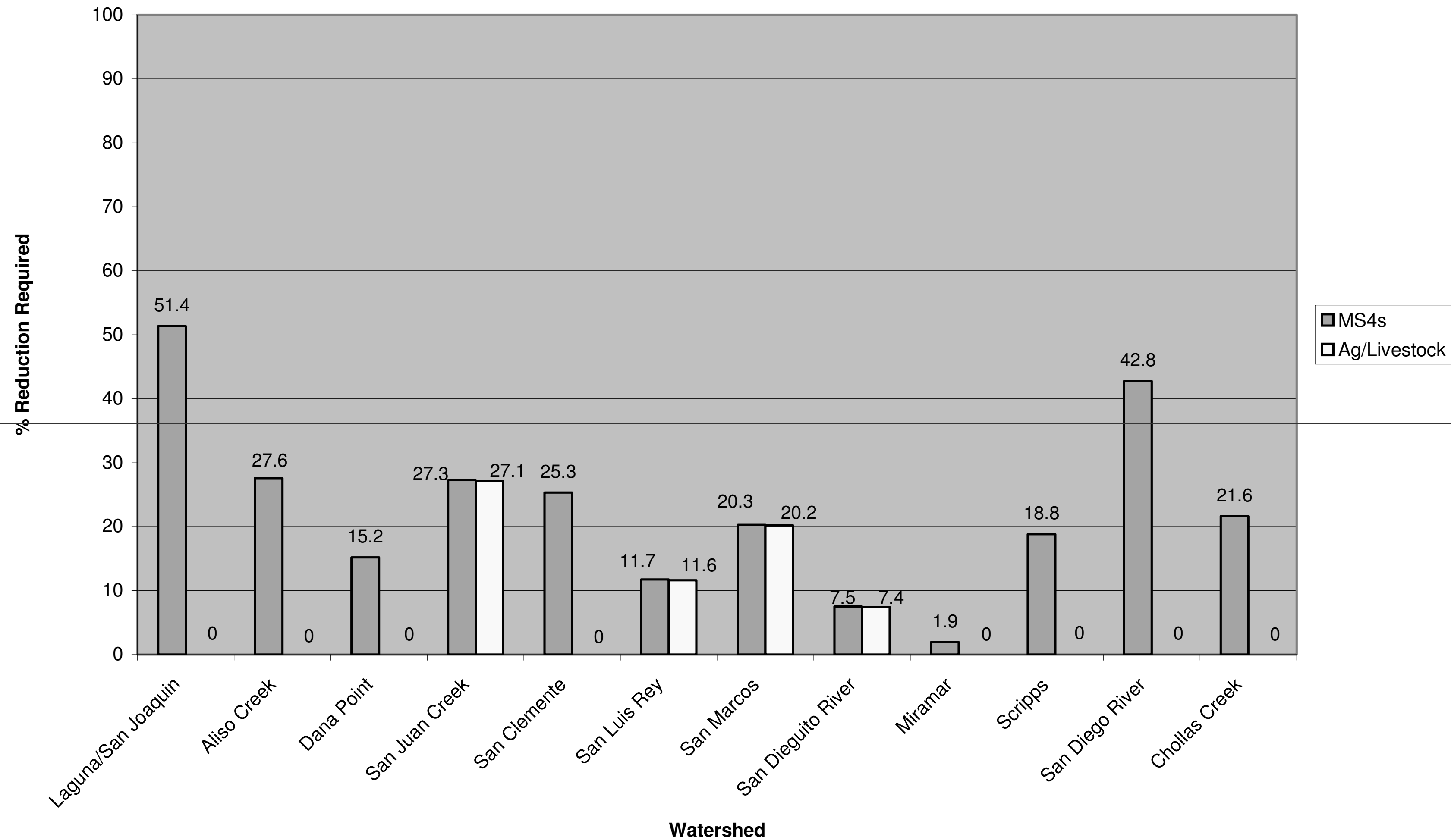


Figure I-41. Wet Weather Fecal Coliform Loads: Percent Reduction Required from Controllable Sources to Meet Interim TMDLs



~~Figure I-42. Wet Weather Total Coliform Loads: Percent Reduction Required from Controllable Sources to Meet Interim TMDLs~~



~~Figure I-43. Wet Weather Enterococci Loads: Percent Reduction Required from Controllable Sources to Meet Interim TMDLs~~

APPENDIX J

WET WEATHER MODEL CONFIGURATION, CALIBRATION AND VALIDATION

Wet weather sources of bacteria are generally associated with wash-off of loads accumulated on the land surface. During rainy periods, these bacteria loads are delivered from the land surface to the waterbody via storm water runoff through creeks and stormwater collection systems. Often, bacteria sources can be linked to specific land use types that have higher relative accumulation rates of bacteria, or are more likely to deliver bacteria to waterbodies due to delivery through stormwater collection systems. To assess the link between sources of bacteria and the impaired waters, a modeling system may be utilized that simulates the build-up and wash-off of bacteria and the hydrologic and hydraulic processes that affect delivery. Understanding and modeling of these processes provides the necessary decision support for TMDL development and allocation of loads to sources.

The mass-load based wet weather TMDL calculation was based on a watershed model of the drainage area associated with each impaired waterbody. The USEPA's Loading Simulation Program in C++ (LSPC) was selected to simulate the hydrologic processes and bacteria loading to receiving waterbodies in the San Diego Region. LSPC is a component of the USEPA's TMDL Modeling Toolbox (Toolbox), which has been developed through a joint effort between the USEPA and Tetra Tech, Inc. It integrates a geographical information system (GIS), comprehensive data storage and management capabilities, a dynamic watershed model (a re-coded version of the USEPA's Hydrological Simulation Program – FORTRAN [HSPF]) and a data analysis/post-processing system into a convenient PC-based windows interface that dictates no software requirements.

An LSPC model was configured for many of the watersheds in the San Diego Region and was then used to simulate a series of hydraulically connected subwatersheds. Configuration of the model involved subdividing the watersheds within the San Diego Region into modeling units, followed by continuous simulation of flow and water quality for those units using meteorological, land use, soils, stream, point source and bacteria representation data. Development and application of the watershed model to address the project objectives involved a number of important steps:

1. Watershed Segmentation
2. Configuration of Key Model Components
3. Model Calibration and Validation

J.1 Watershed Segmentation

Watershed segmentation refers to the subdivision of all watersheds in the San Diego Region into smaller, discrete subwatersheds for modeling and analysis. This subdivision was primarily based on the stream networks and topographic variability and secondarily on the locations of flow and water quality monitoring stations, consistency of hydrologic factors, land use consistency and existing watershed boundaries (based on CALWTR 2.2 watershed boundaries). The San Diego

Region was divided into sixteen basins for model configuration and subwatershed delineation—thirteen basins were modeled for assessment of bacteria loads to impaired waterbodies; three additional watersheds (Santa Margarita River, Tecolote Creek and Rose Creek) were configured for region-wide calibration, since data in these watersheds were plentiful. Basins and respective subwatershed delineations are presented in Appendix E.

J.2 Configuration of Key Model Components

Configuration of the watershed model involved consideration of four major components: meteorological data, land use representation, hydrologic and pollutant representation and waterbody representation. These components provided the basis for the model's ability to estimate flow and pollutant loadings. Meteorological data essentially drive the watershed model. Rainfall and other parameters are key inputs to LSPC's hydrologic algorithms. The land use representation provides the basis for distributing soils and pollutant loading characteristics throughout the basin. Hydrologic and pollutant representation refers to the LSPC modules or algorithms used to simulate hydrologic processes (e.g., surface runoff, evapotranspiration and infiltration) and pollutant loading processes (primarily accumulation and washoff). Waterbody representation refers to LSPC modules or algorithms used to simulate flow and pollutant transport through streams and rivers.

J.2.1 Meteorology

Meteorological data are a critical component of the watershed model. LSPC requires appropriate representation of precipitation and potential evapotranspiration. In general, hourly precipitation (or finer resolution) data are recommended for nonpoint source modeling. Therefore, only weather stations with hourly-recorded data were considered in the precipitation data selection process. Rainfall-runoff processes for each subwatershed were driven by precipitation data from the most representative station. These data provide necessary input to LSPC algorithms for hydrologic and water quality representation.

Meteorological data have been accessed from a number of sources in an effort to develop the most representative dataset for the San Diego Region. Hourly rainfall data were obtained from the National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA), the Automatic Local Evaluation in Real Time (ALERT) Flood Warning System managed by the County of San Diego and the California Irrigation Management Information System (CIMIS) (Appendix G, No. 21-23). The above data were reviewed based on geographic location, period of record and missing data to determine the most appropriate meteorological stations. Ultimately, meteorological data were utilized from 16 area weather stations for January 1990-September 2002 (Figure J-1).

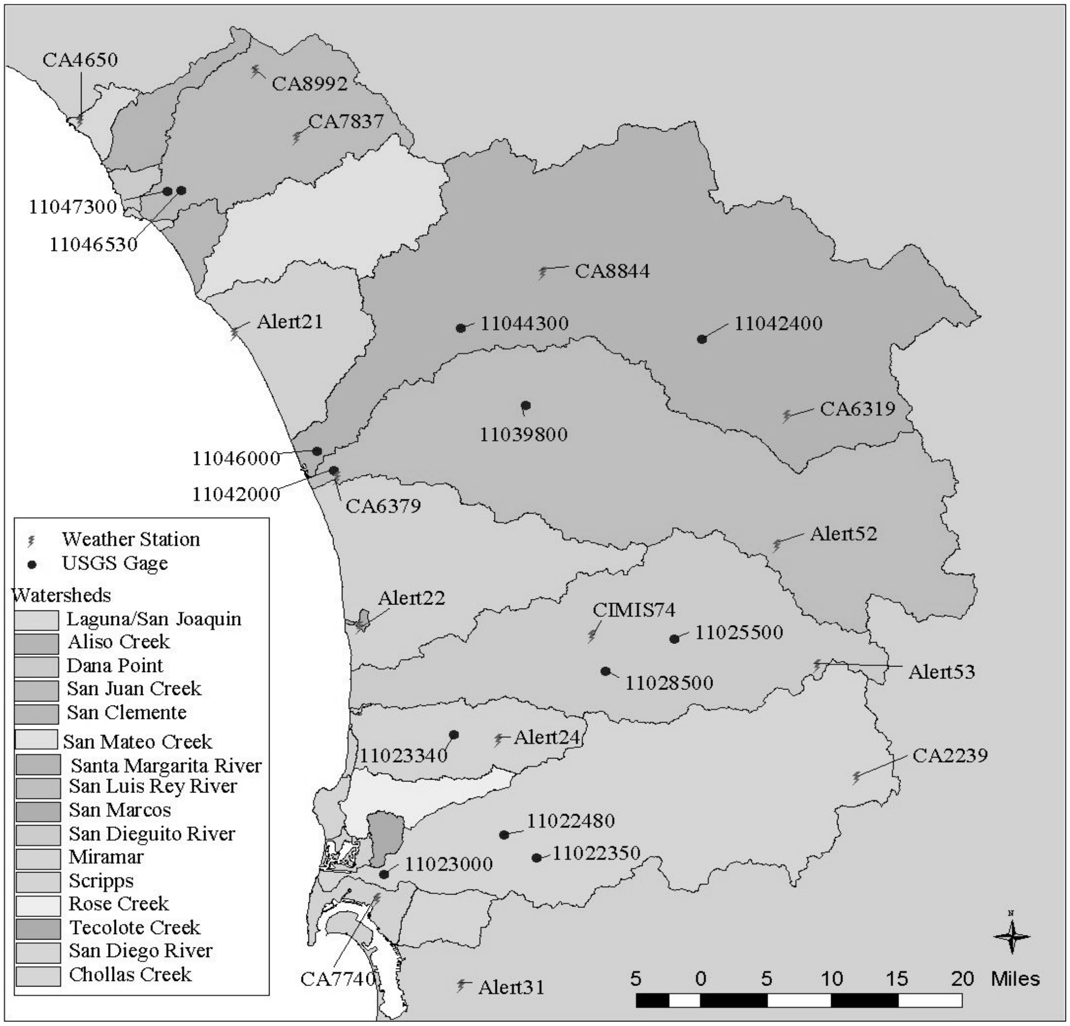


Figure J-1. Weather stations and flow gages utilized for wet weather modeling

Long-term hourly wind speed, cloud cover, temperature and dew point data are available for a number of weather stations in the San Diego Region. Data from Lindbergh Field, the San Diego Airport (COOP ID #047740), were obtained from NCDC for characterization of meteorology of the modeled watersheds (Appendix G, No. 21). Using this data, the METCMP utility, available from USGS, was used to calculate hourly potential evapotranspiration.

J.2.2 Land Use Representation

The watershed model requires a basis for distributing hydrologic and pollutant loading parameters. This is necessary to appropriately represent hydrologic variability throughout the basin, which is influenced by land surface and subsurface characteristics. It is also necessary to represent variability in pollutant loading, which is highly correlated to land practices. The basis for this distribution was provided by land use coverage of the entire watershed.

Three sources of land use data were used in this modeling effort. The primary source of data was the San Diego Association of Governments (SANDAG) 2000 land use dataset that covers San Diego County. This dataset was supplemented with land use data from the Southern California Association of Governments (SCAG) for Orange County and portions of Riverside County. A small area in Riverside County was not covered by either land use dataset. To obtain complete coverage, the 1993 USGS Multi-Resolution Land Characteristic data was used to fill this remaining data gap (Appendix G, No. 25).

Although the multiple categories in the land use coverage provide much detail regarding spatial representation of land practices in the watershed, such resolution is unnecessary for watershed modeling if many of the categories share hydrologic or pollutant loading characteristics. Therefore, many land use categories 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. Table J-1 presents the land use distribution in each of the thirteen watersheds contributing to waterbody impairments. Land use categories are identified by land use codes, shown in parentheses.

LSPC algorithms require that land use categories be divided into separate pervious and impervious land units for modeling. This division was made for the appropriate land uses (primarily urban) to represent impervious and pervious areas separately. The division was based on typical impervious percentages associated with different land use types from the Soil Conservation Service's TR-55 Manual (Soil Conservation Service, 1986) (Table J-2).

Table J-1. Land use areas (square miles) of each modeled watershed

Watershed	LRD (1100)	HDR (1200)	COM/ INST (1400)	IND/ TRNS (1500)	MIL (1600)	PRK/ REC (1700)	TRAN (7000)	DRY/ LIV (2400)	AGR (2000)	HRS (2700)	OPRC (1800)	OPSP (4000)	WTR (5000)	TOTAL
San Joaquin Hills HSA/ Laguna Beach HSA	2.39	0.61	0.34	0.11	0	0.18	0.23	0	0	0.02	0.02	10.02	0	13.92
Aliso HSA	8.75	3.76	2.14	0.89	0	0.69	2.86	0	0.07	0.03	0.4	16.09	0.06	35.74
Dana Point HSA	3.51	1.3	0.25	0.01	0	0.28	0.53	0	0	0	0.32	2.7	0	8.9
Lower San Juan HSA	15.61	2.97	3.09	2.9	0	1.03	4.03	0	7.57	0.4	1.86	137.07	0.66	177.19
San Clemente HA	3.85	1.31	0.66	1.17	0.02	0.37	0.81	0	0	0	0.52	10.06	0	18.77
San Luis Rey HU	42.86	4.22	3.24	4.92	15.31	1.65	0.63	8.51	123.49	0	2.56	350.46	2.56	560.41
San Marcos HA	0.34	0.17	0.19	0.05	0	0.04	0.1	0.25	0.06	0	0.1	0.13	0.01	1.44
San Dieguito HU	43.58	2.26	5.33	2.22	0	1.19	2.34	5.71	61.72	0	3.19	215.96	2.72	346.22
Miramar Reservoir HA	22.42	3.86	11.41	3.28	0	1.7	1.96	0.93	2.29	0	1.14	44.47	0.26	93.72
Scripps HA	5.21	1.32	0.86	0.05	0	0.13	0.03	0	0	0	0.2	0.94	0.01	8.75
Teoclote HA	4.83	0.78	1.89	0.36	0.03	0.31	0	0	0	0	0.09	1.74	0	10.0
Mission San Diego HSA/ Santee HSA	65.65	10.61	16.36	10.07	3.07	2.73	0.5	0.87	9.46	0	2.06	308.67	6.44	436.49
Chollas HSA	14.75	2.87	3.79	1.61	0.02	0.38	0.09	0	0	0	0.52	2.73	0.03	26.79

Abbreviations:

LDR: Low density residential
HDR: High density residential
COM/INST: Commercial/Institutional
IND/TRNS: Industrial/Transportation
MIL: Military
PRK/REC: Parks/Recreation
TRAN: Transitional
DRY/LIV: Dairy/Intensive livestock
AGR: Agriculture
HRS: Horse ranch
OPRC: Open recreation
OPSP: Open space
WTR: Water

~~*Table J-1. Land use areas (square miles) of each impaired watershed*~~

~~Watershed~~	~~Low Density Residential (1100)~~	~~High Density Residential (1200)~~	~~Commercial/ Institutional (1400)~~	~~Industrial/ Transportation (1500)~~	~~Military (1600)~~	~~Parks/ Recreation (1700)~~	~~Open Recreation (1800)~~	~~Agriculture (2000)~~	~~Dairy/ Intensive Live-stock (2400)~~	~~Horse Ranches (2700)~~	~~Open Space (4000)~~	~~Water (5000)~~	~~Transitional (7000)~~	~~Total~~
~~Laguna / San Joaquin~~	~~2.39~~	~~0.61~~	~~0.34~~	~~0.11~~	~~0.00~~	~~0.18~~	~~0.02~~	~~0.00~~	~~0.00~~	~~0.02~~	~~10.02~~	~~0.00~~	~~0.23~~	~~13.94~~
~~Aliso Creek~~	~~8.75~~	~~3.76~~	~~2.14~~	~~0.89~~	~~0.00~~	~~0.69~~	~~0.40~~	~~0.07~~	~~0.00~~	~~0.03~~	~~16.09~~	~~0.06~~	~~2.86~~	~~35.74~~
~~Dana Point~~	~~3.51~~	~~1.30~~	~~0.25~~	~~0.01~~	~~0.00~~	~~0.28~~	~~0.32~~	~~0.00~~	~~0.00~~	~~0.00~~	~~2.70~~	~~0.00~~	~~0.53~~	~~8.89~~
~~San Juan Creek~~	~~15.61~~	~~2.97~~	~~3.09~~	~~2.90~~	~~0.00~~	~~1.03~~	~~1.86~~	~~7.57~~	~~0.00~~	~~0.40~~	~~137.07~~	~~0.66~~	~~4.03~~	~~177.18~~
~~San Clemente~~	~~3.85~~	~~1.31~~	~~0.66~~	~~1.17~~	~~0.02~~	~~0.37~~	~~0.52~~	~~0.00~~	~~0.00~~	~~0.00~~	~~10.06~~	~~0.00~~	~~0.81~~	~~18.78~~
~~San Luis Rey River~~	~~42.86~~	~~4.22~~	~~3.24~~	~~4.92~~	~~15.31~~	~~1.65~~	~~2.56~~	~~123.49~~	~~8.51~~	~~0.00~~	~~350.46~~	~~2.56~~	~~0.63~~	~~560.42~~
~~San Marcos~~	~~0.34~~	~~0.17~~	~~0.19~~	~~0.05~~	~~0.00~~	~~0.04~~	~~0.10~~	~~0.06~~	~~0.25~~	~~0.00~~	~~0.13~~	~~0.01~~	~~0.10~~	~~1.43~~
~~San Dieguito River~~	~~43.58~~	~~2.26~~	~~5.33~~	~~2.22~~	~~0.00~~	~~1.19~~	~~3.19~~	~~61.72~~	~~5.71~~	~~0.00~~	~~215.96~~	~~2.72~~	~~2.34~~	~~346.22~~
~~Miramar~~	~~22.42~~	~~3.86~~	~~11.41~~	~~3.28~~	~~0.00~~	~~1.70~~	~~1.14~~	~~2.29~~	~~0.93~~	~~0.00~~	~~44.47~~	~~0.26~~	~~1.96~~	~~93.73~~
~~Scripps~~	~~5.21~~	~~1.32~~	~~0.86~~	~~0.05~~	~~0.00~~	~~0.13~~	~~0.20~~	~~0.00~~	~~0.00~~	~~0.00~~	~~0.94~~	~~0.01~~	~~0.03~~	~~8.75~~
~~San Diego River~~	~~65.65~~	~~10.61~~	~~16.36~~	~~10.07~~	~~3.07~~	~~2.73~~	~~2.06~~	~~9.46~~	~~0.87~~	~~0.00~~	~~308.67~~	~~6.44~~	~~0.50~~	~~436.48~~
~~Chollas Creek~~	~~14.75~~	~~2.87~~	~~3.79~~	~~1.61~~	~~0.02~~	~~0.38~~	~~0.52~~	~~0.00~~	~~0.00~~	~~0.00~~	~~2.73~~	~~0.03~~	~~0.09~~	~~26.80~~
~~Pine Valley Creek~~	~~0.13~~	~~0.00~~	~~0.03~~	~~0.00~~	~~0.00~~	~~0.11~~	~~0.00~~	~~0.03~~	~~0.00~~	~~0.00~~	~~29.10~~	~~0.13~~	~~0.00~~	~~29.53~~

Table J-2. Percent impervious for urban land uses (based on TR-55)

Land Use	Impervious
Industrial/Transportation	72%
Low Density Residential	15%
High Density Residential	65%
Commercial/Institutional	85%
Parks/Recreation	12%

J.2.3 Hydrology Representation

The LSPC PWATER (water budget simulation for pervious land segments) and IWATER (water budget simulation for impervious land segments) modules, which are identical to those in HSPF, were used to represent hydrology for all pervious and impervious land units (Bicknell et al., 1996). Designation of key hydrologic parameters in the PWATER and IWATER modules of LSPC were required. These parameters are associated with infiltration, groundwater flow and overland flow. USDA's STATSGO Soils Database served as a starting point for designation of infiltration and groundwater flow parameters (Appendix G, No. 26). For parameter values not easily derived from these sources, documentation on past HSPF applications were accessed, particularly the recent modeling studies performed for the San Jacinto River Watershed (Tetra Tech, Inc., 2003) and Santa Monica Bay (Los Angeles Water Board, 2002). Starting values were refined through the hydrologic calibration process (described in the next section).

J.2.4 Hydrology Representation

The LSPC PWATER (water budget simulation for pervious land segments) and IWATER (water budget simulation for impervious land segments) modules, which are identical to those in HSPF, were used to represent hydrology for all pervious and impervious land units (Bicknell et al., 1996). Designation of key hydrologic parameters in the PWATER and IWATER modules of LSPC were required. These parameters are associated with infiltration, groundwater flow and overland flow. USDA's STATSGO Soils Database served as a starting point for designation of infiltration and groundwater flow parameters (Appendix G, No. 26). For parameter values not easily derived from these sources, documentation on past HSPF applications were accessed, particularly the recent modeling studies performed for the San Jacinto River Watershed (Tetra Tech, Inc, 2003) and Santa Monica Bay (Los Angeles Water Board, 2002). Starting values were refined through the hydrologic calibration process (described in the next section).

J.2.5 Pollutant Representation

Loading processes for FC, TC and ENT were represented for each land unit using the LSPC PQUAL (simulation of quality constituents for pervious land segments) and IQUAL (simulation of quality constituents for impervious land segments) modules, which are identical to those in HSPF. These modules simulate the accumulation of pollutants during dry periods and the washoff of pollutants during storm events. Starting values for parameters relating to land-use-specific accumulation rates and buildup limits, were obtained from a study performed by the Southern California Coastal Water Research Project (SCCWRP) to support bacteria TMDL development of Santa Monica Bay (Los Angeles Water Board, 2002 and Ackerman, 2006). These starting values (Table J-3) served as baseline conditions for water quality calibration; the appropriateness of these values to the San Diego Region watershed was validated through comparison to local water quality data.

Table J-3. Model Build-up Rates for Fecal Indicator Bacteria Calibrated by Land Use in Santa Monica Bay

Land Use	Fecal Coliform (MPN/Ac*day)	Total Coliform (MPN/Ac*day)	Enterococci (MPN/Ac*day)
Agriculture	5×10^{10}	3×10^{11}	2×10^{10}
Commercial	5×10^{8}	3×10^{10}	3.5×10^{9}
High Density Residential	3×10^{9}	6×10^{10}	2.5×10^{9}
Industrial	8×10^{7}	3×10^{9}	1.5×10^{8}
Low Density Residential	6×10^{8}	1.5×10^{10}	2×10^{9}
Open	9×10^{9}	8.2×10^{10}	9.5×10^{9}
Transportation	1×10^{8}	3.5×10^{9}	3.5×10^{9}
Mixed Urban	6.6×10^{8}	1.2×10^{10}	2.1×10^{9}

There were six major inland dischargers during the simulation period and these were incorporated into the LSPC model as point sources of flow and bacteria. Each point source is located in the Santa Margarita River watershed – five at Camp Pendleton and one along Murrieta Creek (Santa Rosa Water Reclamation Facility). Although the Santa Margarita River watershed had no waterbodies impaired for bacteria, it was simulated in this wet weather modeling effort due to the availability of streamflow and bacteria monitoring data, which were used for hydrologic and water quality calibration and validation. It is important to note that all six major inland discharges were eliminated by 2002.

J.2.6 Waterbody Representation

Each delineated subwatershed was represented with a single stream assumed to be completely mixed, one-dimensional segments with a trapezoidal cross-section. The National Hydrography Dataset (NHD) stream reach network for USGS hydrologic units 18070301 through 18070305 were used to determine the representative stream reach for each subwatershed. Once the representative reach was identified, slopes were calculated based on DEM data and stream lengths measured from the original NHD stream coverage (Appendix G, No. 24 and 27). In addition to stream slope and length, mean depths and channel widths are required to route flow and pollutants through the hydrologically connected subwatersheds. Mean stream depth and channel width were estimated using regression curves that relate upstream drainage area to stream dimensions. An estimated Manning's roughness coefficient of 0.2 was also applied to each representative stream reach.

In addition to the streams which route flow and transport pollutants through the watersheds, there were several reservoirs within the region that were large enough to impound a significant portion of flow during wet periods. To represent these reservoirs in the watershed model, the length, width, maximum depth, infiltration rate and spillway height and width were obtained for each reservoir. The reservoirs impounded all upstream flow until the water depth exceeded the spillway height, causing overflow and thus contributing to downstream flow and bacteria loading.

J.3 Model Calibration and Validation

After the model was configured, model calibration and validation were performed. This is generally a two-phase process, with hydrology calibration and validation completed before repeating the process for water quality. Upon completion of the calibration and validation at selected locations, a calibrated dataset containing parameter values for each modeled land use and pollutant was developed.

Calibration refers to the adjustment or fine-tuning of modeling parameters to reproduce observations. The calibration was performed for different LSPC modules at multiple locations throughout the watershed. This approach ensured that heterogeneities were accurately represented. Subsequently, model validation was performed to test the calibrated parameters at different locations or for different time periods, without further adjustment. To ensure that the model results are as current as possible and to provide for a range of hydrologic conditions, January 1991 through September 2002 was selected as the time period for simulation.

J.3.1 Hydrology Calibration and Validation

Hydrology is the first model component calibrated because estimation of bacteria loading relies heavily on flow prediction. The hydrology calibration involves a comparison of model results to in-stream flow observations at selected locations. After comparing the results, key hydrologic parameters were adjusted and additional model simulations were performed. This iterative process was repeated until the simulated results closely represented the system and reproduced observed flow patterns and magnitudes.

Gaging stations representing diverse hydrologic regions of the San Diego Region were used for calibration, including eleven USGS streamflow gage stations (Table J-4 and Figure J-1) (Appendix G, No.3). These gaging stations were selected because they either had a robust historical record or they were in a strategic location (i.e. along a 303(d) listed waterbody, downstream of a reservoir, or along an otherwise unmonitored reach).
The calibration years were selected based on annual precipitation variability and the availability of observation data to represent a continuum of hydrologic conditions: low, mean and high flow. Calibration for these conditions was necessary to ensure that the model would accurately predict a range of conditions over a longer period of time.

Key considerations in the hydrology calibration included the overall water balance, the high-flow/low-flow distribution, storm flows and seasonal variation. At least two criteria for goodness of fit were used for calibration: graphical comparison and the relative error method. Graphical comparisons were extremely useful for judging the results of model calibration; time-variable plots of observed versus modeled flow provided insight into the model's representation of storm hydrographs, baseflow recession, time distributions and other pertinent factors often overlooked by statistical comparisons. The model's accuracy was primarily assessed through interpretation of the time-variable plots. The relative error method was used to support the goodness of fit evaluation through a quantitative comparison.

After calibrating hydrology at the eleven locations, a validation of these hydrologic parameters was made through a comparison of model output to different time periods at the same gages as well as two additional gages (Table J-4). The validation essentially confirmed the applicability of the regional hydrologic parameters derived during the calibration process. Validation results were assessed in a similar manner to calibration: graphical comparison and the relative error method.

Hydrology calibration and validation results, including time series plots and relative error tables, are presented for each gage in Appendix M. The calibration results, which are presented first, include graphs to represent overall model fit, seasonal trends and two time series plots. These graphs are followed by a table that quantified the model results and observed gage data. This table also provides relative errors between the modeled and observed values in the storm volumes and highest flows. The presentation of model validation results follows the calibration tables and graphs for each gage. Two additional gages that had a limited historical record were used as additional validation. Validation was assessed through a time series plot and a relative error table identical to the calibration table.

Overall, during model calibration the model predicted storm volumes and storm peaks well. Since the runoff and resulting streamflow is highly dependent on rainfall, occasional storms were over-predicted or under-predicted depending on the spatial variability of the meteorologic and gage stations. The validation results also showed a good fit between modeled and observed values, thus confirming the applicability of the calibrated hydrologic parameters to the San Diego Region.

Table J-4. USGS stations used for hydrology calibration and validation

Station Number	Station Name	Historical Record	Selected Calibration Period	Selected Validation Period	Watershed and Model Subwatershed
11022480	San Diego River at Mast Road near Santee, CA	5/1/1912 - 9/30/2002	1/1/1991 - 12/31/1996	1/1/1997 - 12/31/2001	San Diego River (1805)
11023000	San Diego River at Fashion Valley at San Diego, CA	1/18/1982 - 9/30/2002	1/1/1991 - 12/31/1996	1/1/1997 - 12/31/2001	San Diego River (1801)
11023340	Los Penasquitos Creek near Poway, CA	10/1/1964 - 9/30/2002	1/1/1991 - 12/31/1996	1/1/1997 - 12/31/2001	Miramar (1406)
11025500	Santa Ysabel Creek near Ramona, CA	2/1/1912 - 9/30/2002	1/1/1991 - 12/31/1996	1/1/1997 - 12/31/2001	San Dieguito (1316)
11028500	Santa Maria Creek near Ramona, CA	12/1/1912 - 9/30/2002	1/1/1991 - 12/31/1996	1/1/1997 - 12/31/2001	San Dieguito (1324)
11042000	San Luis Rey River at Oceanside, CA	10/1/1912 - 11/10/1997; 4/29/1998 - 9/30/2002	9/1/1993 - 8/31/1997	5/1/1998 - 4/30/0202	San Luis Rey (702)
11042400	Temecula Creek near Aguanga, CA	8/1/1957 - 9/30/2002	1/1/1991 - 12/31/1996	1/1/1997 - 12/31/2001	Santa Margarita (658)
11044300	Santa Margarita River at FPUD Sump near Fallbrook, CA	10/1/1989 - 9/30/2002	1/1/1991 - 12/31/1996	1/1/1997 - 12/31/2001	Santa Margarita (615)
11046000	Santa Margarita River at Ysidora, CA	3/1/1923 - 2/25/1999; 10/1/2001 - 9/30/2002	1/1/1991 - 12/31/1995	1/1/1996 - 12/31/1998	Santa Margarita (602)
11046530	San Juan Creek at La Novia Street Bridge near San Juan Capistrano, CA	10/1/1985 - 9/30/2002	1/1/1991 - 12/31/1996	1/1/1997 - 12/31/2001	San Juan (411)
11047300	Arroyo Trabuco near San Juan Capistrano, CA	10/1/1970 - 9/30/1989; 10/1/1995 - 9/30/2002	10/1/1995 - 4/30/1999	5/1/1999 - 4/30/2002	San Juan (403)
11022350	Forester Creek near El Cajon, CA	10/1/1993 - 9/30/2002	none (insufficient period of record)	1/1/1991 - 9/30/1993	San Diego River (1843)
11039800	San Luis Rey River at Couser Canyon Bridge near Pala, CA	10/1/1986 - 1/4/1993	none (insufficient period of record)	1/1/1991 - 12/31/1992	San Luis Rey (711)

J.3.2 Water Quality

After the model was calibrated and validated for hydrology, water quality simulations were performed. As described above, previously calibrated, land use specific accumulation and maximum build up rates for fecal coliforms, total coliforms and enterococci (Los Angeles Water Board, 2002) were used for the water quality simulations. Since these values have been successfully applied to recent bacteria models, including TMDLs, in southern California, they were considered to be sufficiently calibrated. Therefore, the water quality simulations were used to further validate these rates. The objective of the validation process was to best represent bacteria concentrations during storm events at monitoring stations throughout the region.

Only data from wet weather events (rainfall of 0.2 inches or greater and the following 72 hours) were used for comparison with model water quality output. This greatly reduced the availability of bacteria monitoring data for use in the validation process; however, it was important to differentiate between wet and dry periods due to the separate approaches utilized for this TMDL. There were 107 monitoring stations in the modeled subwatersheds with wet weather monitoring data that overlapped with the modeling period (Tables J-5 through J-7) (Appendix G, No. 7-14). The spatial variability of these locations was excellent (ranging from urban to open land uses); however, the temporal variability and total number of samples limited statistical analysis to basinwide summary statistics rather than comprehensive time series and relative error analyses at each monitoring location.

Table J-5. Basin-wide water quality data used for fecal coliform validation

Basin	Number of		Fecal Coliform (MPN/100mL)		
	Sites	Samples	Minimum	Mean	Maximum
Aliso Creek	59	217	2	11,142	160,000
San Juan Creek	7	9	200	4,222	26,000
Santa Margarita River	14	83	2	1,204	50,000
Rose Creek & Tecolote Creek	17	30	31	9,939	137,400
San Diego River	6	36	2	1,557	24,000

Table J-6. Basin-wide water quality data used for total coliform validation

Basin	Number of		Total Coliform (MPN/100mL)		
	Sites	Samples	Minimum	Mean	Maximum
Aliso Creek	56	206	2	32,246	160,000
San Juan Creek	7	9	680	16,356	70,000
Santa Margarita River	14	36	230	3,248	50,000
Rose Creek & Tecolote Creek	15	24	4,884	333,384	2,419,200
San Diego River	6	34	300	14,885	300,000

Table J-7. Basin-wide water quality data used for enterococcus validation

Basin	Number of		Enterococcus (MPN/100mL)		
	Sites	Samples	Minimum	Mean	Maximum
Aliso Creek	59	217	1	3,720	72,000
San Juan Creek	7	9	340	8,056	51,000
Rose Creek & Tecolote Creek	17	29	20	6,978	32,550

To assess model fit with available data, the time series model output was graphically compared to the observed data. Appendix N (Figures 1-11) presents time series graphs of modeled and observed data for downstream subwatersheds with a reasonable number of samples. Ensuring that the storm events were represented within the range of the data over time is the most practical and meaningful means of assessing the quality of the model output. The time series plots indicate that the model predicts the fecal coliform, total coliform and enterococci concentrations within the range of observed data (ranges of observed data are presented in Tables J-3 through J-5) and at a similar frequency. This is especially evident in subwatersheds where there is a significant amount of data across a wide temporal range (see Appendix N, Figures N-1-A through N-1-C).

To provide a side-by-side comparison of the available wet weather monitoring data with model output for the same day, data were grouped by basin to increase sample size. Graphs of concentration by percentile of unit area flow (inches/acre-day) are presented in Appendix N (Figures 12-24) for each pollutant in the basins where data were available. Presenting the data as a function of flow facilitates analysis of the results which are pertinent to the wet weather model. Specifically, the higher flows (larger percentiles) are likely associated with the actual precipitation event, rather than the assumed wet period of 72 hours following the storm. For lower flows, observed data that met the wet weather criterion (0.2 inches of rainfall and following 72 hours) may not be representative of true wet conditions, which explains the deviance between model predictions and ranges of observed water quality. However, dry periods are addressed in a separate approach in this TMDL with better accuracy.

Figures 12 through 24 in Appendix N depict the average and range for observed and modeled fecal coliform, total coliform, and enterococci concentrations in the basins identified above. These graphs indicate that the model compared well to observed data, especially for basins with larger sample sizes and in the larger unit area flow percentiles. Discrepancies may be due to small sample sizes, the variability in bacteria monitoring and analysis, or the range of time defined as a wet period (72 hours after a 0.2 inch or greater storm).

Analysis of the time series graphs and the unit area flow summary plots indicate that the previously calibrated bacteria accumulation and maximum build-up rates (Los Angeles Water Board, 2002) are applicable and therefore validated, for the San Diego region. Additional bacteriological data collection is likely to further support these findings considering that the model matched observed data fairly well for all three pollutants when an abundance of observed wet weather data was available (see Appendix N, Figures 12-14).

J.4 Application of Wet Weather Model

After completing model calibration and validation for hydrology and water quality, the model was applied to obtain hourly output for the critical wet year period described in section 6.1.1 of the Technical Report. The maximum hourly fecal coliform, total coliform, and enterococci concentrations were obtained for each wet day in the critical wet year period (1993) for all subwatersheds associated with a 303(d) listed segment. These concentrations, along with their associated average daily flow, were used to generate TMDL load duration curves (Appendixees O and P). ~~The overall load capacity was incorporated into the load duration curves. Predicted loads that fell above the load capacity are exceedances and were then divided by the total existing load to calculate the percent reduction required to achieve the beneficial use of the receiving waterbody.~~

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APPENDIX K

DRY WEATHER MODEL CONFIGURATION, CALIBRATION AND VALIDATION

The variable nature of bacteria sources during dry weather required an approach that relied on detailed analyses of flow and water quality monitoring data to identify and characterize sources. This TMDL used data collected from dry weather samples to develop empirical equations 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 concentrations. A statistical relationship was established between areas of each land use and flow and bacteria concentrations.

K.1 Background

Characterization of dry weather flow and indicator bacteria concentrations was based on analyses of data collected during studies of four watersheds in the San Diego Region. Two of these watersheds, Aliso Creek and San Juan Creek, are located in Orange County and are representative of conditions in the northern part of the Region (Figure 5-3). The remaining two watersheds, Rose Creek and Tecolote Creek, are located in San Diego County and discharge to Mission Bay (Figure 5-4). Three of these watersheds, Aliso Creek, San Juan Creek, and Tecolote Creek, are associated with water quality impairments due to bacteria and are therefore representative of conditions that may contribute to similar impairments in neighboring watersheds. Land uses for all four watersheds are consistent with other impaired watersheds in this study, with varying amounts of urban/residential land uses and open space in different subwatersheds.

To represent the linkage between source contributions and in-stream response, a mass balance spreadsheet model was developed to simulate source loadings and transport of bacteria in the impaired streams and streams flowing to impaired beaches. The model estimates bacterial concentrations to develop load allocations and to allow for future incorporation of new data. This predictive model represents the streams as a series of plug-flow reactors, with each reactor having a constant source of flow and bacteria. A plug-flow reactor can be thought of as an elongated rectangular basin with a constant level in which advection (unidirectional transport) dominates (Figure K-1).

The model segments are assumed to be well mixed laterally and vertically at a steady-state condition (constant flow and constant input). Variations in the longitudinal dimension are what determine any changes in parameters of concern. A “plug” of a conservative substance introduced at one end of the reactor will remain intact as it passes through the reactor. The initial concentration of bacteria can be entered for the injection point. At points farther downstream, the concentration can be estimated based on first- order die-off and mass balance.

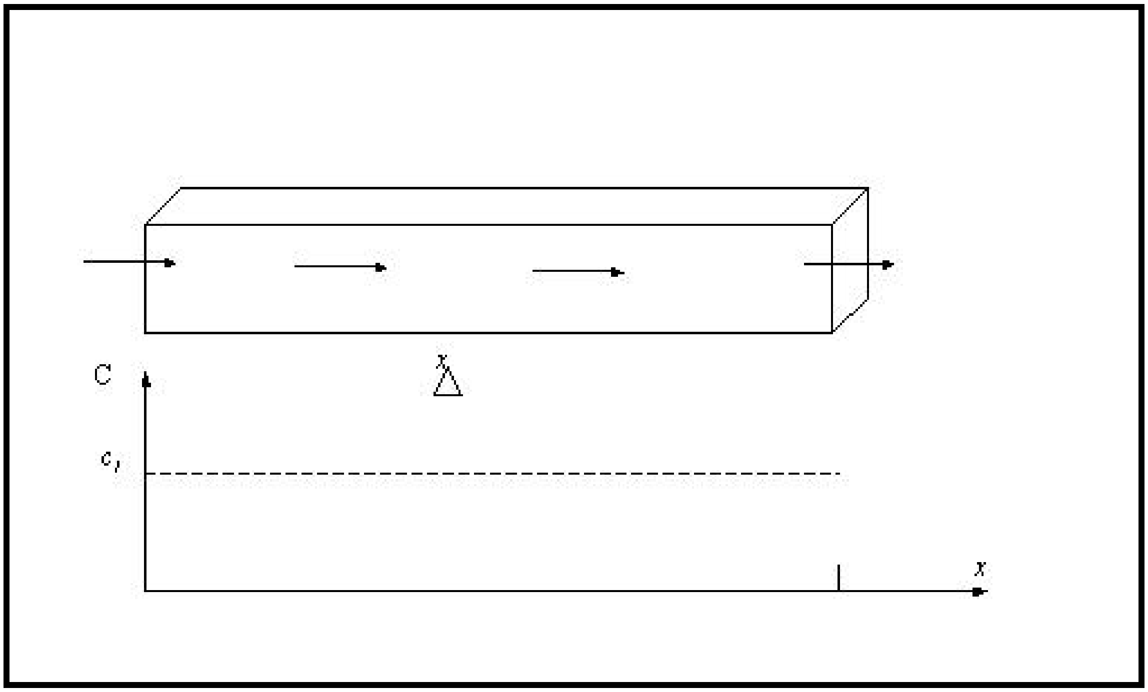

Figure K-1. Theoretical plug-flow reactor

This modeling approach relies on basic segment characteristics, which include flow, width and cross-sectional area. Model input for the flows and bacteria concentration of dry weather urban runoff was estimated using regression equations based on analyses of observed dry weather data. It is important to note that because each of these model parameters was estimated, the accuracy of the model is subject to the accuracy of the estimations. Bacteria concentrations in each reactor, or segment, are calculated using water quality data, a bacteria die-off rate, basic channel geometry and flow. Bacteria die-off rates, which can be attributed to solar radiation, temperature and other environmental conditions, were assumed first-order.

K.2 Model Configuration

Conceptually, the streams are segmented into a series of plug-flow reactors defined along the entire length of the stream to simulate the steady-state distribution of bacteria along its length. Multiple source contributions in a reactor are lumped and represented as a single input based on empirically derived inflows and bacteria concentrations. The model is one-dimensional (longitudinal) under a steady-state condition. Each reactor defines the mass balance for bacteria and water.

K.2.1 Physical Configuration

The first step in setting up and applying the model was the determination of an appropriate scale for analysis. Model subwatersheds were based on CALWTR 2.2 watersheds, stream networks, locations of flow and water quality monitoring stations, consistency of hydrologic factors and land use uniformity. The subwatersheds used in the dry weather model were the same as those used for the wet-weather model (see Appendix E for delineation of the subwatersheds).

Figure K-2 depicts an example of model connectivity of segments for the Chollas Creek watershed. Segments 1905, 1903, 1908 and 1907 are headwater segments. Segment 1902 begins where Segment 1903 and 1904 converge and so forth. For each model segment, mass balance is performed on all inflows from upstream segments, input from local watershed runoff, first-order bacteria die-off, stream infiltration and evaporation and outflow.

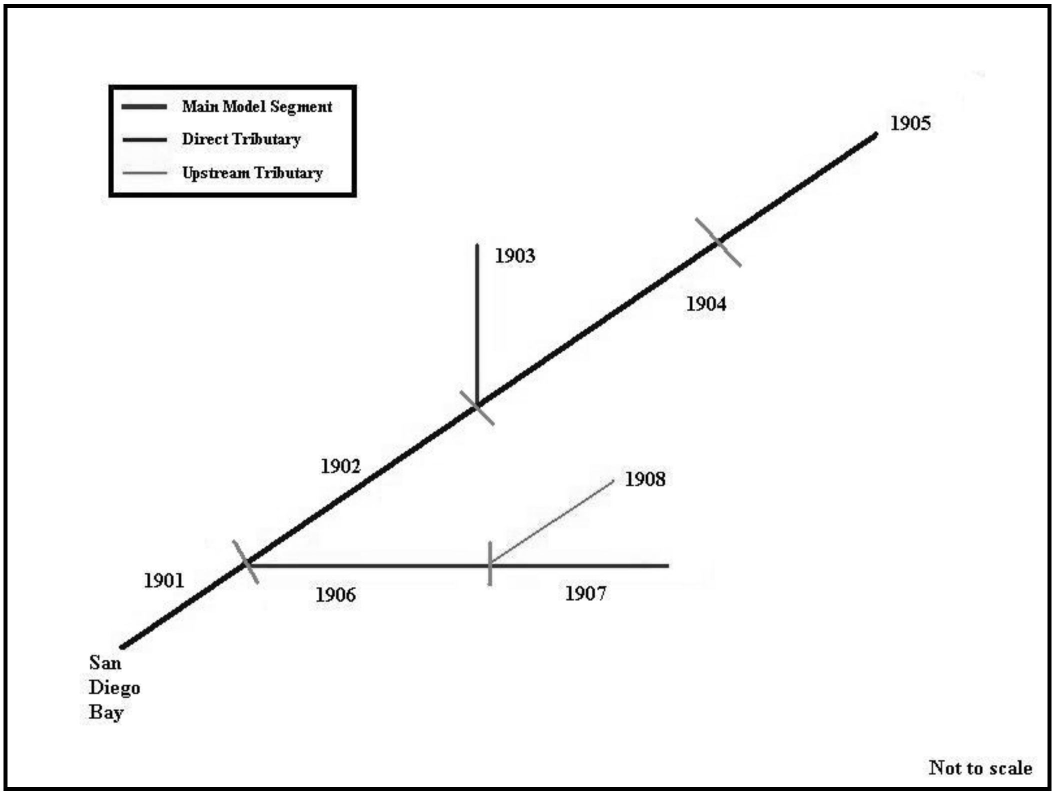

Figure K-2. Schematic of model segments for Chollas Creek and its tributaries

Using an upstream boundary condition of initial concentration (C_{in}) for inflow, the final water column concentration (C_{out}) in a segment can be calculated using the decay equation given below:

$$\frac{dc}{dt} = -kc \qquad \text{or} \qquad C_{out} = C_{in} e^{-kt} = C_{in} e^{-\left(k\frac{x}{u}\right)} \qquad (1)$$

where

C_{in} = initial concentration (#/100 mL)
C_{out} = final concentration (#/100 mL)
k = die-off rate (1/d)
χ = segment length (mi)
u = stream velocity (mi/d)

At each confluence, a mass balance of the watershed load and, if applicable, the load from the upstream tributary is performed to determine the initial concentration in the inflow to the reach. This is represented by the following equation:

$$C_{in} = \frac{Q_r C_r + Q_t C_t}{Q_r + Q_t} \qquad (2)$$

where
Q = flow (ft^3/s)
C = concentration (#/100 mL)

In the previous equation, Q_r and C_r refer to the flow and concentration from the receiving watershed and Q_t and C_t refer to the flow and concentration from the upstream tributary. The concentration calculated from this equation is then used as the initial concentration (C_{in}) in equation 1 for the receiving segment.

For calculation of outflows from the reach, the following equation is used. Infiltration rates for the model were determined through model calibration and comparison to literature ranges (see section K.5), and are dependent on stream length and width.

$$Q = Q_t + Q_r - I \qquad (3)$$

where
I = infiltration (ft^3/s)

Precise channel geometry data were not available for the modeled stream segments and therefore stream dimensions were estimated from analysis of observed data. Analysis was performed on streamflow data and associated stream dimension data from 53 USGS gages throughout Southern California. For this analysis, it was assumed that all streamflow at these gages less than 15 ft^3/s represented dry weather flow conditions. Using this dry weather data, the relationship between flow and cross-sectional area was estimated ($R^2 = 0.51$). The following is the resulting regression equation relating flow to cross-sectional area:

$$A = e^{0.2253 \times Q} \qquad (4)$$

where
A = cross-sectional area (ft^2)
Q = flow (ft^3/s)

In addition, data from the USGS gages were used to determine the width of each segment based on a regression between cross-sectional area and width. The best relationship ($R^2 = 0.75$) was based on the natural logarithms of each parameter. The following is the resulting regression equation from the analysis:

$$LN(W) = (0.6296 \times LN(A)) + 1.3003 \quad \text{or} \quad W = e^{((0.6296 \times LN(A)) + 1.3003)} \qquad (5)$$

where

W = width of model segment (ft)
A = cross-sectional area (ft^2)

K.3 Estimation of Dry weather Runoff

Flow data were not available for many of the subwatersheds. Estimates of inflows from the subwatersheds to the stream model were obtained through analysis of available data. Monitoring studies for which dry weather flow data were collected were available for Aliso Creek (performed by the Orange County Pubic Facilities and Resources Department and the Orange County Public Health Laboratory) and for Rose Creek and Tecolote Creek (performed by the City of San Diego) (Appendix G, No. 1 and 2). Information from these studies was assumed sufficient for use in characterizing dry weather flow conditions for the entire study area. For each study, flow data were collected throughout the year at stations throughout the watersheds. This information was used to understand the relationship between land use and stream flow.

An analysis was performed using dry weather data from the Aliso Creek (27 stations), Rose Creek (3 stations) and Tecolote Creek (2 stations) subwatersheds to determine whether there is a correlation between the respective land use types and the average of dry weather flow measurements collected at the mouth of each subwatershed. Table K-1 lists the stations and number of flow measurements used in this analysis. Selection of stations used in the analyses considered the number of flow measurements, the size of the watershed, as well as strategic locations of multiple watersheds representative of varied land uses. A linear relationship was established based on land use areas, with coefficients established through a *step-wise* multivariable regression analyses. For this regression, variables (land use areas) were added to the regression in a step-wise approach, and p-values were evaluated for each parameter. A p-value of less than 0.05 for each variable was used to determine their statistical significance. Some variables added at an early state of the regression analysis became statistically insignificant as additional variables were subsequently added to the model, which verified the necessity for a robust *step-wise* regression analyses over other more simplified methods. The resulting equation showed a good correlation between the flow and the commercial/institutional, open space and industrial/transportation land uses ($R^2 = 0.78$). The following is the resulting equation from the analysis (p-values for each variable are listed below):

$$Q = (A_{COM} \times 0.00168) + (A_{OPS} \times 0.000256) - (A_{IND} \times 0.00141) \qquad (6)$$

where

Q = flow (ft^3/s)
A_{COM} = area of commercial/institutional (acres) (p-value = 6E-13)
A_{OPS} = area of open space, including military operations (acres) (p-value = 0.029)
A_{IND} = area of industrial/transportation (acres) (p-value = 0.002)

Table K-1. Number of Flow Measurements at Each Station Used in Analyses

Watershed	Station	No. of Flow of Measurements
Aliso Creek	J01P08	35
	J01P06	21
	J07P02	40
	J07P01	38
	J01P01	40
	J01P05	39
	J01P03	40
	J01P04	40
	J06	15
	J05	39
	J01P30	39
	J01P28	39
	J01P27	40
	J01P33	40
	J01P25	40
	J01P26	40
	J01P24	35
	J01P23	40
	J01P22	39
	J03P02	39
	J01P21	32
	J02P05	39
	J02P08	40
	J03P13	38
	J03P05	40
	J03P01	39
	J04	6
Rose Creek	MBW11	7
	MBW13	80
	MBW16	76
Tecolote Creek	MBW7	23
	MBW9	77

Figure K-3 shows the predicted and observed flow data used in this regression.

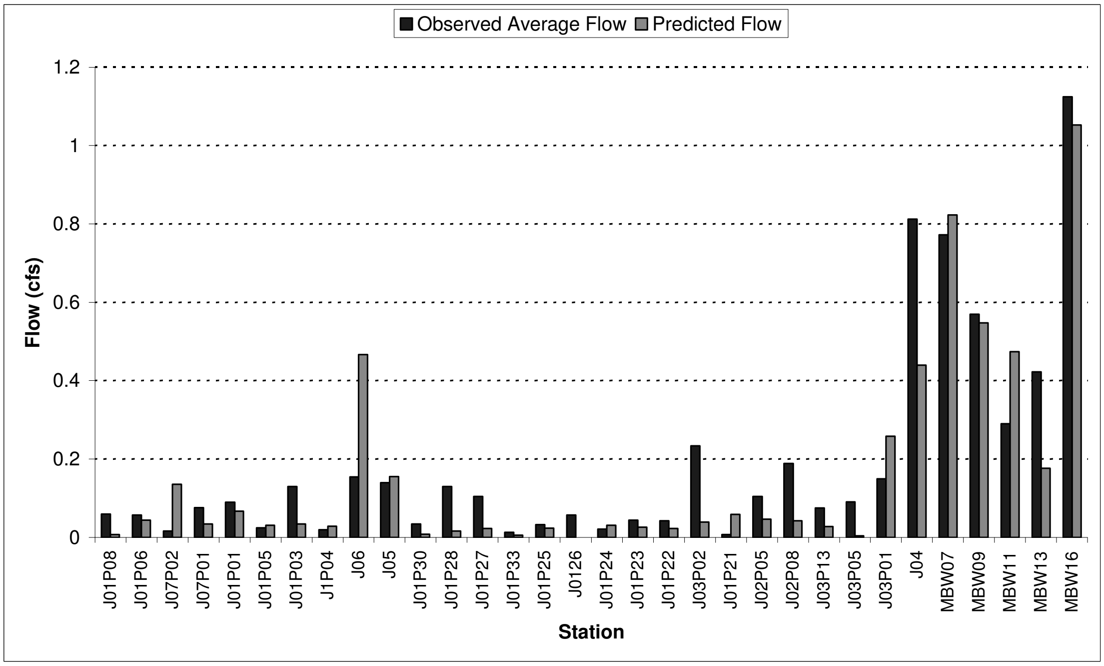

Figure K-3. Predicted and observed flows in Aliso Creek, Rose Creek and Tecolote Creek.

K.4 Estimation of Bacteria Densities

Like flow data, bacteria data were not available for many watersheds modeled. However, bacteria data had been collected for Aliso Creek (Orange County Pubic Facilities and Resources Department), San Juan Creek (Orange County Pubic Facilities and Resources Department) and Rose Creek and Tecolote Creek in the Mission Bay area (City of San Diego) (Appendix G, No. 4-6). For each study, multiple bacteria samples were collected throughout the year at stations throughout the watersheds. For this study, the information was used to understand the relationship between land use and water quality.

An analysis was performed using data from subwatersheds tributary to Aliso Creek (27 stations), Tecolote Creek (5 stations), Rose Creek (4 stations) and San Juan Creek (9 stations) to determine the correlation between dry weather fecal coliform concentrations, land use distribution and the overall size of the subwatersheds. For comparison, geometric means were calculated for each station using all dry weather data collected. Large data sets are preferred to reduce random error and normalize observations at each site. For example, if a station has 40 dry weather samples, the geometric mean of bacteria concentrations can be used for that station with confidence that they are representative of the range of conditions that normally occur. Likewise, if a station has only two samples, there is less confidence. It was critical that the data are normalized as well as possible before regression analysis so that variability does not propagate error. However, no criteria were developed for selection of stations based on the number of samples for representative geometric mean calculations. Rather, station selection included qualitative evaluation for consideration in the analyses. Specific stations of Rose Creek, Tecolote Creek, and San Juan Creek were selected for analyses even though few samples were available at these locations for geometric mean calculations. These stations were selected based on multiple reasons, including the relatively low indicator bacteria concentrations observed (see Figure K-4), strategic locations of watersheds to provide an expanded spatial coverage for analyses, size of the watershed, or representation of key land uses.

Table K-2. Number of Water Quality Samples at Each Station Used in Analyses

Watershed	Station	Number of Samples		
		Fecal Coliform	Total Coliform	Enterococci
Aliso Creek	J01P08	40	40	40
	J01P06	39	39	39
	J07P02	40	40	40
	J07P01	40	40	40
	J01P01	40	40	40
	J01P05	40	40	40
	J01P03	40	40	40
	J01P04	40	40	40
	J06	40	40	40
	J05	40	40	40
	J01P30	40	40	40
	J01P28	40	40	40
	J01P27	40	40	40
	J01P33	40	40	40
	J01P25	40	40	40
	J01P26	40	40	40
	J01P24	40	40	40
	J01P23	40	40	40
	J01P22	40	40	40
	J03P02	40	40	40
	J01P21	33	33	33
	J02P05	40	40	40
	J02P08	40	40	40
	J03P13	40	40	40
	J03P05	40	40	40
	J03P01	40	40	40
	J04	40	40	40
Rose Creek	MBW13	55	80	60
	MBW15	22	78	26
	MBW16	18	76	21
	MBW24	3	7	3

Table K-2. Number of Water Quality Samples at Each Station Used in Analyses (Cont'd)

Watershed	Station	Number of Samples		
		Fecal Coliform	Total Coliform	Enterococci
Tecolote Creek	MBW6	5	70	8
	MBW7	6	23	11
	MBW8	5	27	15
	MBW9	20	77	25
	MBW10	40	88	54
San Juan Creek	SJ13	11	11	11
	SJ14	10	10	10
	SJ15	11	11	11
	SJ16	11	11	11
	SJ19	3	3	3
	SJ20	11	11	11
	SJ21	11	11	11
	SJ29	2	2	2
	SJ32	11	11	11

A regression analysis was then performed to determine whether there is a correlation between the representative geometric mean of fecal coliform data at each station, the percent of each land use category in the subwatershed and the total subwatershed area. Due to the variability of bacteria concentrations that often exceed multiple orders of magnitude, the analyses was based on the natural log of bacteria concentrations.

Coefficients in the equation were established through a *step-wise* multivariable regression analyses. For this regression, variables (percent of land uses) were added to the regression in a step-wise approach, and *p*-values were evaluated for each parameter. Percentages of land uses were used instead of land use areas since concentrations are not expected to increase with the size of the watershed, but rather due to the density of specific land uses. To include a function for reduction of bacteria concentration due to watershed size and increased potential for bacteria die-off (prior to entering the stream), an additional variable was added for watershed area. A *p*-value of less than 0.05 for each variable was used to determine their statistical significance (although this criterion was relaxed for open recreation which slightly exceeded at 0.067). As with the flow analysis, some variables added at an early state of the regression analysis became statistically insignificant as additional variables were subsequently added to the model, verifying the need for a robust *step-wise* regression analyses over other more simplified methods.

Results showed a good correlation between the natural log of fecal coliform concentrations and low-density residential, high-density residential, industrial/transportation, open space, transitional, commercial/institutional and recreation land uses, as well as subwatershed size (R^2=0.74). The following is the resulting regression equation from the analysis of fecal coliform concentrations (*p*-values for each variable are listed below). Figure K-4 shows observed geometric means and predicted concentrations to allow comparison.

$$LN(FC) = 8.48 \times (\%LU_{LDR}) + 9.81 \times (\%LU_{HDR}) + 8.30 \times (\%LU_{IND}) + 8.46 \times (\%LU_{OPS}) + 10.76 \times (\%LU_{TRN}) + 6.60 \times (\%LU_{COM}) + 17.92 \times (\%LU_{PRK}) + 12.85 \times (\%LU_{OPR}) - 0.000245 \times A \quad (7)$$

where: FC = fecal coliform concentration (#/100 mL)
$\%LU_{LDR}$ = percent of low density residential (p-value = 8E-16)
$\%LU_{HDR}$ = percent of high density residential (p-value = 7E-15)
$\%LU_{IND}$ = percent of industrial/transportation (p-value = 0.005)
$\%LU_{OPS}$ = percent of open space, including military operations (p-value = 7E-24)
$\%LU_{TRN}$ = percent of transitional space (p-value = 1E-19)
$\%LU_{COM}$ = percent of commercial/institutional (p-value = 4E-9)
$\%LU_{PRK}$ = percent of park/recreation (p-value = 0.009)
$\%LU_{OPR}$ = percent of open recreation (p-value = 0.067)
A = total area of watershed (acres) (p-value = 1E-7)

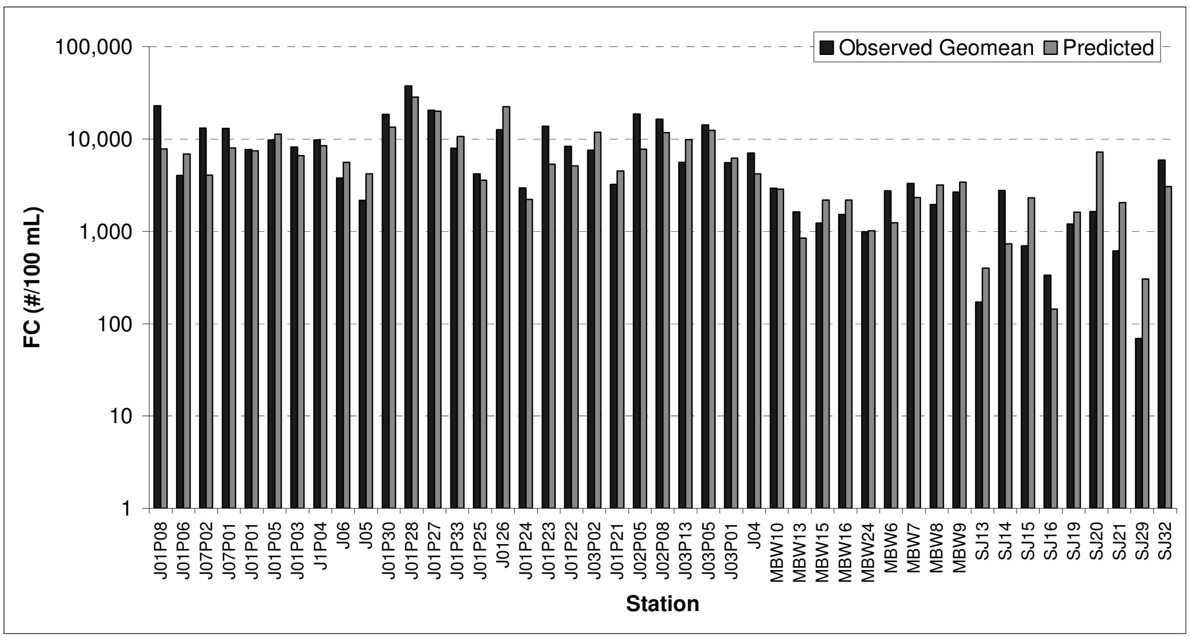

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Figure K-4. Predicted versus observed fecal coliform concentrations.

The methodology for estimating fecal coliform concentrations was not as successful for prediction of total coliform and enterococci. Similar regression analyses were performed to determine whether there are relationships between total coliform and enterococci and land use and subwatershed size, but no acceptable correlations were found. As a result, a separate approach was used for estimating total coliform and enterococci concentrations in dry weather runoff for each subwatershed. For all stations in Aliso Creek, San Juan Creek, Rose Creek, and Tecolote Creek with five or more measurements of indicator bacteria concentrations (total of 170 stations), geometric means of fecal coliform, total coliform, and enterococci were calculated for each station and analyzed for trend analyses. This resulted in a single, normalized value of fecal coliform, total coliform, and enterococci at each station for comparison. Regression analyses were performed to determine whether there is a correlation between fecal coliform and levels of enterococci and total coliform. Results showed a good correlation for prediction of total coliform and enterococci as a function of fecal coliform (R^2=0.67 and R^2=0.77, respectively). The following are the resulting equations obtained (units of fecal coliform and total coliform/enterococci are consistent):

$$\text{total coliform} = 5.0324 \times \text{fecal coliform and}$$
$$\text{enterococci} = 0.8466 \times \text{fecal coliform} \qquad (8)$$

Figures K-5 and K-6 show comparisons of predicted (based on fecal coliform) and geometric means of observed total coliform and enterococci concentrations at each station.

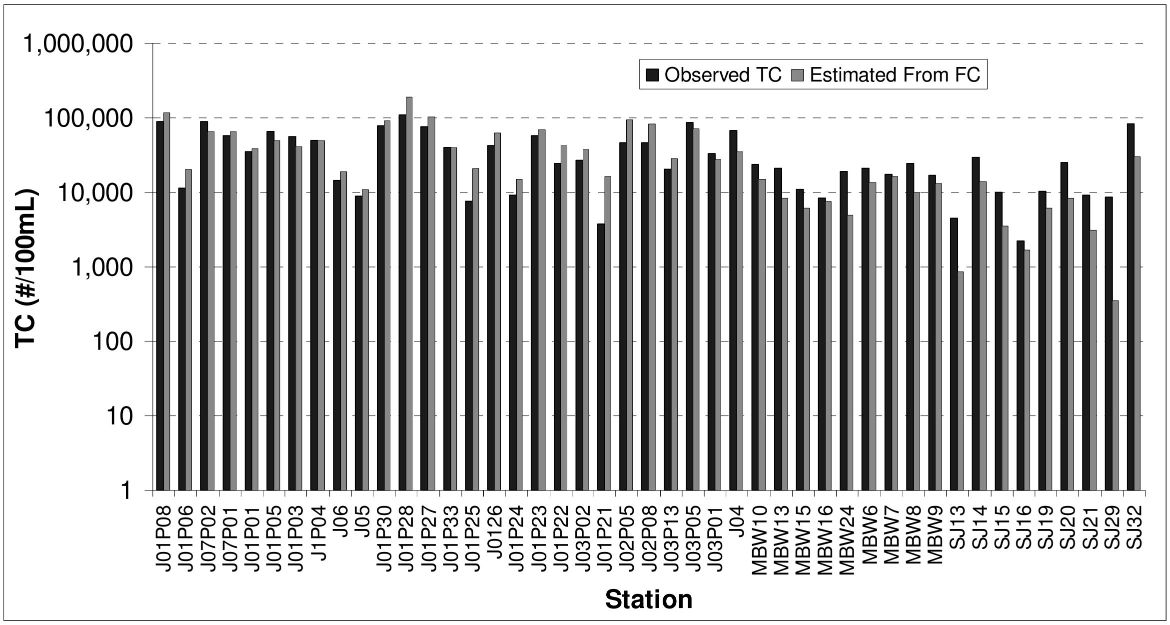

Figure K-5. Predicted versus observed total coliform densities

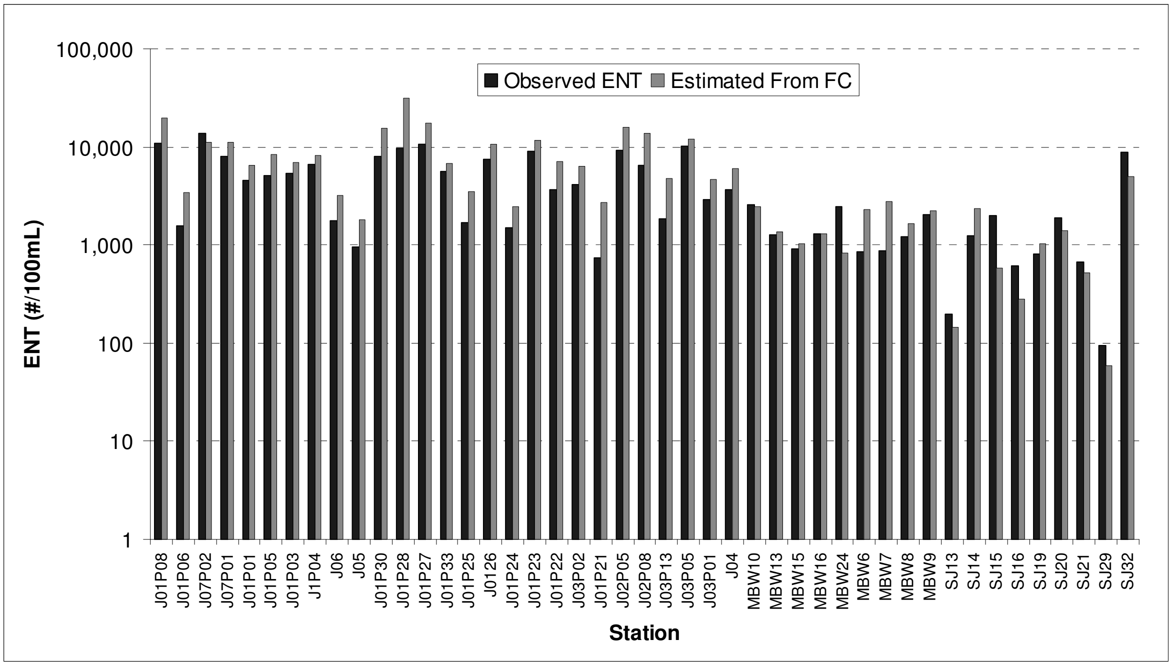

Figure K-6. Predicted versus observed enterococci densities

The above equations were used to estimate steady-state flows and indicator bacteria concentrations for each of the model subwatersheds. Several of the subwatersheds associated with monitoring stations used in the above analyses did not correspond to subwatersheds used in model development. For instance, stations on the Aliso Creek mainstem were used in regression analyses, and included the entire upstream watershed tributary to that location for characterization of land use and total area. However, model development of Aliso Creek included several smaller subwatersheds flowing into multiple segmented reaches that, although may result in a total watershed area consistent with the single watershed used in the regression analyses, differed in that stream infiltration and bacterial die-off rates in the multiple reaches must be defined. Therefore, model prediction of flows and bacterial concentration at locations on the Aliso Creek mainstem were based on upstream subwatershed loads predicted using the above equations, and routing through stream reaches that included assumptions for infiltration and bacterial die-off (based on model reach calibration and validation).

K.5 Model Calibration and Validation

Model assumptions for stream reach infiltration and bacterial die-off rates were derived through calibration based on data collected within reaches of Aliso Creek (11 stations) and Rose Creek (6 stations). Some of these stations were also used for development of regression equations for prediction of flow and fecal coliform concentrations from subwatersheds, however, effects of infiltration or bacteria die-off that may be implicitly incorporated in the regression equations (e.g., negative correlation of bacteria concentration to watershed size suggests effects of bacteria die-off in equation 7) were not considered duplicated in the reach assumptions. Model configuration of multiple subwatersheds and reaches differed from single representative watersheds used in regression analyses, and required incorporation of assumptions for reach infiltration and bacterial die-off to account for losses occurring during transport. Each model subwatershed used the regression equations to estimate flow and bacterial concentration that were routed through a network of stream reaches that ultimately met locations corresponding to monitoring stations used for calibration. However, watersheds used for regression analyses represented a single watershed for the same area, with no stream routing. Hence, the infiltration and die-off rates developed for the reaches were not consistent with errors associated with regression equations applied to the entire watershed without reach routing and losses considered. To further prove the independence of the calibration procedure from the regression analyses, data from five additional instream monitoring stations that were not used for regression analyses were also used for calibration. Model validation included nine additional stations not included in the regression analyses.

The calibration was completed by adjusting infiltration rates to reflect observed in-stream flow conditions and adjusting bacteria die-off rates to reflect observed in-stream bacteria concentrations. Following model calibration to in-stream flow and bacteria concentrations, a separate validation process was undertaken to verify the predictive capability of the model in other watersheds. Table K-3 lists the sampling locations used in calibration and validation, along with their corresponding watersheds. Figure K-7 shows the sampling locations in relation to the watersheds modeled for TMDL development (Appendix G, No. 4-6).

Table K-3. Calibration and Validation Sampling Locations

Calibration – Flow and Bacteria		Validation – Flow		Validation – Bacteria	
Watershed	**Sampling Location**	**Watershed**	**Sampling Location**	**Watershed**	**Sampling Location**
208	J01P22	403	USGS11047300	402	SJ04
209	J01P23	1701	MBW06	403	SJ05
210	J01P28	1702	MBW07	405	SJ18
211	J01P27	1703	MBW10	406	SJ24
212	J06	1704	MBW08	408	SJ1
213	J01P05	1705	MBW09	409	SJ29 & SJ17
214	J01P01			411	SJ06
215	J01TBN8			413	SJ08 & SJ07
219	J04			414	SJ30 & SJ09
220	J03P13			416	SJ15
221	J03P01			1701	MBW06
1601	MBW20			1702	MBW07
1602	MBW17			1703	MBW10
1603	MBW15			1704	MBW08
1605	MBW11			1705	MBW09
1606	MBW13				
1607	MBW24				

In the model, infiltration rates vary by soil type. Stream infiltration was calibrated by adjusting a single infiltration value, which was varied for each soil type by factors established from literature ranges (USEPA, 2000) of infiltration rates specific to each soil type. The goal of calibration was to minimize the difference between averages of observed streamflows and modeled flow at each station location (Figure K-7). Nine stations were used in calibrating the infiltration rate. The resulting infiltration rates were 1.368 in/hr (Soil Group A), 0.698 in/hr (Soil Group B), 0.209 in/hr (Soil Group C) and 0.084 in/hr (Soil Group D). The infiltration rates for Soil Groups B, C and D are within the infiltration range given in literature (Wanielisata et al., 1997). Soil Group A is below the range given in Wanielisata et al. (1997), however only one watershed in this TMDL is dominated by Soil Group A. Figure H-8 shows the results of the model calibration.

The modeled first-order die-off rate reflects the net effect on bacteria of various environmental conditions, such as solar radiation, temperature, dissolved oxygen, nutrients, regrowth, deposition, resuspension and toxins in the water. The die-off rates for fecal coliform, total coliform and enterococci were used as calibration parameters to minimize the difference between observed in-stream bacteria levels and model predictions. Calibration results for fecal coliform, total coliform and enterococci are presented in Figures K-9 through K-11. Die-off rates were determined for fecal coliform (0.137 1/d), total coliform (0.209 1/d) and enterococci (0.145 1/d). These values are within the range of die-off rates used in various modeling studies as reported by the USEPA (1985). Seventeen stations were used in calibrating die-off rates.

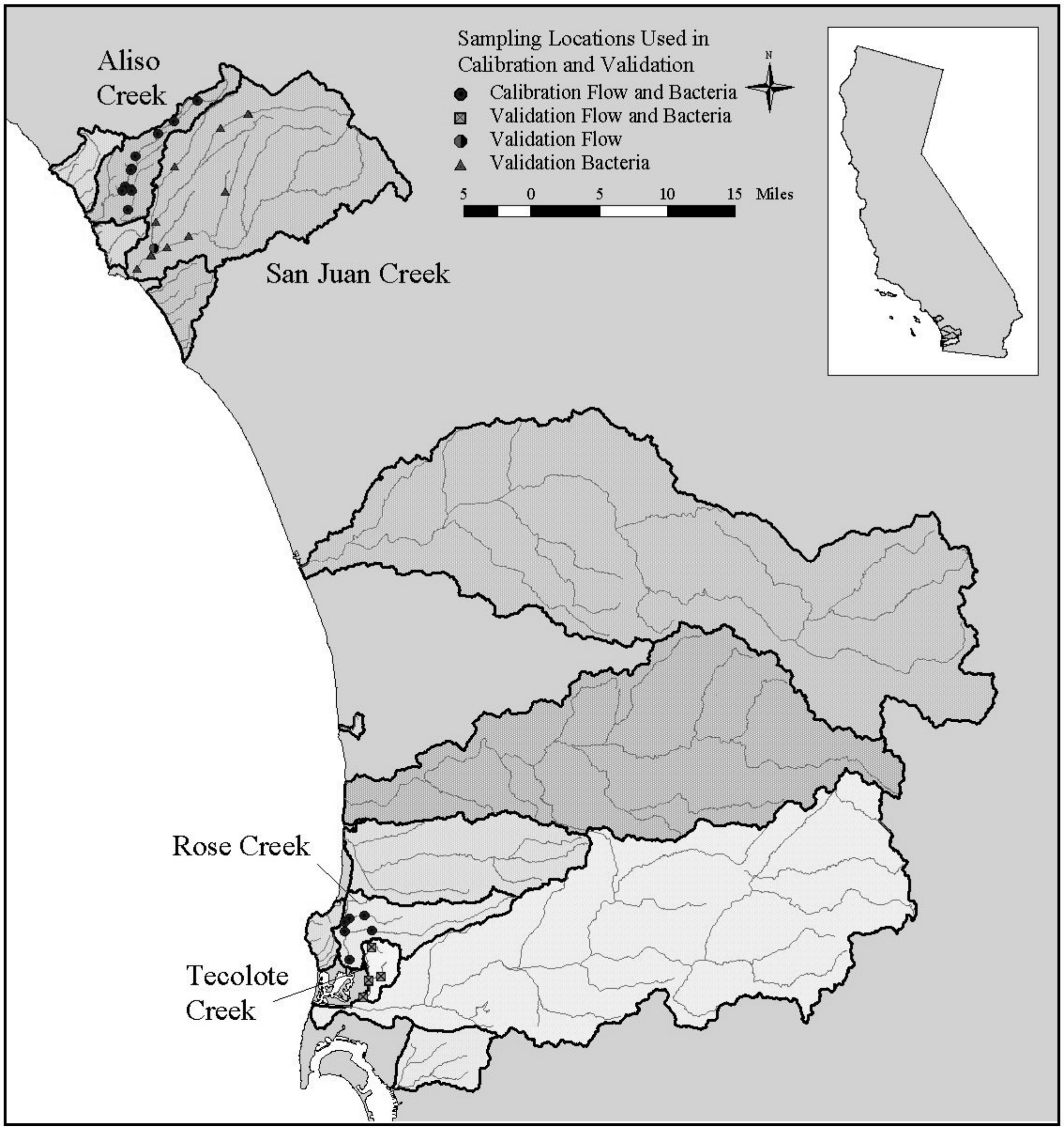

Figure K-7. Sampling locations used in model calibration and validation

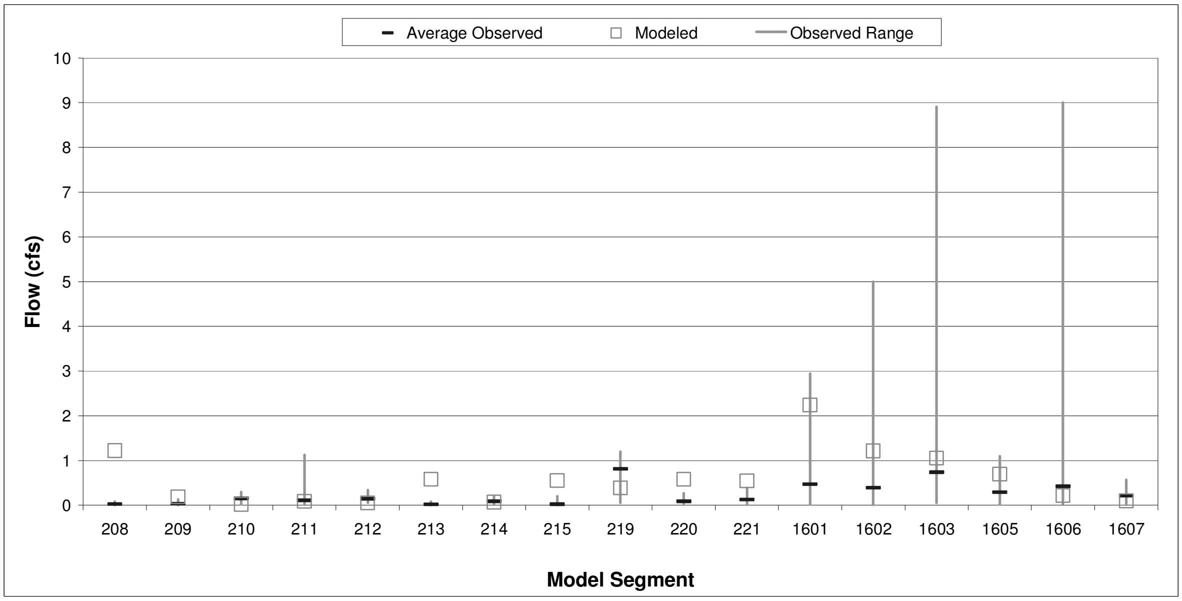

Figure K-8. Calibration modeled versus observed flows for Aliso Creek, Rose Creek and Tecolote Creek (Appendix B, No. 1 and 2)

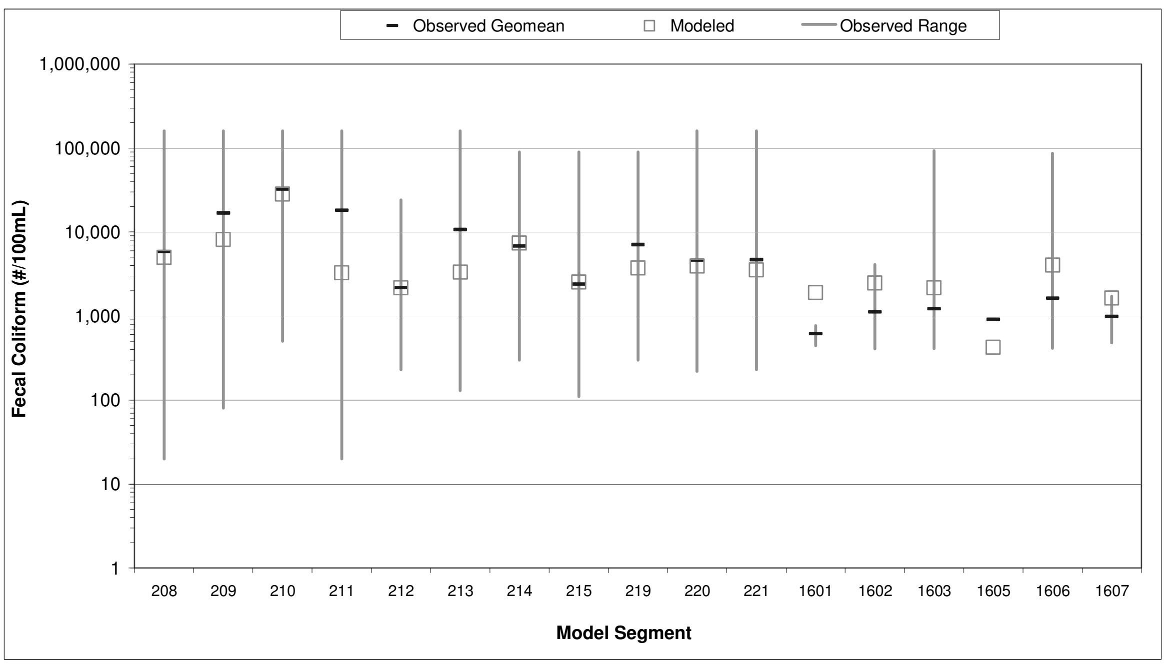

Figure K-9. Calibration modeled versus observed in-stream fecal coliform concentra-tions for Aliso Creek, Rose Creek and Tecolote Creek (Appendix B, No. 4 and 5)

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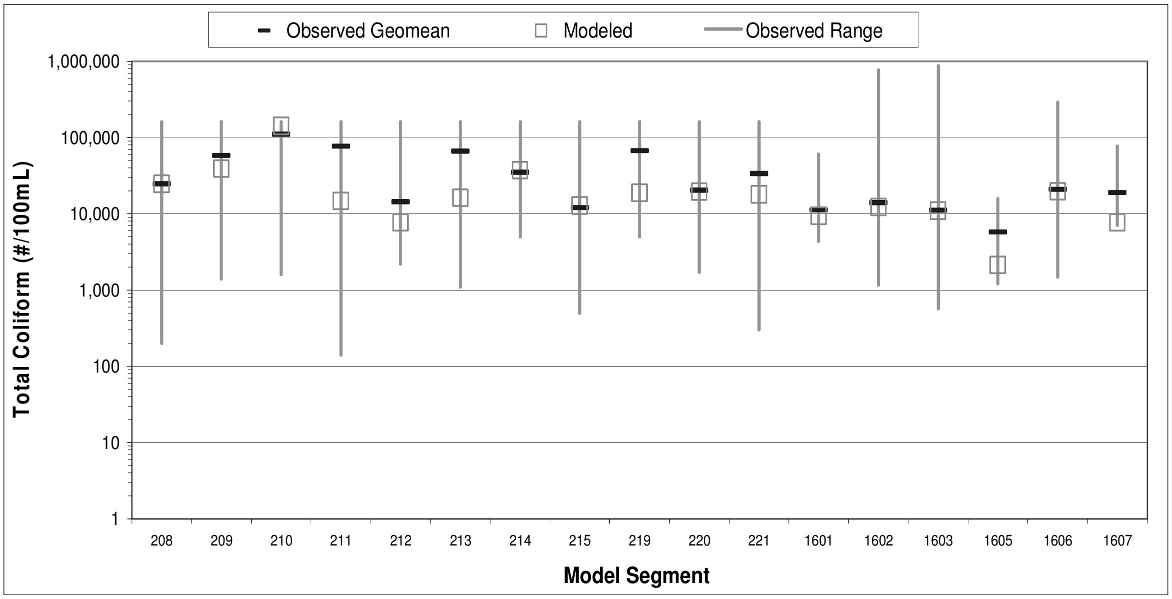

Figure K-10. Calibration modeled versus observed in-stream total coliform concentra-tions for Aliso Creek, Rose Creek and Tecolote Creek (Appendix B, No. 4 and 5)

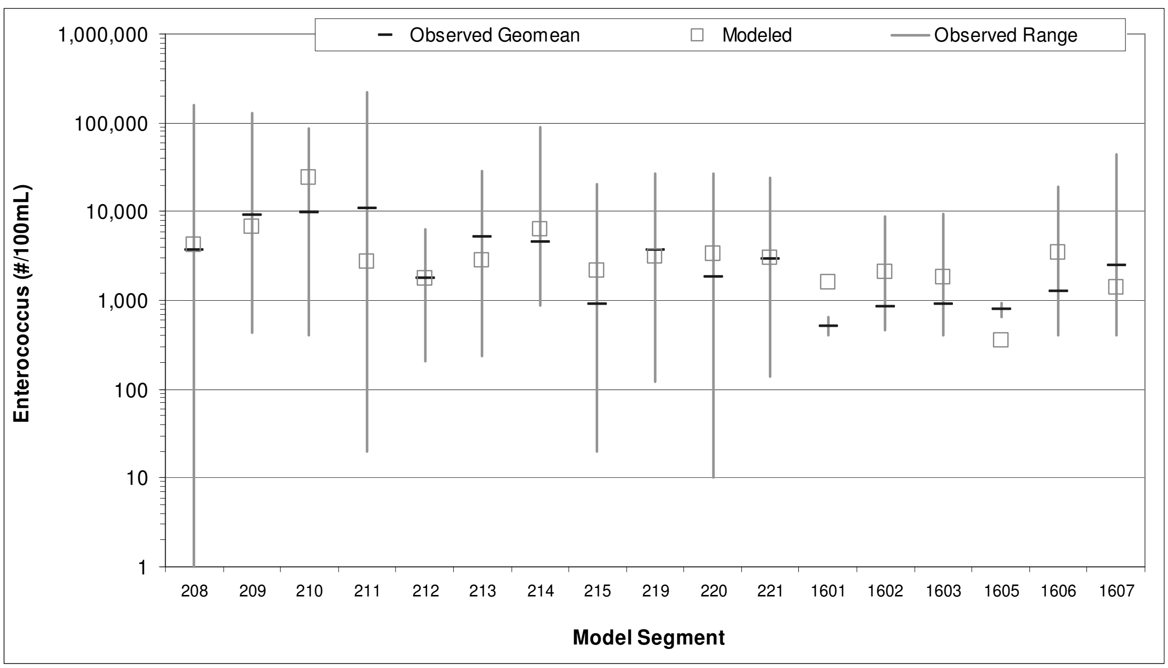

Figure K-11. Calibration modeled versus observed in-stream enterococci concentrations for Aliso Creek, Rose Creek and Tecolote Creek (Appendix B, No. 4 and 5)

The model was validated using six stations from San Juan Creek and Tecolote Creek (Appendix G, No. 2 and 3). One of these stations (USGS11047300) was not used in development of the regression equation 6. The model-predicted flows were within the observed ranges of dry weather flows (Figure K-12).

Model validation to in-stream water quality was provided using 15 stations on Tecolote Creek and San Juan Creek (Appendix G, No. 5 and 6). Eight of these stations were not used in development of the regression equation 7. The results of the water quality validation are presented in Figures K-13 through K-15.

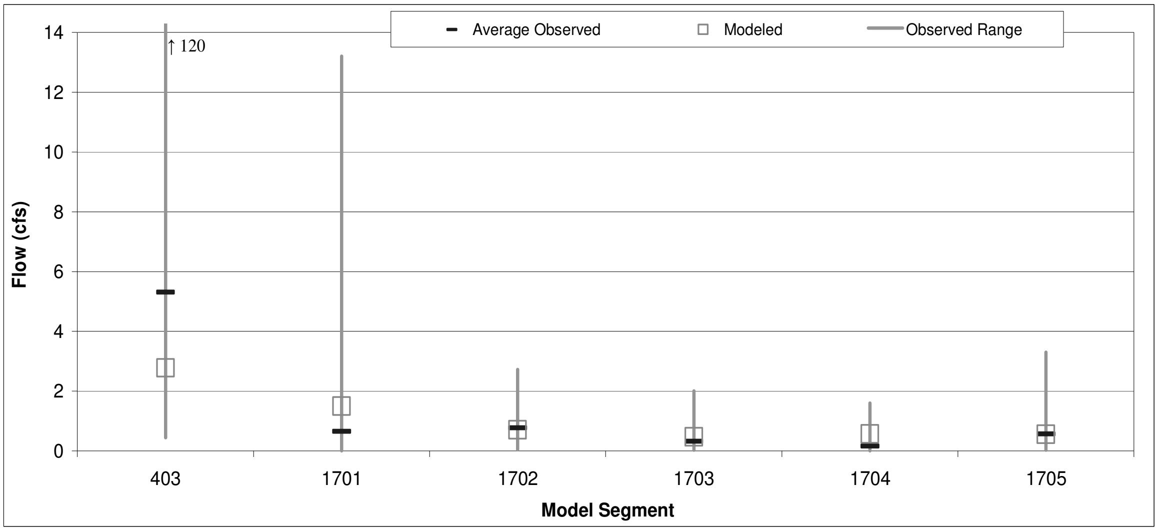

Figure K-12. Validation of modeled versus observed streamflow for San Juan Creek, Rose Creek and Tecolote Creek (Appendix B, No. 2 and 3)

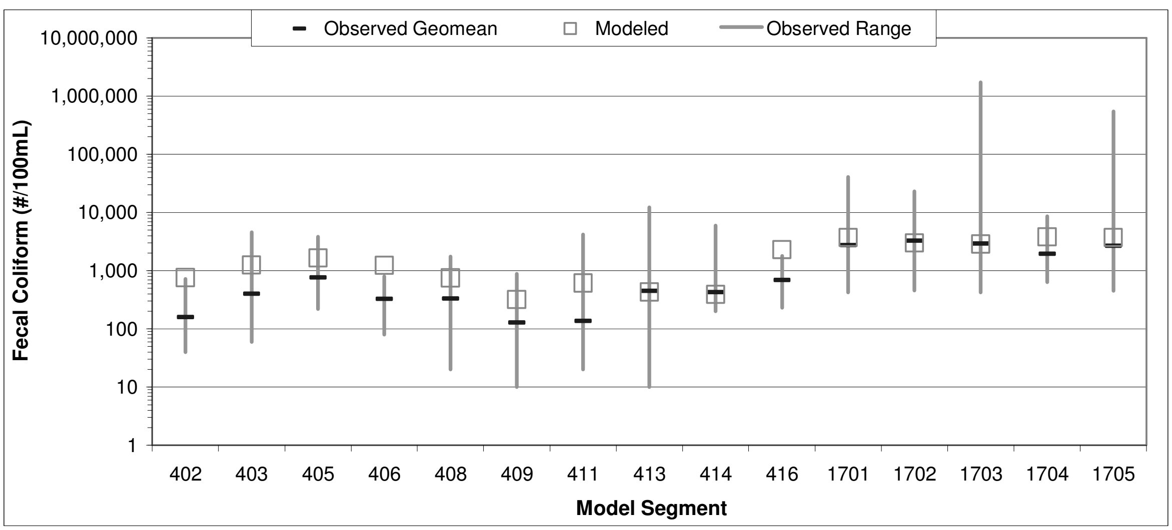

Figure K-13. Validation modeled versus observed fecal coliform concentration for San Juan Creek, Rose Creek and Tecolote Creek (Appendix B, No. 5 and 6)

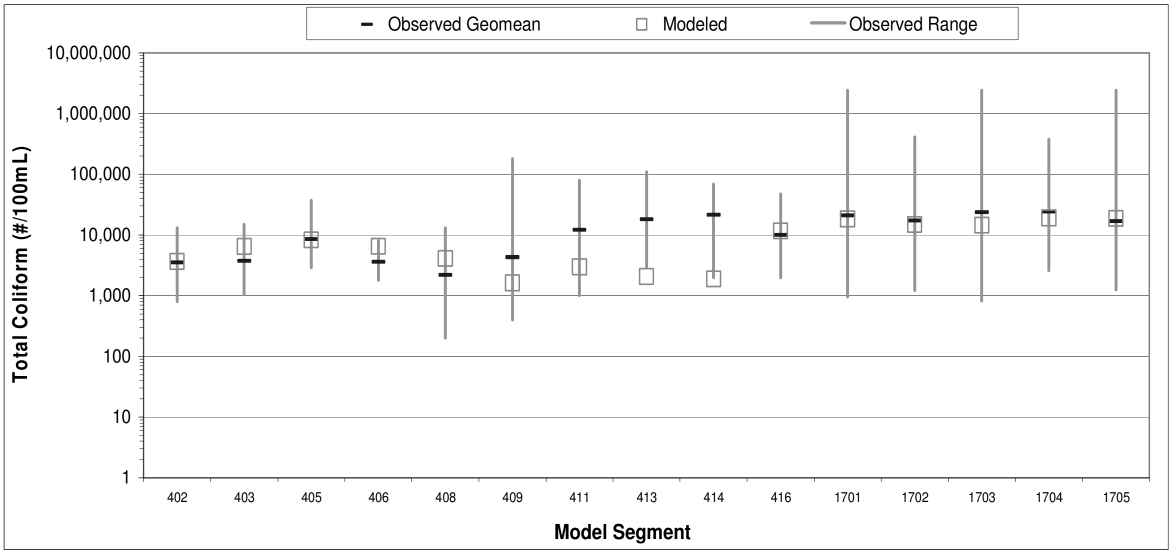

Figure K-14. Validation modeled versus observed total coliform concentration for San Juan Creek, Rose Creek and Tecolote Creek (Appendix B, No. 5 and 6)

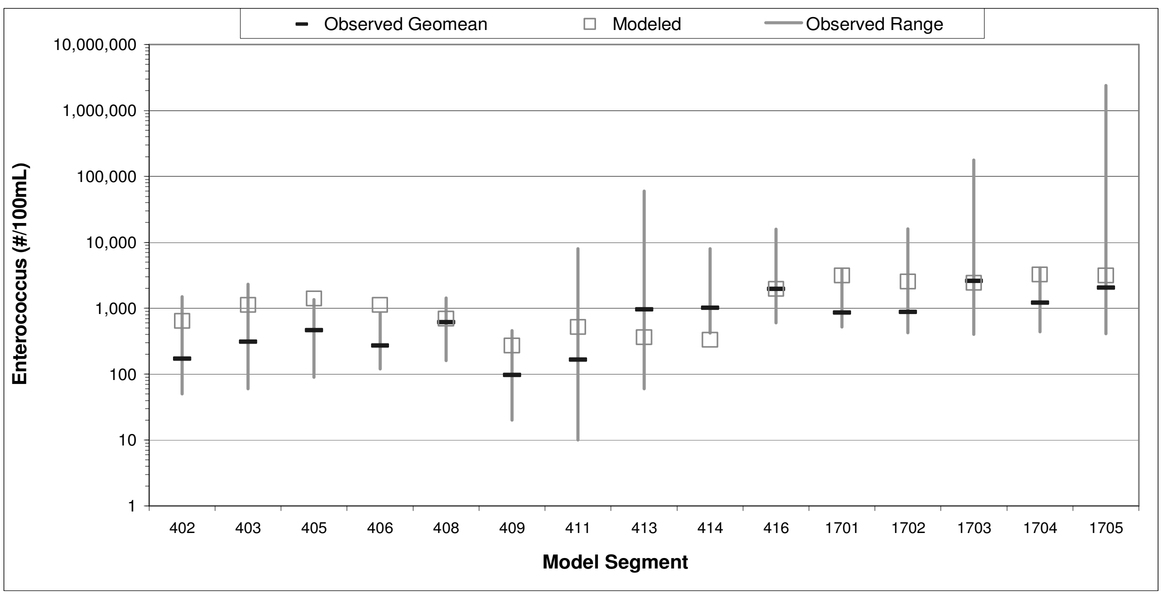

Figure K-15. Validation modeled versus observed enterococci concentration for San Juan Creek, Rose Creek and Tecolote Creek (Appendix B, No. 5 and 6)

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APPENDIX L

ASSUMPTIONS

This appendix describes assumptions that were made for the development of the wet weather and dry weather TMDLs. TMDLs were calculated for both wet and dry conditions; therefore the assumptions involved in both sets of calculations are described below. Additionally, some general assumptions were made regarding overall conditions in the environment affecting bacteria subsistence and growth. These assumptions were intended to be conservative in nature, therefore generating an implicit margin of safety for the TMDLs.

Wet Weather Modeling Assumptions

The watershed modeling system developed to represent wet weather conditions is described in Appendix J of the Technical Report. The following assumptions are relevant to the LSPC model developed to simulate wet weather sources of bacteria in the region.

- *General LSPC/HSPF Model Assumptions* - Many model assumptions are inherent in the algorithms used by the LSPC watershed model and are reported extensively in Bicknell et al. (1996).
- *Land Use* - A combination of SCAG, SANDAG and MRLC land use GIS datasets is assumed representative of the current land use areas. For areas where significant changes in land use have occurred since the creation of these datasets, model predictions may not be representative of observed conditions.
- *Stream Representation* - Each delineated subwatershed was represented with a single stream assumed to be a completely mixed, one-dimensional segment with a trapezoidal cross-section.
- *Hydrologic Modeling Parameters* - Hydrologic modeling parameters were developed during previous modeling studies in southern California (e.g., Los Angeles River, San Jacinto River) and refined through calibration to streamflow data collected in the San Diego Region. Through the calibration and validation process (summary statistics reported in Appendix M of the Technical Report), a set of modeling parameters were obtained specific to land use and hydrologic soil groups. These parameters are assumed to be representative of the hydrology of other watersheds in the San Diego Region that are presently ungaged and therefore unverified.
- *Water Quality Modeling Parameters* - Dynamic models require a substantial amount of information regarding input parameters and data for calibration purposes. All sources of indicator bacteria from watersheds are represented in the LSPC model as build-up/wash-off from specific land use categories. Limited data are currently available in the San Diego Region to allow development of unique modeling parameters for simulation of build-up/wash-off, so parameters were obtained from a similar study performed in the Los Angeles Region. These build-up/wash-off modeling parameters were originally developed by the Southern California Coastal Water Research Project (SCCWRP) for a watershed model of the Santa Monica Bay Beaches (Los Angeles Water Board, 2002) and are assumed representative of land use sources in the San Diego region. This

assumption was validated through evaluation of model results with local data. Summary statistics of model validation are reported in Appendix M of the Technical Report.

- *Lumped Parameter Model Characteristic* - LSPC is a lumped-parameter model and is assumed to be sufficient for modeling transport of flows and bacteria loads from watersheds in the region. For lumped parameter models, transport of flows and bacteria loads to the streams within a given model subwatershed cannot consider relative distances of land use activities and topography that may enhance or impede time of travel over the land surface. Although this limitation could result in mistiming of peak flows or under-prediction of bacteria die-off because overland losses are not simulated, impacts are assumed minimal.
- *Bacteria Loading Rates* – Bacteria loading rates associated with various land use categories are constant. Rates estimated for current loading are accurate for establishing total allowable loading for each land use category.
- *First-order Bacteria Die-off* - Each stream is modeled assuming an apparent first-order die-off of bacteria. Bacteria die-off rates for wet weather are assumed to be 0.8/day, based on sensitivity analyses performed by SCCWRP (Los Angeles Water Board, 2002).
- *In-stream Bacteria Re-growth* - The LSPC model assumes no in-stream regrowth of bacteria. No data or literature were located to provide indication that such sources are significant during wet weather or could be estimated for model input.

Dry Weather Modeling Assumptions

The watershed modeling system developed for simulation of steady-state dry weather flows and sources of bacteria is described in Appendix K of the Technical Report. The following assumptions are relevant to that discussion.

- *Channel Geometry* - Channel geometry during low-flow, dry weather conditions is assumed to be represented appropriately using equations derived from flows and physical data collected at 53 USGS stream gages in southern California.
- *Steady-state Model Configuration* - Although dry weather flows and bacteria densities vary over time for any given stream, for prediction of average conditions in the stream, flows and concentrations are assumed to be steady state.
- *Plug Flow Model Configuration* - Plug flow reaction kinetics are assumed sufficient in modeling dry weather, steady-state stream routing and bacteria die-off (with first-order die-off).
- *Sources for Characterization of Dry Weather Conditions* - Data used for characterization of dry weather flows and water quality are assumed representative of conditions throughout the region.
- *Methods for Characterization of Dry Weather Conditions* - The equations derived through multivariable regression analyses are assumed sufficient to represent the dry weather flows and water quality as functions of land use and watershed size. This assumption was verified through model calibration and validation (summary statistics reported in Appendix M of the Technical Report).
- *First-order Bacteria Die-off* - Each stream is modeled assuming an apparent first-order die-off of bacteria. First-order rates were obtained through model calibration and verified as consistent with ranges reported by the USEPA (1985). These values were determined

for fecal coliform, total coliform, and enterococci bacteria as 0.137/day, 0.209/day and 0.145/day, respectively. These die-off rates are assumed representative of all streams studied in the region.

- *Bacteria Re-growth* - The dry weather model assumed no in-stream sources or regrowth of bacteria. No data or literature were located to provide an indication that such sources are significant during dry weather or could be estimated for model input.
- *Stream Infiltration* - Losses of volume through stream infiltration were modeled assuming infiltration rates were constant for each of the four hydrologic soil groups (A, B, C and D). Infiltration rates were based on literature vales and refined through model calibration and validation (summary statistics reported in Appendix M of the Technical Report). The resulting infiltration rates were 1.368 in/hr (Soil Group A), 0.698 in/hr (Soil Group B), 0.209 in/hr (Soil Group C) and 0.084 in/hr (Soil Group D). These infiltration rates are within the range of values given in literature (Wanielisata et al., 1997). These infiltration rates are assumed representative for all streams studied in the region within each hydrologic soil group.
- *Dilution From Groundwater* – Dilution factors caused by groundwater base flows were not considered.

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Appendix M

Wet Weather Model
Hydrology Calibration and Validation
Summary Statistics

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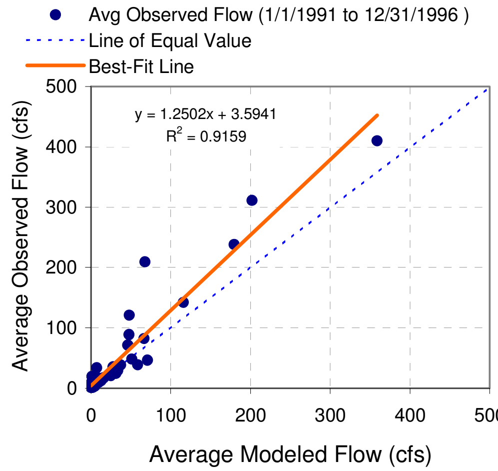
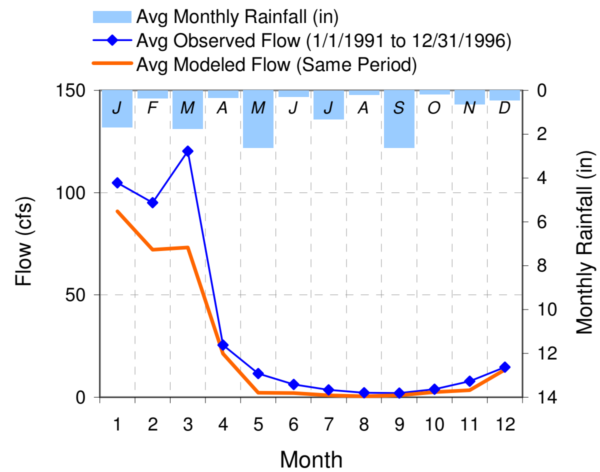
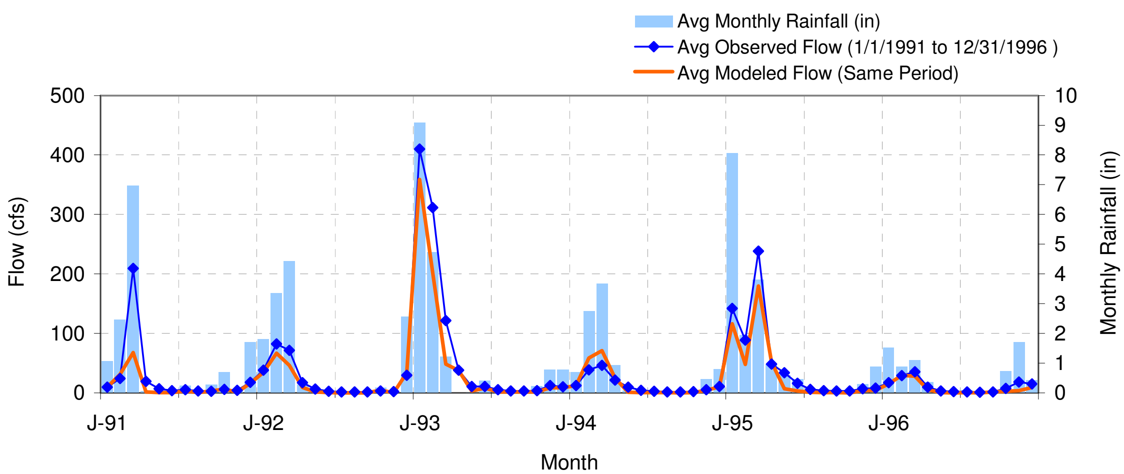
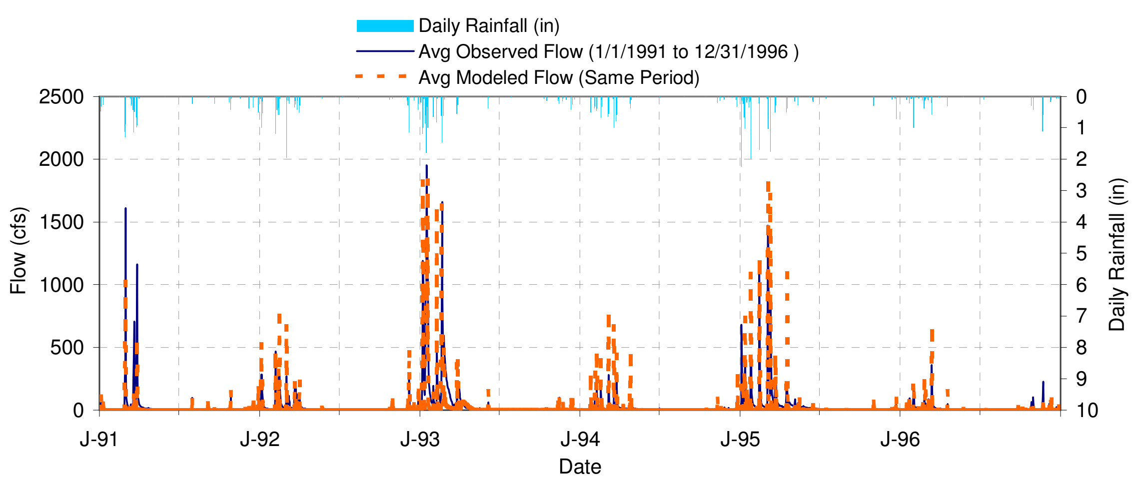
Summary statistics of wet weather model hydrology calibration to USGS gage 11022480 (Appendix G, No. 3) (1 of 2).





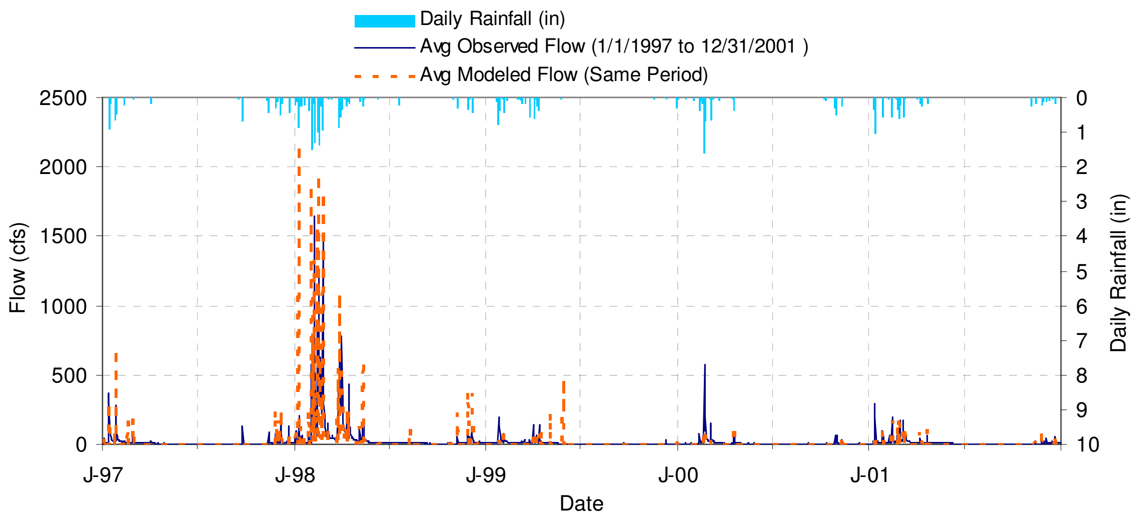




Summary statistics of wet weather model hydrology calibration to USGS gage 11022480 (Appendix G, No. 3) (2 of 2).

LSPC Simulated Flow		**Observed Flow Gage**		
REACH OUTFLOW FROM SUBBASIN 1805 6-Year Analysis Period: 1/1/1991 - 12/31/1996 Flow volumes are (inches/year) for upstream drainage area		**USGS 11022480 SAN DIEGO R A MAST RD NR SANTEE CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 32°50'25", Longitude 117°01'30" NAD27 Drainage area 368 square miles		
Total Simulated In-stream Flow:	**13.93**	Total Observed In-stream Flow:		**19.55**
Total of simulated highest 10% flows:	**13.16**	Total of Observed highest 10% flows:		**14.77**
Total of Simulated lowest 50% flows:	**0.04**	Total of Observed Lowest 50% flows:		**0.77**
Simulated Summer Flow Volume (months 7-9):	**0.12**	Observed Summer Flow Volume (7-9):		**0.39**
Simulated Fall Flow Volume (months 10-12):	**0.98**	Observed Fall Flow Volume (10-12):		**1.33**
Simulated Winter Flow Volume (months 1-3):	**11.59**	Observed Winter Flow Volume (1-3):		**15.69**
Simulated Spring Flow Volume (months 4-6):	**1.25**	Observed Spring Flow Volume (4-6):		**2.13**
Total Simulated Storm Volume:	**12.06**	Total Observed Storm Volume:		**10.08**
Simulated Summer Storm Volume (7-9):	**0.06**	Observed Summer Storm Volume (7-9):		**0.06**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-12.20	15		
Error in storm volumes:	16.43	20		

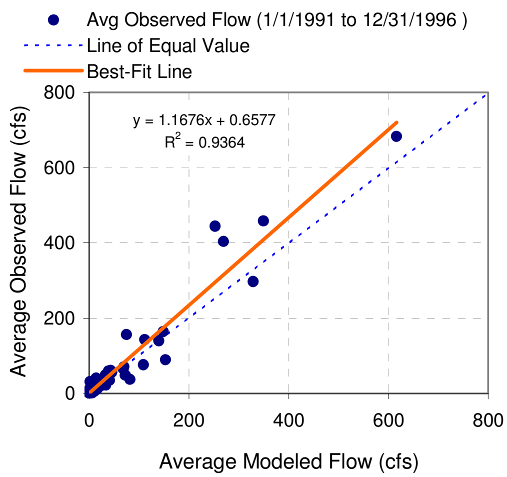
Summary statistics of wet weather model hydrology validation to USGS gage 11022480 (Appendix G, No. 3).

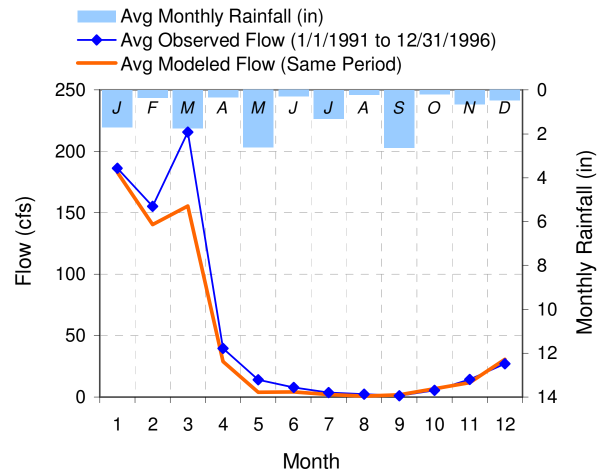


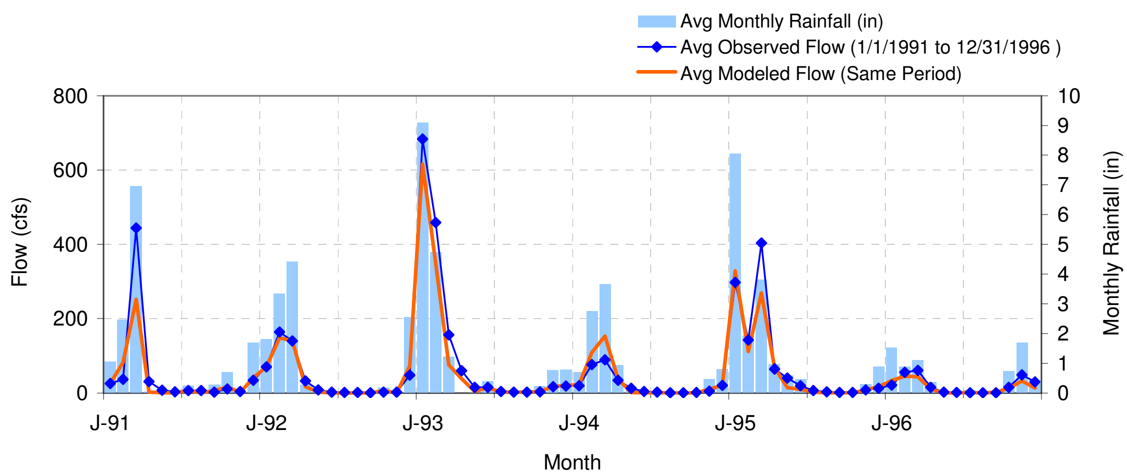
LSPC Simulated Flow		**Observed Flow Gage**	
REACH OUTFLOW FROM SUBBASIN 1805 5-Year Analysis Period: 1/1/1997 - 12/31/2001 Flow volumes are (inches/year) for upstream drainage area		**USGS 11022480 SAN DIEGO R A MAST RD NR SANTEE CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 32°50'25", Longitude 117°01'30" NAD27 Drainage area 368 square miles	
Total Simulated In-stream Flow:	**11.23**	Total Observed In-stream Flow:	**12.95**
Total of simulated highest 10% flows:	**10.66**	Total of Observed highest 10% flows:	**9.60**
Total of Simulated lowest 50% flows:	**0.01**	Total of Observed Lowest 50% flows:	**0.68**
Simulated Summer Flow Volume (months 7-9):	**0.15**	Observed Summer Flow Volume (7-9):	**0.42**
Simulated Fall Flow Volume (months 10-12):	**1.09**	Observed Fall Flow Volume (10-12):	**1.18**
Simulated Winter Flow Volume (months 1-3):	**8.19**	Observed Winter Flow Volume (1-3):	**8.87**
Simulated Spring Flow Volume (months 4-6):	**1.80**	Observed Spring Flow Volume (4-6):	**2.47**
Total Simulated Storm Volume:	**10.11**	Total Observed Storm Volume:	**6.69**
Simulated Summer Storm Volume (7-9):	**0.07**	Observed Summer Storm Volume (7-9):	**0.08**

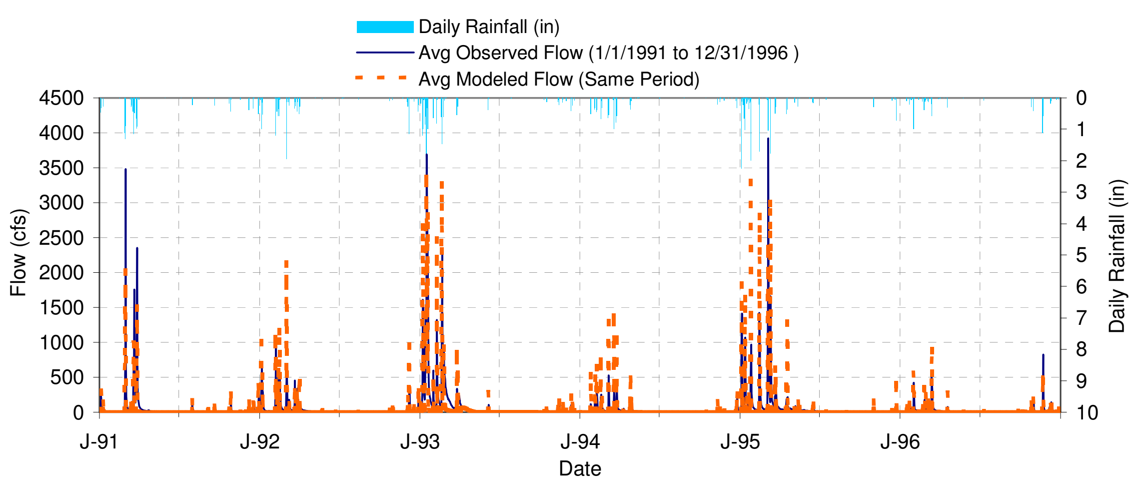
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	9.93	15		
Error in storm volumes:	33.83	20		

Summary statistics of wet weather model hydrology calibration to USGS gage 11023000 (Appendix G, No. 3) (1 of 2).





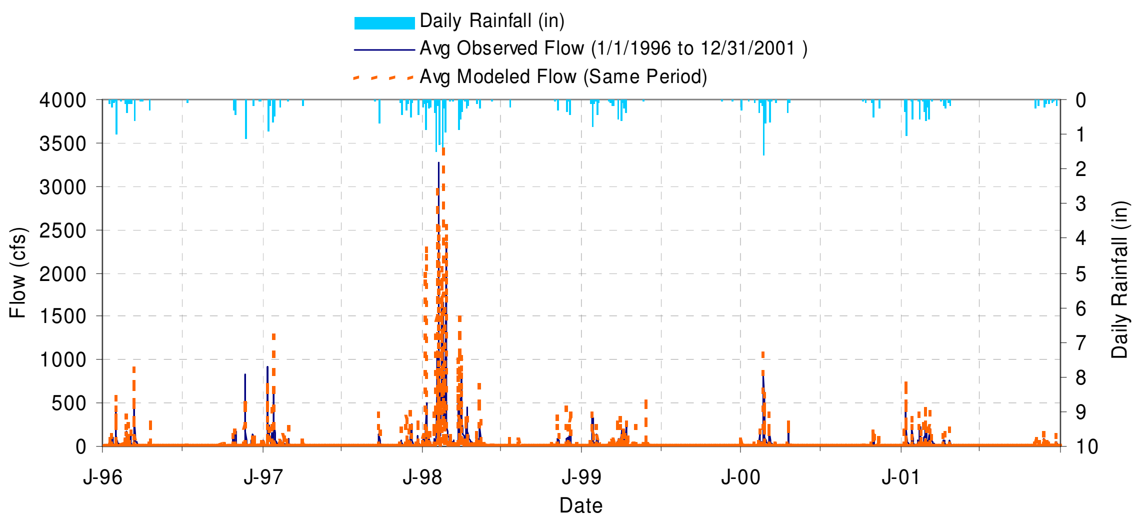




Summary statistics of wet weather model hydrology calibration to USGS gage 11023000 (Appendix G, No. 3) (2 of 2).

LSPC Simulated Flow		**Observed Flow Gage**		
REACH OUTFLOW FROM SUBBASIN 1801 6-Year Analysis Period: 1/1/1991 - 12/31/1996 Flow volumes are (inches/year) for upstream drainage area		**USGS 11023000 SAN DIEGO R A FASHION VALLEY AT SAN DIEGO CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 32°45'54", Longitude 117°10'04" NAD27 Drainage area 429 square miles		
Total Simulated In-stream Flow:	**1.49**	Total Observed In-stream Flow:		**1.77**
Total of simulated highest 10% flows:	**1.42**	Total of Observed highest 10% flows:		**1.38**
Total of Simulated lowest 50% flows:	**0.00**	Total of Observed Lowest 50% flows:		**0.04**
Simulated Summer Flow Volume (months 7-9):	**0.01**	Observed Summer Flow Volume (7-9):		**0.02**
Simulated Fall Flow Volume (months 10-12):	**0.13**	Observed Fall Flow Volume (10-12):		**0.12**
Simulated Winter Flow Volume (months 1-3):	**1.25**	Observed Winter Flow Volume (1-3):		**1.46**
Simulated Spring Flow Volume (months 4-6):	**0.10**	Observed Spring Flow Volume (4-6):		**0.16**
Total Simulated Storm Volume:	**1.43**	Total Observed Storm Volume:		**1.26**
Simulated Summer Storm Volume (7-9):	**0.01**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	2.65	15		
Error in storm volumes:	12.33	20		

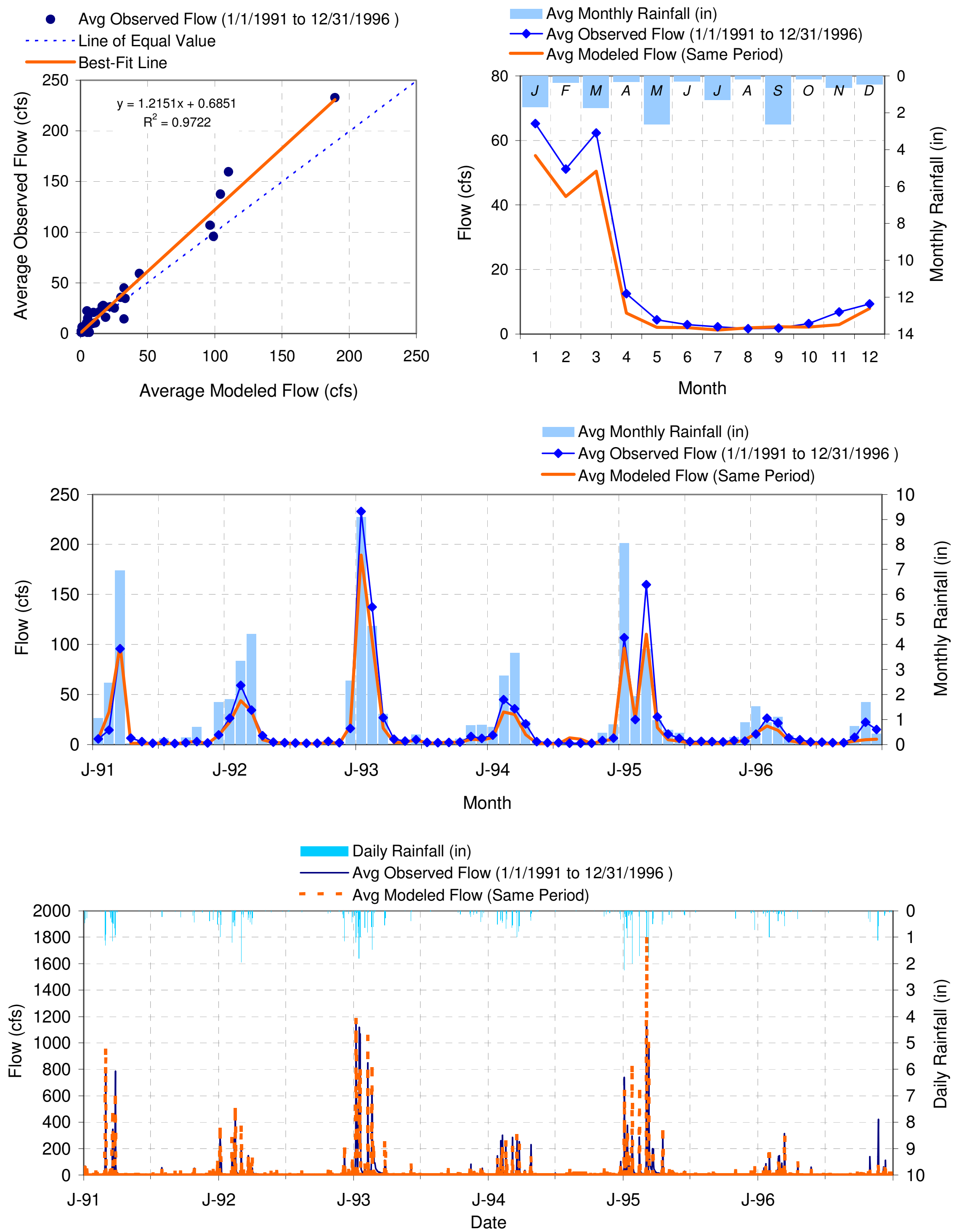
Summary statistics of wet weather model hydrology validation to USGS gage 11023000 (Appendix G, No. 3).



LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 1801 6-Year Analysis Period: 1/1/1996 - 12/31/2001 Flow volumes are (inches/year) for upstream drainage area		**USGS 11023000 SAN DIEGO R A FASHION VALLEY AT SAN DIEGO CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 32°45'54", Longitude 117°10'04" NAD27 Drainage area 429 square miles		
Total Simulated In-stream Flow:	**0.93**	Total Observed In-stream Flow:		**0.97**
Total of simulated highest 10% flows:	**0.89**	Total of Observed highest 10% flows:		**0.71**
Total of Simulated lowest 50% flows:	**0.00**	Total of Observed Lowest 50% flows:		**0.04**
Simulated Summer Flow Volume (months 7-9):	**0.01**	Observed Summer Flow Volume (7-9):		**0.02**
Simulated Fall Flow Volume (months 10-12):	**0.11**	Observed Fall Flow Volume (10-12):		**0.12**
Simulated Winter Flow Volume (months 1-3):	**0.68**	Observed Winter Flow Volume (1-3):		**0.68**
Simulated Spring Flow Volume (months 4-6):	**0.12**	Observed Spring Flow Volume (4-6):		**0.15**
Total Simulated Storm Volume:	**0.89**	Total Observed Storm Volume:		**0.62**
Simulated Summer Storm Volume (7-9):	**0.01**	Observed Summer Storm Volume (7-9):		**0.01**

Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	20.16	15		
Error in storm volumes:	29.61	20		

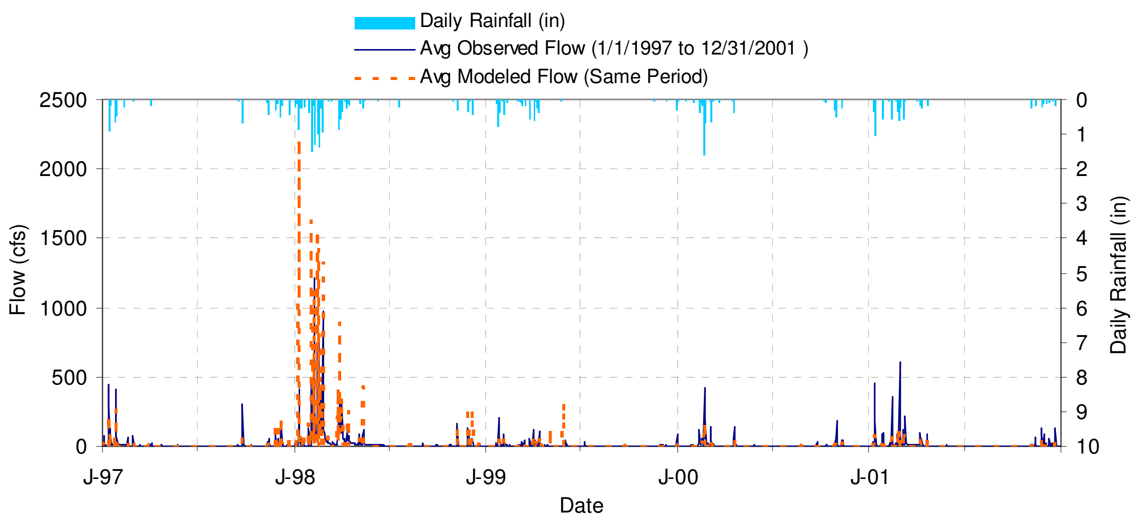
Summary statistics of wet weather model hydrology calibration to USGS gage 11023340 (Appendix G, No. 3) (1 of 2).



Summary statistics of wet weather model hydrology calibration to USGS gage 11023340 (Appendix G, No. 3) (2 of 2).

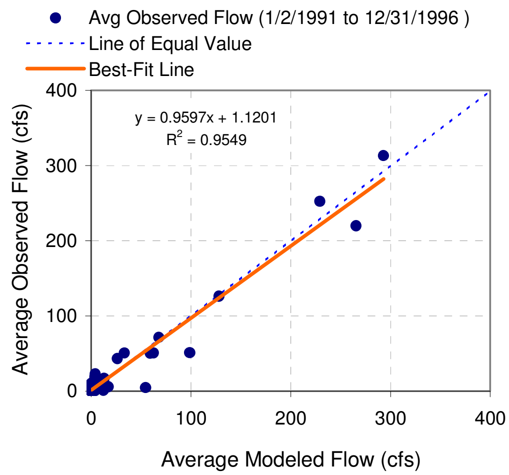
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 1406 6-Year Analysis Period: 1/1/1991 - 12/31/1996 Flow volumes are (inches/year) for upstream drainage area		**USGS 11023340 LOS PENASQUITOS C NR POWAY CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 32°56'35", Longitude 117°07'15" NAD27 Drainage area 42.1 square miles		
Total Simulated In-stream Flow:	**4.74**	Total Observed In-stream Flow:		**5.98**
Total of simulated highest 10% flows:	**4.38**	Total of Observed highest 10% flows:		**4.91**
Total of Simulated lowest 50% flows:	**0.09**	Total of Observed Lowest 50% flows:		**0.26**
Simulated Summer Flow Volume (months 7-9):	**0.14**	Observed Summer Flow Volume (7-9):		**0.15**
Simulated Fall Flow Volume (months 10-12):	**0.35**	Observed Fall Flow Volume (10-12):		**0.53**
Simulated Winter Flow Volume (months 1-3):	**3.96**	Observed Winter Flow Volume (1-3):		**4.77**
Simulated Spring Flow Volume (months 4-6):	**0.28**	Observed Spring Flow Volume (4-6):		**0.53**
Total Simulated Storm Volume:	**4.44**	Total Observed Storm Volume:		**4.49**
Simulated Summer Storm Volume (7-9):	**0.09**	Observed Summer Storm Volume (7-9):		**0.03**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-12.11	15		
Error in storm volumes:	-1.31	20		

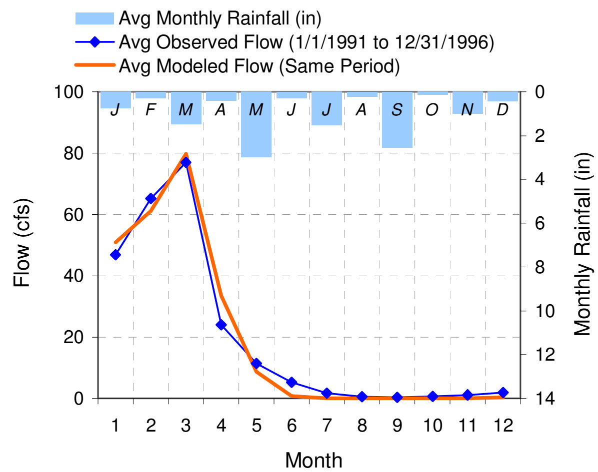
Summary statistics of wet weather model hydrology validation to USGS gage 11023340 (Appendix G, No. 3).

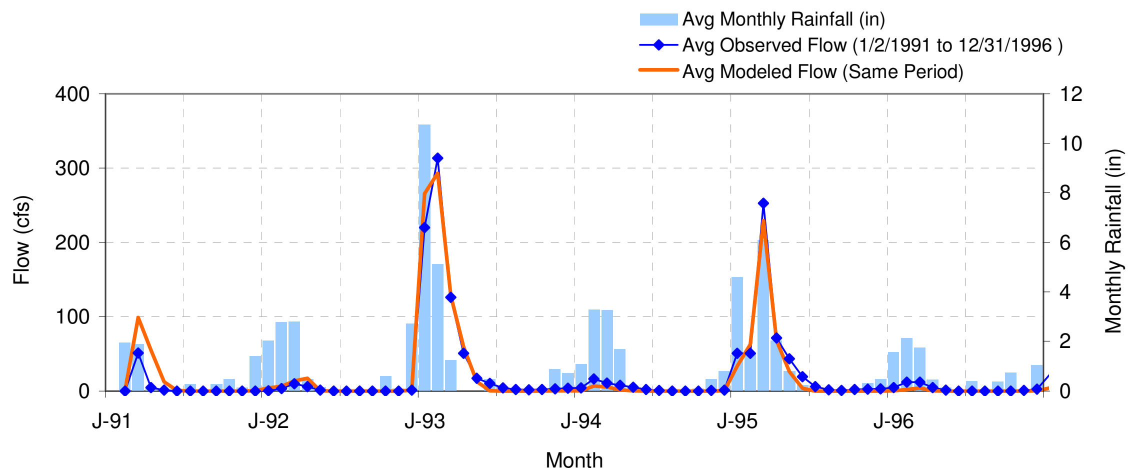


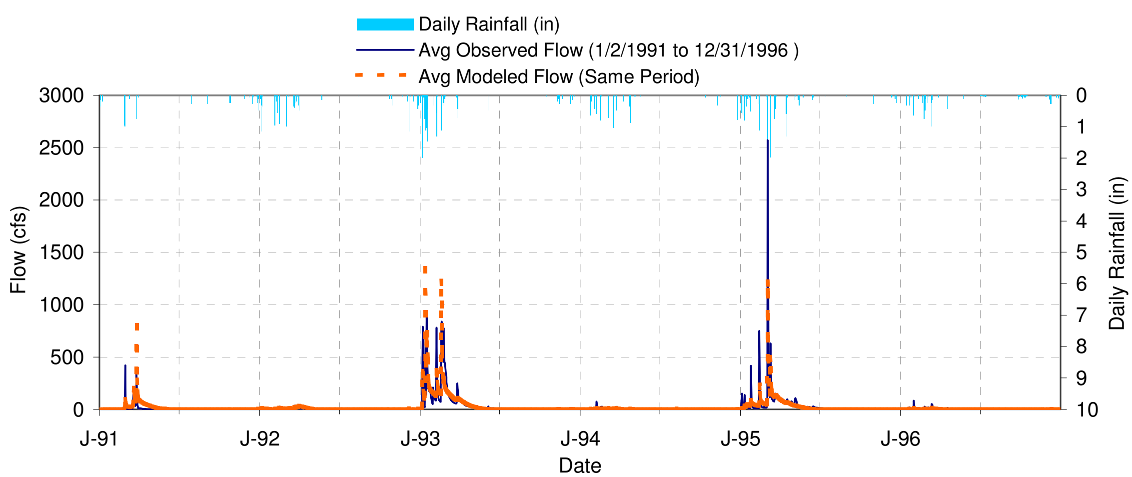
LSPC Simulated Flow		**Observed Flow Gage**		
REACH OUTFLOW FROM SUBBASIN 1406 5-Year Analysis Period: 1/1/1997 - 12/31/2001 Flow volumes are (inches/year) for upstream drainage area		**USGS 11023340 LOS PENASQUITOS C NR POWAY CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 32°56'35", Longitude 117°07'15" NAD27 Drainage area 42.1 square miles		
Total Simulated In-stream Flow:	**4.68**	Total Observed In-stream Flow:		**5.10**
Total of simulated highest 10% flows:	**4.38**	Total of Observed highest 10% flows:		**3.95**
Total of Simulated lowest 50% flows:	**0.04**	Total of Observed Lowest 50% flows:		**0.38**
Simulated Summer Flow Volume (months 7-9):	**0.09**	Observed Summer Flow Volume (7-9):		**0.28**
Simulated Fall Flow Volume (months 10-12):	**0.45**	Observed Fall Flow Volume (10-12):		**0.67**
Simulated Winter Flow Volume (months 1-3):	**3.47**	Observed Winter Flow Volume (1-3):		**3.37**
Simulated Spring Flow Volume (months 4-6):	**0.67**	Observed Spring Flow Volume (4-6):		**0.78**
Total Simulated Storm Volume:	**4.39**	Total Observed Storm Volume:		**3.59**
Simulated Summer Storm Volume (7-9):	**0.04**	Observed Summer Storm Volume (7-9):		**0.10**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	9.91	15		
Error in storm volumes:	18.20	20		

Summary statistics of wet weather model hydrology calibration to USGS gage 11025500 (Appendix G, No. 3) (1 of 2).





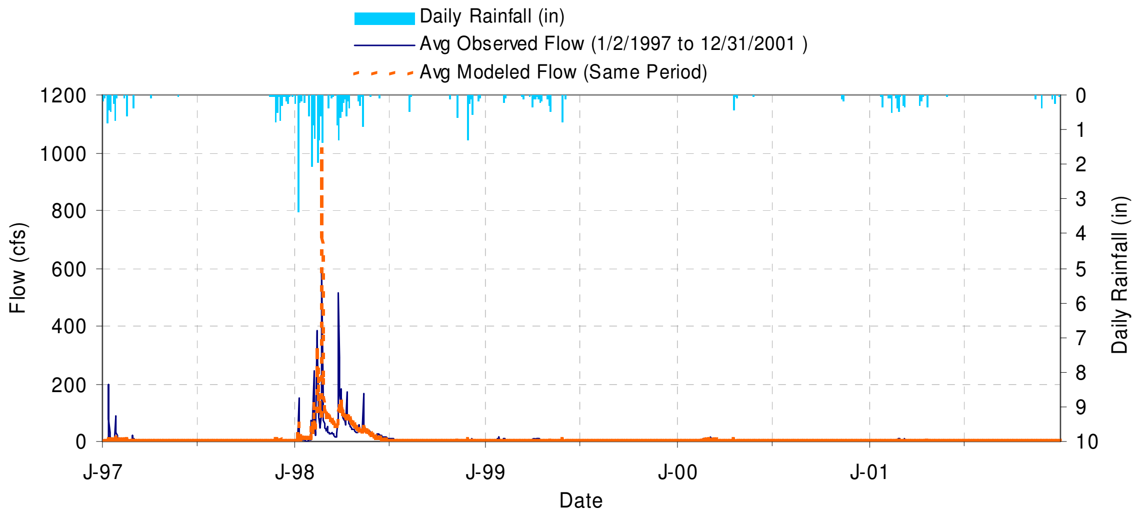




Summary statistics of wet weather model hydrology calibration to USGS gage 11025500 (Appendix G, No. 3) (2 of 2).

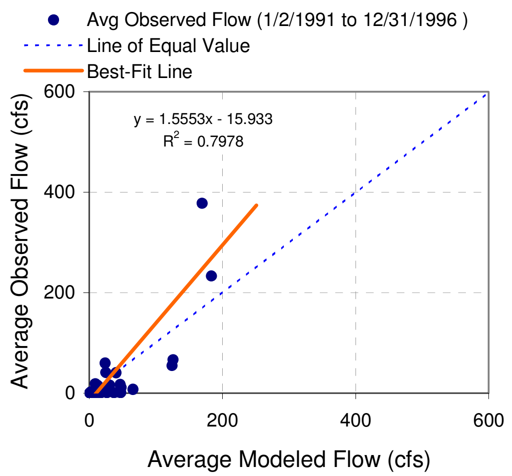
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 1316 6-Year Analysis Period: 1/1/1991 - 12/31/1996 Flow volumes are (inches/year) for upstream drainage area		**USGS 11025500 SANTA YSABEL C NR RAMONA CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 33°06'25", Longitude 116°51'55" NAD27 Drainage area 112 square miles		
Total Simulated In-stream Flow:	**11.52**	Total Observed In-stream Flow:		**11.54**
Total of simulated highest 10% flows:	**9.86**	Total of Observed highest 10% flows:		**9.74**
Total of Simulated lowest 50% flows:	**0.00**	Total of Observed Lowest 50% flows:		**0.09**
Simulated Summer Flow Volume (months 7-9):	**0.00**	Observed Summer Flow Volume (7-9):		**0.13**
Simulated Fall Flow Volume (months 10-12):	**0.02**	Observed Fall Flow Volume (10-12):		**0.19**
Simulated Winter Flow Volume (months 1-3):	**9.39**	Observed Winter Flow Volume (1-3):		**9.22**
Simulated Spring Flow Volume (months 4-6):	**2.10**	Observed Spring Flow Volume (4-6):		**2.00**
Total Simulated Storm Volume:	**3.52**	Total Observed Storm Volume:		**5.06**
Simulated Summer Storm Volume (7-9):	**0.00**	Observed Summer Storm Volume (7-9):		**0.02**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	1.20	15		
Error in storm volumes:	-43.75	20		

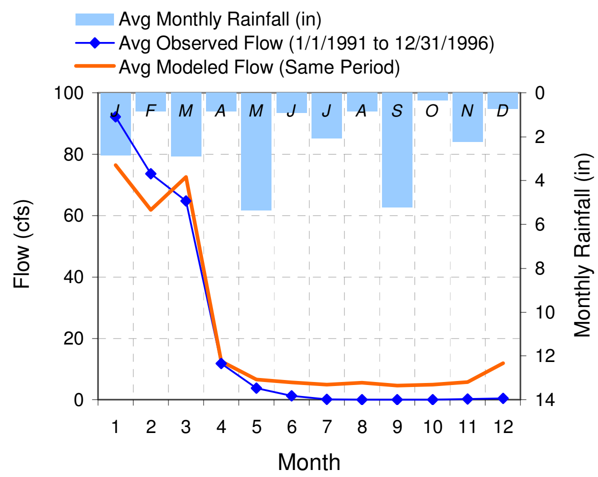
Summary statistics of wet weather model hydrology validation to USGS gage 11025500 (Appendix G, No. 3).

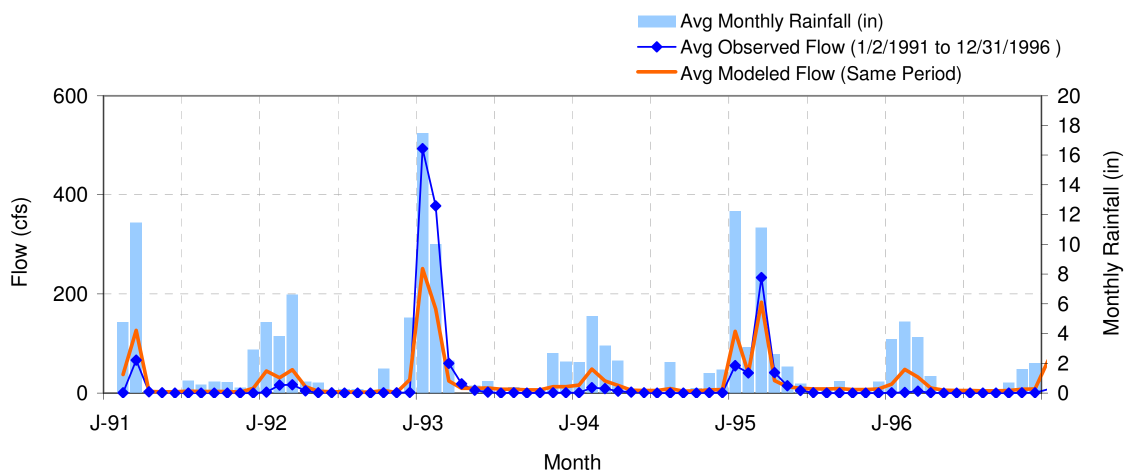


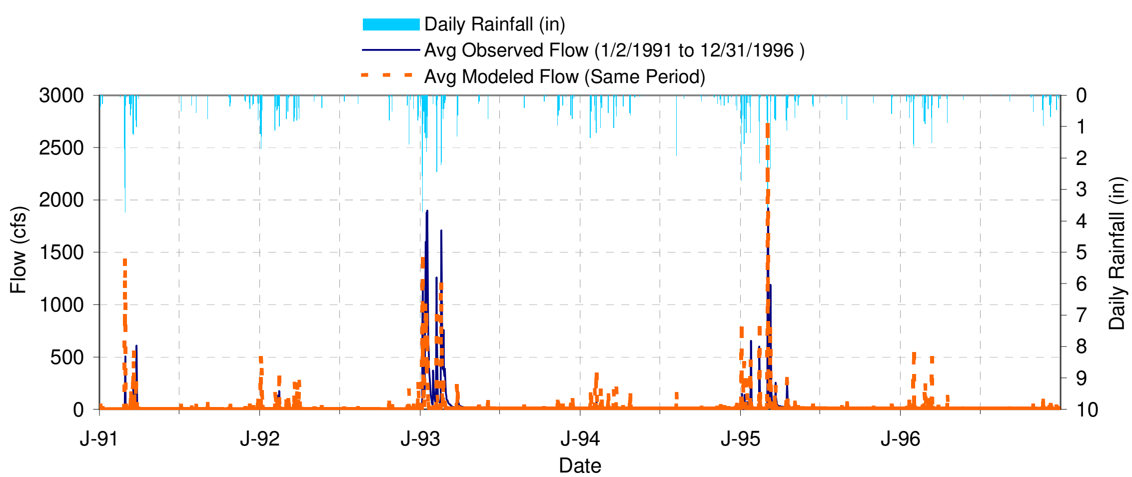
LSPC Simulated Flow		**Observed Flow Gage**		
REACH OUTFLOW FROM SUBBASIN 1316 5-Year Analysis Period: 1/1/1997 - 12/31/2001 Flow volumes are (inches/year) for upstream drainage area		**USGS 11025500 SANTA YSABEL C NR RAMONA CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 33°06'25", Longitude 116°51'55" NAD27 Drainage area 112 square miles		
Total Simulated In-stream Flow:	**3.58**	Total Observed In-stream Flow:		**4.08**
Total of simulated highest 10% flows:	**3.45**	Total of Observed highest 10% flows:		**3.38**
Total of Simulated lowest 50% flows:	**0.00**	Total of Observed Lowest 50% flows:		**0.01**
Simulated Summer Flow Volume (months 7-9):	**0.00**	Observed Summer Flow Volume (7-9):		**0.08**
Simulated Fall Flow Volume (months 10-12):	**0.03**	Observed Fall Flow Volume (10-12):		**0.10**
Simulated Winter Flow Volume (months 1-3):	**2.33**	Observed Winter Flow Volume (1-3):		**2.44**
Simulated Spring Flow Volume (months 4-6):	**1.22**	Observed Spring Flow Volume (4-6):		**1.46**
Total Simulated Storm Volume:	**0.92**	Total Observed Storm Volume:		**1.59**
Simulated Summer Storm Volume (7-9):	**0.00**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	2.02	15		
Error in storm volumes:	-73.39	20		

Summary statistics of wet weather model hydrology calibration to USGS gage 11028500 (Appendix G, No. 3) (1 of 2).





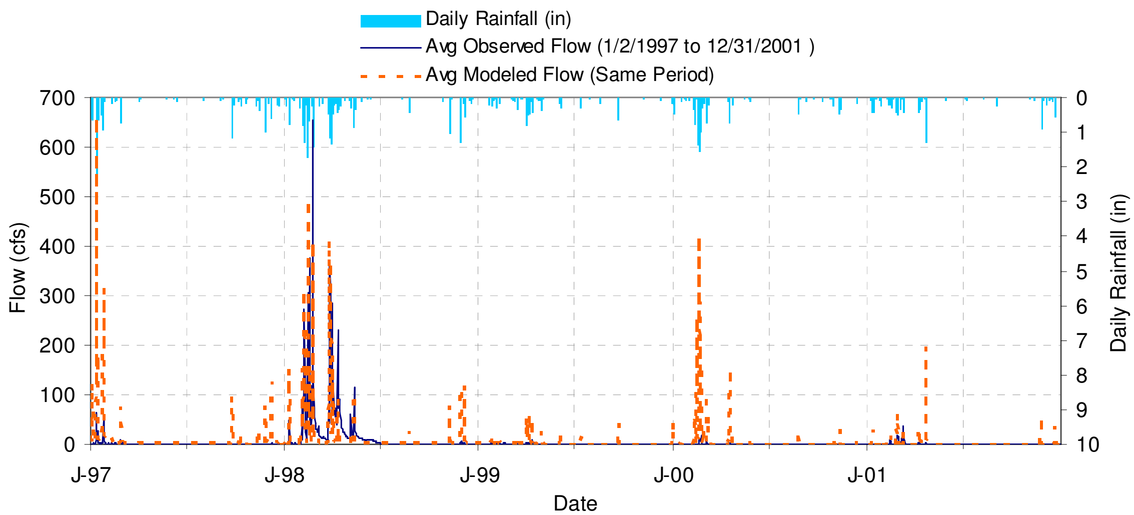




Summary statistics of wet weather model hydrology calibration to USGS gage 11028500 (Appendix G, No. 3) (2 of 2).

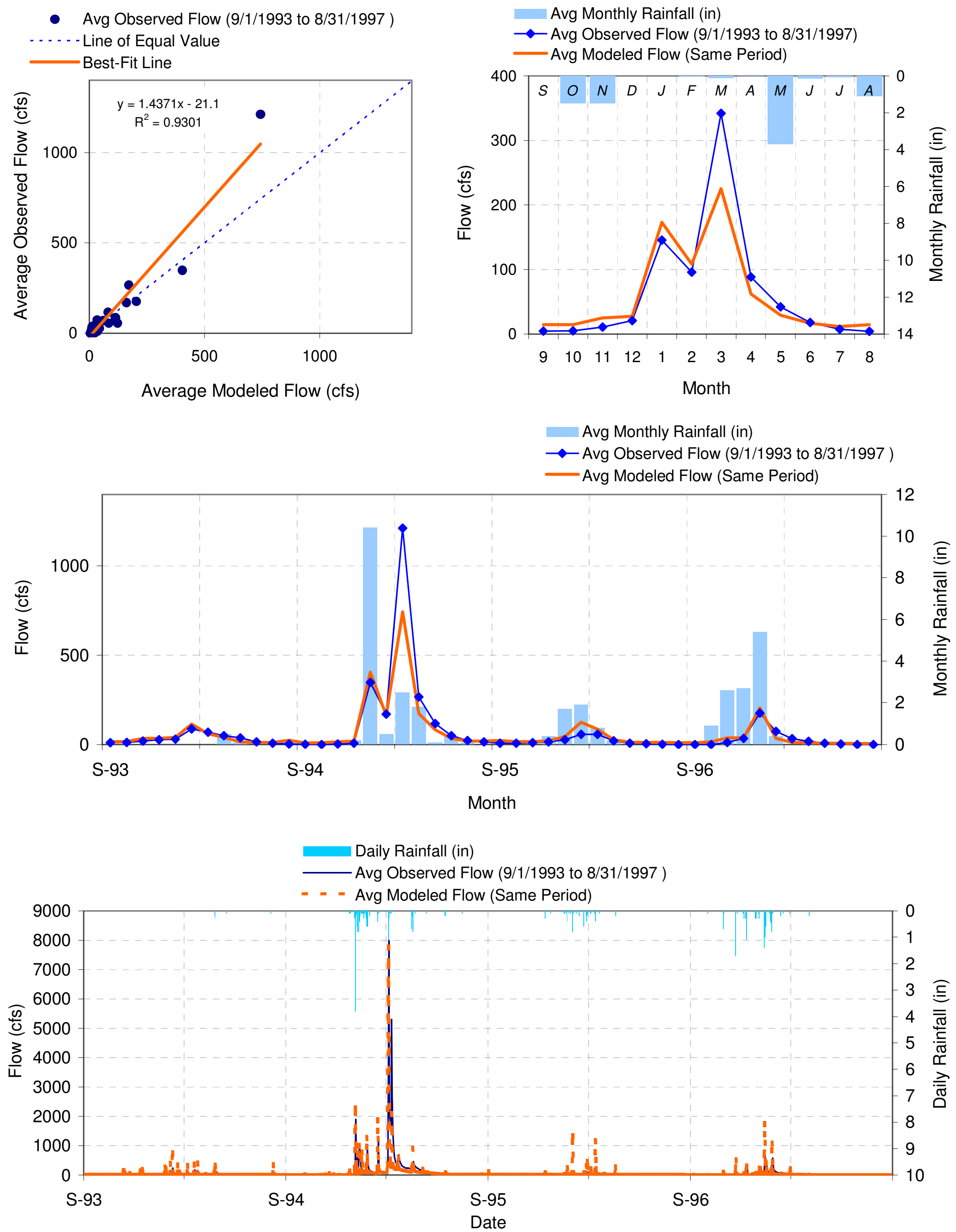
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 1324 6-Year Analysis Period: 1/1/1991 - 12/31/1996 Flow volumes are (inches/year) for upstream drainage area		**USGS 11028500 SANTA MARIA C NR RAMONA CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 33°03'08", Longitude 116°56'41" NAD27 Drainage area 57.6 square miles		
Total Simulated In-stream Flow:	**13.43**	Total Observed In-stream Flow:		**12.15**
Total of simulated highest 10% flows:	**10.76**	Total of Observed highest 10% flows:		**11.48**
Total of Simulated lowest 50% flows:	**0.81**	Total of Observed Lowest 50% flows:		**0.02**
Simulated Summer Flow Volume (months 7-9):	**0.75**	Observed Summer Flow Volume (7-9):		**0.01**
Simulated Fall Flow Volume (months 10-12):	**1.13**	Observed Fall Flow Volume (10-12):		**0.04**
Simulated Winter Flow Volume (months 1-3):	**10.33**	Observed Winter Flow Volume (1-3):		**11.27**
Simulated Spring Flow Volume (months 4-6):	**1.21**	Observed Spring Flow Volume (4-6):		**0.83**
Total Simulated Storm Volume:	**9.56**	Total Observed Storm Volume:		**7.40**
Simulated Summer Storm Volume (7-9):	**0.12**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-6.62	15		
Error in storm volumes:	22.58	20		

Summary statistics of wet weather model hydrology validation to USGS gage 11028500 (Appendix G, No. 3).



LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 1324 5-Year Analysis Period: 1/1/1997 - 12/31/2001 Flow volumes are (inches/year) for upstream drainage area		**USGS 11028500 SANTA MARIA C NR RAMONA CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 33°03'08", Longitude 116°56'41" NAD27 Drainage area 57.6 square miles		
Total Simulated In-stream Flow:	**4.28**	Total Observed In-stream Flow:		**2.68**
Total of simulated highest 10% flows:	**3.50**	Total of Observed highest 10% flows:		**2.55**
Total of Simulated lowest 50% flows:	**0.13**	Total of Observed Lowest 50% flows:		**0.00**
Simulated Summer Flow Volume (months 7-9):	**0.26**	Observed Summer Flow Volume (7-9):		**0.01**
Simulated Fall Flow Volume (months 10-12):	**0.49**	Observed Fall Flow Volume (10-12):		**0.02**
Simulated Winter Flow Volume (months 1-3):	**2.81**	Observed Winter Flow Volume (1-3):		**1.72**
Simulated Spring Flow Volume (months 4-6):	**0.72**	Observed Spring Flow Volume (4-6):		**0.93**
Total Simulated Storm Volume:	**3.19**	Total Observed Storm Volume:		**1.52**
Simulated Summer Storm Volume (7-9):	**0.09**	Observed Summer Storm Volume (7-9):		**0.00**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	27.19	15		
Error in storm volumes:	52.24	20		

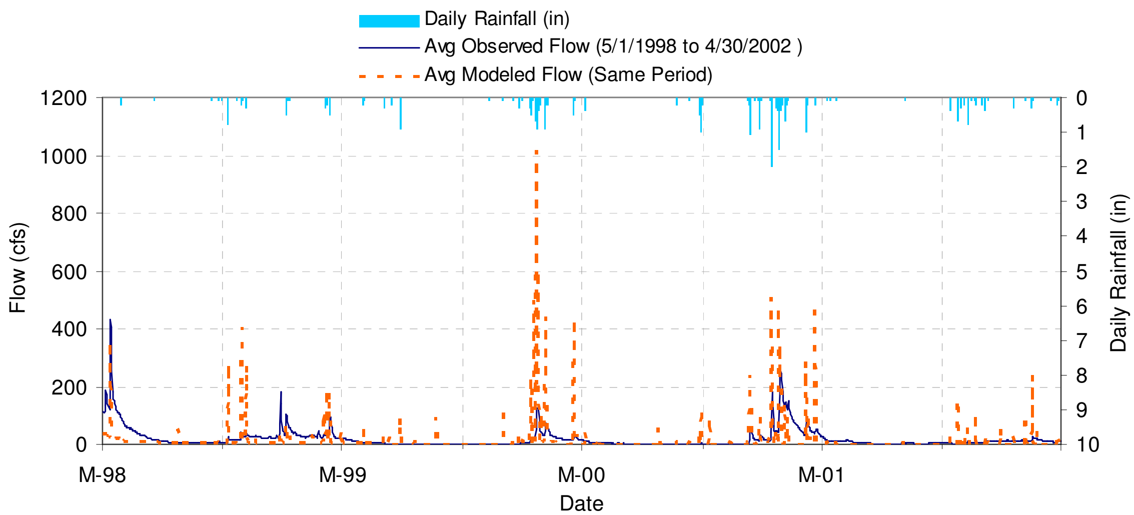
Summary statistics of wet weather model hydrology calibration to USGS gage 11042000 (Appendix G, No. 3) (1 of 2).



Summary statistics of wet weather model hydrology calibration to USGS gage 11042000 (Appendix G, No. 3) (2 of 2).

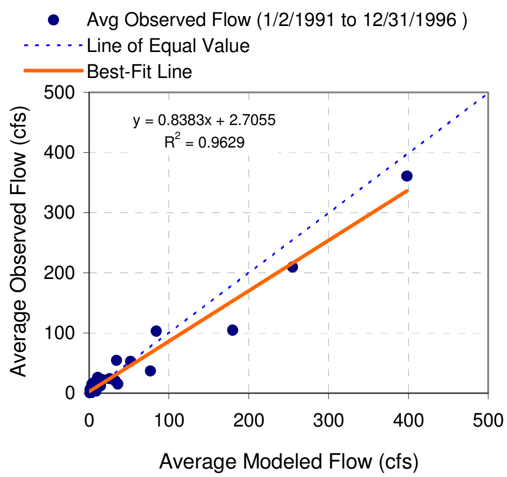
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 702 4-Year Analysis Period: 9/1/1993 - 8/31/1997 Flow volumes are (inches/year) for upstream drainage area		**USGS 11042000 SAN LUIS REY R A OCEANSIDE CA** San Diego County, California Hydrologic Unit Code 18070303 Latitude 33°13'05", Longitude 117°21'34" NAD27 Drainage area 557 square miles		
Total Simulated In-stream Flow:	**1.47**	Total Observed In-stream Flow:		**1.60**
Total of simulated highest 10% flows:	**1.07**	Total of Observed highest 10% flows:		**1.15**
Total of Simulated lowest 50% flows:	**0.12**	Total of Observed Lowest 50% flows:		**0.06**
Simulated Summer Flow Volume (months 7-9):	**0.08**	Observed Summer Flow Volume (7-9):		**0.03**
Simulated Fall Flow Volume (months 10-12):	**0.14**	Observed Fall Flow Volume (10-12):		**0.07**
Simulated Winter Flow Volume (months 1-3):	**1.03**	Observed Winter Flow Volume (1-3):		**1.19**
Simulated Spring Flow Volume (months 4-6):	**0.22**	Observed Spring Flow Volume (4-6):		**0.30**
Total Simulated Storm Volume:	**0.94**	Total Observed Storm Volume:		**0.77**
Simulated Summer Storm Volume (7-9):	**0.01**	Observed Summer Storm Volume (7-9):		**0.00**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-7.69	15		
Error in storm volumes:	18.76	20		

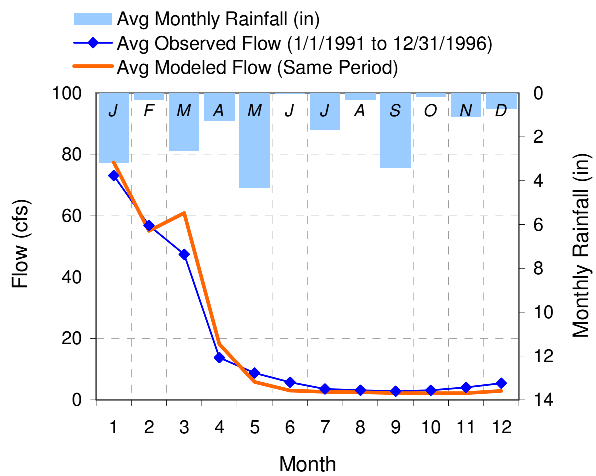
Summary statistics of wet weather model hydrology validation to USGS gage 11042000 (Appendix G, No. 3).

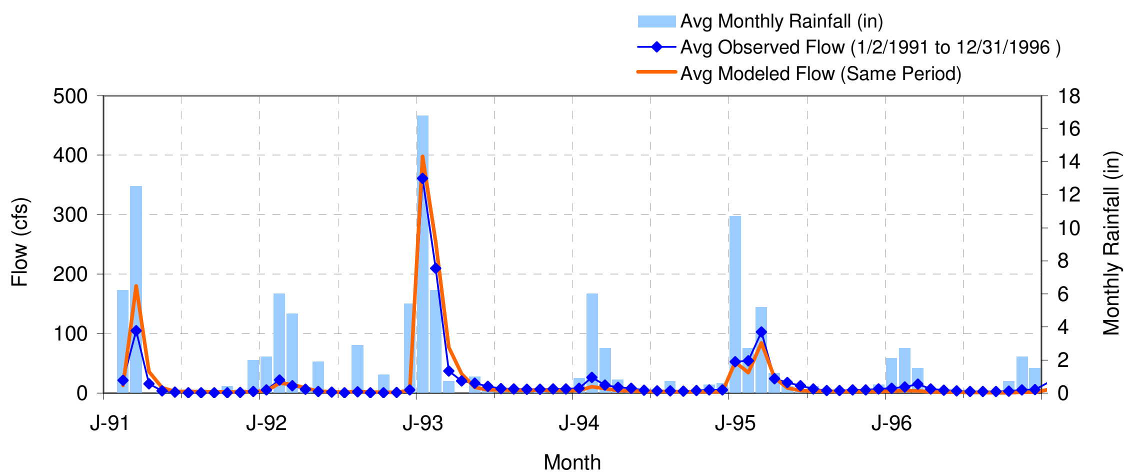


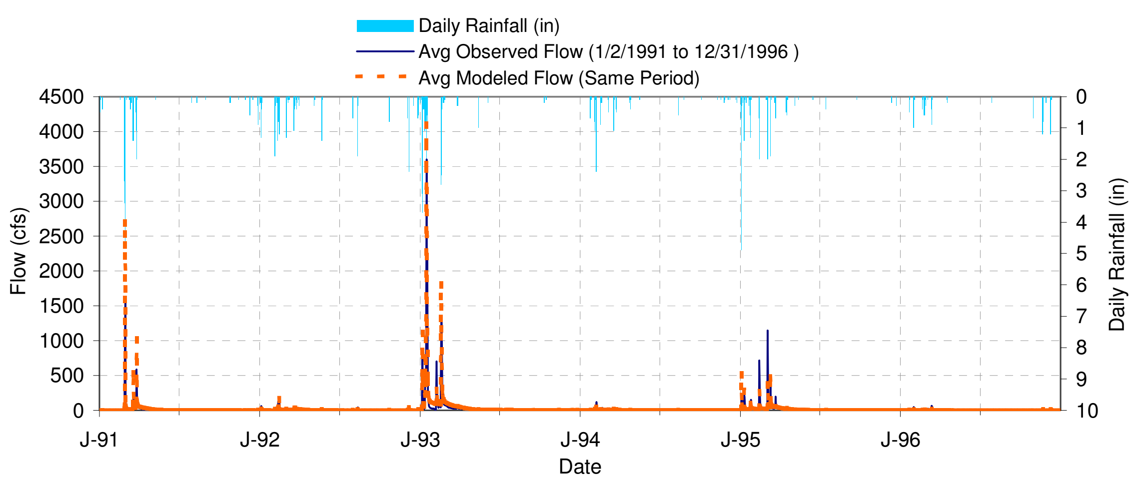
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 702 4-Year Analysis Period: 5/1/1998 - 4/30/2002 Flow volumes are (inches/year) for upstream drainage area		**USGS 11042000 SAN LUIS REY R A OCEANSIDE CA** San Diego County, California Hydrologic Unit Code 18070303 Latitude 33°13'05", Longitude 117°21'34" NAD27 Drainage area 557 square miles		
Total Simulated In-stream Flow:	**0.34**	Total Observed In-stream Flow:		**0.43**
Total of simulated highest 10% flows:	**0.27**	Total of Observed highest 10% flows:		**0.23**
Total of Simulated lowest 50% flows:	**0.01**	Total of Observed Lowest 50% flows:		**0.02**
Simulated Summer Flow Volume (months 7-9):	**0.03**	Observed Summer Flow Volume (7-9):		**0.02**
Simulated Fall Flow Volume (months 10-12):	**0.05**	Observed Fall Flow Volume (10-12):		**0.03**
Simulated Winter Flow Volume (months 1-3):	**0.17**	Observed Winter Flow Volume (1-3):		**0.20**
Simulated Spring Flow Volume (months 4-6):	**0.09**	Observed Spring Flow Volume (4-6):		**0.18**
Total Simulated Storm Volume:	**0.27**	Total Observed Storm Volume:		**0.11**
Simulated Summer Storm Volume (7-9):	**0.01**	Observed Summer Storm Volume (7-9):		**0.00**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	12.00	15		
Error in storm volumes:	57.19	20		

Summary statistics of wet weather model hydrology calibration to USGS gage 11042400 (Appendix G, No. 3) (1 of 2).





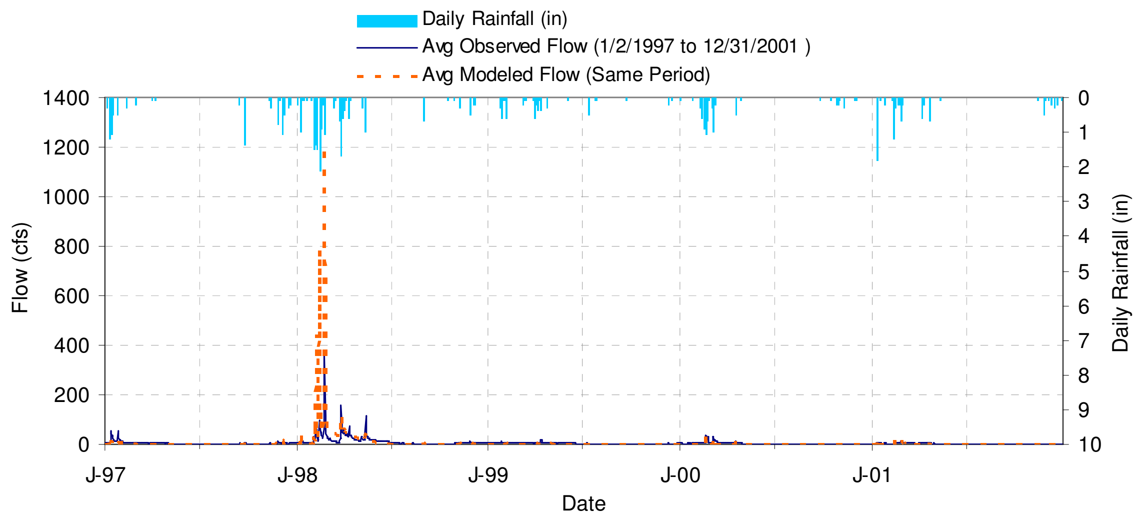




Summary statistics of wet weather model hydrology calibration to USGS gage 11042400 (Appendix G, No. 3) (2 of 2).

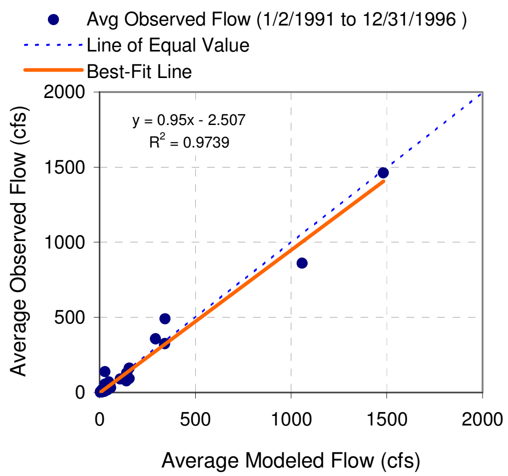
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 658 6-Year Analysis Period: 1/1/1991 - 12/31/1996 Flow volumes are (inches/year) for upstream drainage area		**USGS 11042400 TEMECULA C NR AGUANGA CA** Riverside County, California Hydrologic Unit Code 18070302 Latitude 33°27'33", Longitude 116°55'22" NAD27 Drainage area 131 square miles		
Total Simulated In-stream Flow:	**2.01**	Total Observed In-stream Flow:		**1.95**
Total of simulated highest 10% flows:	**1.64**	Total of Observed highest 10% flows:		**1.43**
Total of Simulated lowest 50% flows:	**0.08**	Total of Observed Lowest 50% flows:		**0.12**
Simulated Summer Flow Volume (months 7-9):	**0.06**	Observed Summer Flow Volume (7-9):		**0.08**
Simulated Fall Flow Volume (months 10-12):	**0.06**	Observed Fall Flow Volume (10-12):		**0.11**
Simulated Winter Flow Volume (months 1-3):	**1.66**	Observed Winter Flow Volume (1-3):		**1.51**
Simulated Spring Flow Volume (months 4-6):	**0.23**	Observed Spring Flow Volume (4-6):		**0.24**
Total Simulated Storm Volume:	**1.11**	Total Observed Storm Volume:		**1.19**
Simulated Summer Storm Volume (7-9):	**0.00**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	12.78	15		
Error in storm volumes:	-7.18	20		

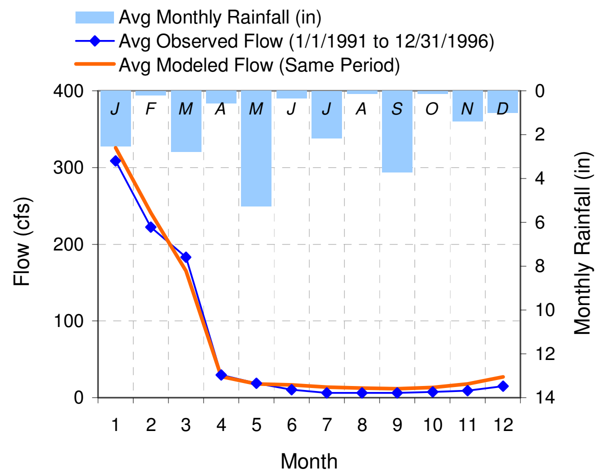
Summary statistics of wet weather model hydrology validation to USGS gage 11042400 (Appendix G, No. 3).

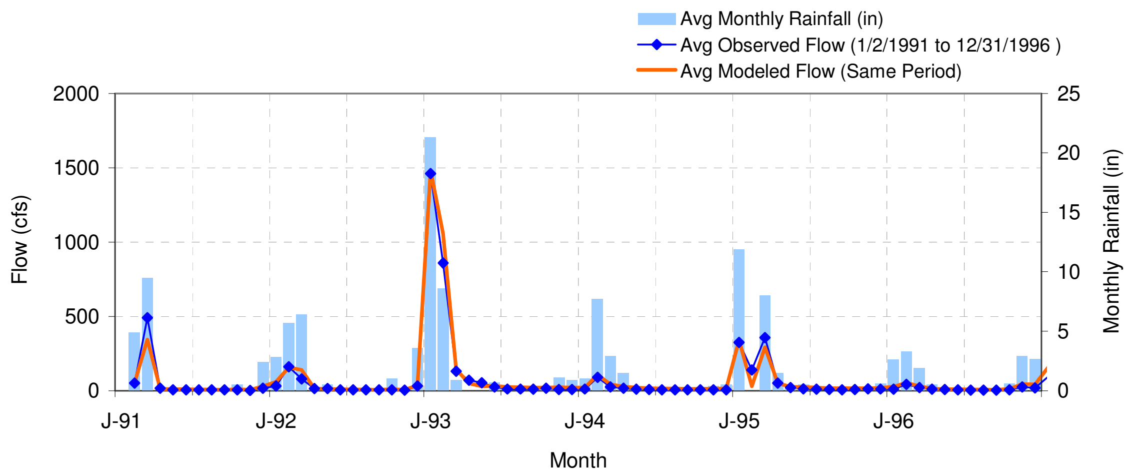


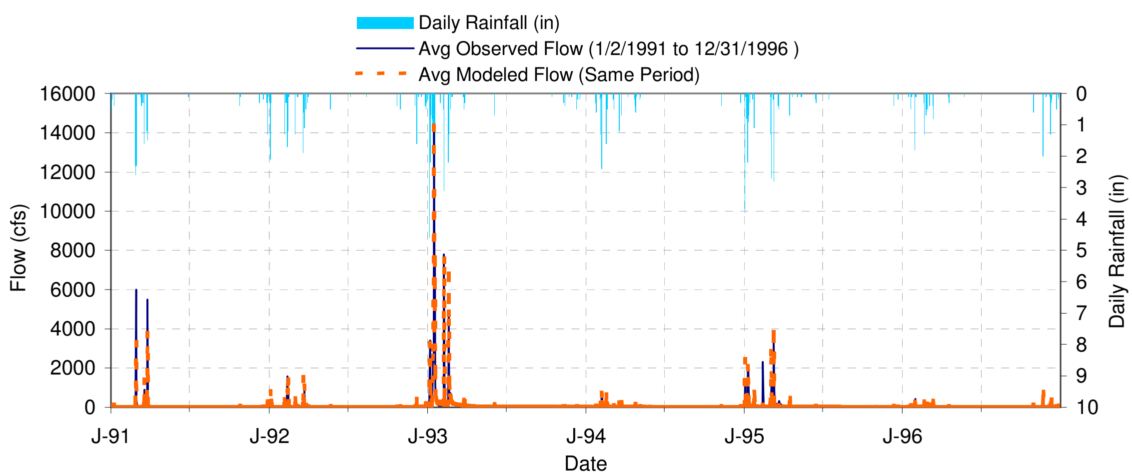
LSPC Simulated Flow		**Observed Flow Gage**		
REACH OUTFLOW FROM SUBBASIN 658 5-Year Analysis Period: 1/1/1997 - 12/31/2001 Flow volumes are (inches/year) for upstream drainage area		**USGS 11042400 TEMECULA C NR AGUANGA CA** Riverside County, California Hydrologic Unit Code 18070302 Latitude 33°27'33", Longitude 116°55'22" NAD27 Drainage area 131 square miles		
Total Simulated In-stream Flow:	**0.58**	Total Observed In-stream Flow:		**0.55**
Total of simulated highest 10% flows:	**0.52**	Total of Observed highest 10% flows:		**0.29**
Total of Simulated lowest 50% flows:	**0.00**	Total of Observed Lowest 50% flows:		**0.07**
Simulated Summer Flow Volume (months 7-9):	**0.01**	Observed Summer Flow Volume (7-9):		**0.04**
Simulated Fall Flow Volume (months 10-12):	**0.02**	Observed Fall Flow Volume (10-12):		**0.06**
Simulated Winter Flow Volume (months 1-3):	**0.43**	Observed Winter Flow Volume (1-3):		**0.27**
Simulated Spring Flow Volume (months 4-6):	**0.12**	Observed Spring Flow Volume (4-6):		**0.18**
Total Simulated Storm Volume:	**0.30**	Total Observed Storm Volume:		**0.16**
Simulated Summer Storm Volume (7-9):	**0.00**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	43.86	15		
Error in storm volumes:	47.39	20		

Summary statistics of wet weather model hydrology calibration to USGS gage 11044300 (Appendix G, No. 3) (1 of 2).





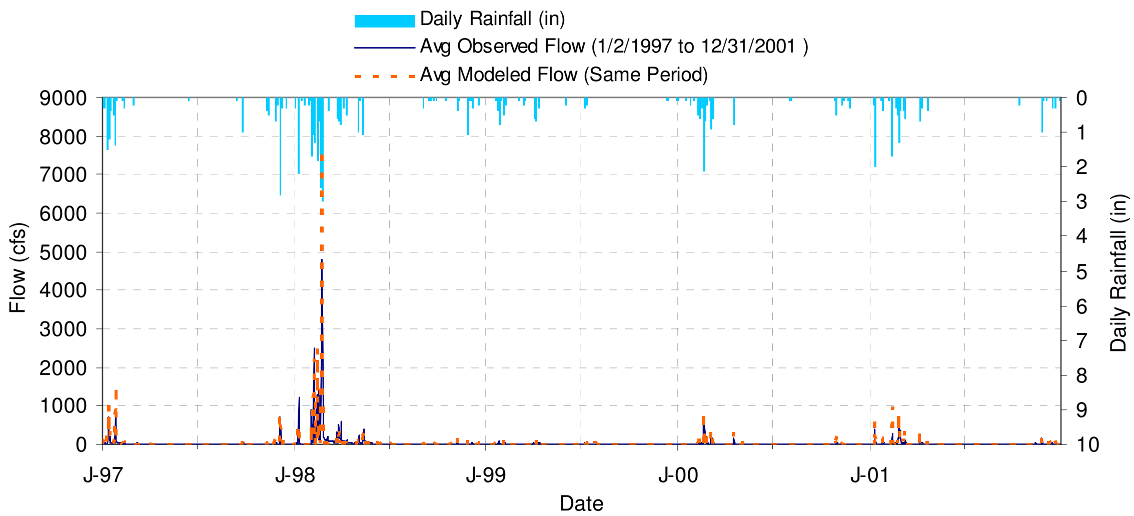




Summary statistics of wet weather model hydrology calibration to USGS gage 11044300 (Appendix G, No. 3) (2 of 2).

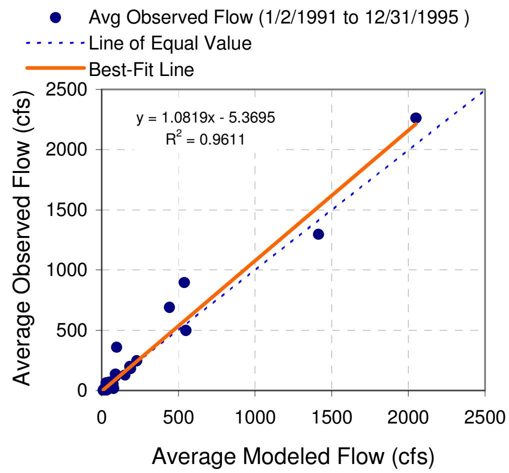
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 615 6-Year Analysis Period: 1/1/1991 - 12/31/1996 Flow volumes are (inches/year) for upstream drainage area		**USGS 11044300 SANTA MARGARITA R A FPUD SUMP NR FALLBROOK CA** San Diego County, California Hydrologic Unit Code 18070302 Latitude 33°24'49", Longitude 117°14'25" NAD27 Drainage area 620 square miles		
Total Simulated In-stream Flow:	**1.69**	Total Observed In-stream Flow:		**1.57**
Total of simulated highest 10% flows:	**1.40**	Total of Observed highest 10% flows:		**1.35**
Total of Simulated lowest 50% flows:	**0.10**	Total of Observed Lowest 50% flows:		**0.05**
Simulated Summer Flow Volume (months 7-9):	**0.07**	Observed Summer Flow Volume (7-9):		**0.03**
Simulated Fall Flow Volume (months 10-12):	**0.11**	Observed Fall Flow Volume (10-12):		**0.06**
Simulated Winter Flow Volume (months 1-3):	**1.39**	Observed Winter Flow Volume (1-3):		**1.36**
Simulated Spring Flow Volume (months 4-6):	**0.12**	Observed Spring Flow Volume (4-6):		**0.11**
Total Simulated Storm Volume:	**1.26**	Total Observed Storm Volume:		**1.22**
Simulated Summer Storm Volume (7-9):	**0.00**	Observed Summer Storm Volume (7-9):		**0.00**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	3.57	15		
Error in storm volumes:	3.40	20		

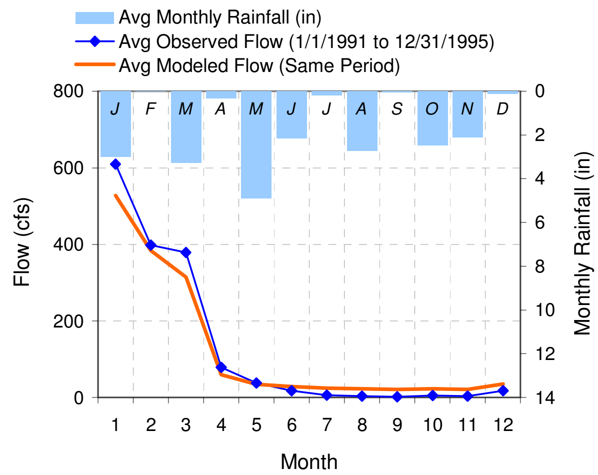
Summary statistics of wet weather model hydrology validation to USGS gage 11044300 (Appendix G, No. 3).

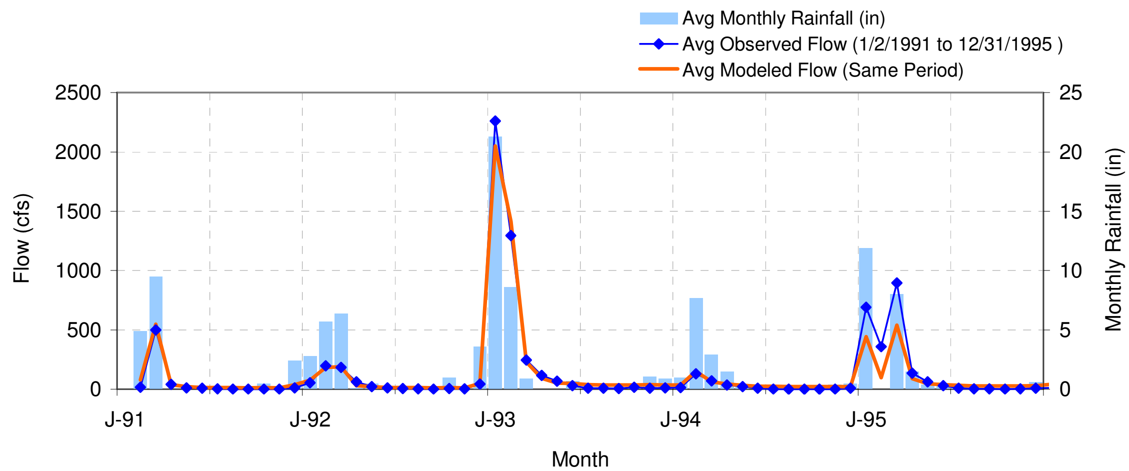


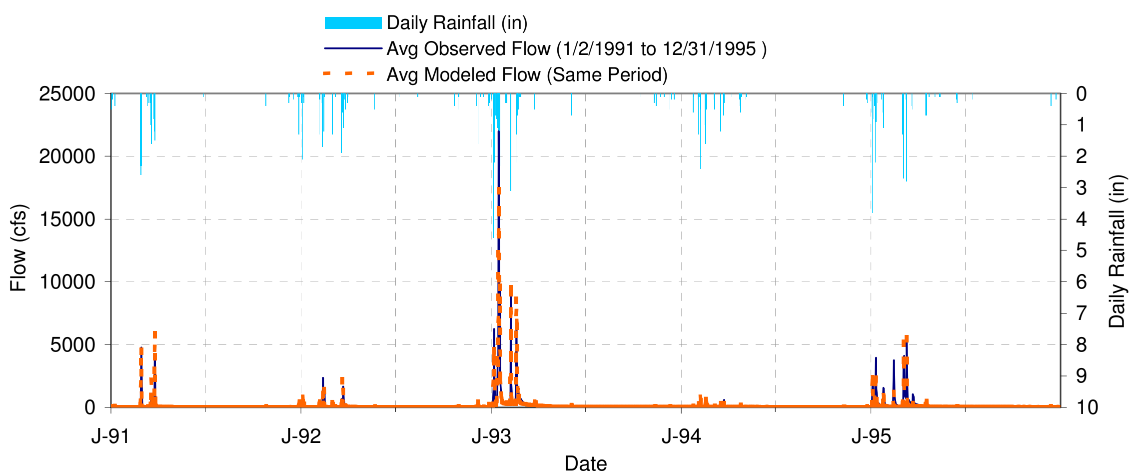
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 615 5-Year Analysis Period: 1/1/1997 - 12/31/2001 Flow volumes are (inches/year) for upstream drainage area		**USGS 11044300 SANTA MARGARITA R A FPUD SUMP NR FALLBROOK CA** San Diego County, California Hydrologic Unit Code 18070302 Latitude 33°24'49", Longitude 117°14'25" NAD27 Drainage area 620 square miles		
Total Simulated In-stream Flow:	**0.74**	Total Observed In-stream Flow:		**0.63**
Total of simulated highest 10% flows:	**0.55**	Total of Observed highest 10% flows:		**0.50**
Total of Simulated lowest 50% flows:	**0.07**	Total of Observed Lowest 50% flows:		**0.04**
Simulated Summer Flow Volume (months 7-9):	**0.06**	Observed Summer Flow Volume (7-9):		**0.03**
Simulated Fall Flow Volume (months 10-12):	**0.08**	Observed Fall Flow Volume (10-12):		**0.05**
Simulated Winter Flow Volume (months 1-3):	**0.51**	Observed Winter Flow Volume (1-3):		**0.47**
Simulated Spring Flow Volume (months 4-6):	**0.09**	Observed Spring Flow Volume (4-6):		**0.09**
Total Simulated Storm Volume:	**0.54**	Total Observed Storm Volume:		**0.47**
Simulated Summer Storm Volume (7-9):	**0.01**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	8.70	15		
Error in storm volumes:	12.74	20		

Summary statistics of wet weather model hydrology calibration to USGS gage 11046000 (Appendix G, No. 3) (1 of 2).





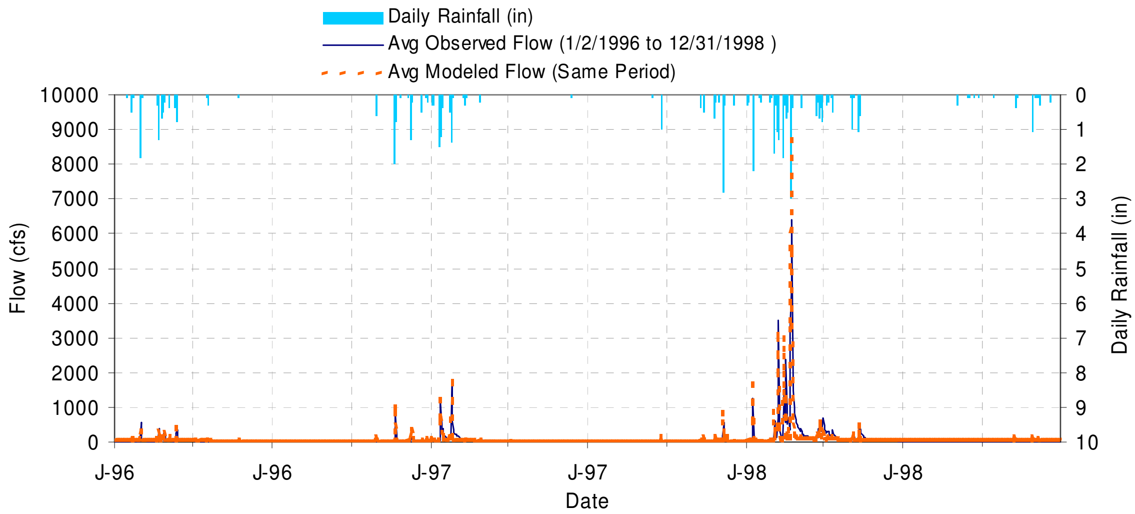




Summary statistics of wet weather model hydrology calibration to USGS gage 11046000 (Appendix G, No. 3) (2 of 2).

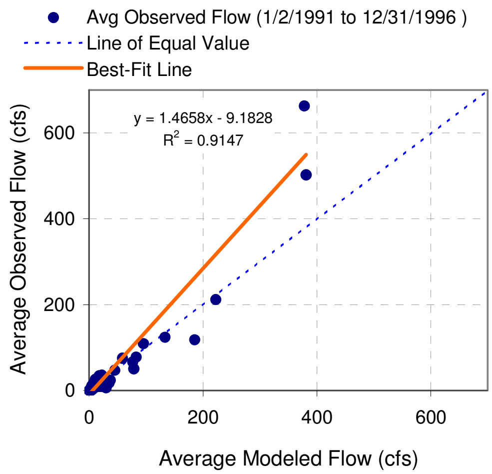
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 602 5-Year Analysis Period: 1/1/1991 - 12/31/1995 Flow volumes are (inches/year) for upstream drainage area		**USGS 11046000 SANTA MARGARITA R A YSIDORA CA** San Diego County, California Hydrologic Unit Code 18070302 Latitude 33°14'13", Longitude 117°23'14" NAD27 Drainage area 723 square miles		
Total Simulated In-stream Flow:	**2.32**	Total Observed In-stream Flow:		**2.42**
Total of simulated highest 10% flows:	**1.84**	Total of Observed highest 10% flows:		**2.05**
Total of Simulated lowest 50% flows:	**0.16**	Total of Observed Lowest 50% flows:		**0.04**
Simulated Summer Flow Volume (months 7-9):	**0.11**	Observed Summer Flow Volume (7-9):		**0.02**
Simulated Fall Flow Volume (months 10-12):	**0.13**	Observed Fall Flow Volume (10-12):		**0.04**
Simulated Winter Flow Volume (months 1-3):	**1.89**	Observed Winter Flow Volume (1-3):		**2.15**
Simulated Spring Flow Volume (months 4-6):	**0.19**	Observed Spring Flow Volume (4-6):		**0.21**
Total Simulated Storm Volume:	**1.63**	Total Observed Storm Volume:		**1.75**
Simulated Summer Storm Volume (7-9):	**0.00**	Observed Summer Storm Volume (7-9):		**0.00**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-11.53	15		
Error in storm volumes:	-7.48	20		

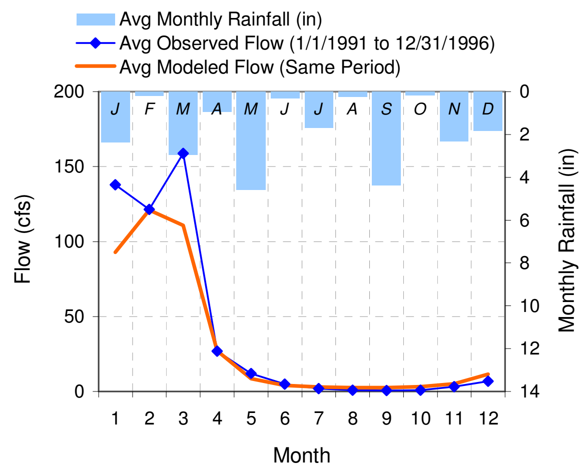
Summary statistics of wet weather model hydrology validation to USGS gage 11046000 (Appendix G, No. 3).

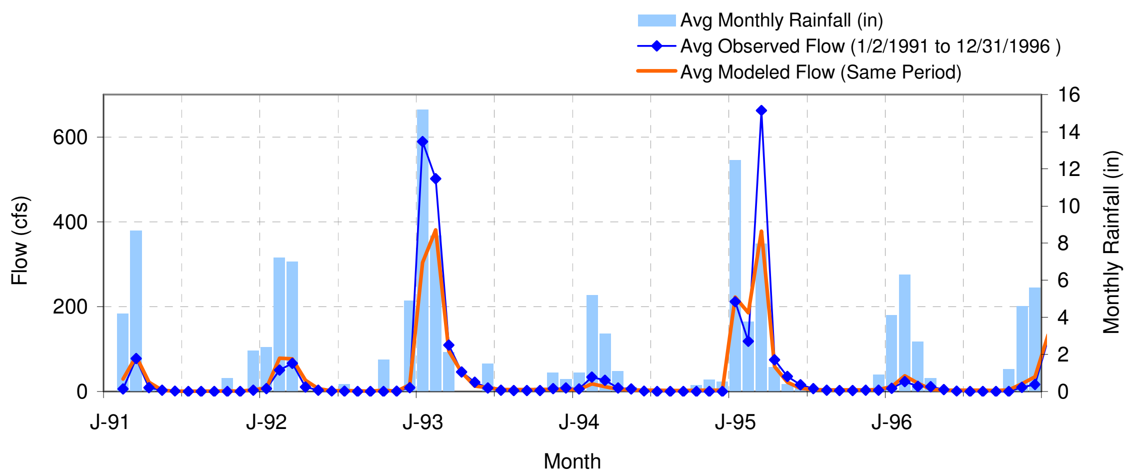


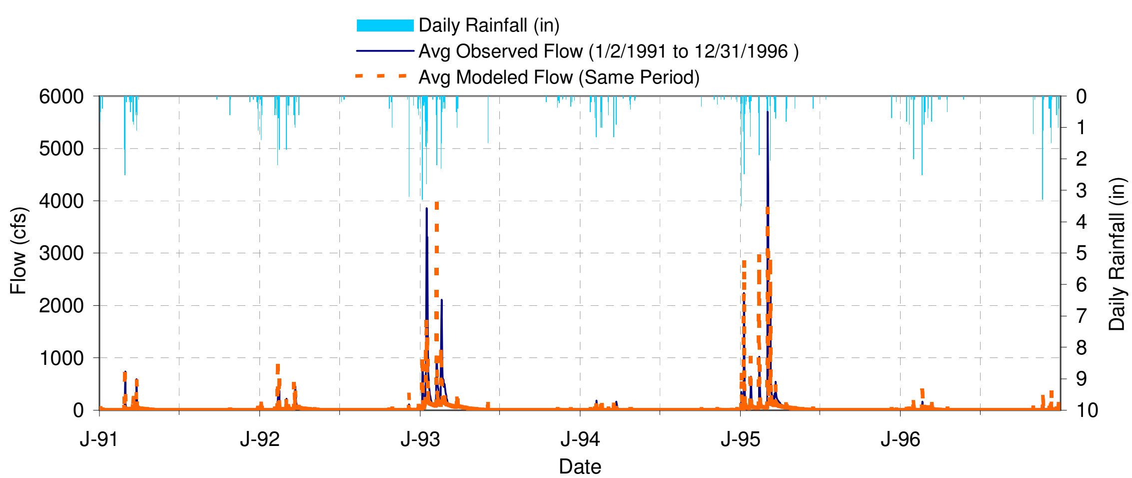
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 602 3-Year Analysis Period: 1/1/1996 - 12/31/1998 Flow volumes are (inches/year) for upstream drainage area		**USGS 11046000 SANTA MARGARITA R A YSIDORA CA** San Diego County, California Hydrologic Unit Code 18070302 Latitude 33°14'13", Longitude 117°23'14" NAD27 Drainage area 723 square miles		
Total Simulated In-stream Flow:	**1.28**	Total Observed In-stream Flow:		**1.29**
Total of simulated highest 10% flows:	**0.90**	Total of Observed highest 10% flows:		**1.03**
Total of Simulated lowest 50% flows:	**0.13**	Total of Observed Lowest 50% flows:		**0.02**
Simulated Summer Flow Volume (months 7-9):	**0.09**	Observed Summer Flow Volume (7-9):		**0.01**
Simulated Fall Flow Volume (months 10-12):	**0.17**	Observed Fall Flow Volume (10-12):		**0.09**
Simulated Winter Flow Volume (months 1-3):	**0.86**	Observed Winter Flow Volume (1-3):		**0.99**
Simulated Spring Flow Volume (months 4-6):	**0.16**	Observed Spring Flow Volume (4-6):		**0.20**
Total Simulated Storm Volume:	**0.85**	Total Observed Storm Volume:		**0.85**
Simulated Summer Storm Volume (7-9):	**0.01**	Observed Summer Storm Volume (7-9):		**0.00**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-14.13	15		
Error in storm volumes:	0.84	20		

Summary statistics of wet weather model hydrology calibration to USGS gage 11046530 (Appendix G, No. 3) (1 of 2).





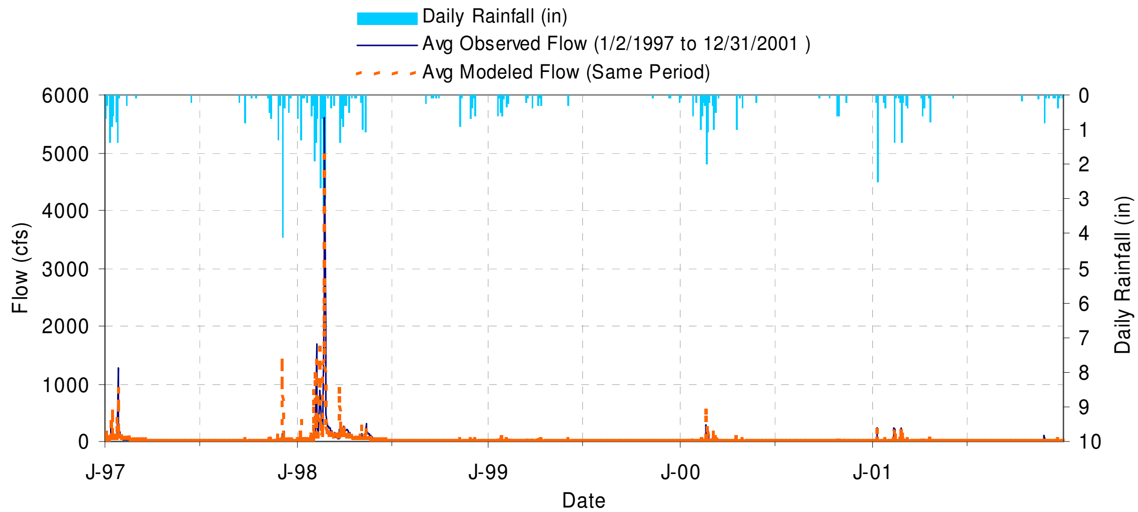




Summary statistics of wet weather model hydrology calibration to USGS gage 11046530 (Appendix G, No. 3) (2 of 2).

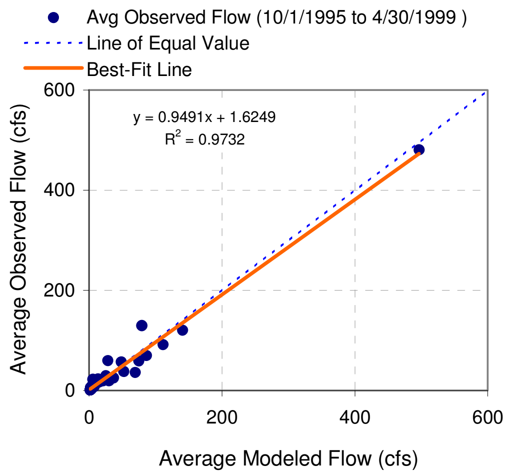
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 411 6-Year Analysis Period: 1/1/1991 - 12/31/1996 Flow volumes are (inches/year) for upstream drainage area		**USGS 11046530 SAN JUAN C AT LA NOVIA ST BR AT SAN JUAN CAPIS CA** Orange County, California Hydrologic Unit Code 18070301 Latitude 33°30'09", Longitude 117°38'50" NAD27 Drainage area 109 square miles		
Total Simulated In-stream Flow:	**4.02**	Total Observed In-stream Flow:		**4.90**
Total of simulated highest 10% flows:	**3.26**	Total of Observed highest 10% flows:		**4.22**
Total of Simulated lowest 50% flows:	**0.12**	Total of Observed Lowest 50% flows:		**0.05**
Simulated Summer Flow Volume (months 7-9):	**0.08**	Observed Summer Flow Volume (7-9):		**0.03**
Simulated Fall Flow Volume (months 10-12):	**0.21**	Observed Fall Flow Volume (10-12):		**0.11**
Simulated Winter Flow Volume (months 1-3):	**3.32**	Observed Winter Flow Volume (1-3):		**4.31**
Simulated Spring Flow Volume (months 4-6):	**0.41**	Observed Spring Flow Volume (4-6):		**0.45**
Total Simulated Storm Volume:	**2.59**	Total Observed Storm Volume:		**2.95**
Simulated Summer Storm Volume (7-9):	**0.00**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-29.36	15		
Error in storm volumes:	-13.85	20		

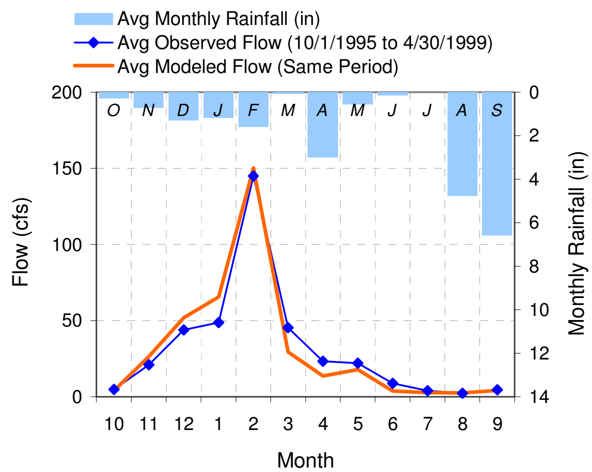
Summary statistics of wet weather model hydrology validation to USGS gage 11046530 (Appendix G, No. 3).

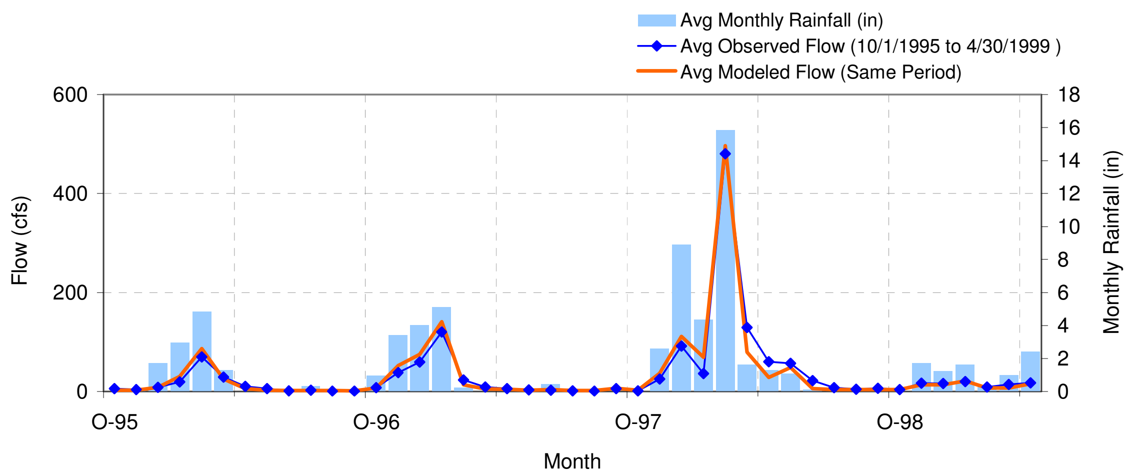


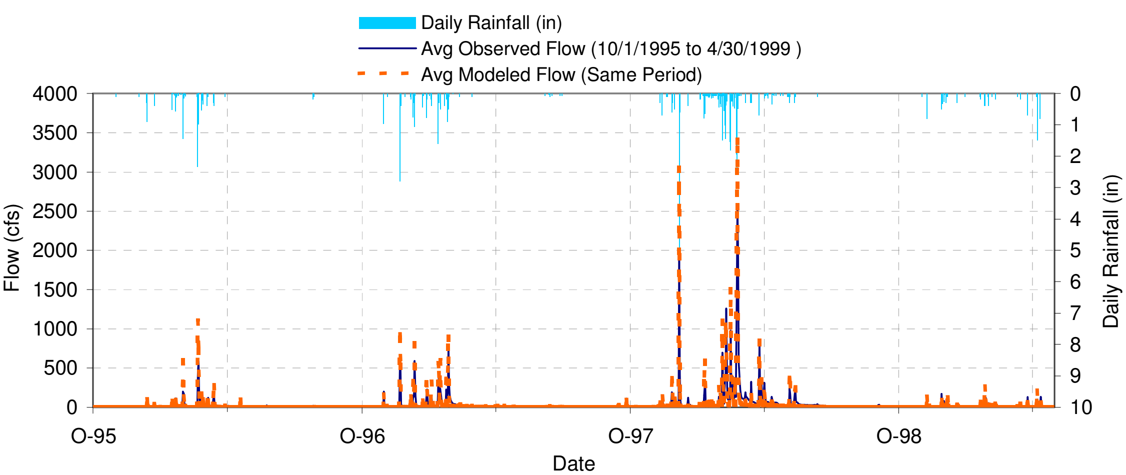
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 411 5-Year Analysis Period: 1/1/1997 - 12/31/2001 Flow volumes are (inches/year) for upstream drainage area		**USGS 11046530 SAN JUAN C AT LA NOVIA ST BR AT SAN JUAN CAPIS CA** Orange County, California Hydrologic Unit Code 18070301 Latitude 33°30'09", Longitude 117°38'50" NAD27 Drainage area 109 square miles		
Total Simulated In-stream Flow:	**3.14**	Total Observed In-stream Flow:		**3.21**
Total of simulated highest 10% flows:	**2.57**	Total of Observed highest 10% flows:		**2.82**
Total of Simulated lowest 50% flows:	**0.12**	Total of Observed Lowest 50% flows:		**0.02**
Simulated Summer Flow Volume (months 7-9):	**0.09**	Observed Summer Flow Volume (7-9):		**0.03**
Simulated Fall Flow Volume (months 10-12):	**0.24**	Observed Fall Flow Volume (10-12):		**0.10**
Simulated Winter Flow Volume (months 1-3):	**2.39**	Observed Winter Flow Volume (1-3):		**2.51**
Simulated Spring Flow Volume (months 4-6):	**0.42**	Observed Spring Flow Volume (4-6):		**0.57**
Total Simulated Storm Volume:	**1.92**	Total Observed Storm Volume:		**1.93**
Simulated Summer Storm Volume (7-9):	**0.01**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-9.98	15		
Error in storm volumes:	-0.53	20		

Summary statistics of wet weather model hydrology calibration to USGS gage 11047300 (Appendix G, No. 3) (1 of 2).





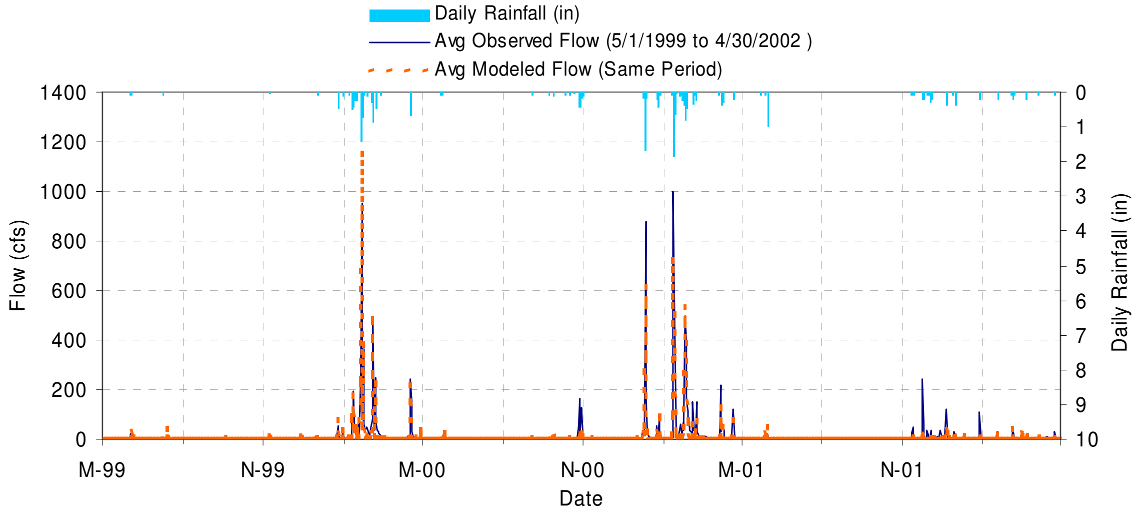




Summary statistics of wet weather model hydrology calibration to USGS gage 11047300 (Appendix G, No. 3) (2 of 2).

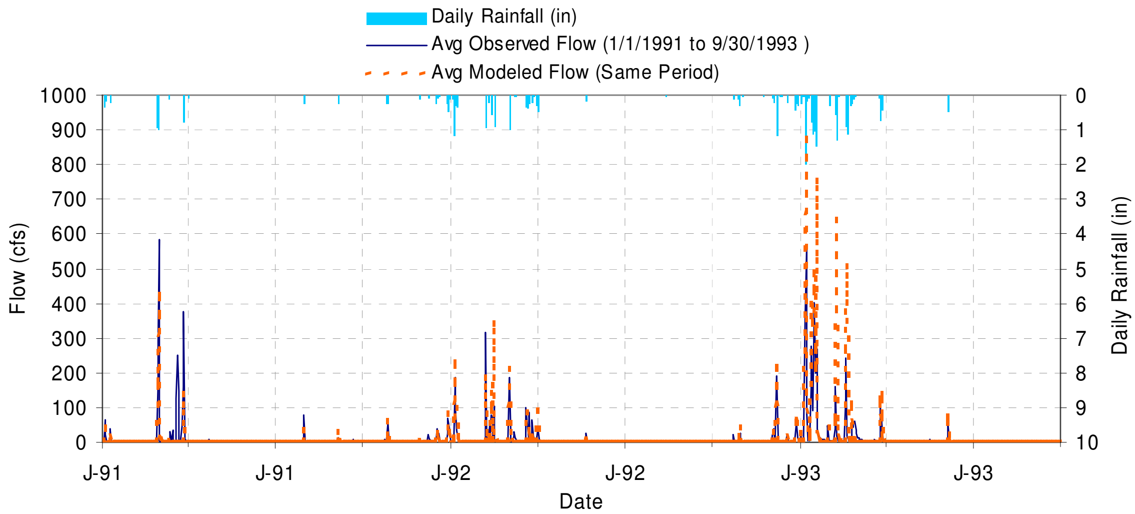
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 403 3.58-Year Analysis Period: 10/1/1995 - 4/30/1999 Flow volumes are (inches/year) for upstream drainage area		**USGS 11047300 ARROYO TRABUCO A SAN JUAN CAPISTRANO CA** Orange County, California Hydrologic Unit Code 18070301 Latitude 33°29'54", Longitude 117°39'54" NAD27 Drainage area 54.1 square miles		
Total Simulated In-stream Flow:	**8.31**	Total Observed In-stream Flow:		**8.28**
Total of simulated highest 10% flows:	**7.15**	Total of Observed highest 10% flows:		**6.32**
Total of Simulated lowest 50% flows:	**0.28**	Total of Observed Lowest 50% flows:		**0.36**
Simulated Summer Flow Volume (months 7-9):	**0.16**	Observed Summer Flow Volume (7-9):		**0.19**
Simulated Fall Flow Volume (months 10-12):	**1.94**	Observed Fall Flow Volume (10-12):		**1.63**
Simulated Winter Flow Volume (months 1-3):	**5.51**	Observed Winter Flow Volume (1-3):		**5.39**
Simulated Spring Flow Volume (months 4-6):	**0.70**	Observed Spring Flow Volume (4-6):		**1.08**
Total Simulated Storm Volume:	**7.07**	Total Observed Storm Volume:		**5.72**
Simulated Summer Storm Volume (7-9):	**0.03**	Observed Summer Storm Volume (7-9):		**0.06**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	11.71	15		
Error in storm volumes:	18.99	20		

Summary statistics of wet weather model hydrology validation to USGS gage 11047300 (Appendix G, No. 3).



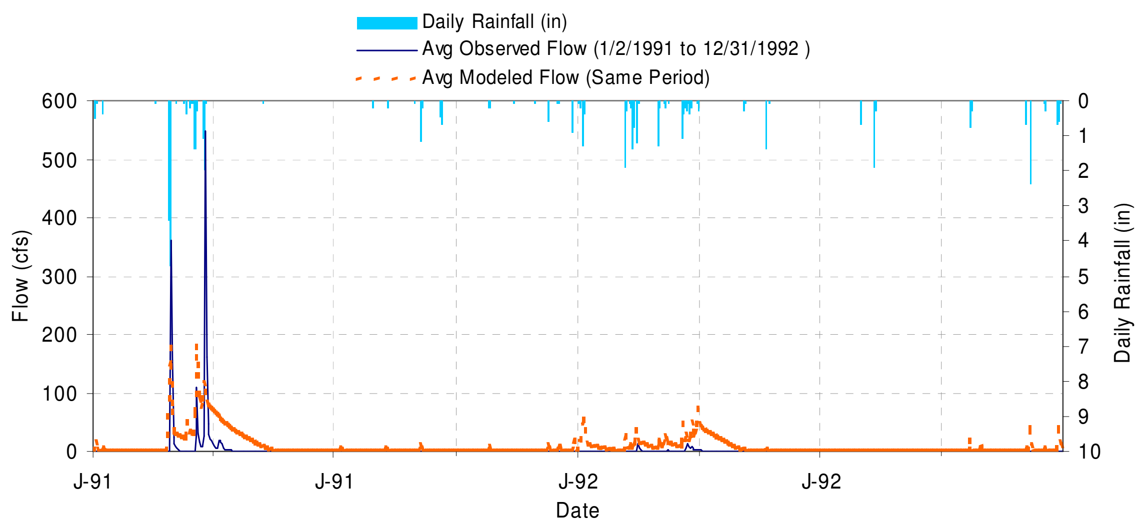
LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 403 3-Year Analysis Period: 5/1/1999 - 4/30/2002 Flow volumes are (inches/year) for upstream drainage area		**USGS 11047300 ARROYO TRABUCO A SAN JUAN CAPISTRANO CA** Orange County, California Hydrologic Unit Code 18070301 Latitude 33°29'54", Longitude 117°39'54" NAD27 Drainage area 54.1 square miles		
Total Simulated In-stream Flow:	**2.28**	Total Observed In-stream Flow:		**3.35**
Total of simulated highest 10% flows:	**1.93**	Total of Observed highest 10% flows:		**2.57**
Total of Simulated lowest 50% flows:	**0.13**	Total of Observed Lowest 50% flows:		**0.23**
Simulated Summer Flow Volume (months 7-9):	**0.11**	Observed Summer Flow Volume (7-9):		**0.10**
Simulated Fall Flow Volume (months 10-12):	**0.15**	Observed Fall Flow Volume (10-12):		**0.45**
Simulated Winter Flow Volume (months 1-3):	**1.71**	Observed Winter Flow Volume (1-3):		**2.32**
Simulated Spring Flow Volume (months 4-6):	**0.30**	Observed Spring Flow Volume (4-6):		**0.47**
Total Simulated Storm Volume:	**1.91**	Total Observed Storm Volume:		**2.33**
Simulated Summer Storm Volume (7-9):	**0.02**	Observed Summer Storm Volume (7-9):		**0.01**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	-33.27	15		
Error in storm volumes:	-21.87	20		

Summary statistics of wet weather model hydrology validation to USGS gage 11022350 (Appendix G, No. 3).



LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 1843 2.75-Year Analysis Period: 1/1/1991 - 9/30/1993 Flow volumes are (inches/year) for upstream drainage area		**USGS 11022350 FORESTER C A EL CAJON CA** San Diego County, California Hydrologic Unit Code 18070304 Latitude 32°49'16", Longitude 116°58'32" NAD27 Drainage area 21.3 square miles		
Total Simulated In-stream Flow:	**6.50**	Total Observed In-stream Flow:		**5.96**
Total of simulated highest 10% flows:	**6.37**	Total of Observed highest 10% flows:		**5.32**
Total of Simulated lowest 50% flows:	**0.03**	Total of Observed Lowest 50% flows:		**0.13**
Simulated Summer Flow Volume (months 7-9):	**0.07**	Observed Summer Flow Volume (7-9):		**0.13**
Simulated Fall Flow Volume (months 10-12):	**0.50**	Observed Fall Flow Volume (10-12):		**0.55**
Simulated Winter Flow Volume (months 1-3):	**5.77**	Observed Winter Flow Volume (1-3):		**4.96**
Simulated Spring Flow Volume (months 4-6):	**0.16**	Observed Spring Flow Volume (4-6):		**0.32**
Total Simulated Storm Volume:	**5.58**	Total Observed Storm Volume:		**4.87**
Simulated Summer Storm Volume (7-9):	**0.05**	Observed Summer Storm Volume (7-9):		**0.07**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	16.45	15		
Error in storm volumes:	12.64	20		

Summary statistics of wet weather model hydrology validation to USGS gage 11039800 (Appendix G, No. 3).



LSPC Simulated Flow		Observed Flow Gage		
REACH OUTFLOW FROM SUBBASIN 711 2-Year Analysis Period: 1/1/1991 - 12/31/1992 Flow volumes are (inches/year) for upstream drainage area		**USGS 11039800 SAN LUIS REY R A COUSER CYN BR NR PALA CA** San Diego County, California Hydrologic Unit Code 18070303 Latitude 33°20'26", Longitude 117°07'50" NAD27 Drainage area 364 square miles		
Total Simulated In-stream Flow:	**4.77**	Total Observed In-stream Flow:		**1.48**
Total of simulated highest 10% flows:	**3.30**	Total of Observed highest 10% flows:		**1.48**
Total of Simulated lowest 50% flows:	**0.00**	Total of Observed Lowest 50% flows:		**0.00**
Simulated Summer Flow Volume (months 7-9):	**0.03**	Observed Summer Flow Volume (7-9):		**0.00**
Simulated Fall Flow Volume (months 10-12):	**0.23**	Observed Fall Flow Volume (10-12):		**0.00**
Simulated Winter Flow Volume (months 1-3):	**2.75**	Observed Winter Flow Volume (1-3):		**1.36**
Simulated Spring Flow Volume (months 4-6):	**1.77**	Observed Spring Flow Volume (4-6):		**0.12**
Total Simulated Storm Volume:	**1.41**	Total Observed Storm Volume:		**1.24**
Simulated Summer Storm Volume (7-9):	**0.03**	Observed Summer Storm Volume (7-9):		**0.00**
Errors (Simulated-Observed)	*Current Run (n)*	*Recommended Criteria*	*Run (n-1)*	*Run (n-2)*
Error in 10% highest flows:	55.14	15		
Error in storm volumes:	11.54	20		

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Appendix N

Comparison of Wet Weather Modeling Results to Observed Densities

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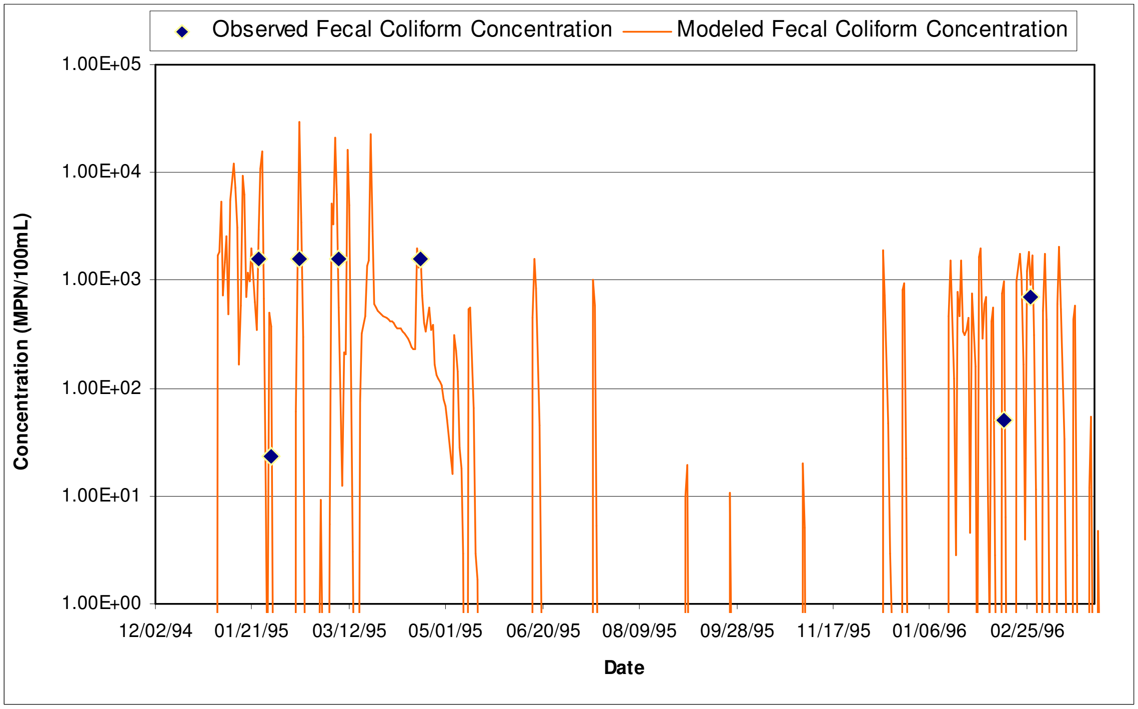

Figure N-1-A. Time-series comparison of modeled and observed wet weather fecal coliform densities in the Santa Margarita River watershed (Appendix G, No. 8 [station #4] and No. 9 [plant #13])

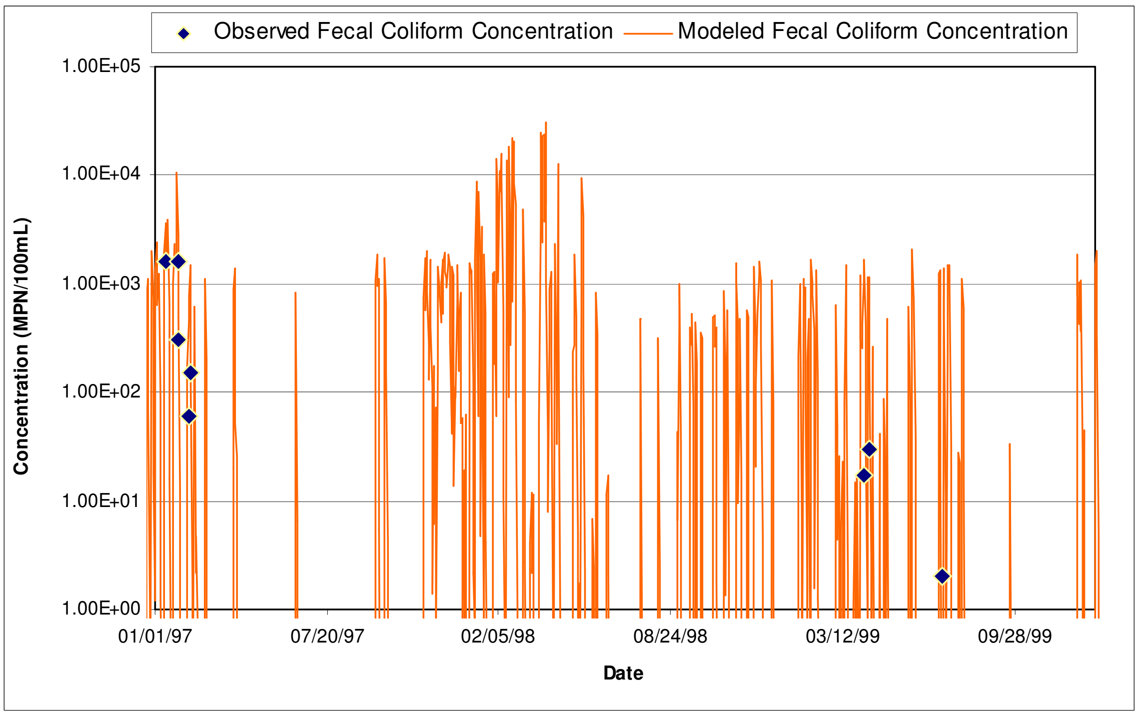

Figure N-1-B. Time-series comparison of modeled and observed wet weather fecal coliform densities in the Santa Margarita River watershed (Appendix G, No. 8 [station #4] and No. 9 [plant #13])

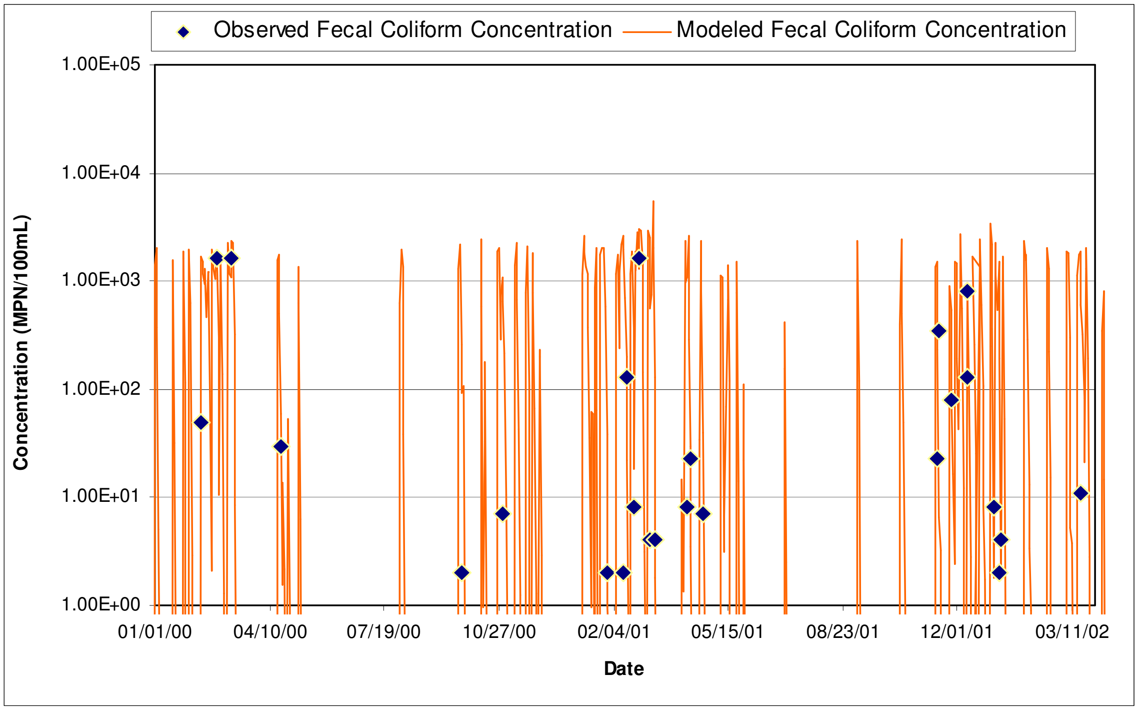

Figure N-1-C. Time-series comparison of modeled and observed wet weather fecal coliform densities in the Santa Margarita River watershed (Appendix G, No. 8 [station #4] and No. 9 [plant #13])

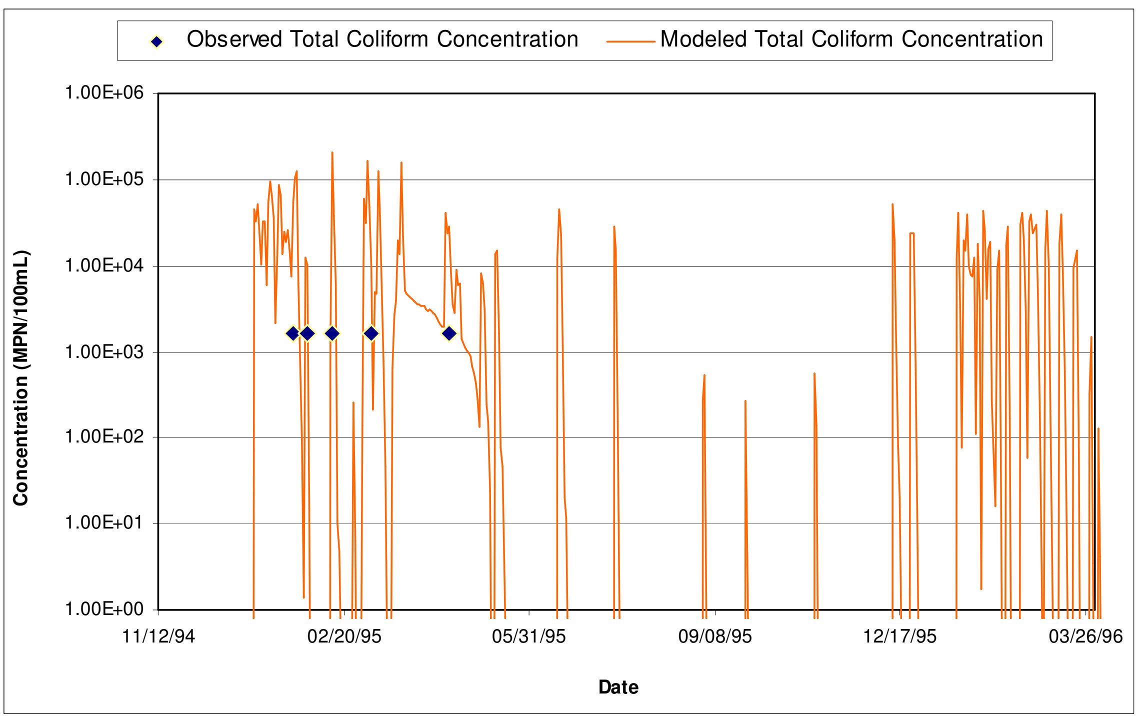

Figure N-2. Time-series comparison of modeled and observed wet weather total coliform densities in the Santa Margarita River watershed (Appendix G, No. 8 [station #4] and No. 9 [plant #13])

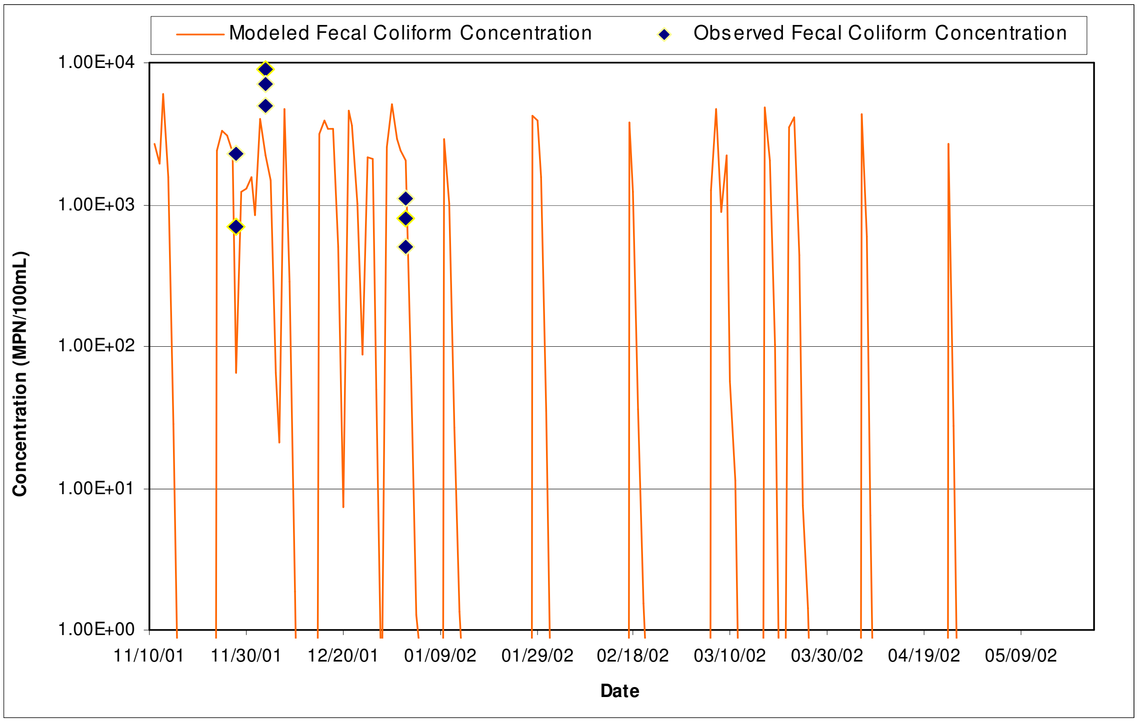

Figure N-3. Time-series comparison of modeled and observed wet weather fecal coliform densities in the Aliso Creek watershed (Appendix G, No. 10 [station J01 at TP and U/S J01/J02])

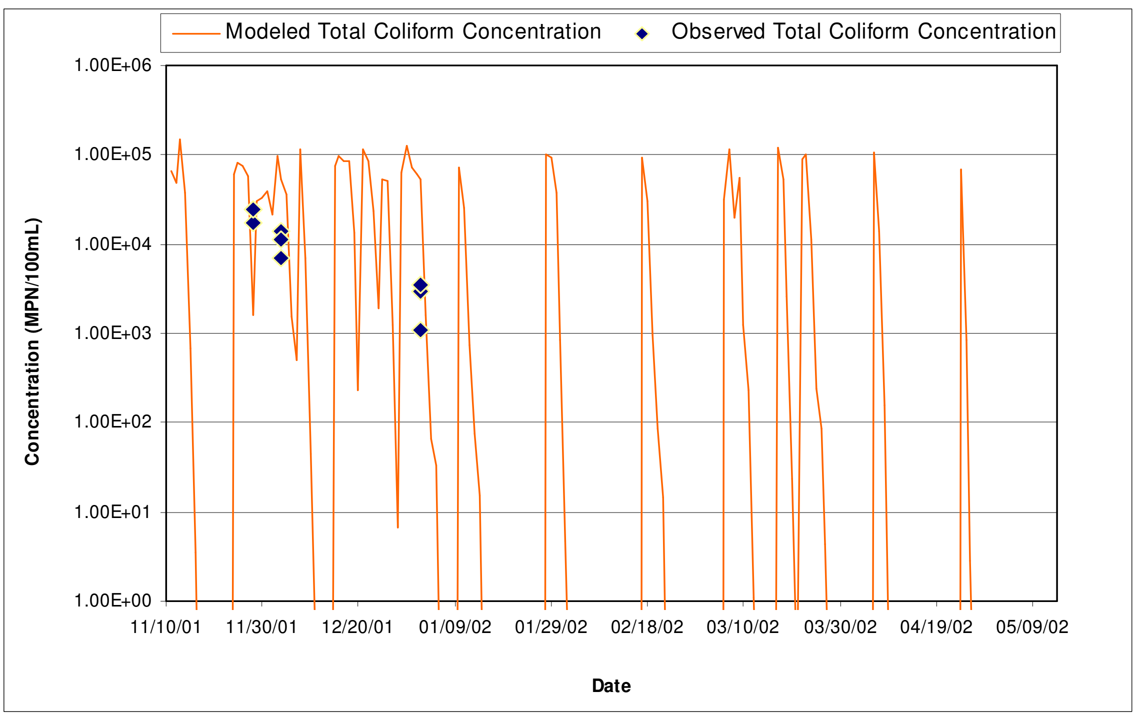

Figure N-4. Time-series comparison of modeled and observed wet weather total coliform densities in the Aliso Creek watershed for stations (Appendix G, No. 10 [station J01 at TP and U/S J01/J02])

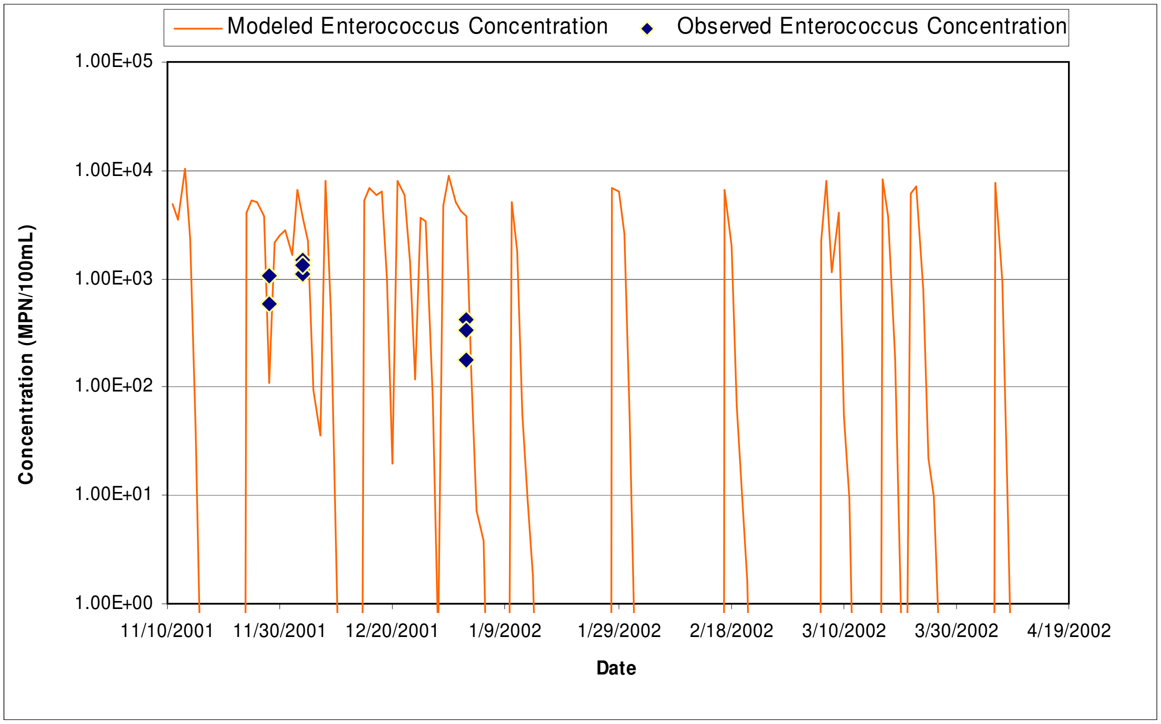

Figure N-5. Time-series comparison of modeled and observed wet weather enterococcus densities in the Aliso Creek watershed for stations (Appendix G, No. 10 [station J01 at TP and U/S J01/J02])

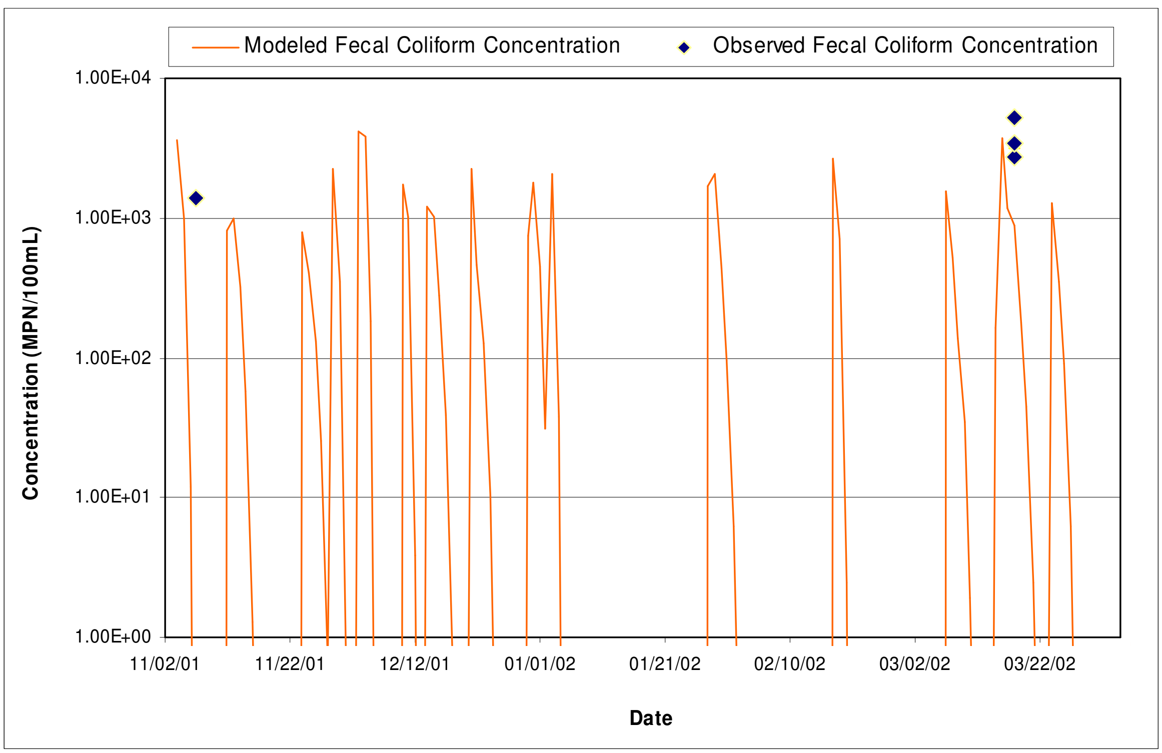

Figure N-6. Time-series comparison of modeled and observed wet weather fecal coliform densities in the Rose Creek watershed (Appendix G, No. 12 [stations MBW 20 and MBW 21])

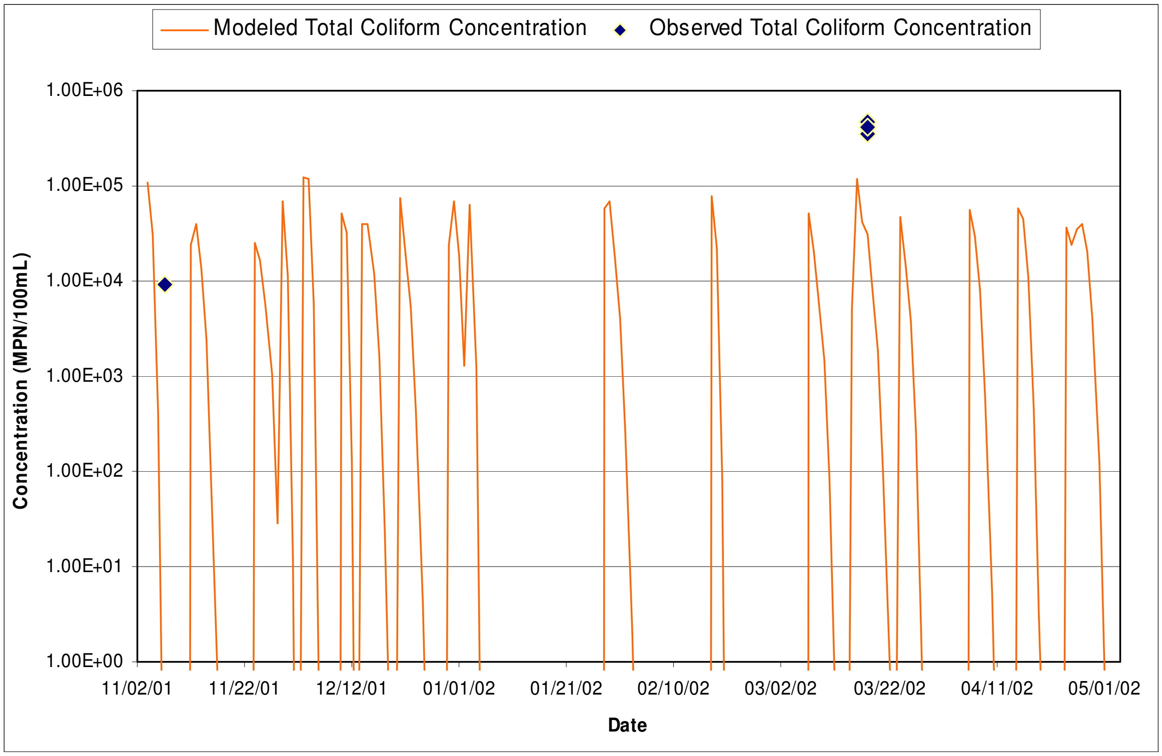

Figure N-7. Time-series comparison of modeled and observed wet weather total coliform densities in the Rose Creek watershed (Appendix G, No. 12 [stations MBW 19, MBW 20 and MBW 21]).

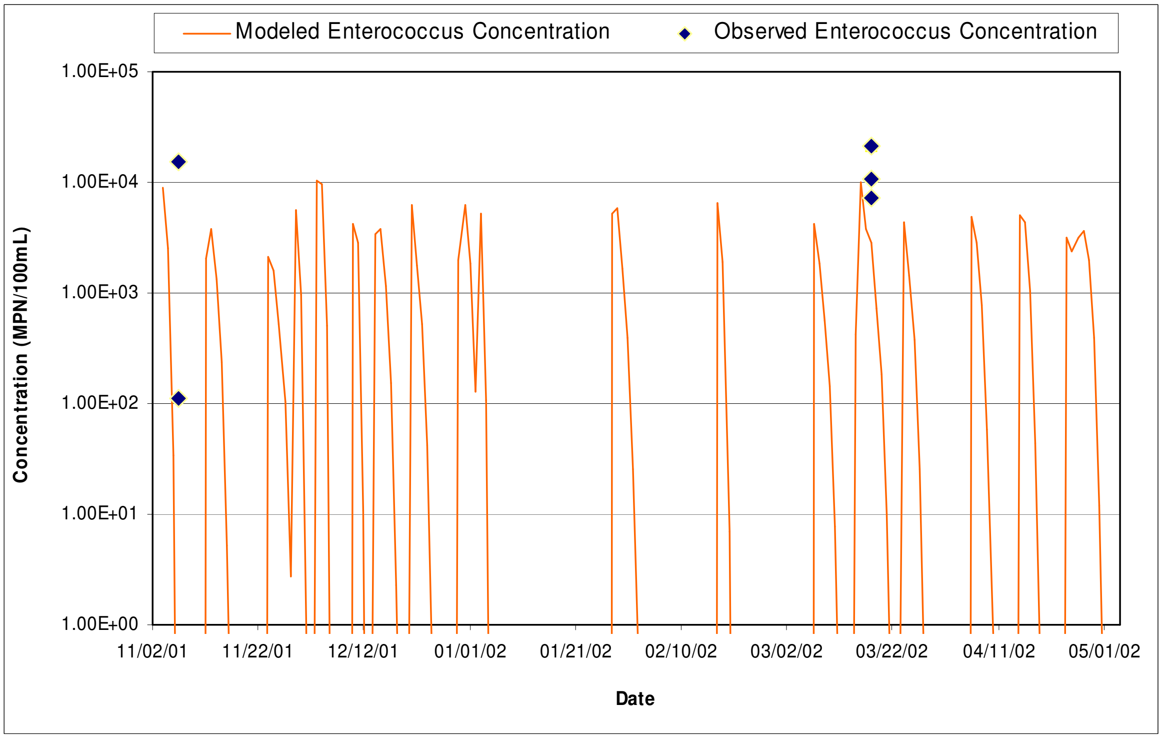

Figure N-8. Time-series comparison of modeled and observed wet weather enterococcus densities in the Rose Creek watershed (Appendix G, No. 12 [stations MBW 19, MBW 20 and MBW 21])

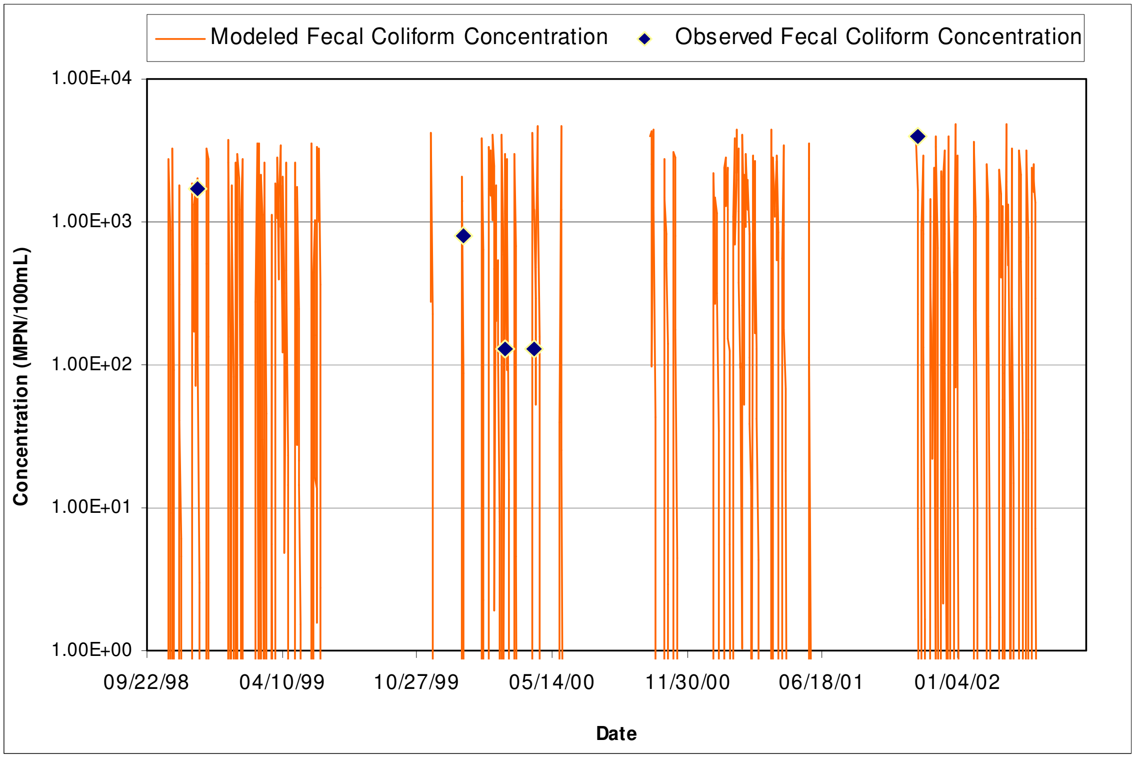

Figure N-9. Time-series comparison of modeled and observed wet weather fecal coliform densities in the San Diego River watershed (Appendix G, No. 13 [station 1])

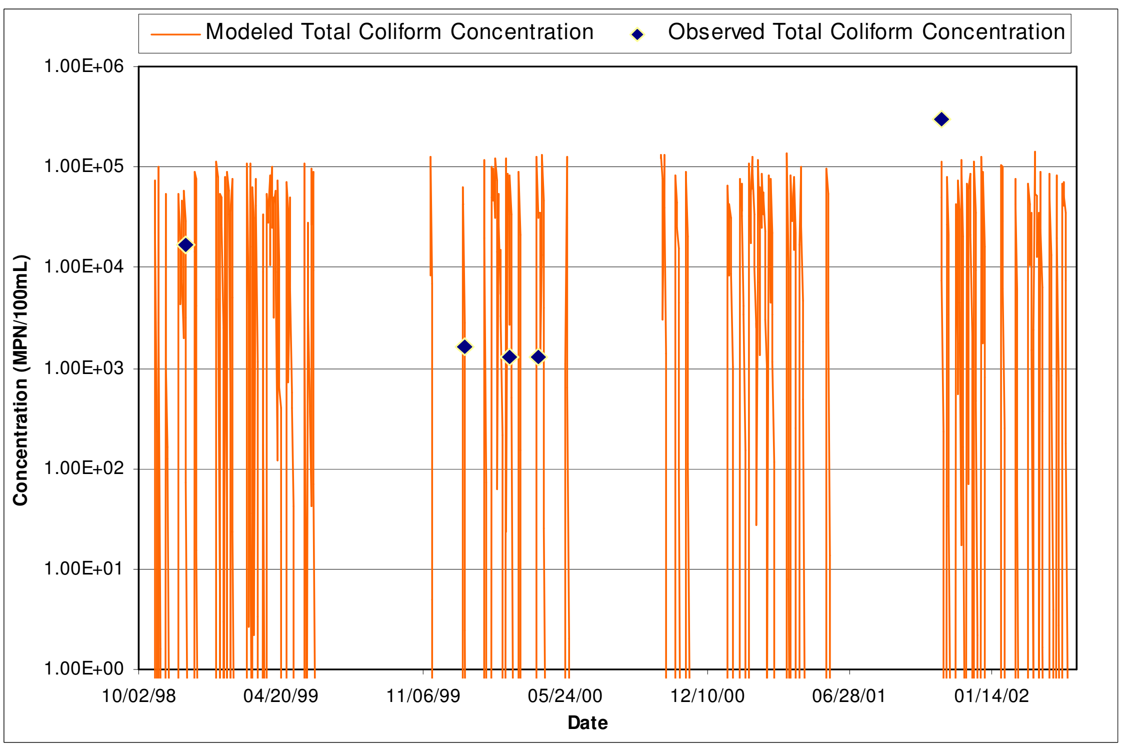

Figure N-10. Time-series comparison of modeled and observed wet weather total coliform densities in the San Diego River watershed (Appendix G, No. 13 [station 1])

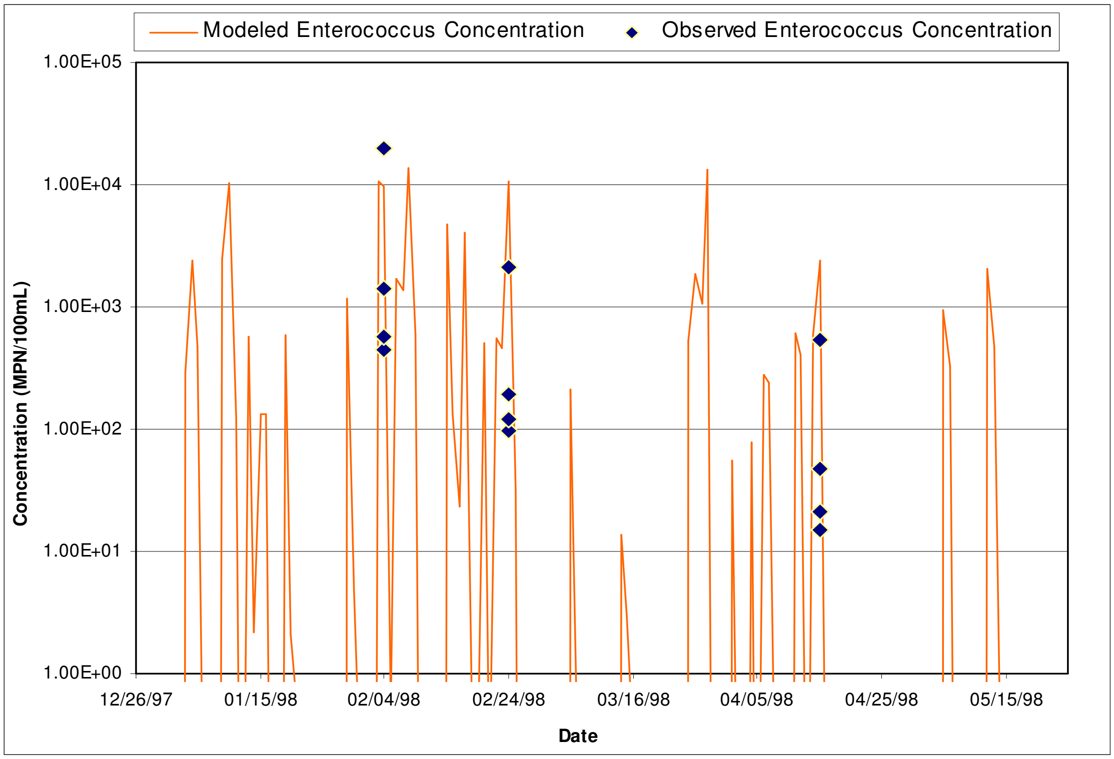

Figure N-11. Time-series comparison of modeled and observed wet weather enterococcus densities in the Pine Valley watershed (Appendix G, No.14 [stations NPC3C, NPC3D, and PVC1A])

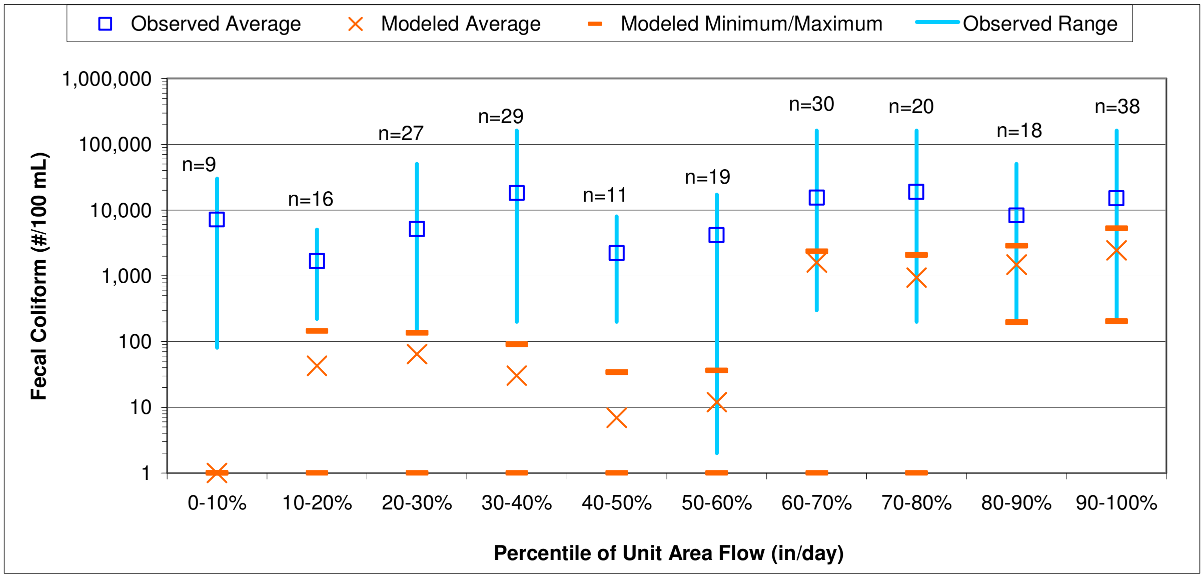

Figure N-12. Graphical comparison of LSPC model results and observed fecal coliform data in the Aliso Creek watershed (Appendix G, No.10)

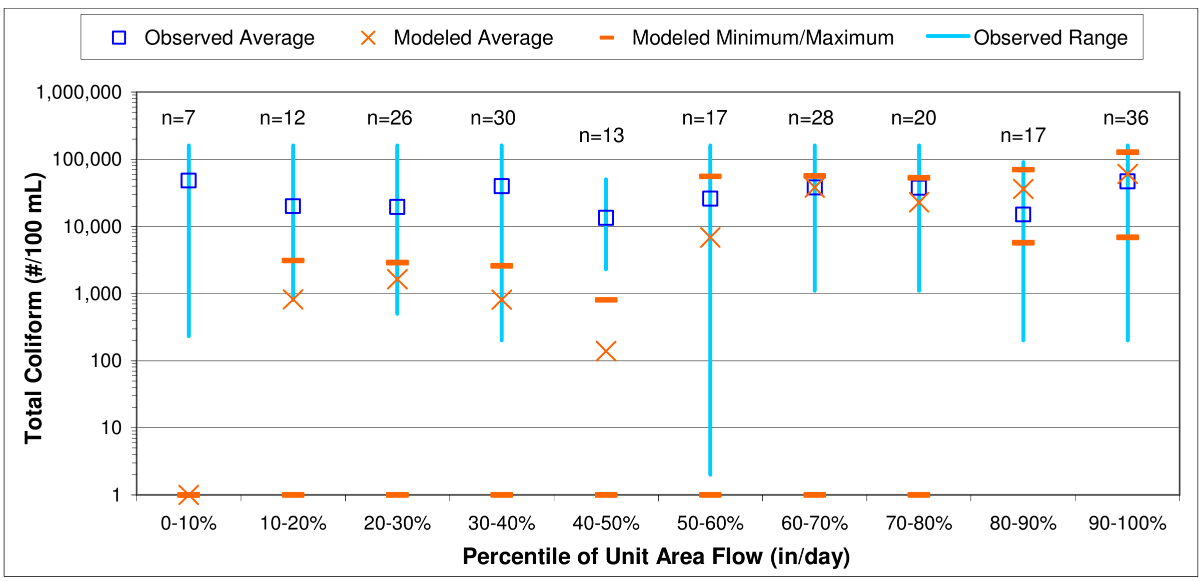

Figure N-13. Graphical comparison of LSPC model results and observed total coliform data in the Aliso Creek watershed (Appendix G, No.10)

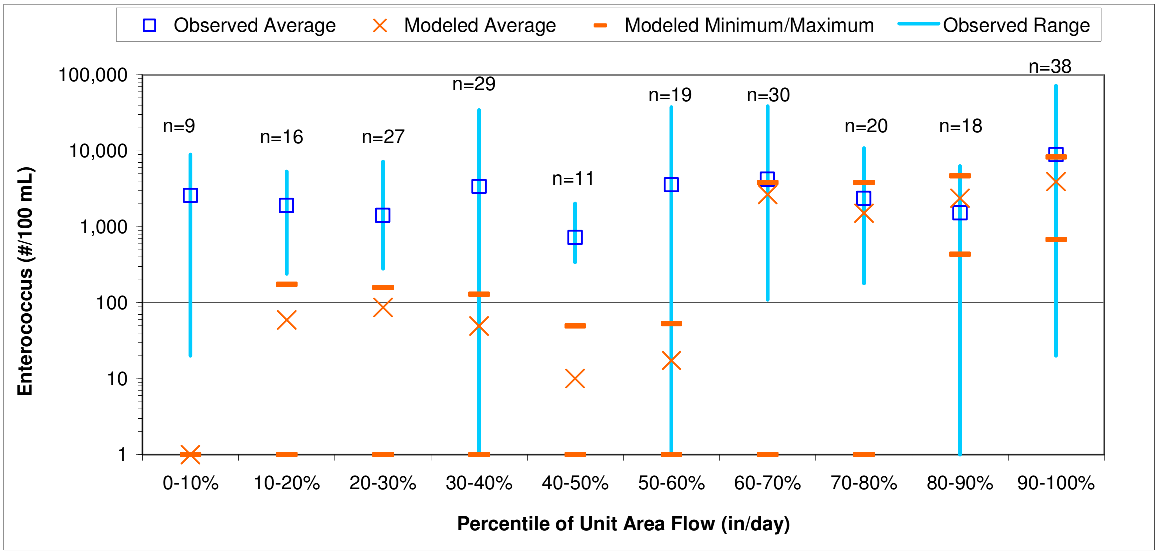

Figure N-14. Graphical comparison of LSPC model results and observed enterococcus data in the Aliso Creek watershed (Appendix G, No.10)

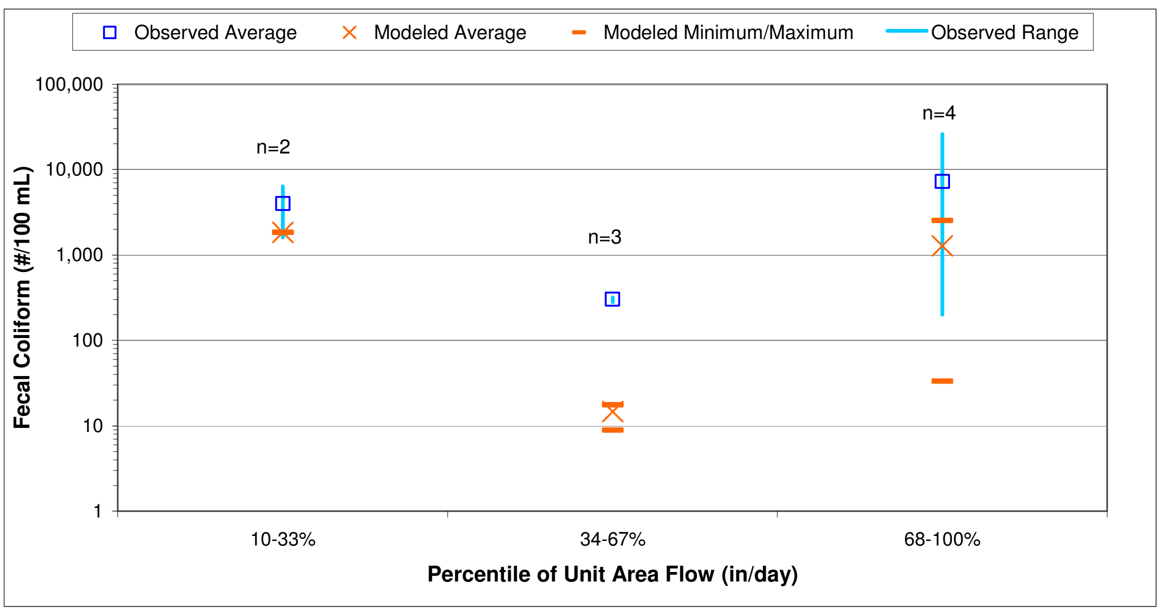

Figure N-15. Graphical comparison of LPSC model results and observed fecal coliform data in the San Juan Creek watershed (Appendix G, No 11)

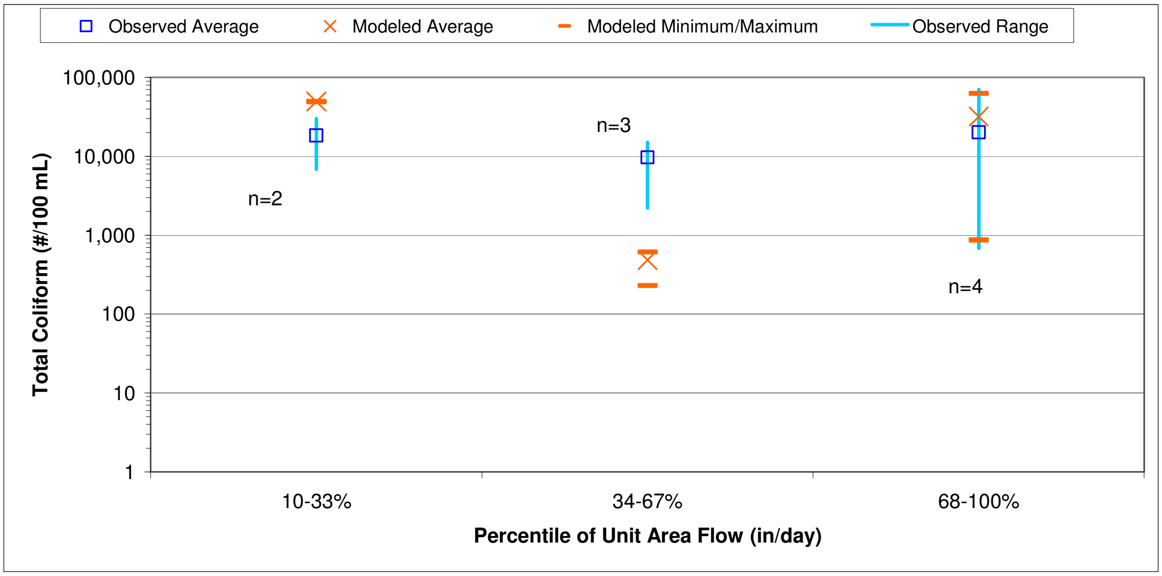

Figure N-16. Graphical comparison of LPSC model results and observed total coliform data in the San Juan Creek watershed (Appendix G, No 11)

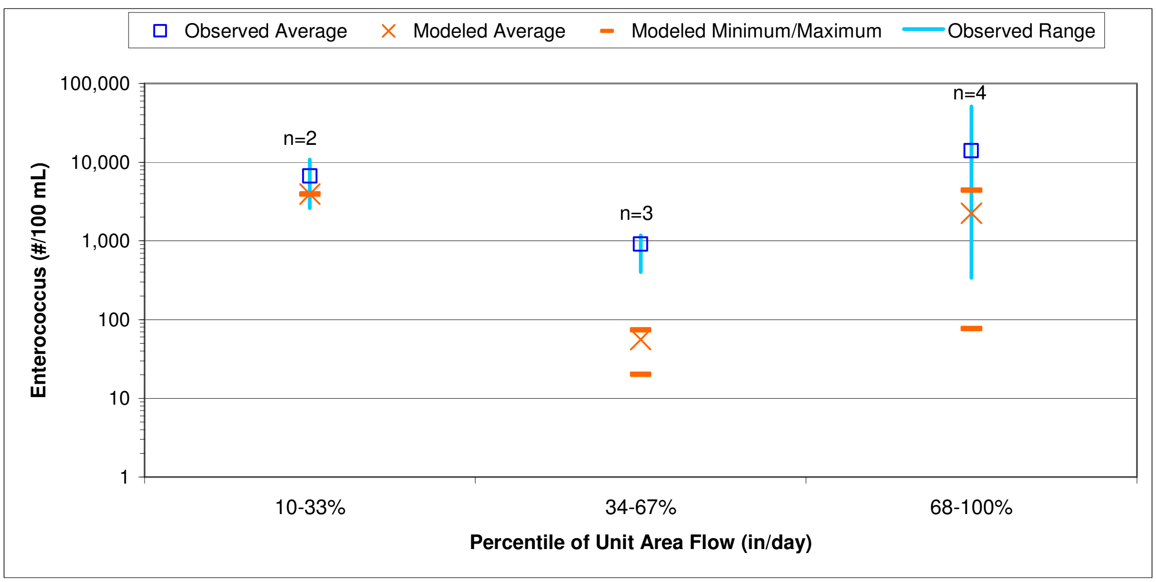

Figure N-17. Graphical comparison of LPSC model results and observed enterococcus data in the San Juan Creek watershed (Appendix G, No 11)

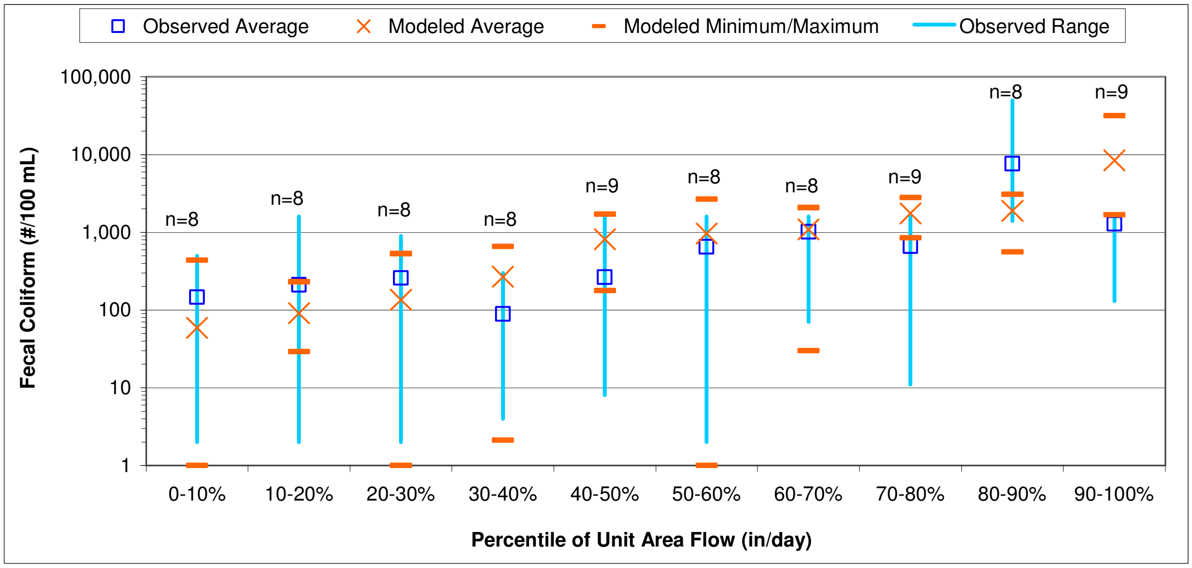

Figure N-18. Graphical comparison of LPSC model results and observed fecal coliform data in the Santa Margarita River watershed (Appendix G, No. 8 and 9)

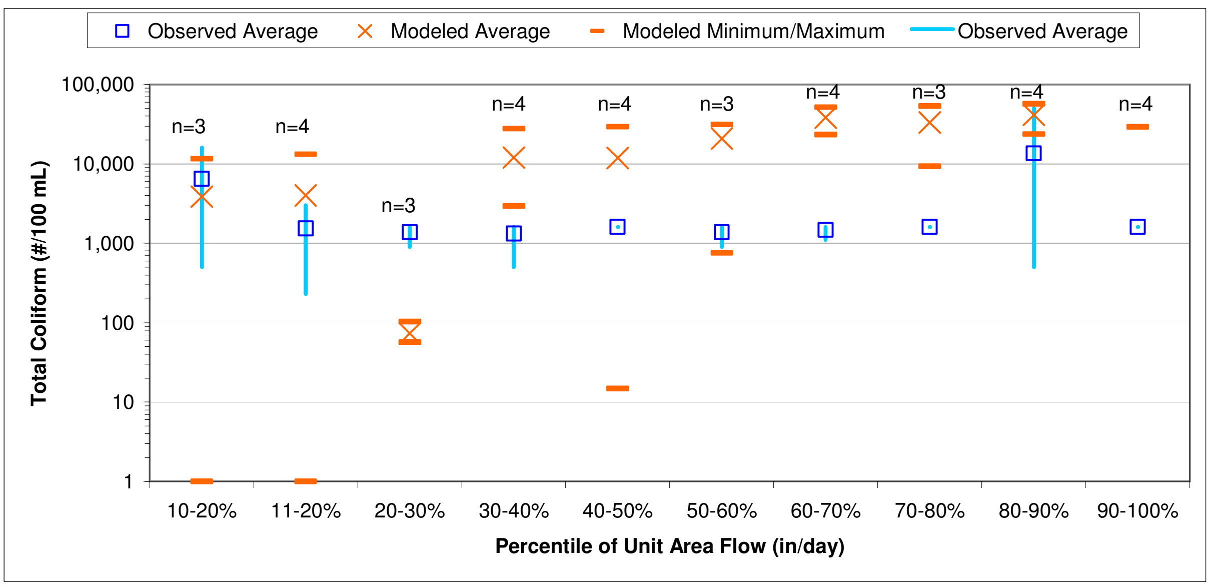

Figure N-19. Graphical comparison of LPSC model results and observed total coliform data in the Santa Margarita River watershed (Appendix G, No. 8 and 9)

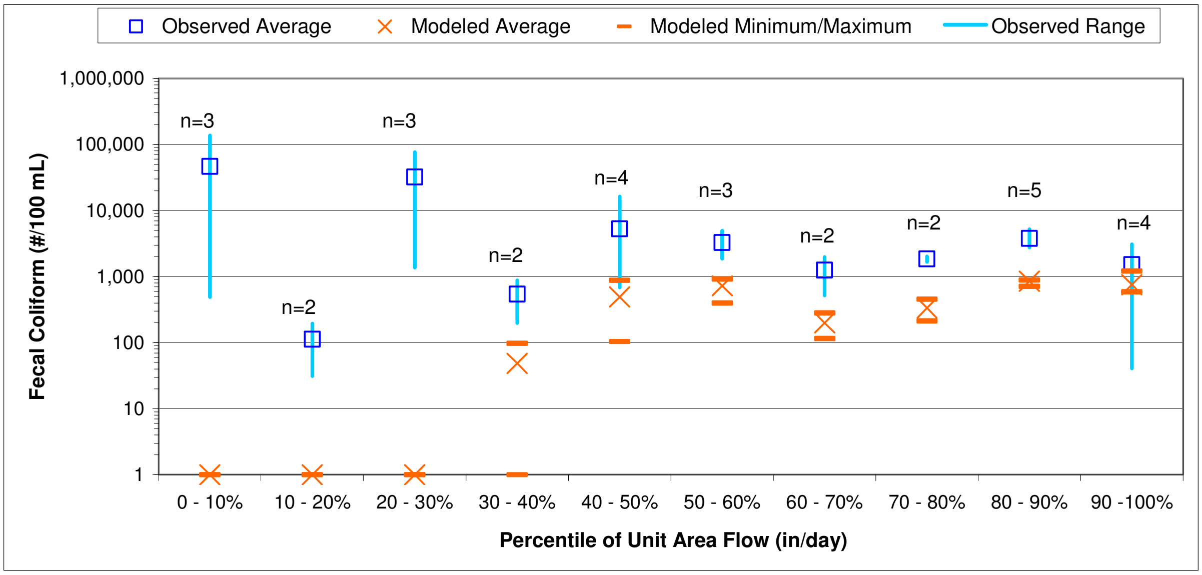

Figure N-20. Graphical comparison of LPSC model results and observed fecal coliform data in the Rose Creek and Tecolote Creek watersheds (Appendix G, No. 12)

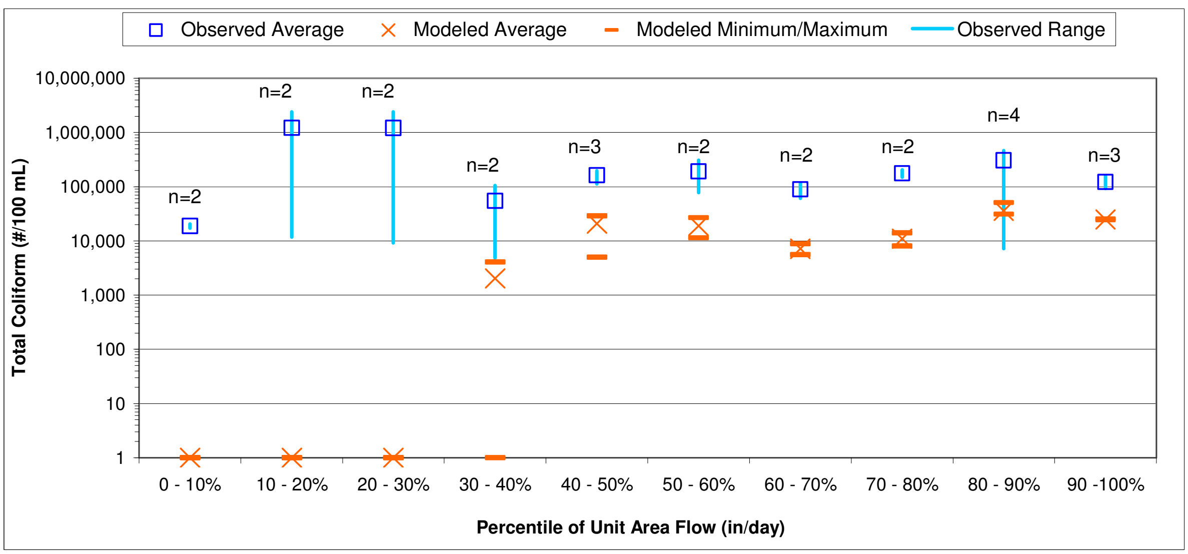

Figure 21. Graphical comparison of LPSC model results and observed total coliform data in the Rose Creek and Tecolote Creek watersheds (Appendix G, No. 12)

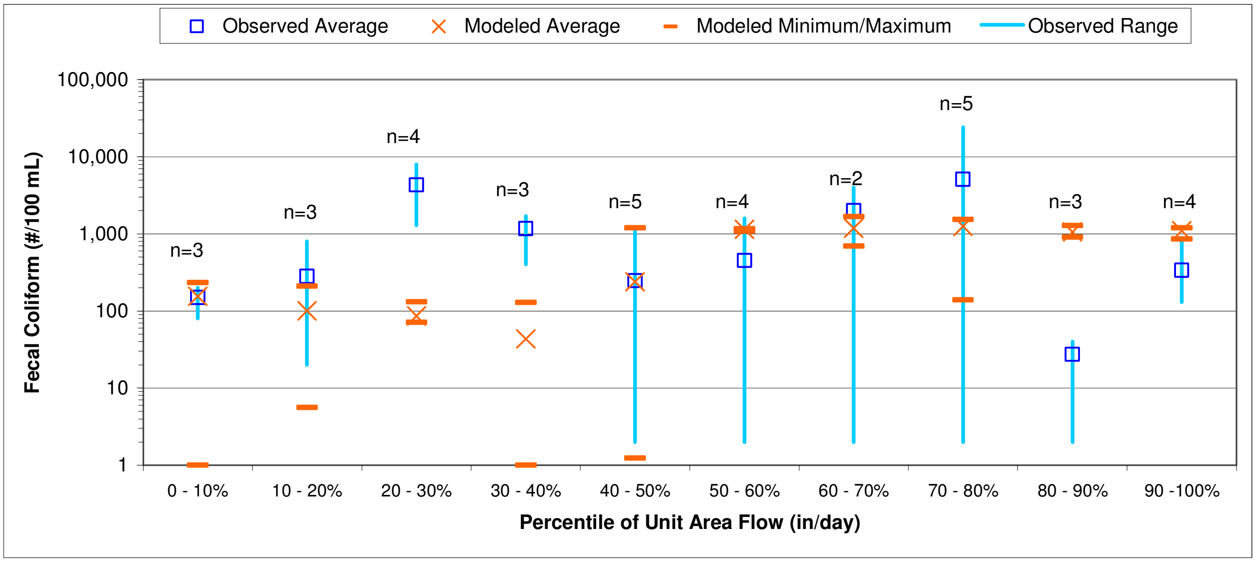

Figure N-22. Graphical comparison of LPSC model results and observed enterococcus data in the Rose Creek and Tecolote Creek watersheds (Appendix G, No. 12)

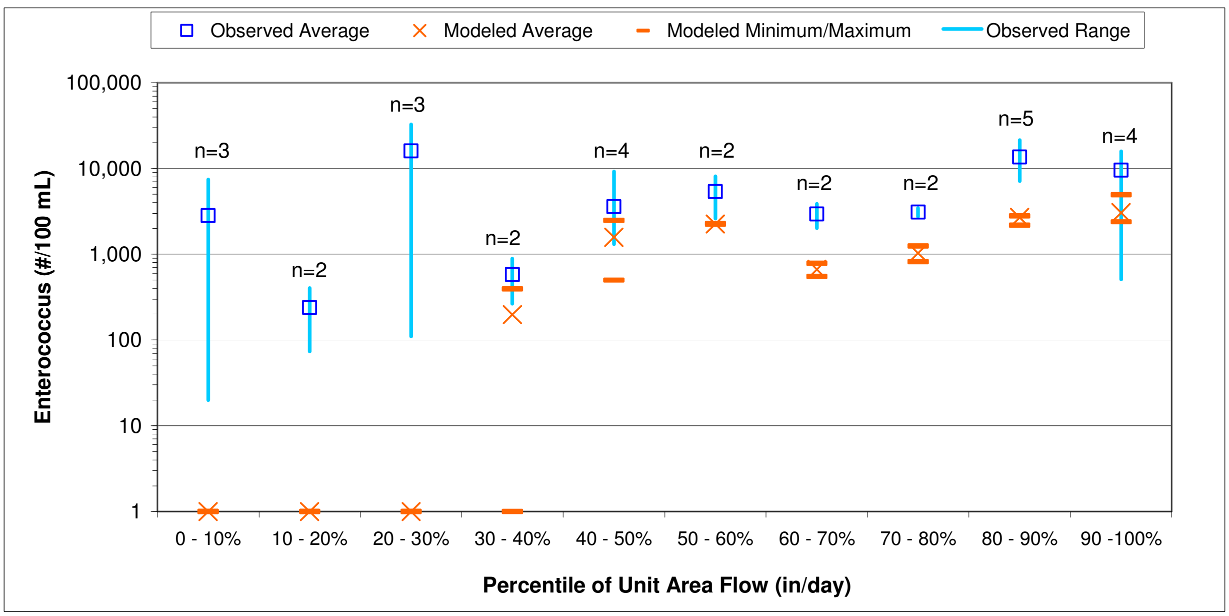

Figure N-23. Graphical comparison of LPSC model results and observed fecal coliform data in the San Diego River watershed (Appendix G, No. 13)

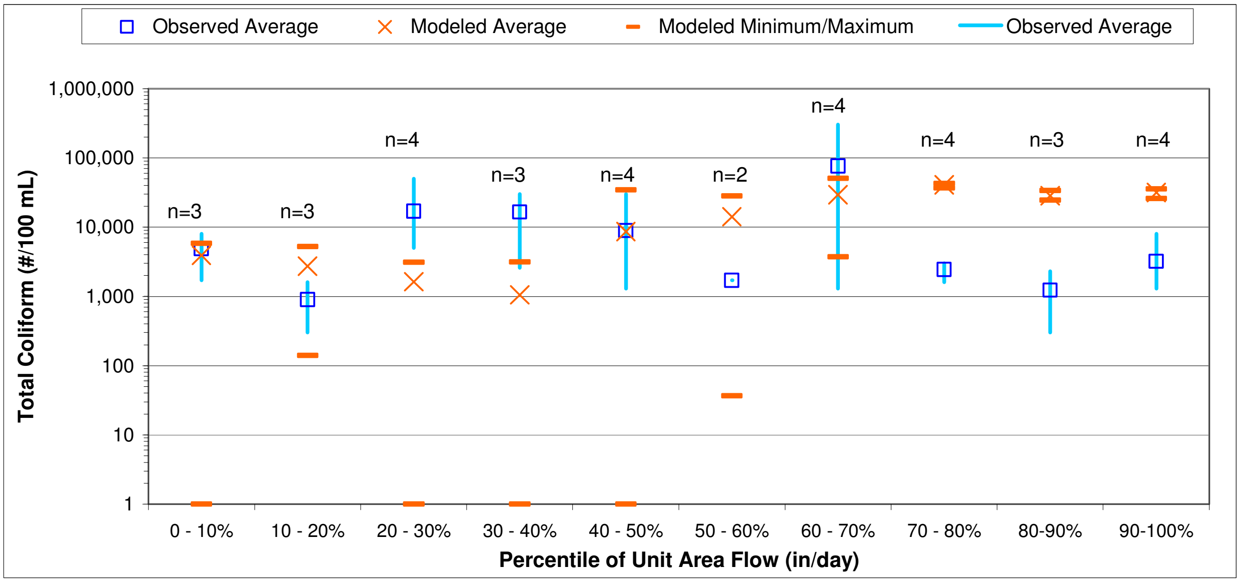

Figure N-24. Graphical comparison of LPSC model results and observed total coliform data in the San Diego River watershed (Appendix G, No. 13)

Appendix O

Wet Weather
Bacteria Load Duration Curves

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San Joaquin Hills HSA/Laguna Beach HSA
Load Duration Curves

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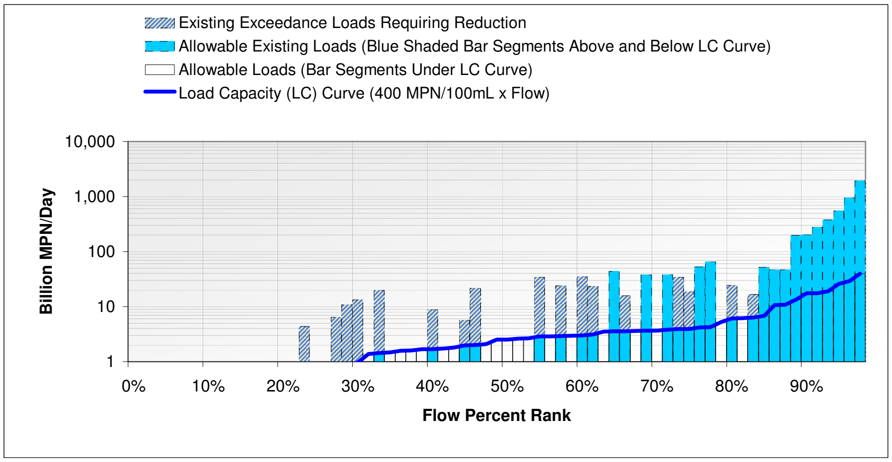
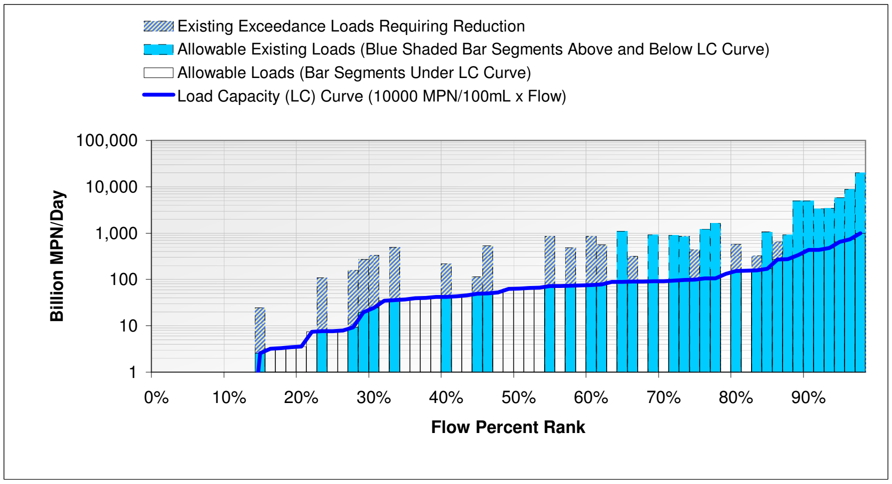
Table O-1. Subwatershed 101 Fecal Coliform Load Duration Curve



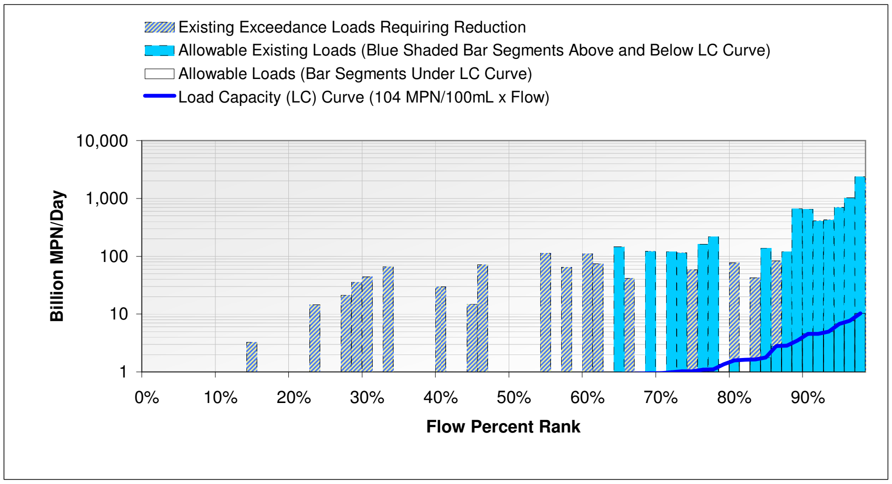
Subwatershed 101 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**5,179**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	255	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	4,651	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**4,906**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**272**	**Billion MPN/Year**

Table O-2. Subwatershed 101 Total Coliform Load Duration Curve



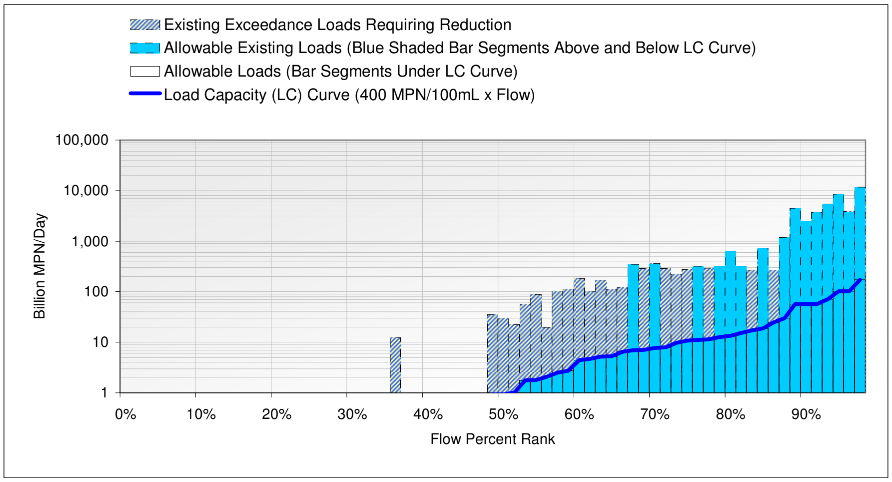
Subwatershed 101 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**67,350**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	6,386	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	54,954	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**61,340**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**6,010**	**Billion MPN/Year**

Table O-3. Subwatershed 101 Enterococcus Load Duration Curve



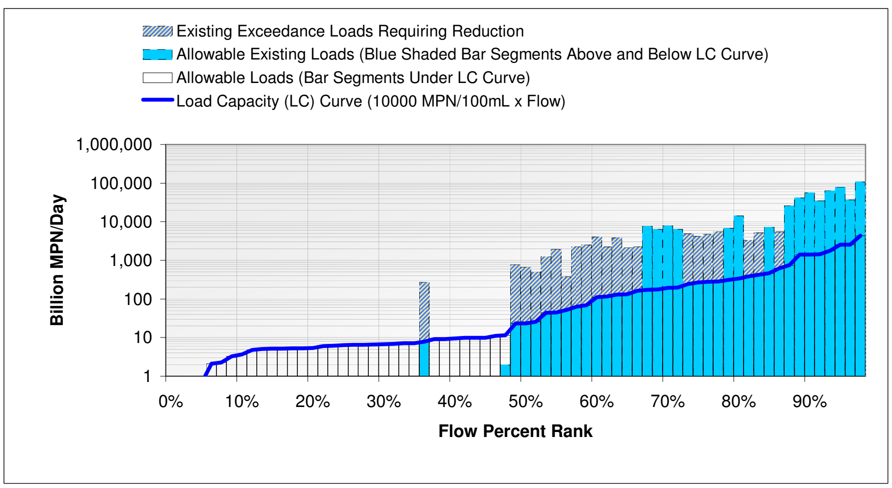
Subwatershed 101 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**8,374**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	66	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	7,356	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**7,422**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**952**	**Billion MPN/Year**

Table O-4. Subwatershed 103 Fecal Coliform Load Duration Curve



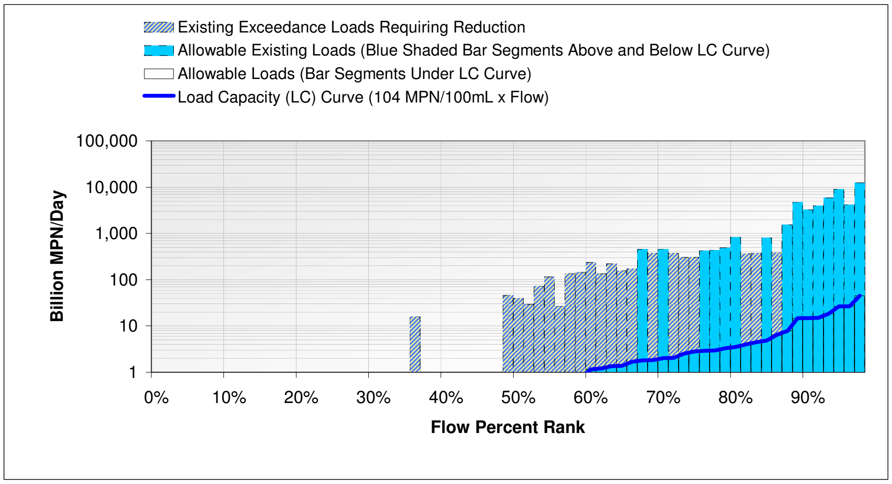
Subwatershed 103 Fecal Coliform Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	36	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	21	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**47,497**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	864	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	43,703	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**44,568**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,930**	**Billion MPN/Year**

Table O-5. Subwatershed 103 Total Coliform Load Duration Curve



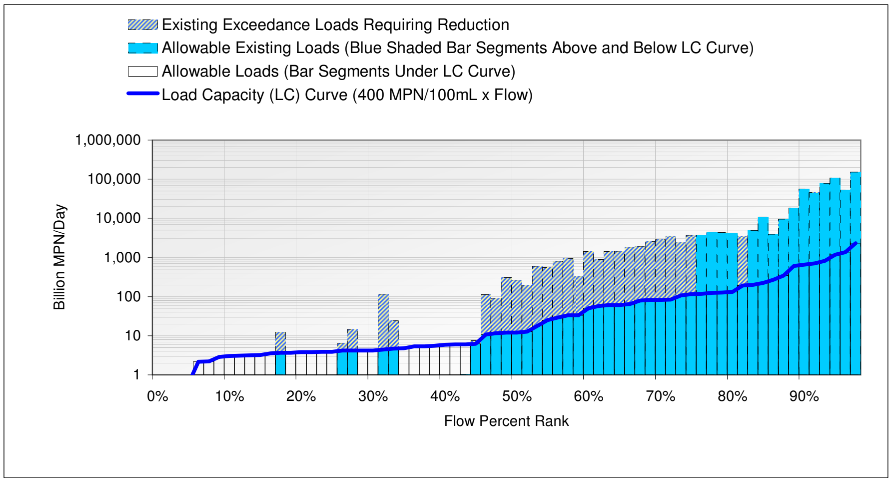
Subwatershed 103 Total Coliform Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	36	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	21	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**561,319**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	21,610	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	484,661	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**506,271**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**55,048**	**Billion MPN/Year**

Table O-6. Subwatershed 103 Enterococcus Load Duration Curve



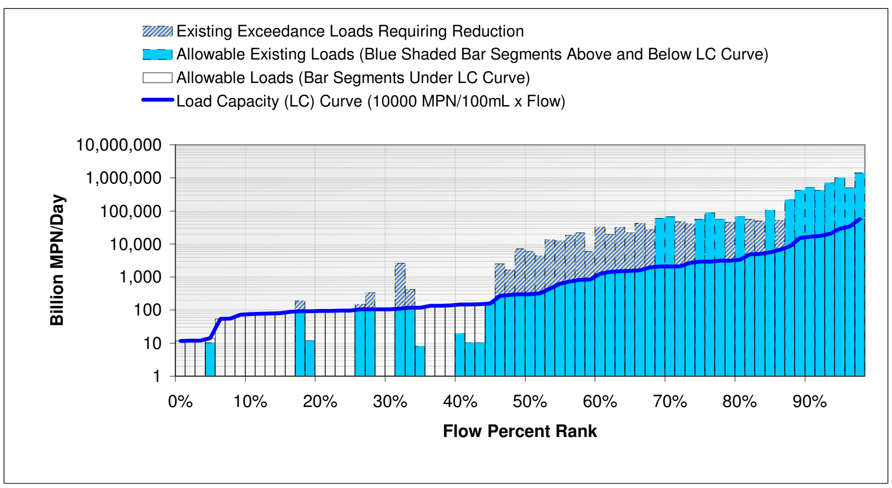
Subwatershed 103 Enterococcus Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	37	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	22	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**52,977**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	225	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	48,772	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**48,997**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,980**	**Billion MPN/Year**

Table O-7. Subwatershed 104 Fecal Coliform Load Duration Curve



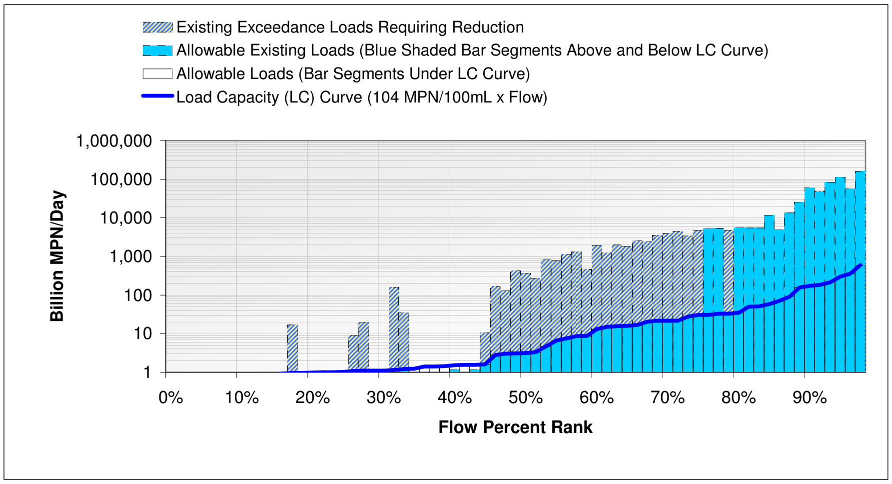
Subwatershed 104 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	43	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	28	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**592,496**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	10,417	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	551,370	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**561,787**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**30,709**	**Billion MPN/Year**

Table O-8. Subwatershed 104 Total Coliform Load Duration Curve



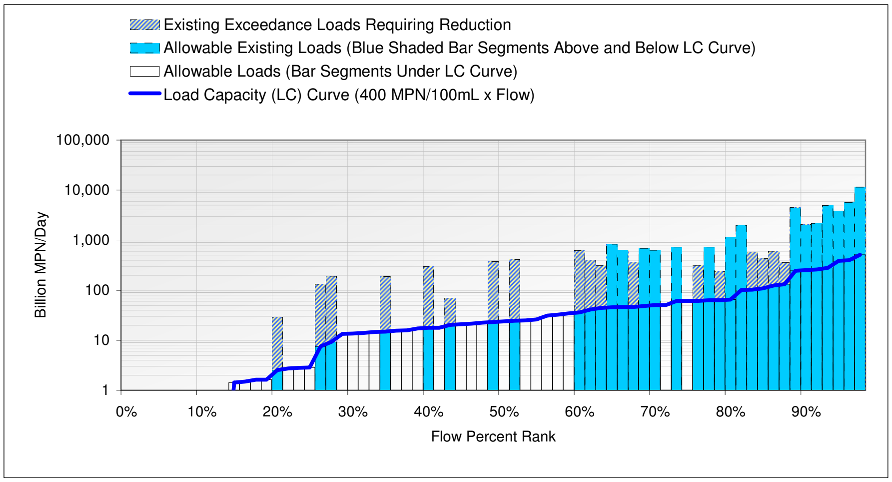
Subwatershed 104 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	43	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	28	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**6,278,214**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	260,396	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	5,489,973	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**5,750,369**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**527,845**	**Billion MPN/Year**

Table O-9. Subwatershed 104 Enterococcus Load Duration Curve



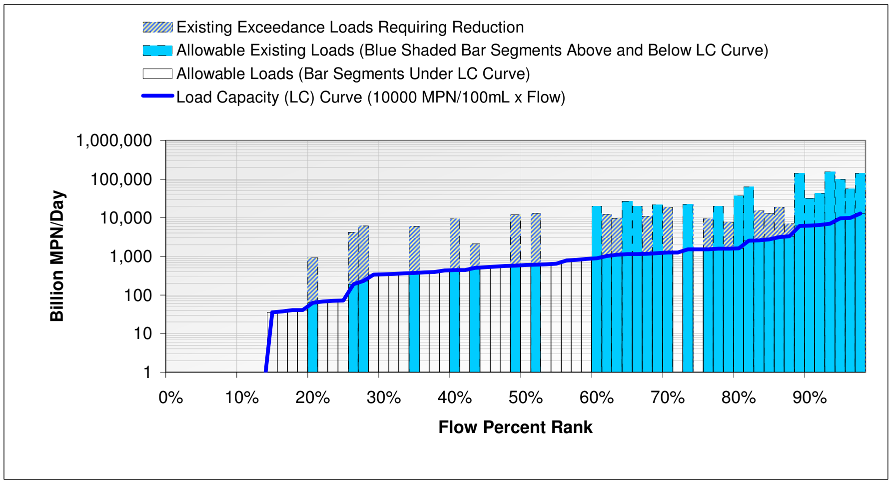
Subwatershed 104 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	44	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	29	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**650,651**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	2,712	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	605,227	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**607,939**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**42,711**	**Billion MPN/Year**

Table O-10. Subwatershed 105 Fecal Coliform Load Duration Curve



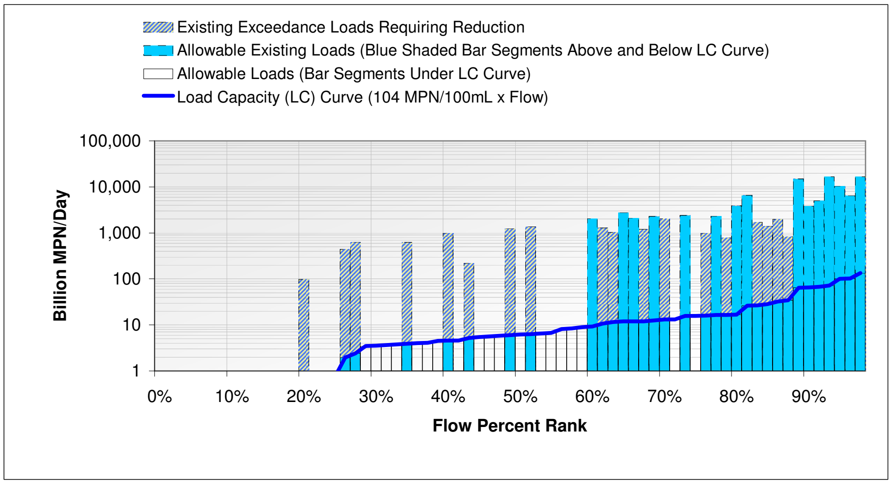
Subwatershed 105 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**47,842**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	3,688	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	39,125	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**42,814**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**5,029**	**Billion MPN/Year**

Table O-11. Subwatershed 105 Total Coliform Load Duration Curve



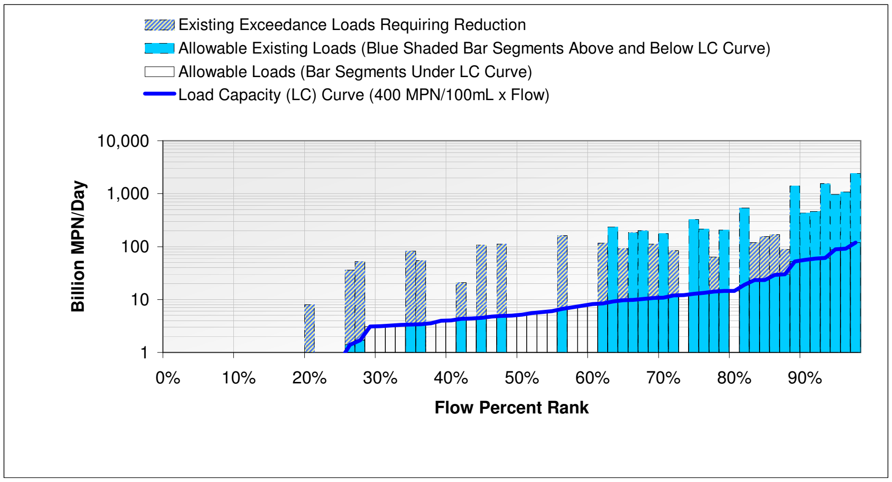
Subwatershed 105 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**1,076,489**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	92,211	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	829,984	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**922,195**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**154,294**	**Billion MPN/Year**

Table O-12. Subwatershed 105 Enterococcus Load Duration Curve



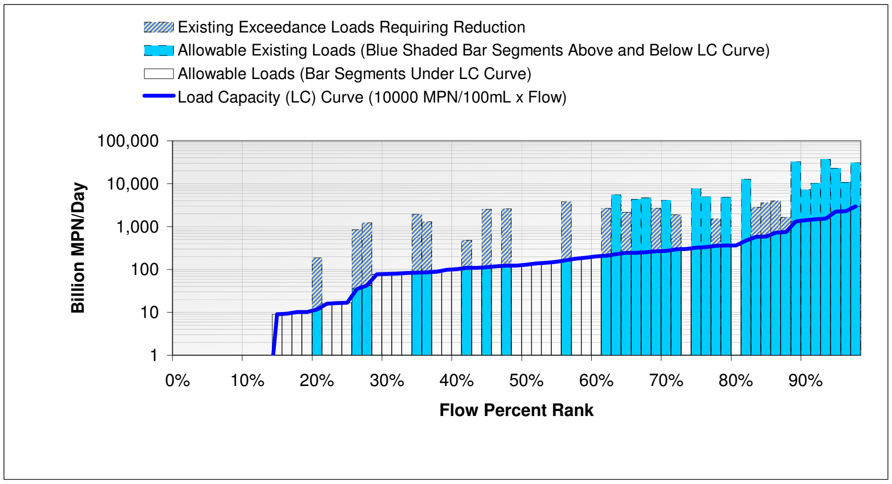
Subwatershed 105 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**117,393**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	959	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	97,724	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**98,683**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**18,710**	**Billion MPN/Year**

Table O-13. Subwatershed 106 Fecal Coliform Load Duration Curve



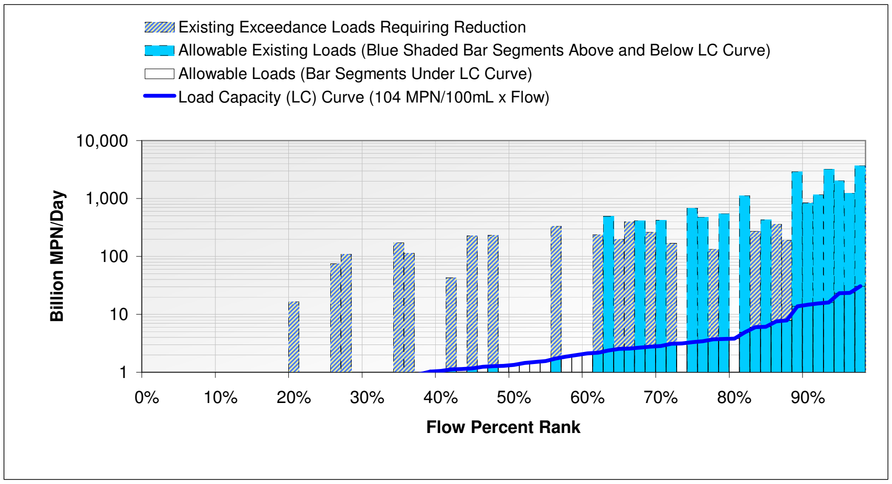
Subwatershed 106 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**12,001**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	818	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	9,742	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**10,559**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,441**	**Billion MPN/Year**

Table O-14. Subwatershed 106 Total Coliform Load Duration Curve



Subwatershed 106 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**238,530**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	20,446	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	185,029	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**205,475**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**33,055**	**Billion MPN/Year**

Table O-15. Subwatershed 106 Enterococcus Load Duration Curve



Subwatershed 106 Enterococcus Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**23,254**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	213	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	19,545	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**19,757**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,496**	**Billion MPN/Year**

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Load Duration Curves

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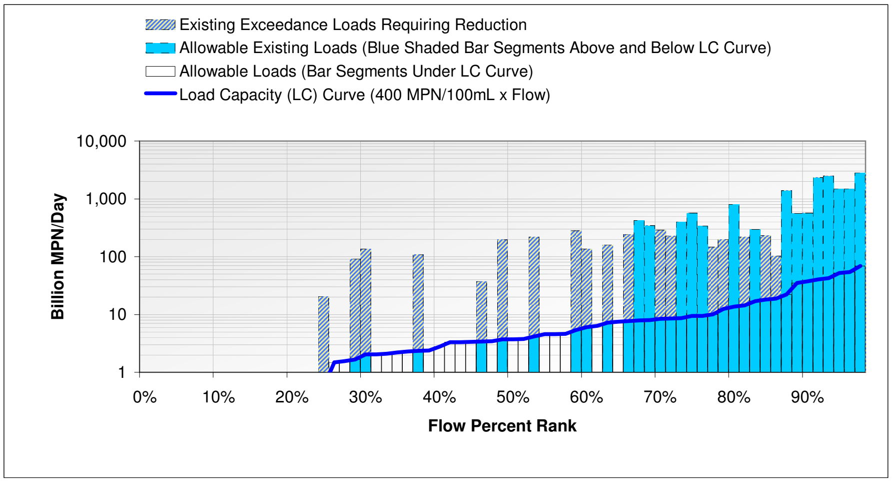
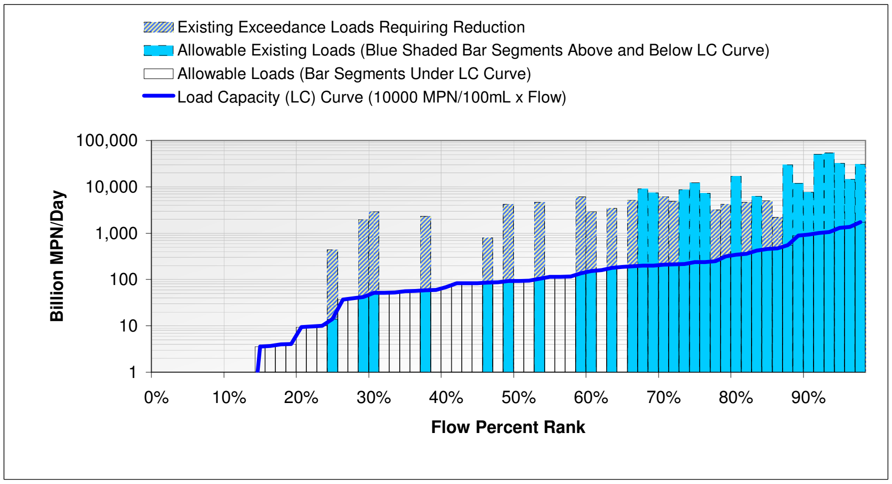
Table O-16. Subwatershed 201 Fecal Coliform Load Duration Curve



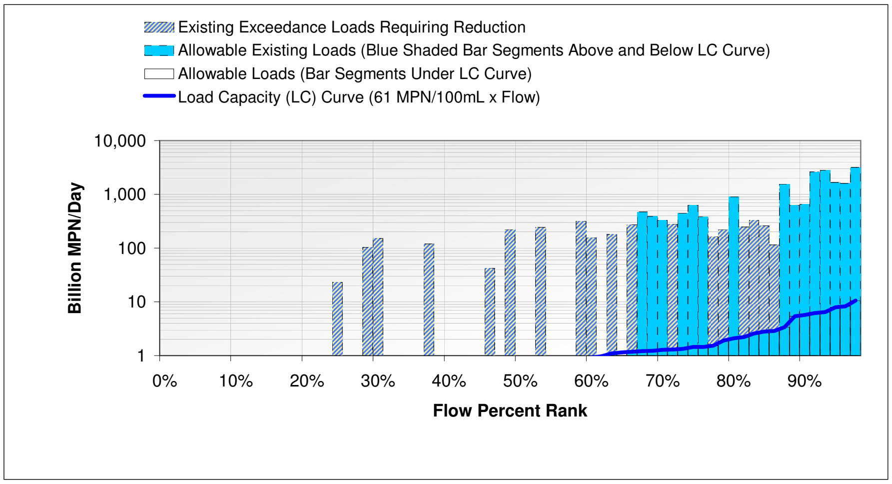
Subwatershed 201 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**19,386**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	563	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	15,917	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**16,480**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,907**	**Billion MPN/Year**

Table O-17. Subwatershed 201 Total Coliform Load Duration Curve



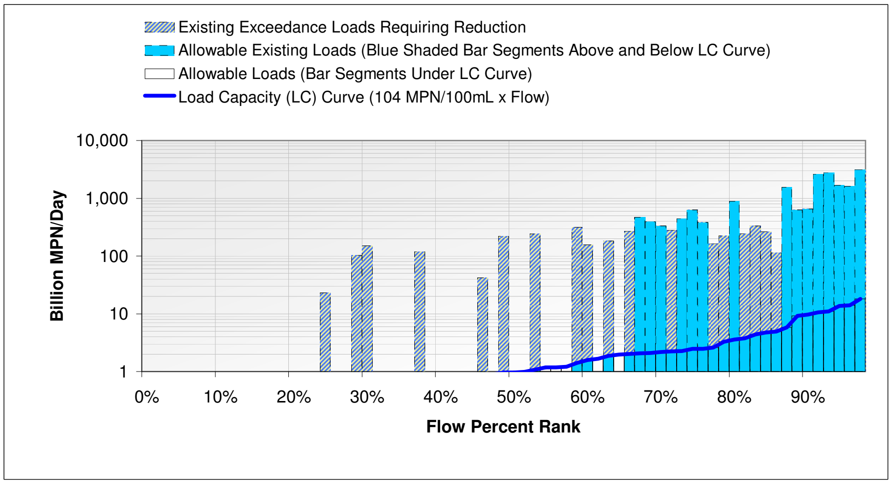
Subwatershed 201 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**364,715**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	14,080	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	288,838	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**302,919**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**61,796**	**Billion MPN/Year**

Table O-18a. Subwatershed 201 Enterococcus (61) Load Duration Curve



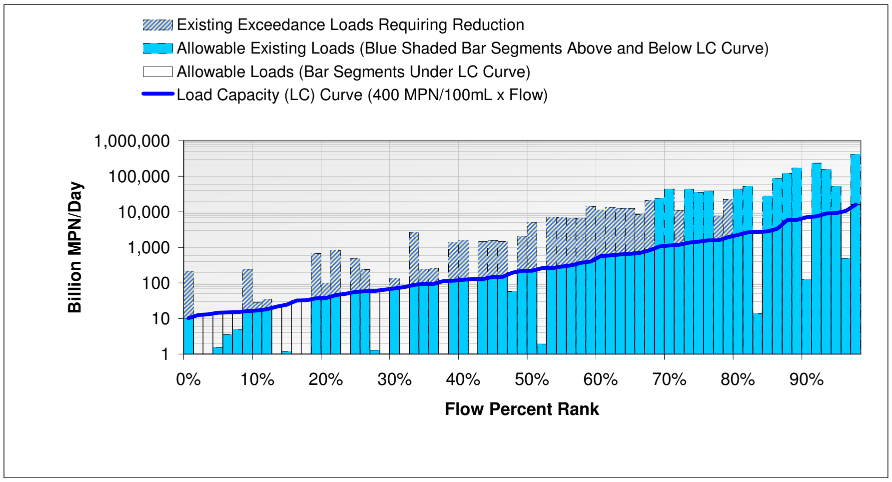
Subwatershed 201 Enterococcus (61) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**21,646**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	86	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	18,138	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**18,224**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,422**	**Billion MPN/Year**

Table O-18b. Subwatershed 201 Enterococcus (104) Load Duration Curve



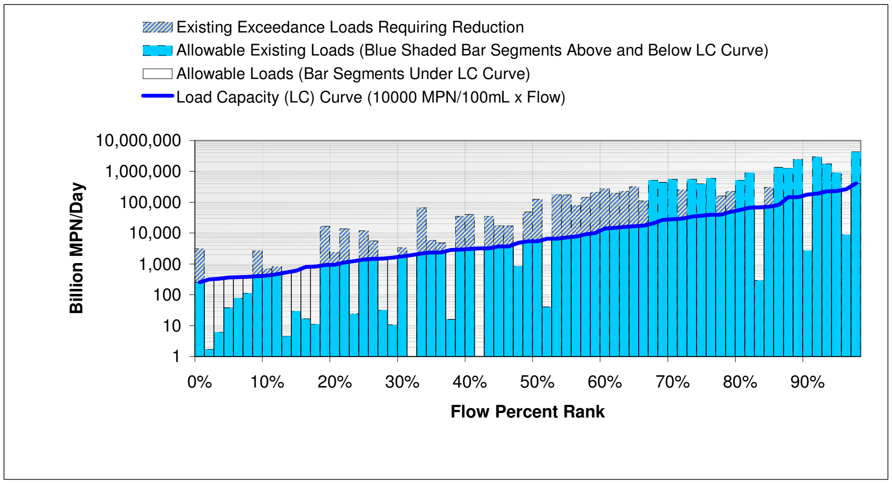
Subwatershed 201 Enterococcus (104) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**21,646**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	146	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	18,093	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**18,239**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,407**	**Billion MPN/Year**

Table O-19. Subwatershed 202 Fecal Coliform Load Duration Curve



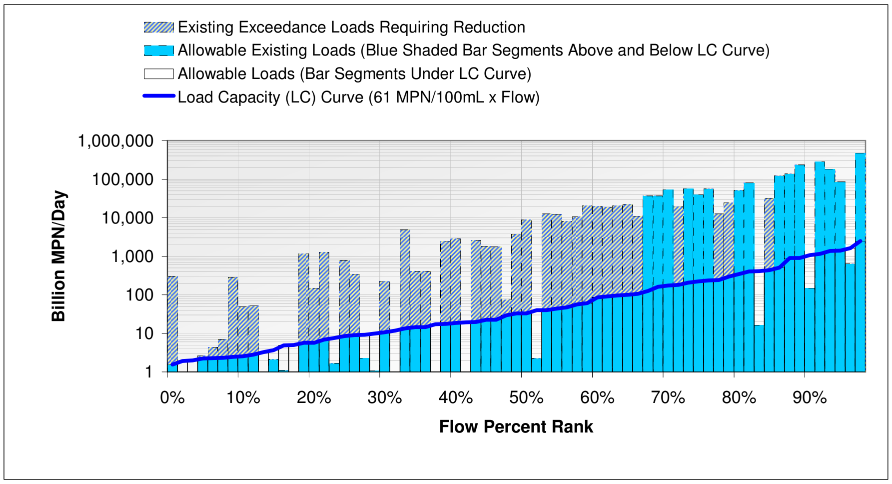
Subwatershed 202 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	49	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	34	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**1,732,709**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	83,999	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,478,595	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**1,562,594**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**170,116**	**Billion MPN/Year**

Table O-20. Subwatershed 202 Total Coliform Load Duration Curve



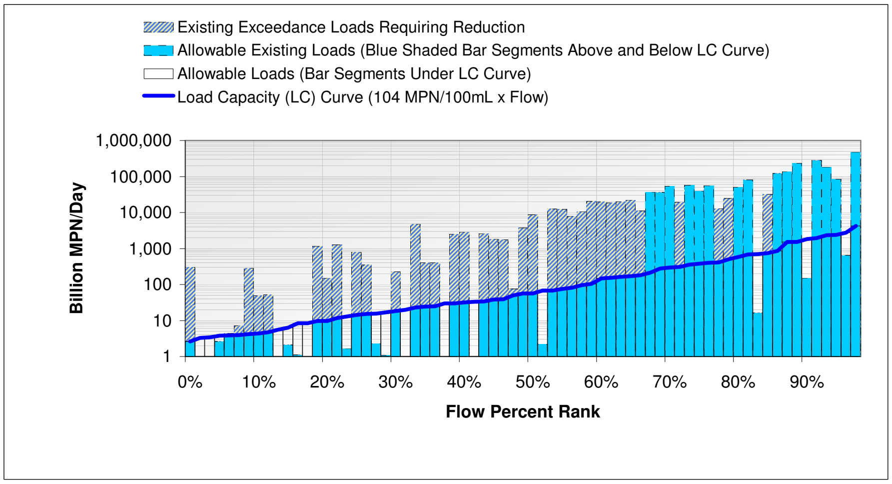
Subwatershed 202 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	49	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	34	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**22,846,059**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	2,095,519	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	17,792,360	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**19,887,879**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,958,180**	**Billion MPN/Year**

Table O-21a. Subwatershed 202 Enterococcus (61) Load Duration Curve



Subwatershed 202 Enterococcus (61) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	53	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	38	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**2,208,560**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	13,558	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,919,183	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**1,932,741**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**275,820**	**Billion MPN/Year**

Table O-21b. Subwatershed 202 Enterococcus (104) Load Duration Curve



Subwatershed 202 Enterococcus (104) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	52	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	37	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**2,208,560**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	22,536	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,911,741	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**1,934,277**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**274,283**	**Billion MPN/Year**

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Load Duration Curves

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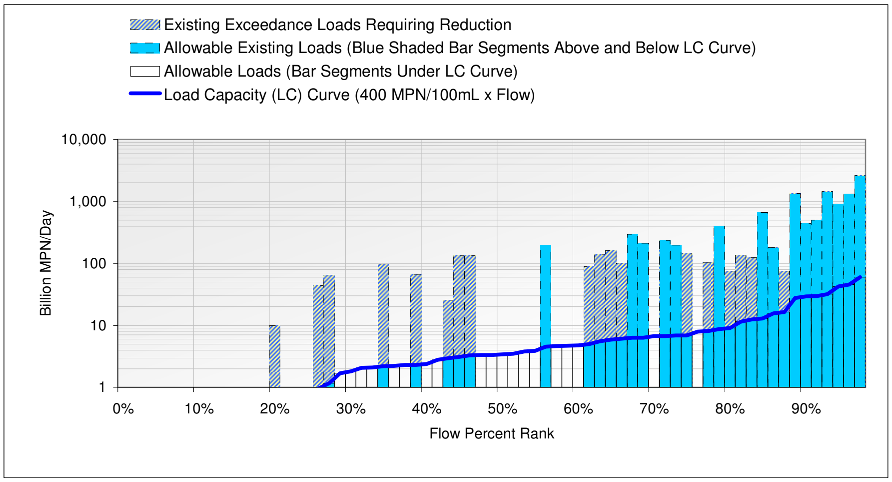
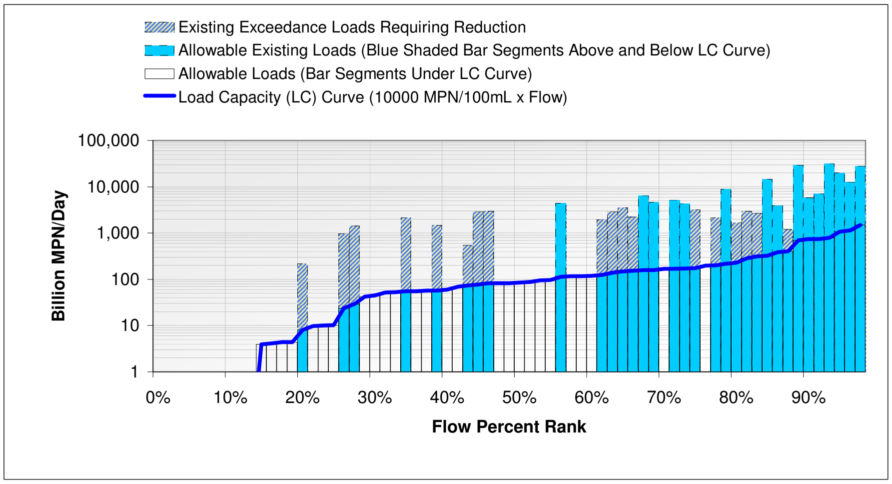
Table O-22. Subwatershed 301 Fecal Coliform Load Duration Curve



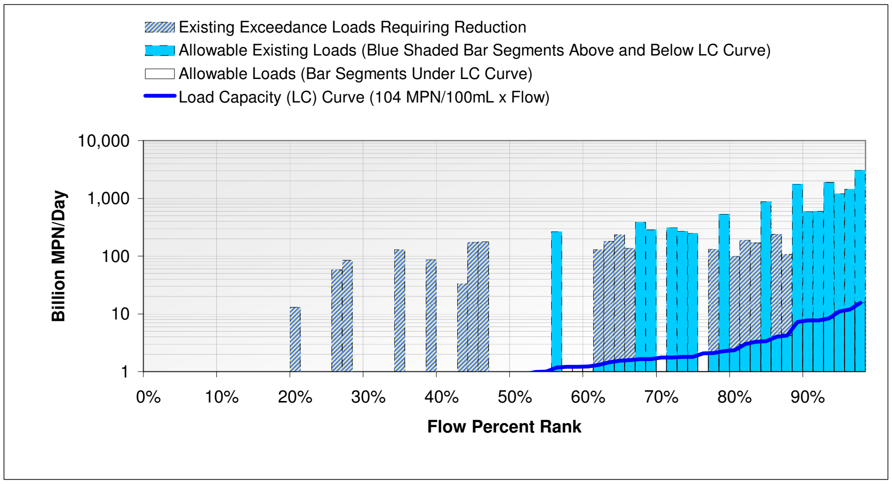
Subwatershed 301 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**12,677**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	438	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	10,615	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**11,053**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,624**	**Billion MPN/Year**

Table O-23. Subwatershed 301 Total Coliform Load Duration Curve



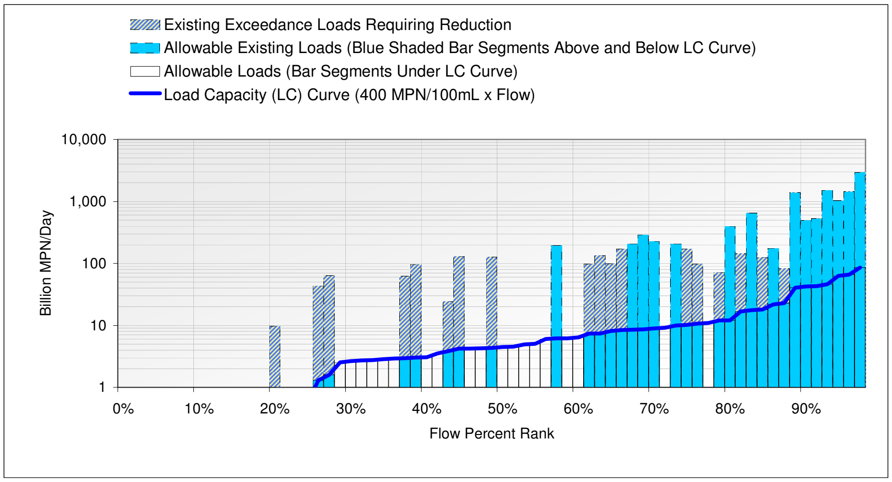
Subwatershed 301 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**224,286**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	10,952	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	178,693	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**189,646**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**34,640**	**Billion MPN/Year**

Table O-24. Subwatershed 301 Enterococcus Load Duration Curve



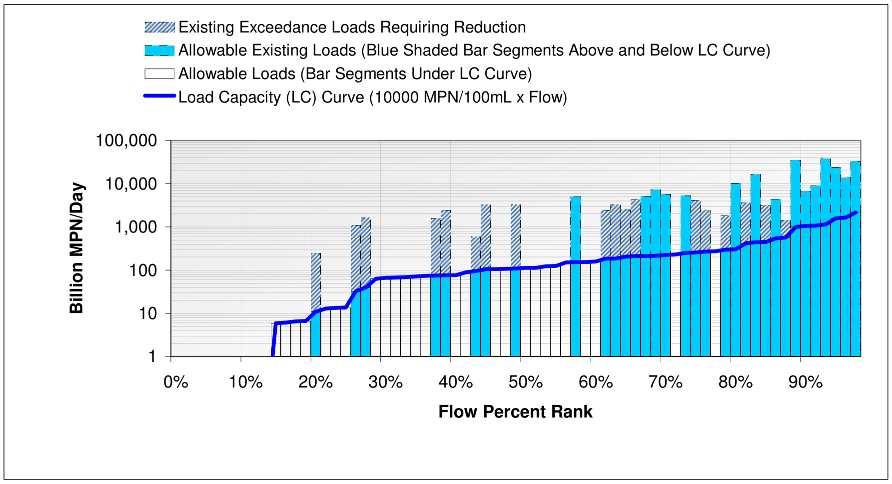
Subwatershed 301 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**16,137**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	114	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	13,679	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**13,793**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,344**	**Billion MPN/Year**

Table O-25. Subwatershed 302 Fecal Coliform Load Duration Curve



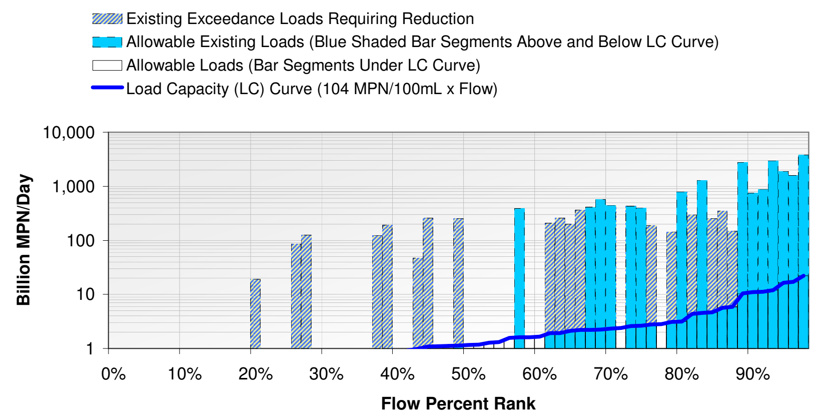
Subwatershed 302 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**13,426**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	623	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	11,193	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**11,816**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,610**	**Billion MPN/Year**

Table O-26. Subwatershed 302 Total Coliform Load Duration Curve



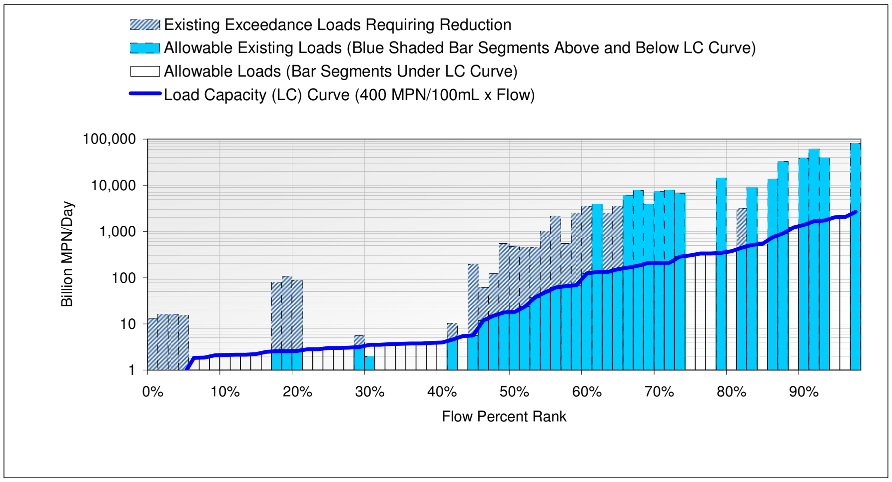
Subwatershed 302 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**261,979**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	15,576	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	207,050	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**222,626**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**39,353**	**Billion MPN/Year**

Table O-27. Subwatershed 302 Enterococcus Load Duration Curve



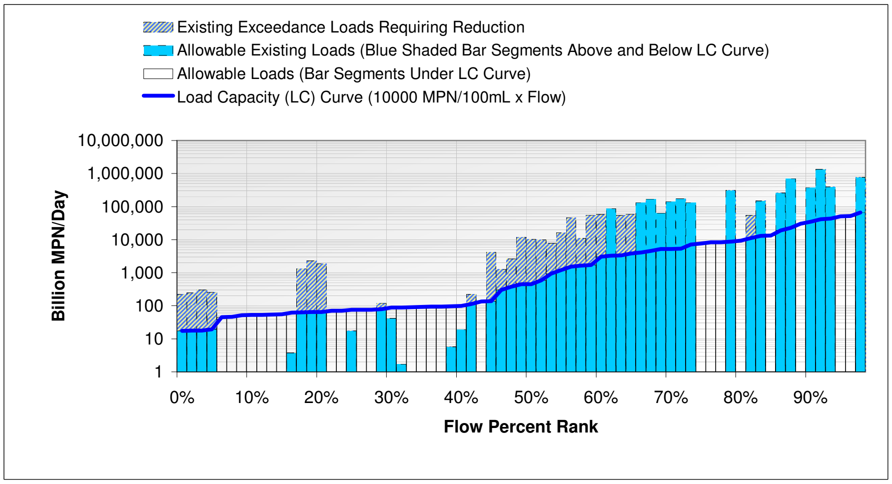
Subwatershed 302 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**22,871**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	162	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	19,236	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**19,398**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,473**	**Billion MPN/Year**

Table O-28. Subwatershed 304 Fecal Coliform Load Duration Curve



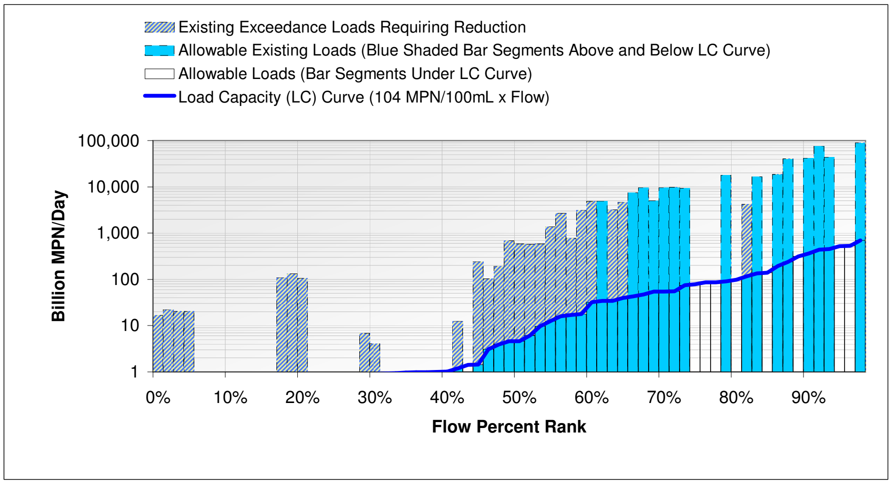
Subwatershed 304 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	39	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	24	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**356,926**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	12,657	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	323,853	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**336,510**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**20,416**	**Billion MPN/Year**

Table O-29. Subwatershed 304 Total Coliform Load Duration Curve



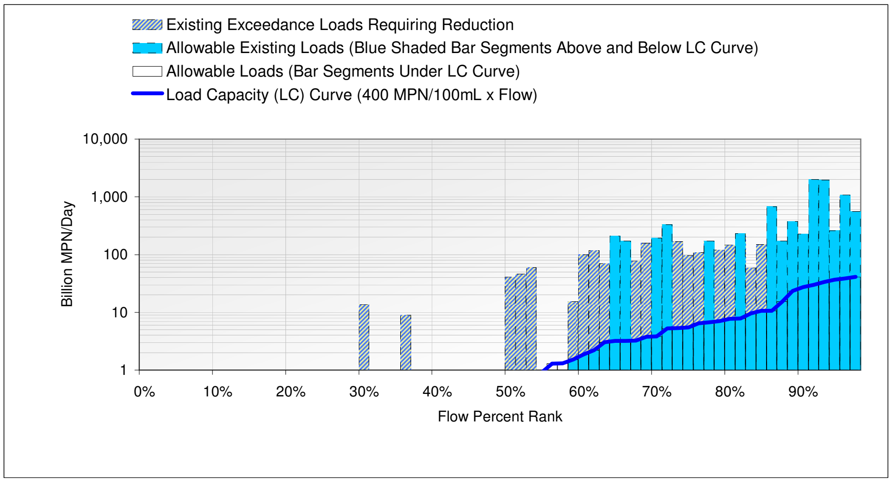
Subwatershed 304 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	39	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	24	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**5,599,516**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	316,396	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	4,906,479	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**5,222,874**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**376,642**	**Billion MPN/Year**

Table O-30. Subwatershed 304 Enterococcus Load Duration Curve



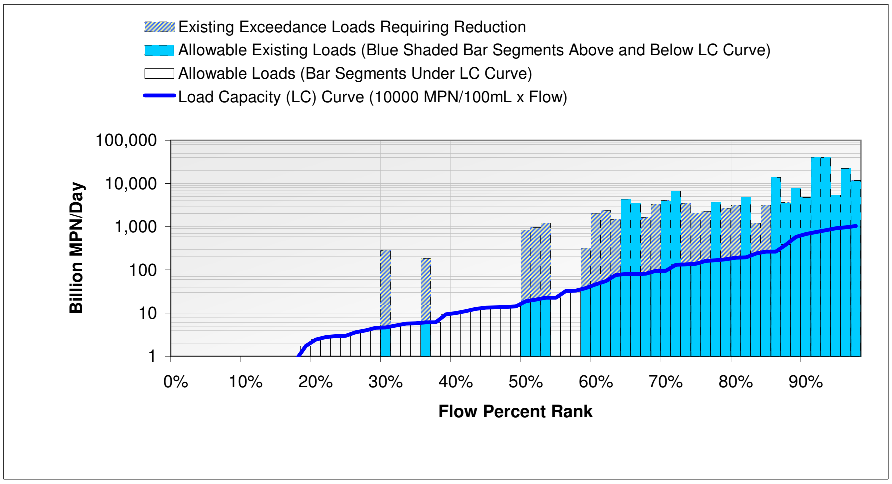
Subwatershed 304 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	42	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	27	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**428,285**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	3,293	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	396,971	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**400,264**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**28,020**	**Billion MPN/Year**

Table O-31. Subwatershed 305 Fecal Coliform Load Duration Curve



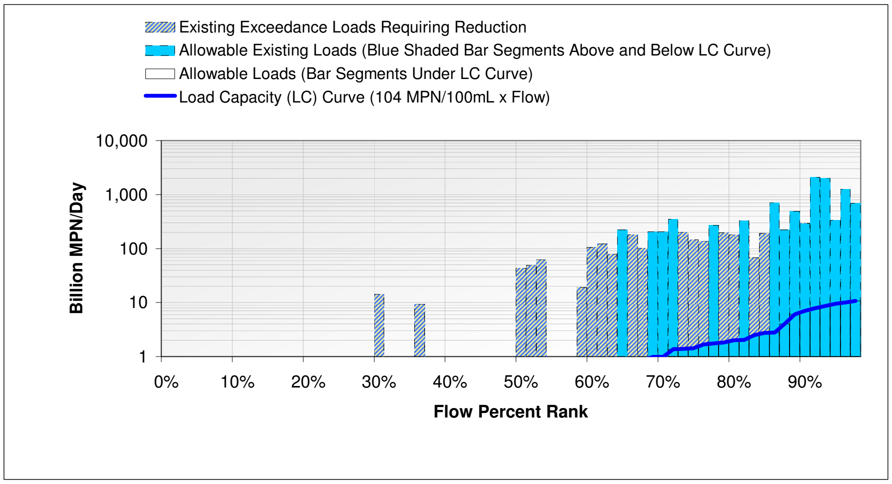
Subwatershed 305 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**10,149**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	357	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	8,306	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**8,662**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,486**	**Billion MPN/Year**

Table O-32. Subwatershed 305 Total Coliform Load Duration Curve



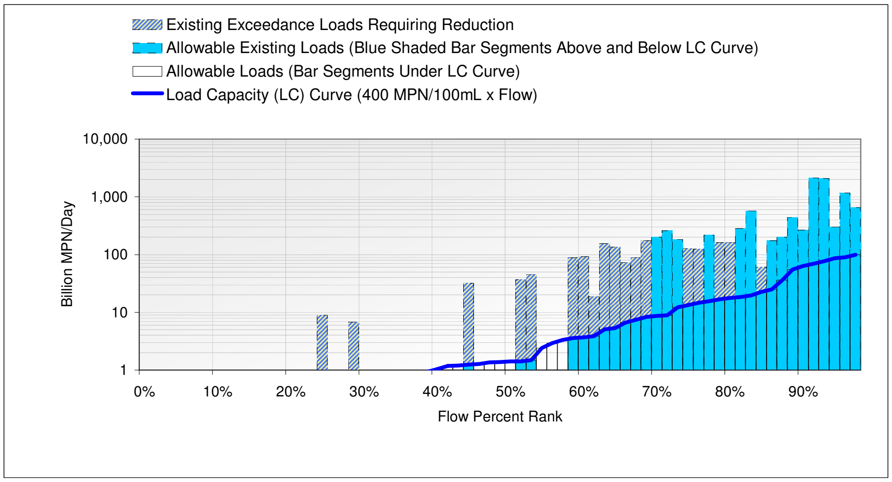
Subwatershed 305 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**209,193**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	8,922	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	169,640	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**178,563**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**30,630**	**Billion MPN/Year**

Table O-33. Subwatershed 305 Enterococcus Load Duration Curve



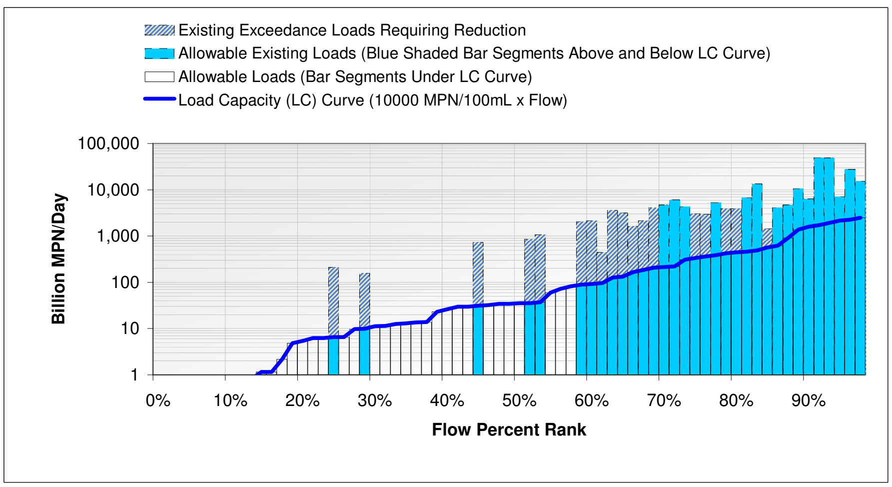
Subwatershed 305 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**11,603**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	93	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	9,618	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**9,711**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,892**	**Billion MPN/Year**

Table O-34. Subwatershed 306 Fecal Coliform Load Duration Curve



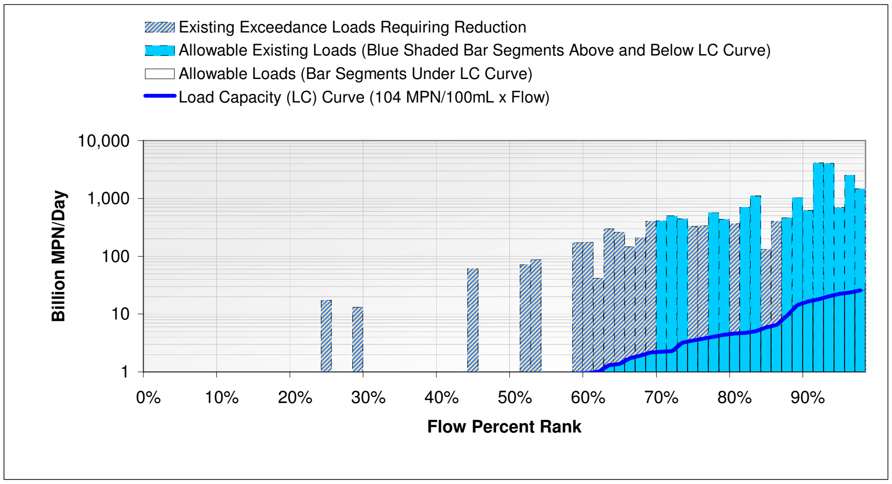
Subwatershed 306 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**10,733**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	819	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	8,452	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**9,272**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,461**	**Billion MPN/Year**

Table O-35. Subwatershed 306 Total Coliform Load Duration Curve



Subwatershed 306 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**251,988**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	20,481	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	197,282	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**217,763**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**34,225**	**Billion MPN/Year**

Table O-36. Subwatershed 306 Enterococcus Load Duration Curve



Subwatershed 306 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	69	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	15	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**22,629**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	213	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	18,927	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**19,140**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,489**	**Billion MPN/Year**

Lower San Juan HSA

Load Duration Curves

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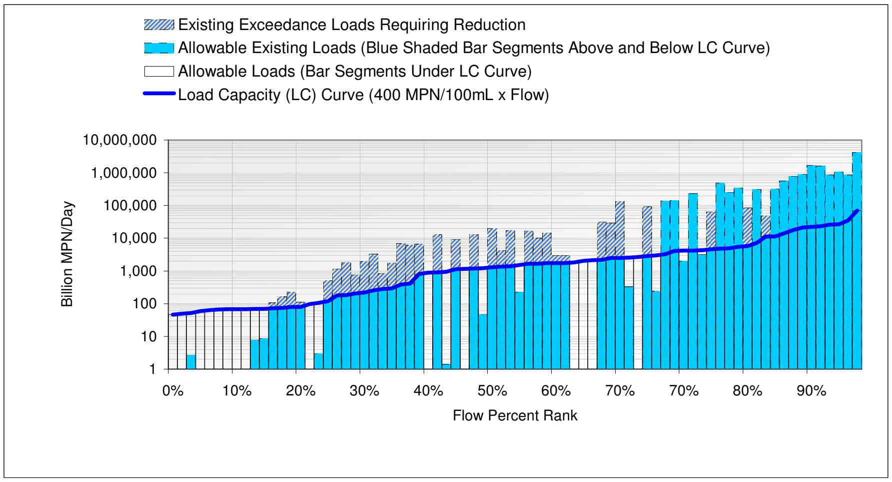
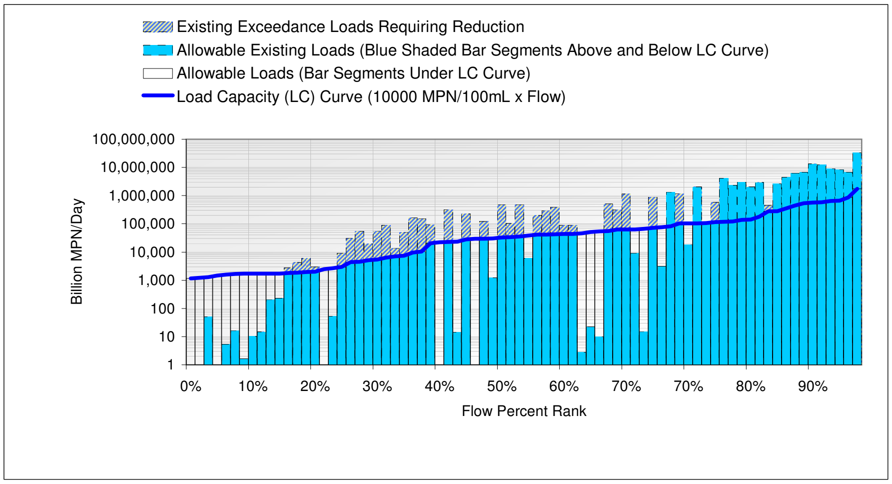
Table O-37. Subwatershed 401 Fecal Coliform Load Duration Curve



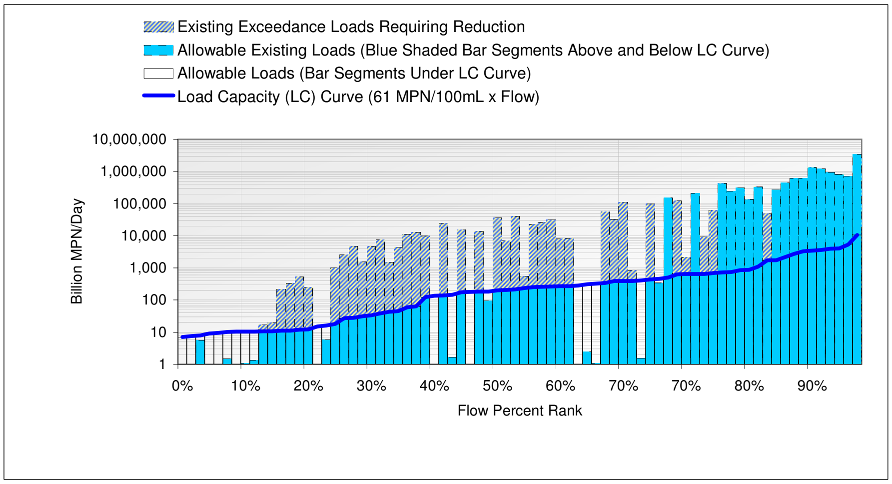
Subwatershed 401 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	76	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	50	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	17	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	33	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**15,304,790**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	358,410	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	14,356,423	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**14,714,833**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**589,958**	**Billion MPN/Year**

Table O-38. Subwatershed 401 Total Coliform Load Duration Curve



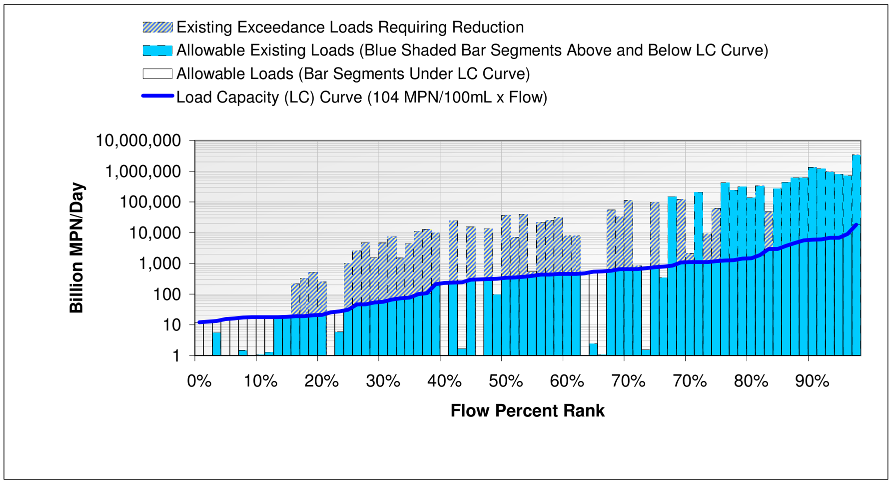
Subwatershed 401 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	76	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	50	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	17	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	33	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**130,258,863**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	8,947,114	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	113,932,076	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**122,879,189**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**7,379,673**	**Billion MPN/Year**

Table O-39a. Subwatershed 401 Enterococcus (61) Load Duration Curve



Subwatershed 401 Enterococcus (61) Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	76	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	56	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	17	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	39	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**12,980,098**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	56,119	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	12,096,327	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**12,152,446**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**827,652**	**Billion MPN/Year**

Table O-39b. Subwatershed 401 Enterococcus (104) Load Duration Curve



Subwatershed 401 Enterococcus (104) Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	76	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	55	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	17	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	38	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**12,980,098**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	95,357	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	12,063,781	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**12,159,138**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**820,960**	**Billion MPN/Year**

San Clemente HA
Load Duration Curves

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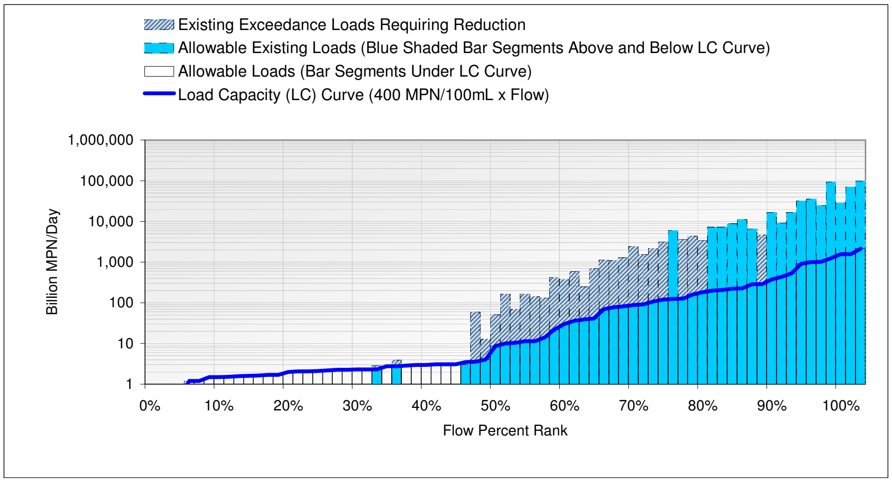
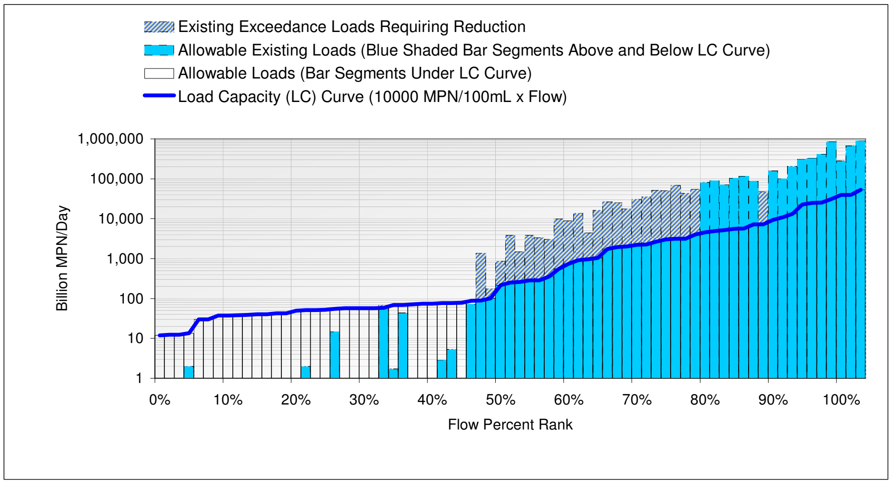
Table O-40. Subwatershed 501 Fecal Coliform Load Duration Curve



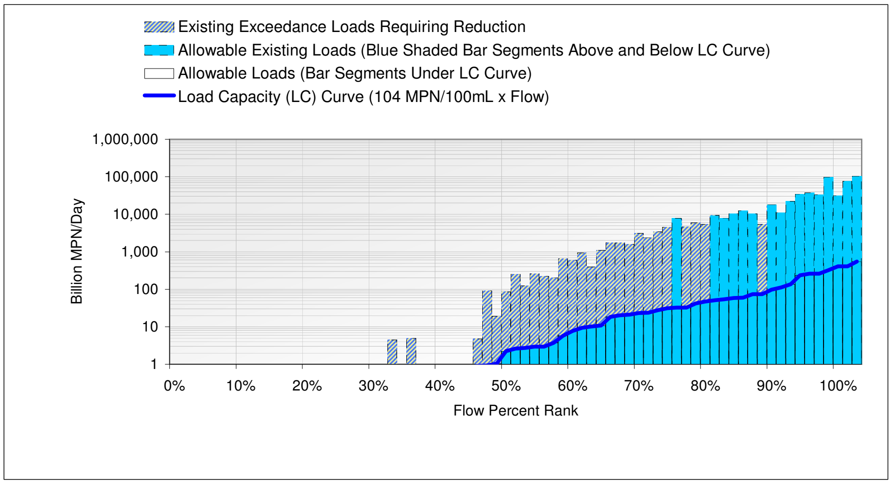
Subwatershed 501 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	42	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	26	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**503,463**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	13,706	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	459,283	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**472,989**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**30,474**	**Billion MPN/Year**

Table O-41. Subwatershed 501 Total Coliform Load Duration Curve



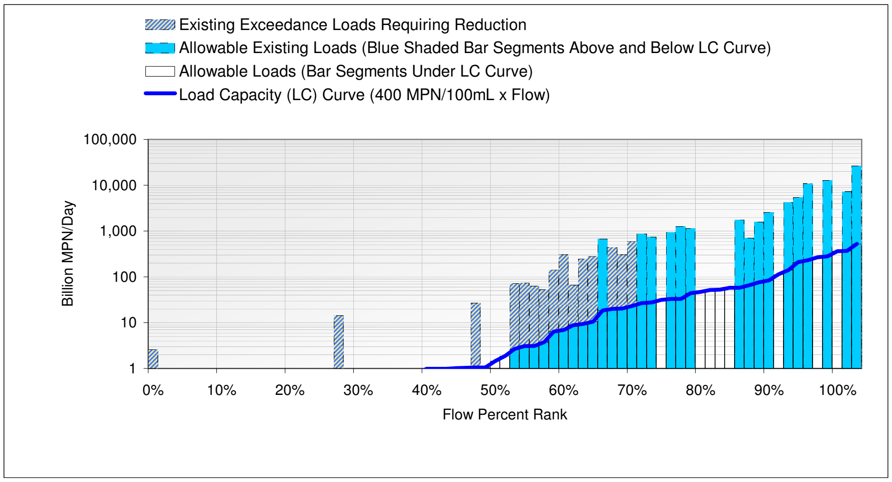
Subwatershed 501 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	41	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	25	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**5,276,543**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	342,618	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	4,451,026	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**4,793,644**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**482,899**	**Billion MPN/Year**

Table O-42. Subwatershed 501 Enterococcus Load Duration Curve



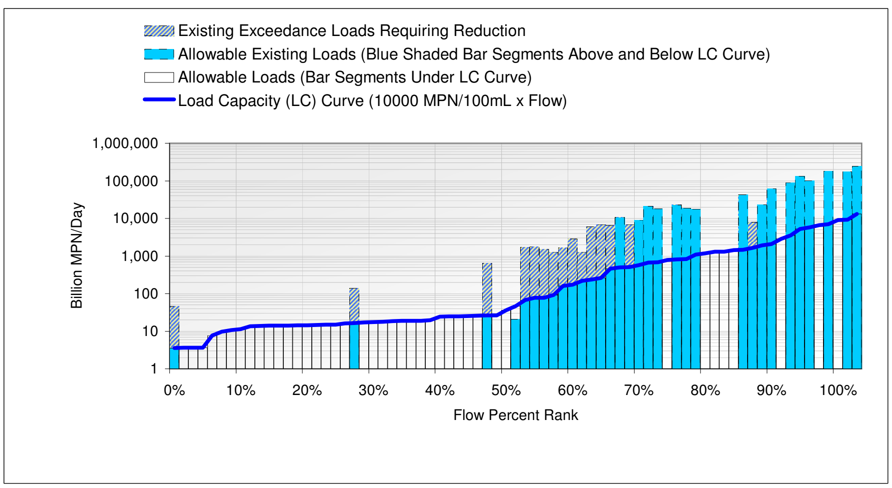
Subwatershed 501 Enterococcus Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	45	Days
Allowable Wet Weather Exceedence Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	29	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**570,531**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	3,565	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	522,815	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**526,380**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**44,151**	**Billion MPN/Year**

Table O-43. Subwatershed 502 Fecal Coliform Load Duration Curve



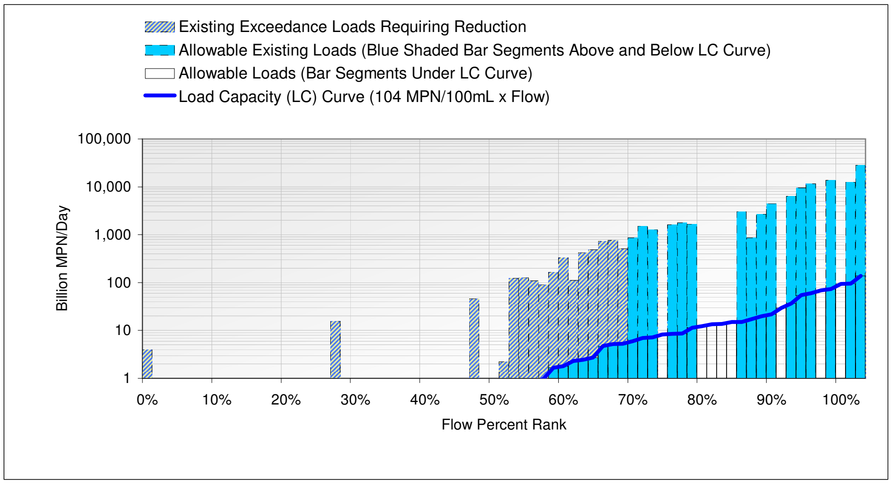
Subwatershed 502 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	31	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	15	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**81,336**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	2,340	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	76,435	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**78,774**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,561**	**Billion MPN/Year**

Table O-44. Subwatershed 502 Total Coliform Load Duration Curve



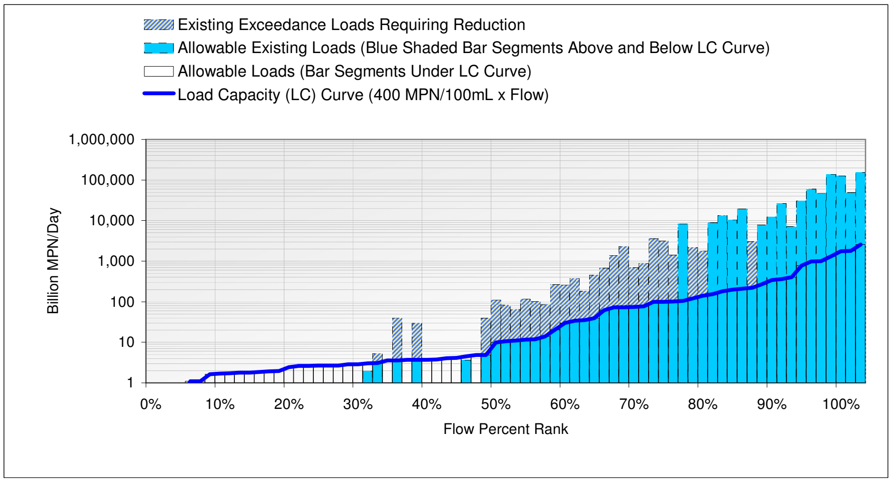
Subwatershed 502 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	31	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	15	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**1,217,027**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	58,491	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,115,636	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**1,174,127**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**42,900**	**Billion MPN/Year**

Table O-45. Subwatershed 502 Enterococcus Load Duration Curve



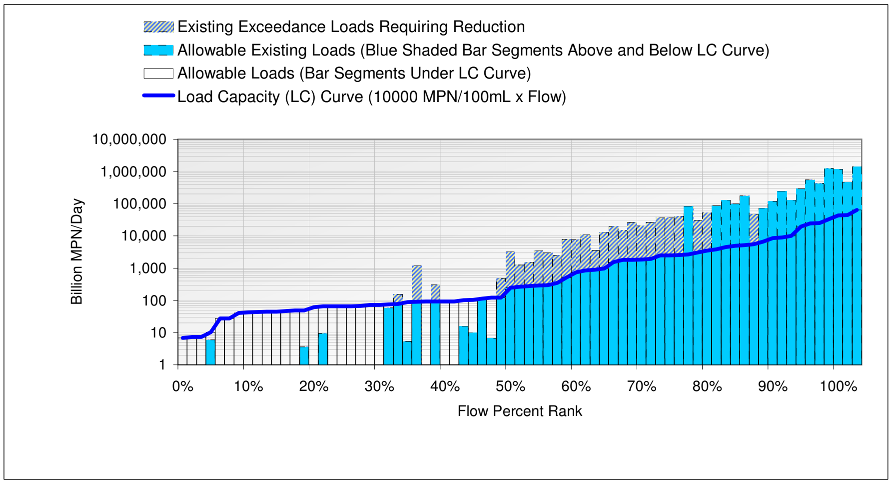
Subwatershed 502 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	32	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	16	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**105,722**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	609	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	101,090	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**101,698**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**4,024**	**Billion MPN/Year**

Table O-46. Subwatershed 503 Fecal Coliform Load Duration Curve



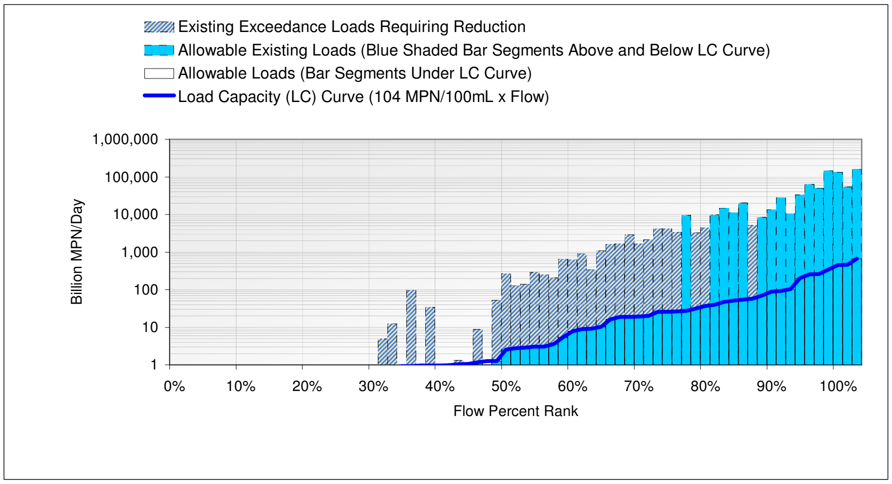
Subwatershed 503 Fecal Coliform Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	42	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	26	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**736,628**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	13,802	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	701,010	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**714,812**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**21,816**	**Billion MPN/Year**

Table O-47. Subwatershed 503 Total Coliform Load Duration Curve



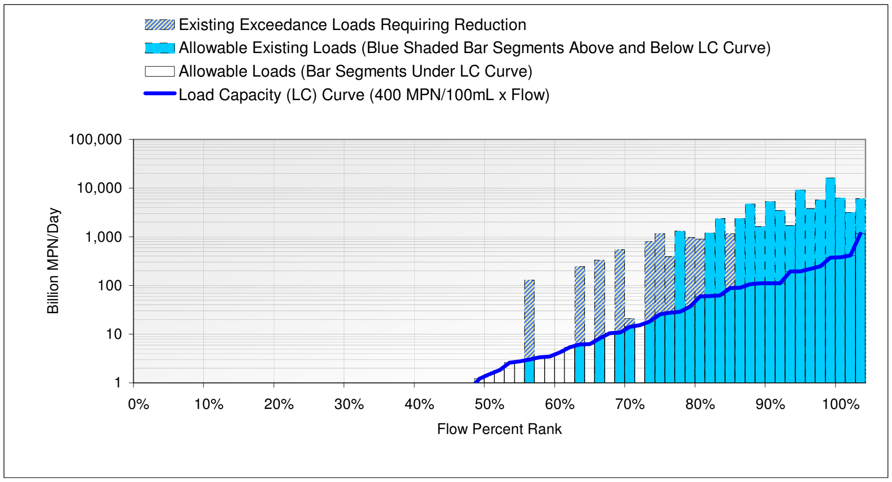
Subwatershed 503 Total Coliform Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	42	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	26	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**7,101,866**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	345,066	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	6,378,829	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**6,723,895**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**377,971**	**Billion MPN/Year**

Table O-48. Subwatershed 503 Enterococcus Load Duration Curve



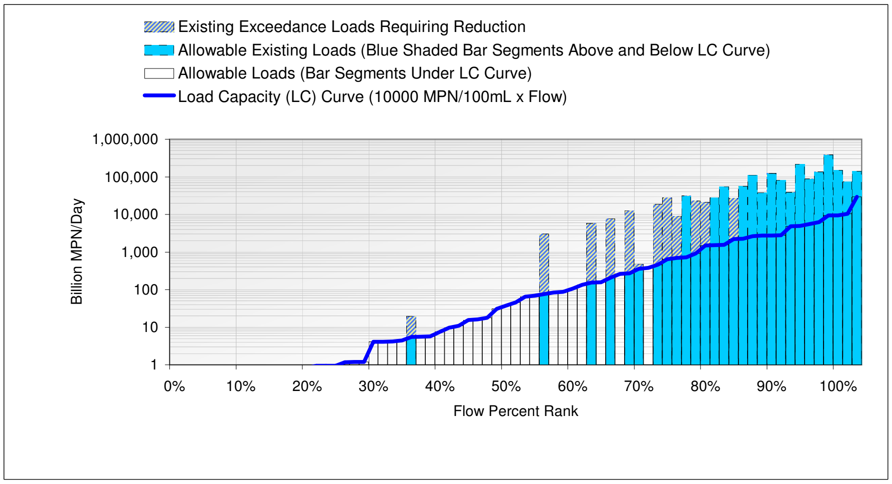
Subwatershed 503 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	47	Days
Allowable Wet Weather Exceedence Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	31	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**806,853**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	3,593	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	763,994	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**767,587**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**39,266**	**Billion MPN/Year**

Table O-49. Subwatershed 504 Fecal Coliform Load Duration Curve



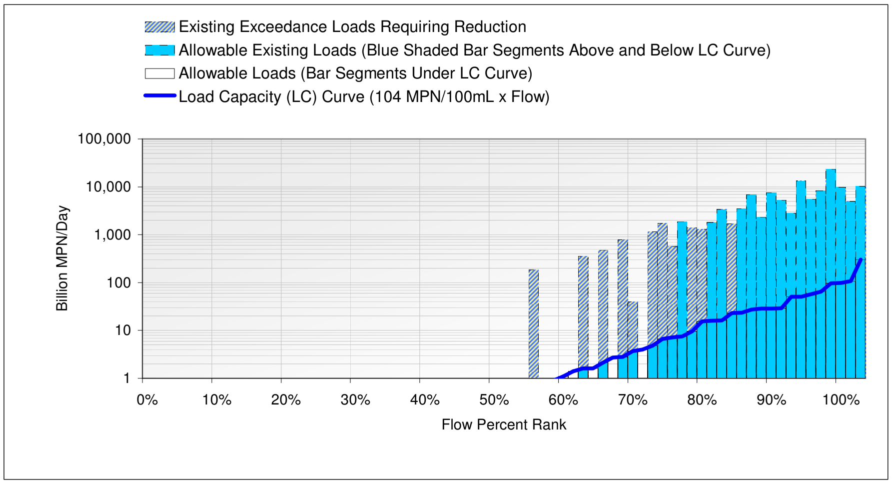
Subwatershed 504 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	12	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**81,576**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	4,172	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	71,022	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**75,194**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**6,382**	**Billion MPN/Year**

Table O-50. Subwatershed 504 Total Coliform Load Duration Curve



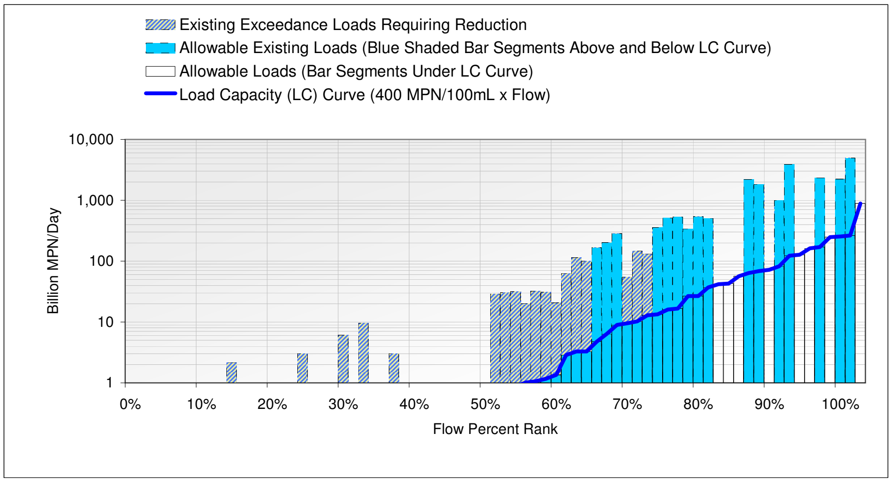
Subwatershed 504 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	12	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**1,903,632**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	104,298	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,650,517	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**1,754,815**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**148,817**	**Billion MPN/Year**

Table O-51. Subwatershed 504 Enterococcus Load Duration Curve



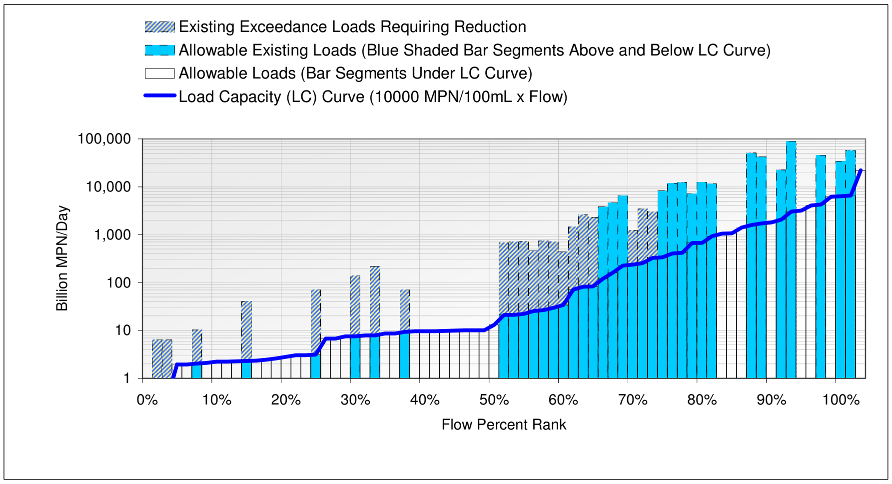
Subwatershed 504 Enterococcus Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	12	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**120,842**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	1,085	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	110,148	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**111,233**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**9,609**	**Billion MPN/Year**

Table O-52. Subwatershed 505 Fecal Coliform Load Duration Curve



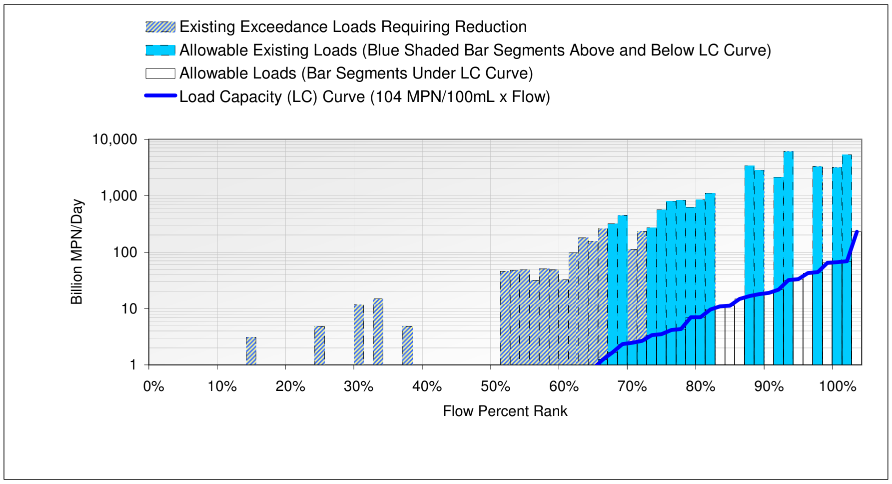
Subwatershed 505 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	37	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	21	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**22,706**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	1,235	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	20,691	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**21,926**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**781**	**Billion MPN/Year**

Table O-53. Subwatershed 505 Total Coliform Load Duration Curve



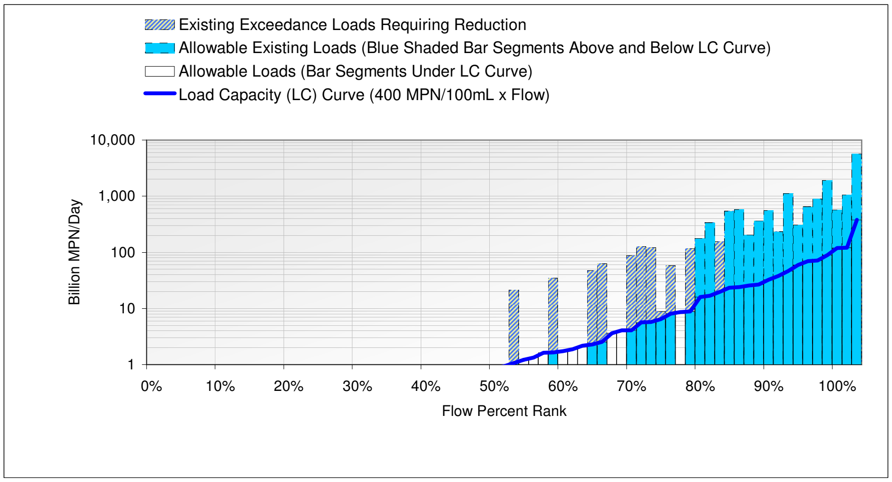
Subwatershed 505 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	37	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	21	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**439,319**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	30,864	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	390,691	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**421,555**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**17,764**	**Billion MPN/Year**

Table O-54. Subwatershed 505 Enterococcus Load Duration Curve



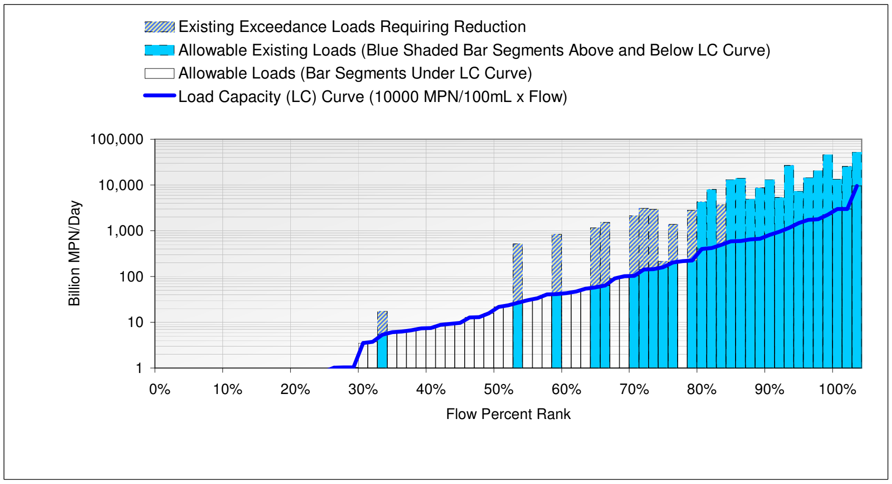
Subwatershed 505 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	37	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	21	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**33,571**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	321	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	31,875	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**32,196**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,375**	**Billion MPN/Year**

Table O-55. Subwatershed 506 Fecal Coliform Load Duration Curve



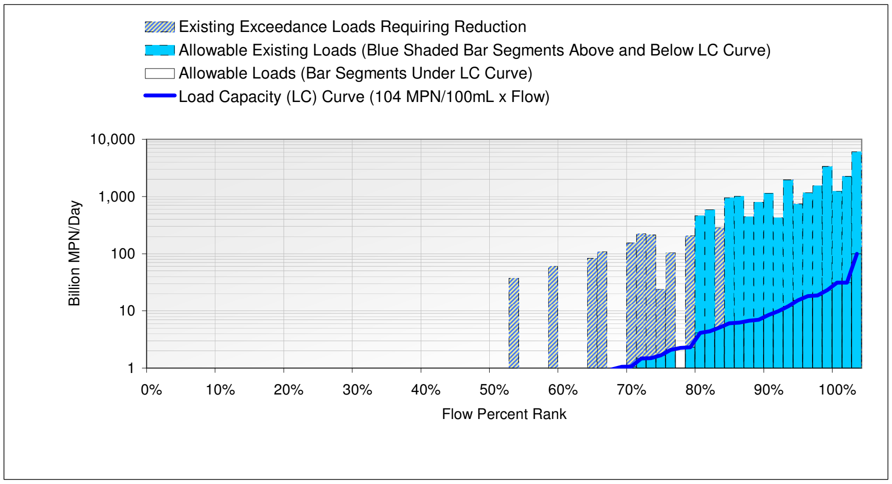
Subwatershed 506 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	12	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**16,014**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	1,226	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	14,009	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**15,235**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**779**	**Billion MPN/Year**

Table O-56. Subwatershed 506 Total Coliform Load Duration Curve



Subwatershed 506 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	12	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**298,219**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	30,657	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	248,909	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**279,566**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**18,652**	**Billion MPN/Year**

Table O-57. Subwatershed 506 Enterococcus Load Duration Curve



Subwatershed 506 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	73	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	16	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	12	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**25,580**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	319	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	23,774	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**24,093**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,487**	**Billion MPN/Year**

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Load Duration Curves

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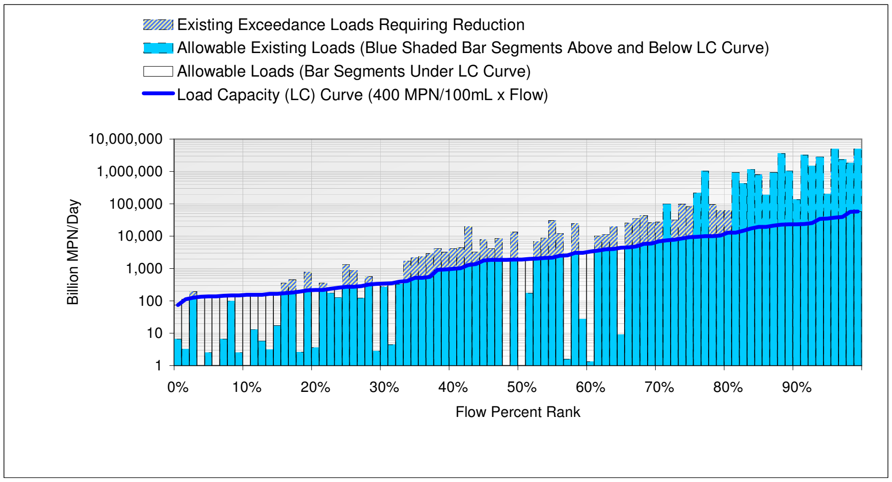
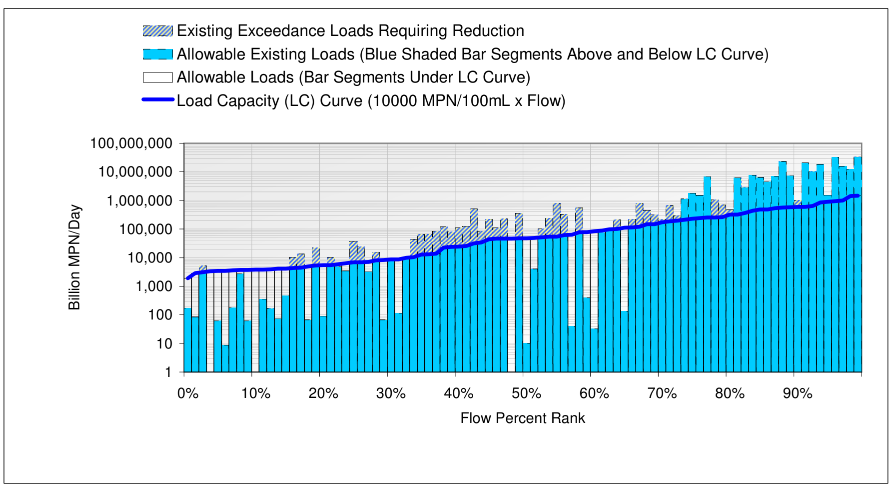
Table O-58. Subwatershed 701 Fecal Coliform Load Duration Curve



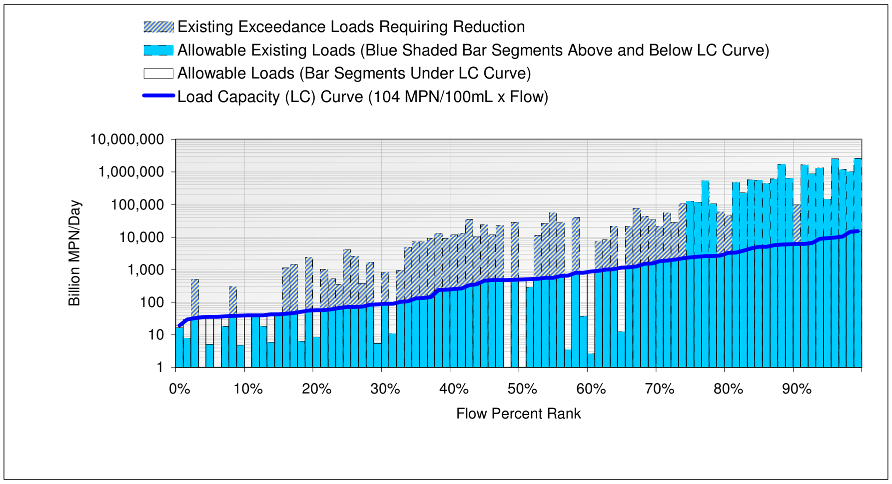
Subwatershed 701 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	90	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	61	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	20	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	41	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**33,120,012**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	640,595	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	31,803,647	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**32,444,242**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**675,770**	**Billion MPN/Year**

Table O-59. Subwatershed 701 Total Coliform Load Duration Curve



Subwatershed 701 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	90	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	59	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	20	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	39	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**231,598,677**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	15,993,384	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	208,157,151	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**224,150,535**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**7,448,142**	**Billion MPN/Year**

Table O-60. Subwatershed 701 Enterococcus Load Duration Curve



Subwatershed 701 Enterococcus Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	90	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	68	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	20	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	48	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**18,439,920**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	167,152	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	17,296,466	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**17,463,618**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**976,302**	**Billion MPN/Year**

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Load Duration Curves

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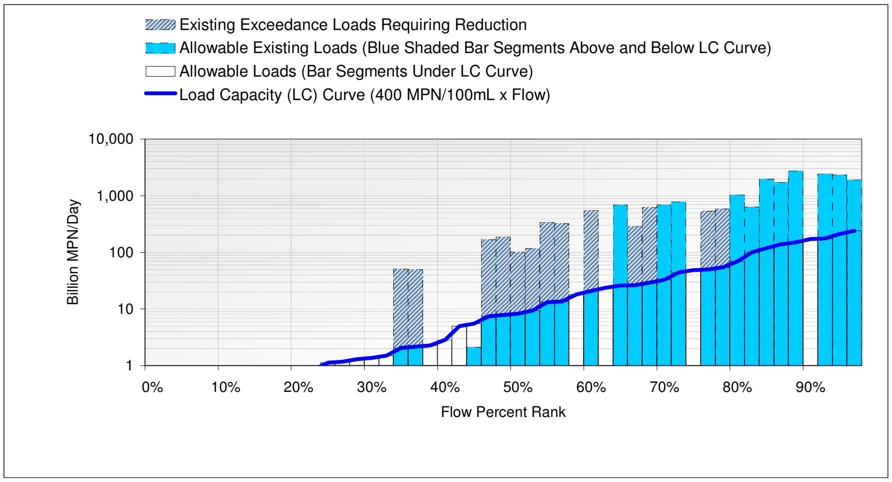
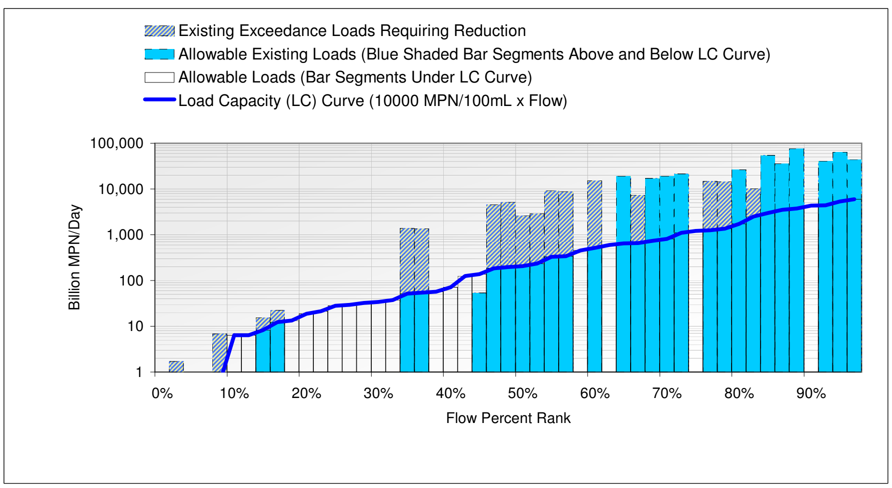
Table O-61. Subwatershed 1101 Fecal Coliform Load Duration Curve



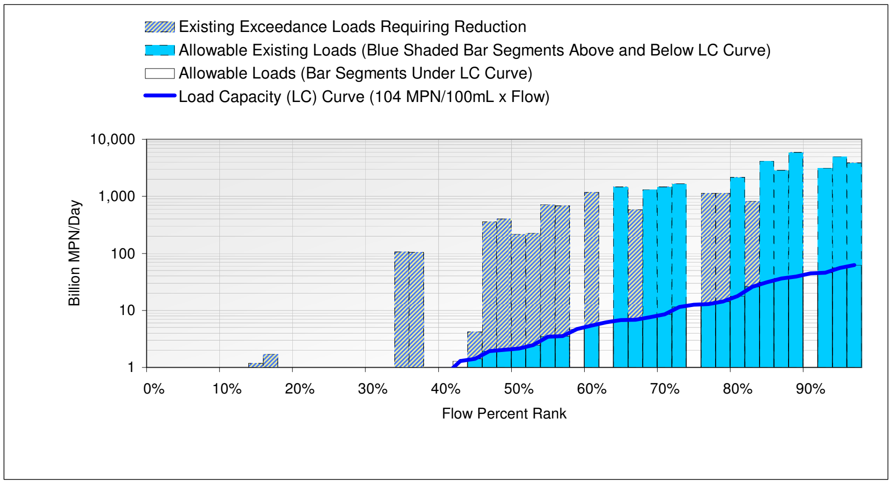
Subwatershed 1101 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	49	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	11	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	17	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**20,886**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	1,559	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	15,665	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**17,224**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,662**	**Billion MPN/Year**

Table O-62. Subwatershed 1101 Total Coliform Load Duration Curve



Subwatershed 1101 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	49	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	11	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	17	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**515,278**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	38,984	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	386,099	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**425,083**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**90,196**	**Billion MPN/Year**

Table O-63. Subwatershed 1101 Enterococcus Load Duration Curve



Subwatershed 1101 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	49	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	29	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	11	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	18	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**40,558**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	406	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	32,559	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**32,966**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**7,592**	**Billion MPN/Year**

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Load Duration Curves

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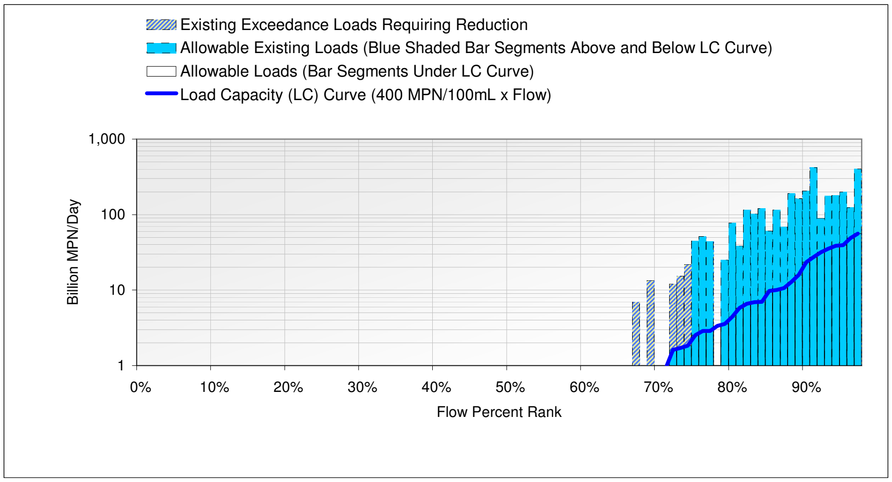
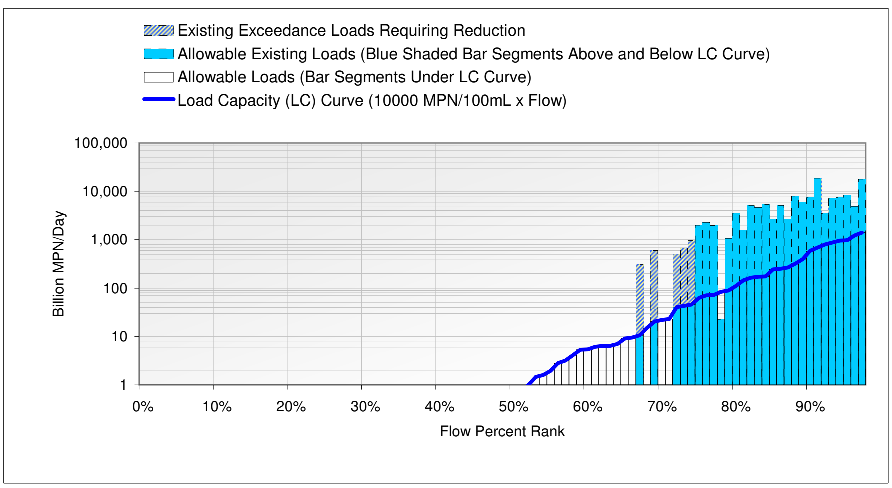
Table O-64. Subwatershed 1301 Fecal Coliform Load Duration Curve



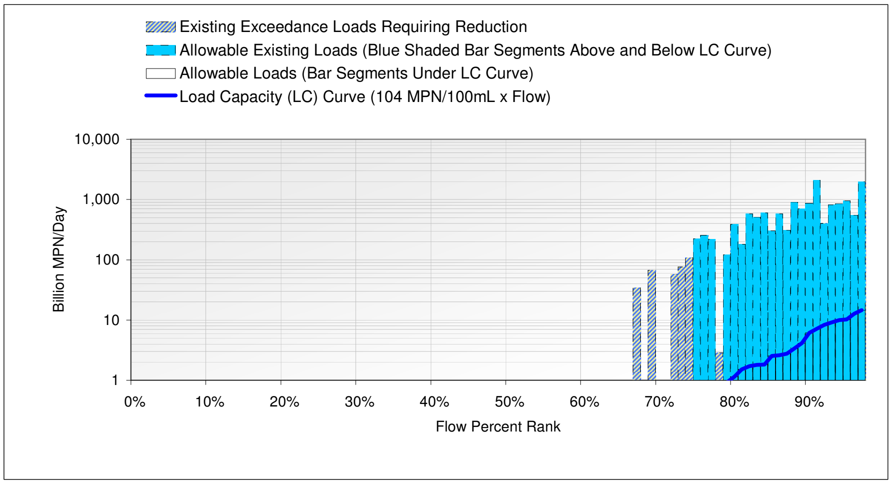
Subwatershed 1301 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	98	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	27	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	22	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	5	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**3,081**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	410	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	2,609	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**3,018**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**63**	**Billion MPN/Year**

Table O-65. Subwatershed 1301 Total Coliform Load Duration Curve



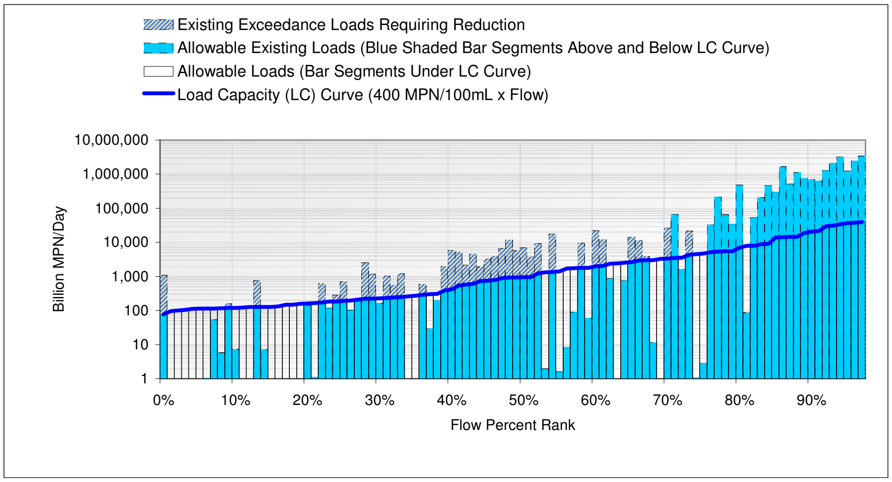
Subwatershed 1301 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	98	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	27	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	22	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	5	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**130,532**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	10,246	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	117,387	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**127,632**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,900**	**Billion MPN/Year**

Table O-66. Subwatershed 1301 Enterococcus Load Duration Curve



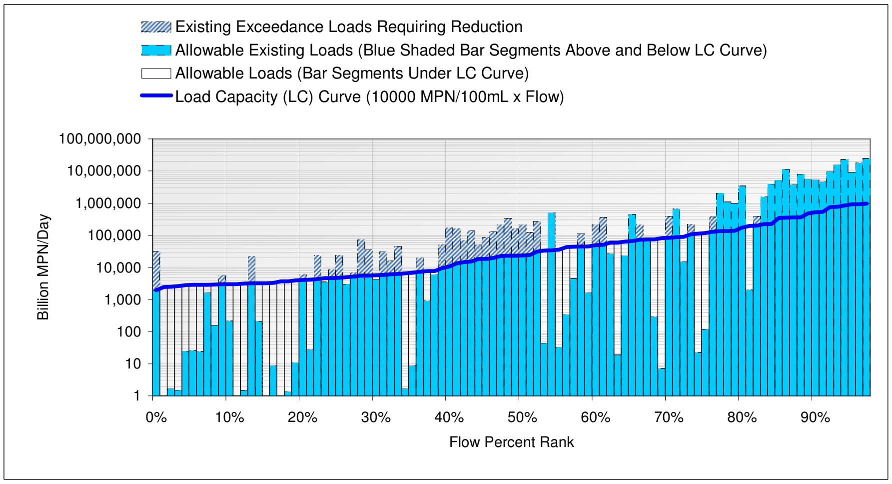
Subwatershed 1301 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	98	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	22	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	6	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**14,763**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	107	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	14,312	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**14,419**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**344**	**Billion MPN/Year**

Table O-67. Subwatershed 1302 Fecal Coliform Load Duration Curve



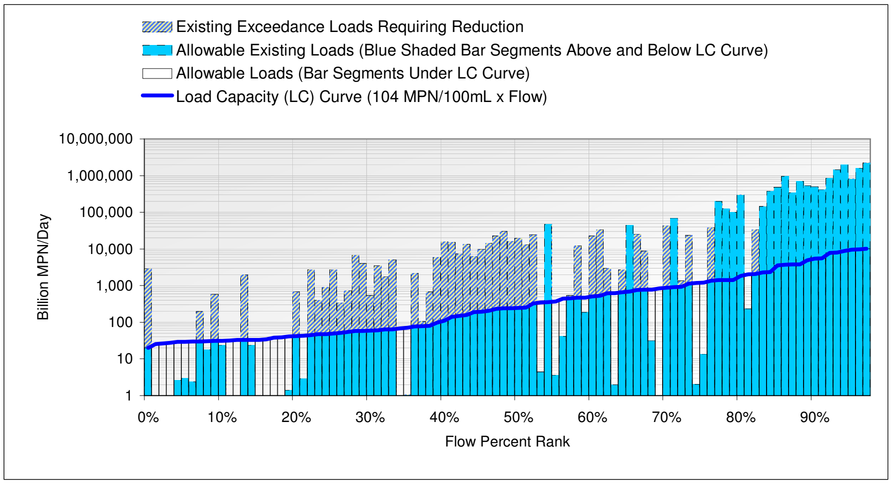
Subwatershed 1302 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	98	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	58	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	22	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	36	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**21,283,828**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	425,559	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	20,673,072	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**21,098,630**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**185,198**	**Billion MPN/Year**

Table O-68. Subwatershed 1302 Total Coliform Load Duration Curve



Subwatershed 1302 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	98	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	59	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	22	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	37	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**163,410,600**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	10,626,979	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	149,059,572	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**159,686,552**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,724,049**	**Billion MPN/Year**

Table O-69. Subwatershed 1302 Enterococcus Load Duration Curve



Subwatershed 1302 Enterococcus Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	98	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	69	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	22	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	47	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**14,781,447**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	113,146	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	14,179,522	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**14,292,668**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**488,779**	**Billion MPN/Year**

Miramar Reservoir HA
Load Duration Curves

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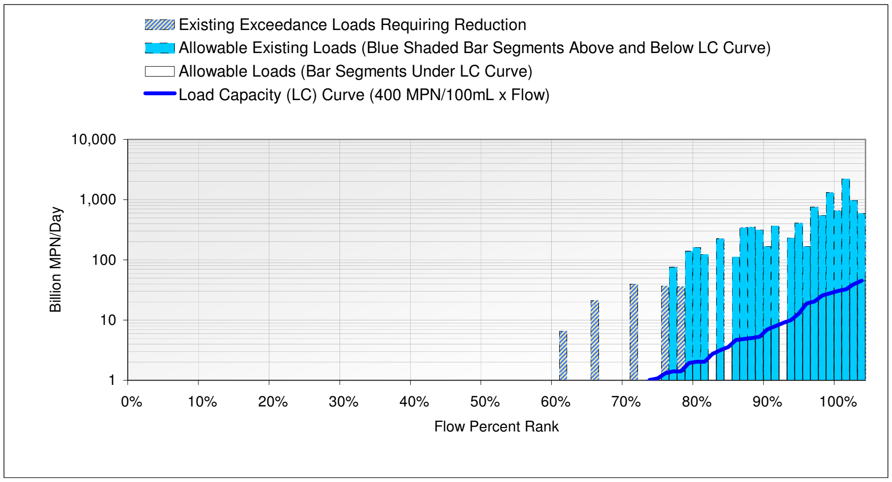
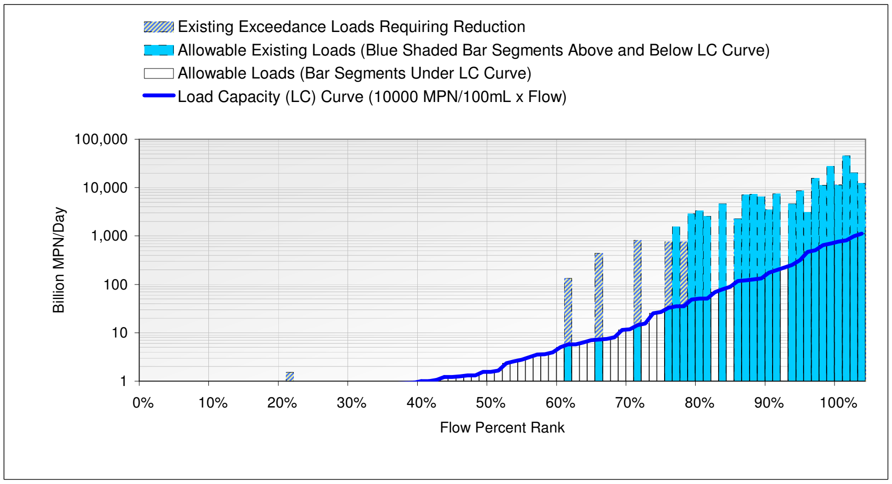
Table O-70. Subwatershed 1401 Fecal Coliform Load Duration Curve



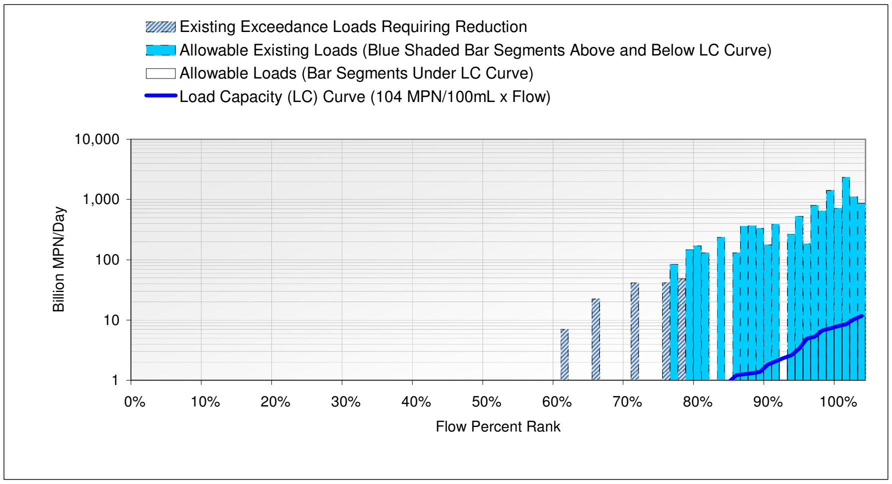
Subwatershed 1401 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	94	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	21	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	7	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**10,392**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	312	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	9,943	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**10,256**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**136**	**Billion MPN/Year**

Table O-71. Subwatershed 1401 Total Coliform Load Duration Curve



Subwatershed 1401 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	94	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	21	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	7	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**212,986**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	7,809	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	202,371	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**210,180**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,807**	**Billion MPN/Year**

Table O-72. Subwatershed 1401 Enterococcus Load Duration Curve



Subwatershed 1401 Enterococcus Loading Summary	**Value**	**Units**
Total Wet Days During Critical Wet Year	94	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	28	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	21	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	7	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**11,564**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	81	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	11,323	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**11,405**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**160**	**Billion MPN/Year**

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Load Duration Curves

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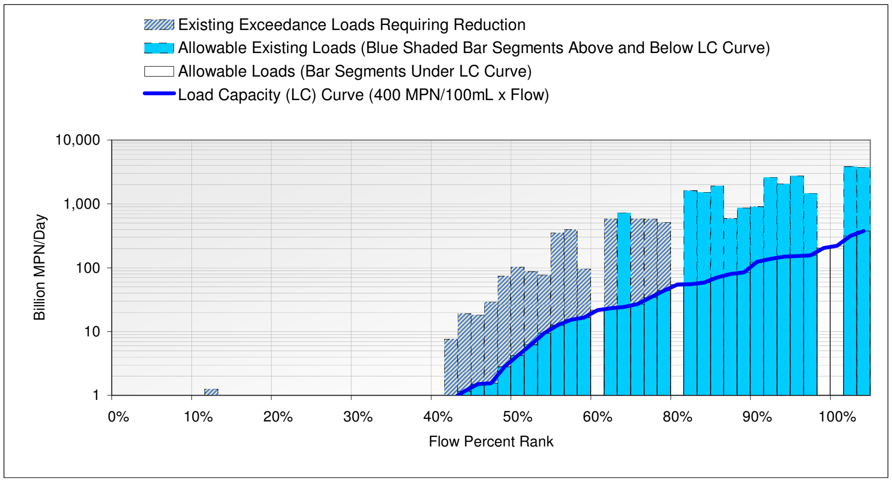
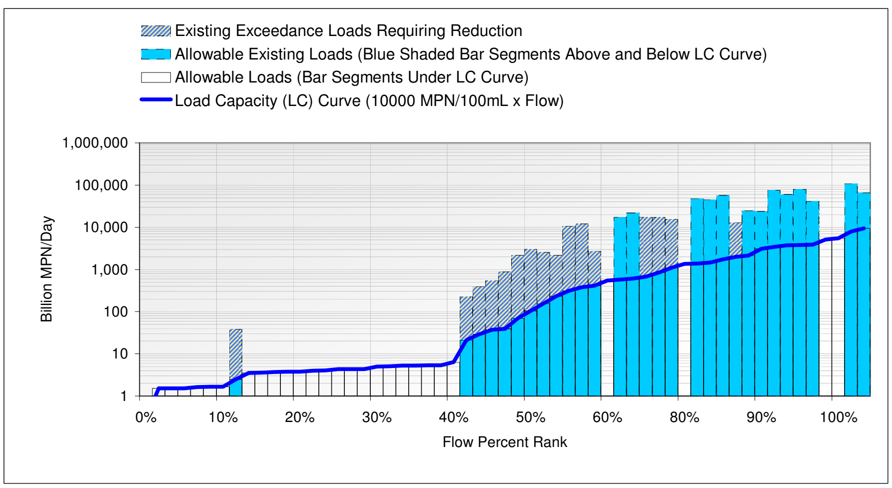
Table O-73. Subwatershed 1501 Fecal Coliform Load Duration Curve



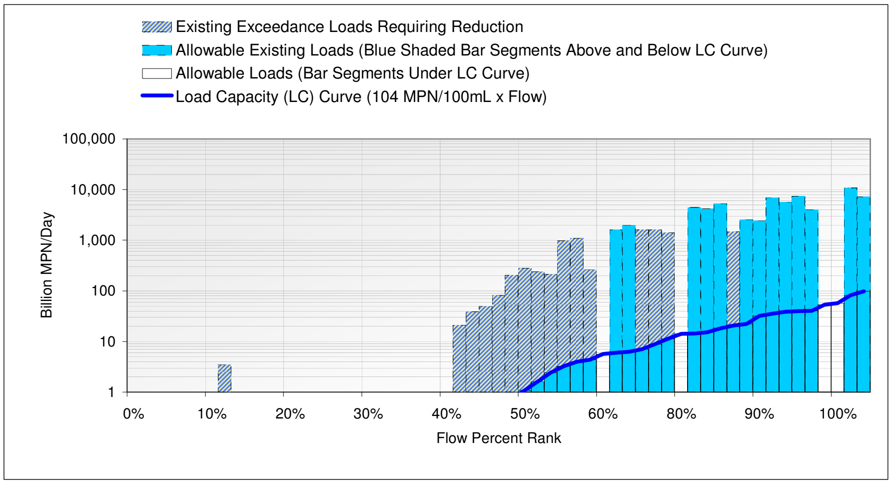
Subwatershed 1501 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	29	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	16	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**28,044**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	1,983	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	22,749	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**24,731**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**3,312**	**Billion MPN/Year**

Table O-74. Subwatershed 1501 Total Coliform Load Duration Curve



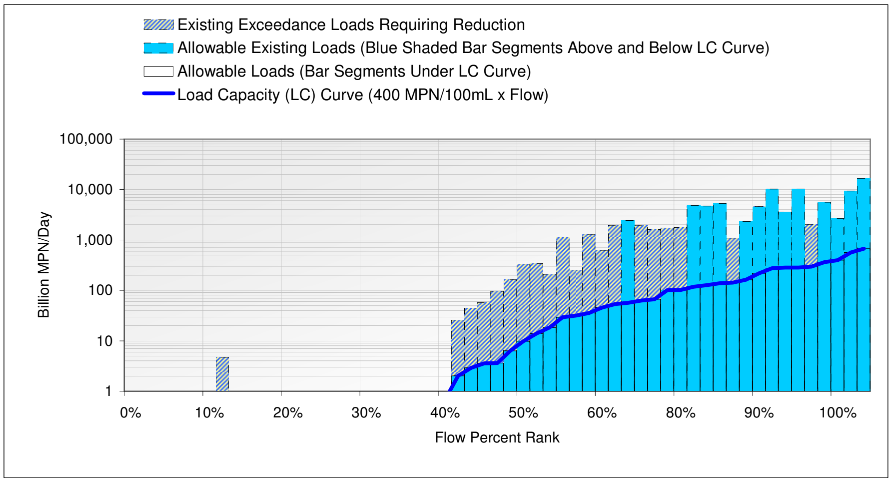
Subwatershed 1501 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	29	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	16	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**768,912**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	49,567	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	625,589	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**675,156**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**93,756**	**Billion MPN/Year**

Table O-75. Subwatershed 1501 Enterococcus Load Duration Curve



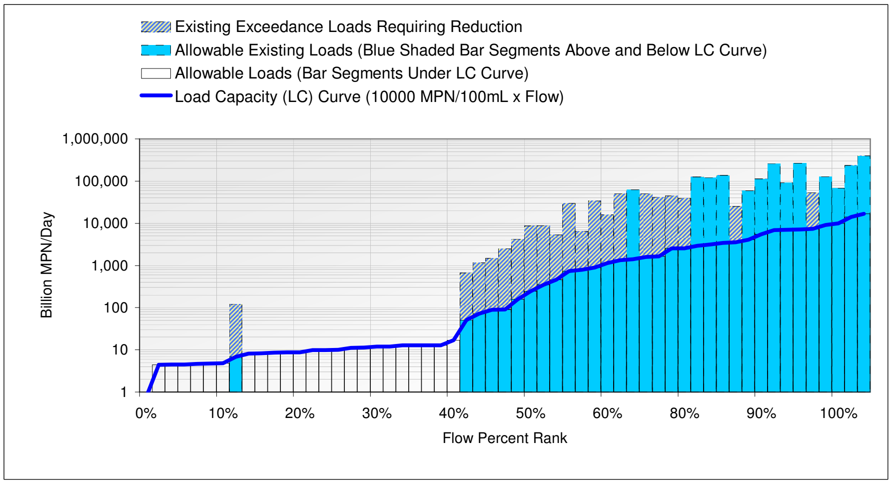
Subwatershed 1501 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	29	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	16	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**74,057**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	515	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	64,059	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**64,574**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**9,483**	**Billion MPN/Year**

Table O-76. Subwatershed 1503 Fecal Coliform Load Duration Curve



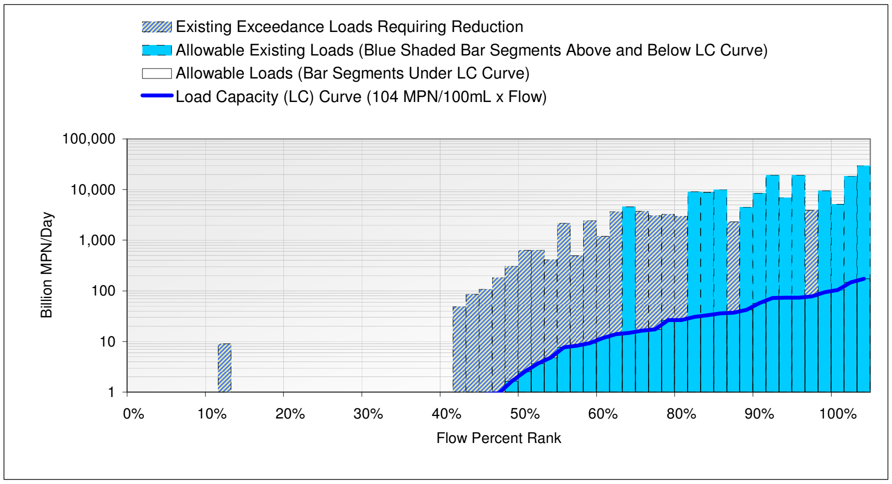
Subwatershed 1503 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	20	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**98,955**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	4,683	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	78,531	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**83,214**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**15,740**	**Billion MPN/Year**

Table O-77. Subwatershed 1503 Total Coliform Load Duration Curve



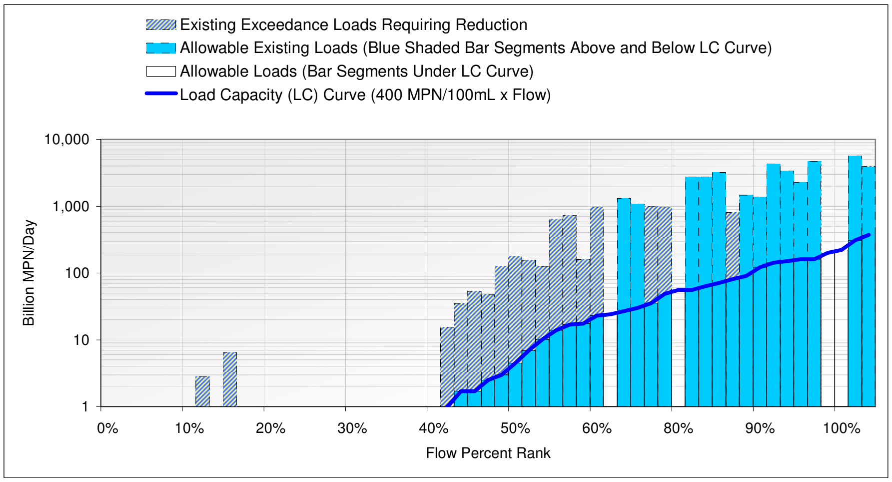
Subwatershed 1503 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	20	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**2,485,458**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	117,080	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,971,219	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**2,088,298**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**397,159**	**Billion MPN/Year**

Table O-78. Subwatershed 1503 Enterococcus Load Duration Curve



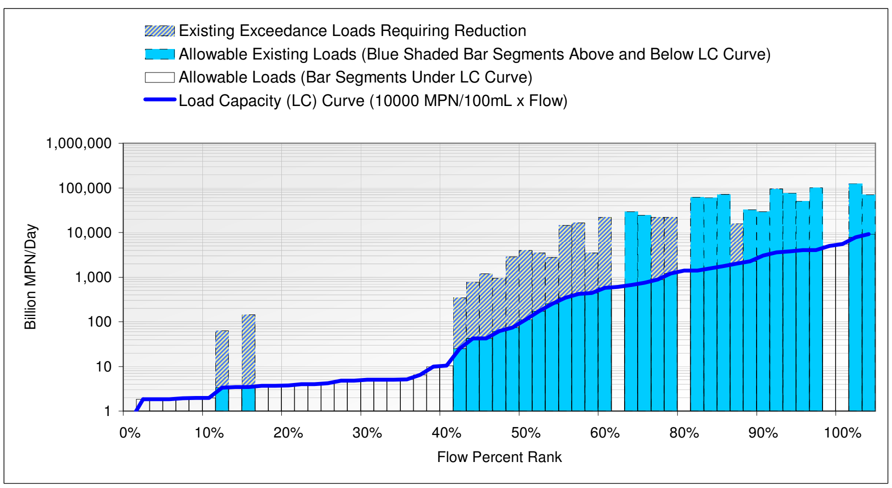
Subwatershed 1503 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	33	Days
Allowable Wet Weather Exceedence Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	20	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**185,674**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	1,218	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	153,059	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**154,277**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**31,398**	**Billion MPN/Year**

Table O-79. Subwatershed 1505 Fecal Coliform Load Duration Curve



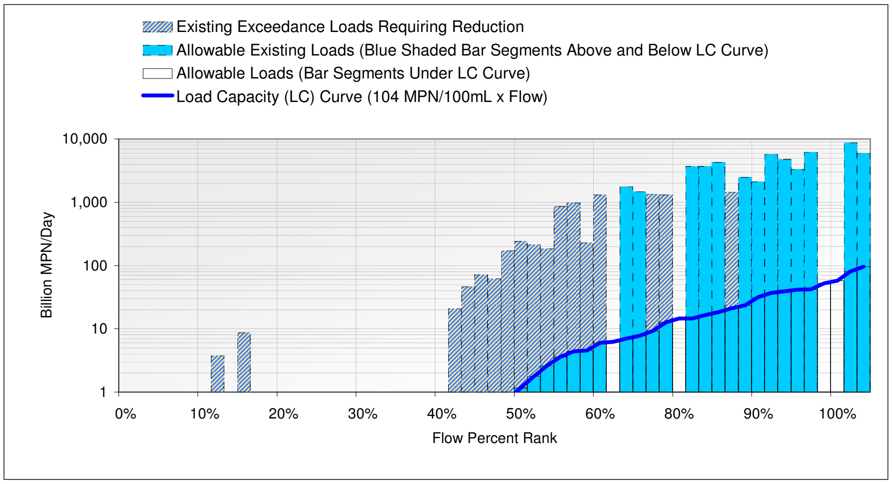
Subwatershed 1505 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	30	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	17	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**44,212**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	2,023	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	36,432	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**38,455**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**5,757**	**Billion MPN/Year**

Table O-80. Subwatershed 1505 Total Coliform Load Duration Curve



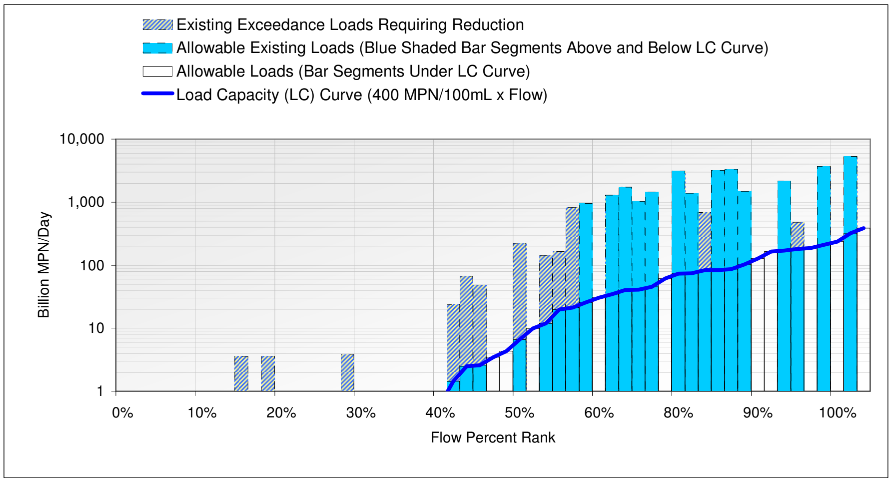
Subwatershed 1505 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	30	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	17	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**958,988**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	50,571	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	783,138	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**833,709**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**125,279**	**Billion MPN/Year**

Table O-81. Subwatershed 1505 Enterococcus Load Duration Curve



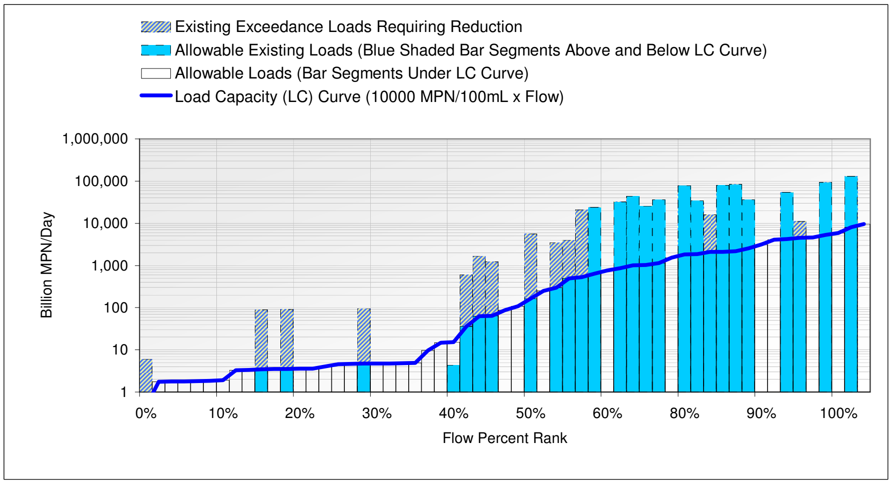
Subwatershed 1505 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	30	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	17	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**62,646**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	526	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	53,700	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**54,226**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**8,420**	**Billion MPN/Year**

Table O-82. Subwatershed 1507 Fecal Coliform Load Duration Curve



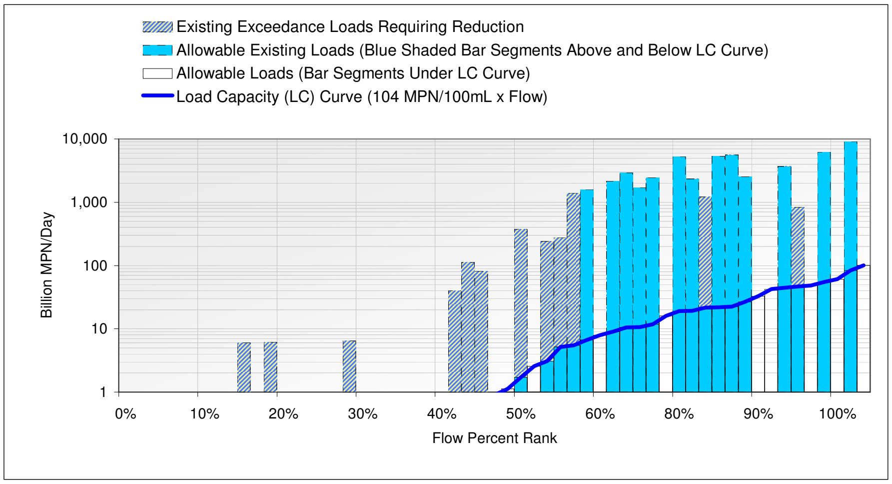
Subwatershed 1507 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	26	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	13	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**32,846**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	1,640	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	28,866	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**30,506**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,340**	**Billion MPN/Year**

Table O-83. Subwatershed 1507 Total Coliform Load Duration Curve



Subwatershed 1507 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	26	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	13	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**816,160**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	41,010	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	718,799	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**759,809**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**56,351**	**Billion MPN/Year**

Table O-84. Subwatershed 1507 Enterococcus Load Duration Curve



Subwatershed 1507 Enterococcus Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	27	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	14	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**55,462**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	427	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	50,529	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**50,956**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**4,506**	**Billion MPN/Year**

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Load Duration Curves

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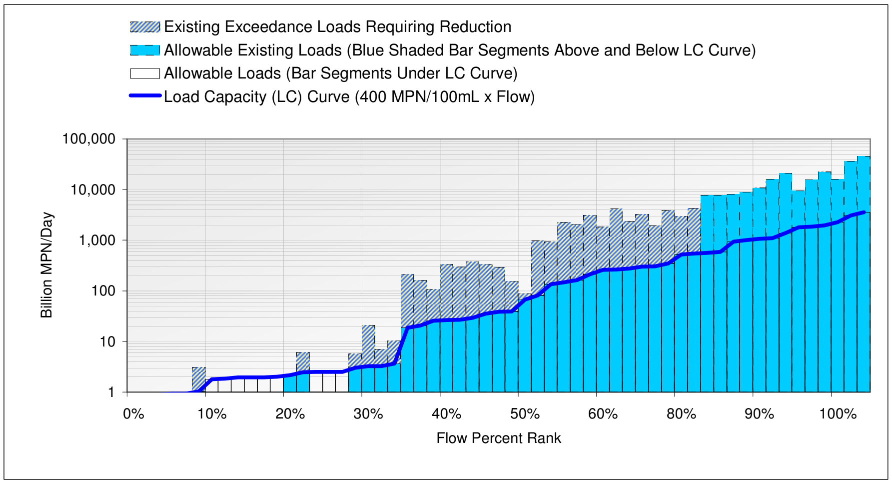
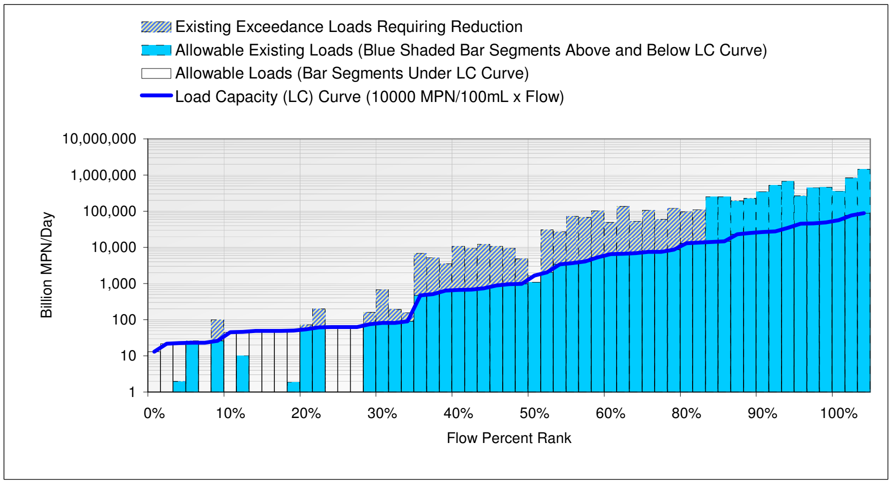
Table O-85. Subwatershed 1700 Fecal Coliform Load Duration Curve



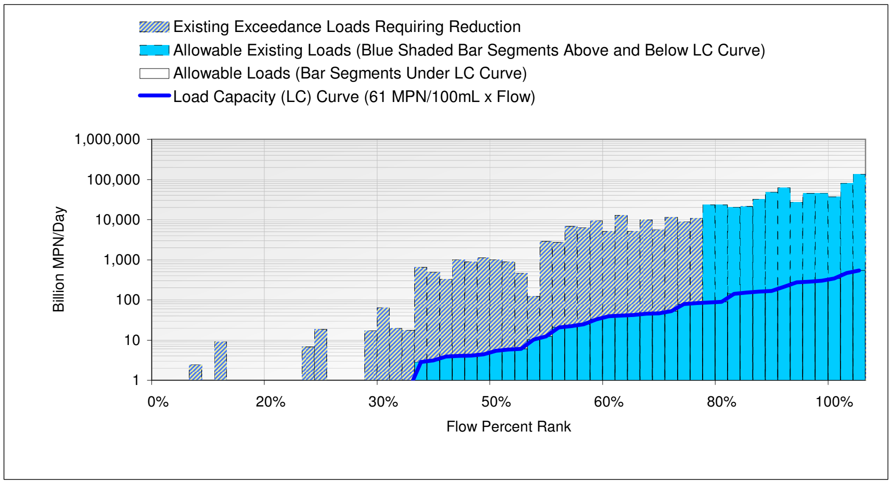
Subwatershed 1700 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	43	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	30	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**261,966**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	25,080	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	204,241	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**229,322**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**32,644**	**Billion MPN/Year**

Table O-86. Subwatershed 1700 Total Coliform Load Duration Curve



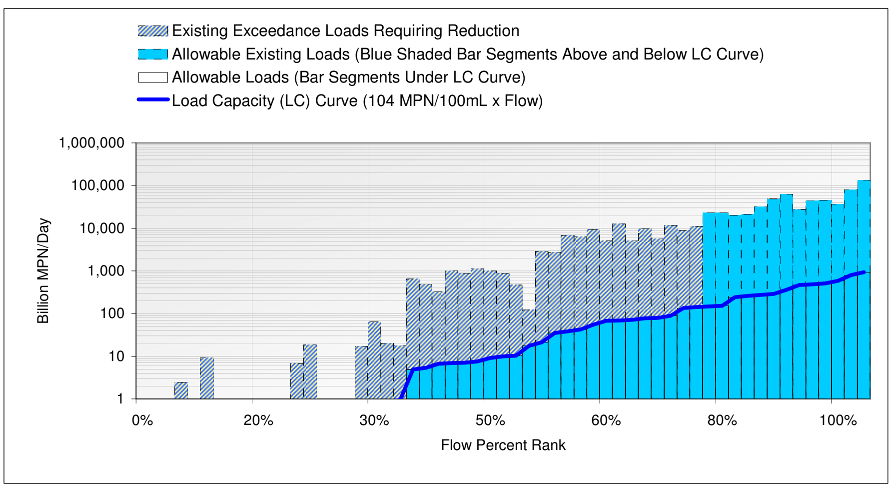
Subwatershed 1700 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	43	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	30	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**7,395,789**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	626,414	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	5,753,355	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**6,379,770**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**1,016,019**	**Billion MPN/Year**

Table O-87a. Subwatershed 1700 Enterococcus (61) Load Duration Curve



Subwatershed 1700 Enterococcus (61) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	46	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	33	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**708,256**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	3,825	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	599,936	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**603,761**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**104,495**	**Billion MPN/Year**

Table O-87b. Subwatershed 1700 Enterococcus (104) Load Duration Curve



Subwatershed 1700 Enterococcus (104) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	57	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	45	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	13	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	32	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**708,256**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	6,522	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	597,659	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**604,180**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**104,076**	**Billion MPN/Year**

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Load Duration Curves

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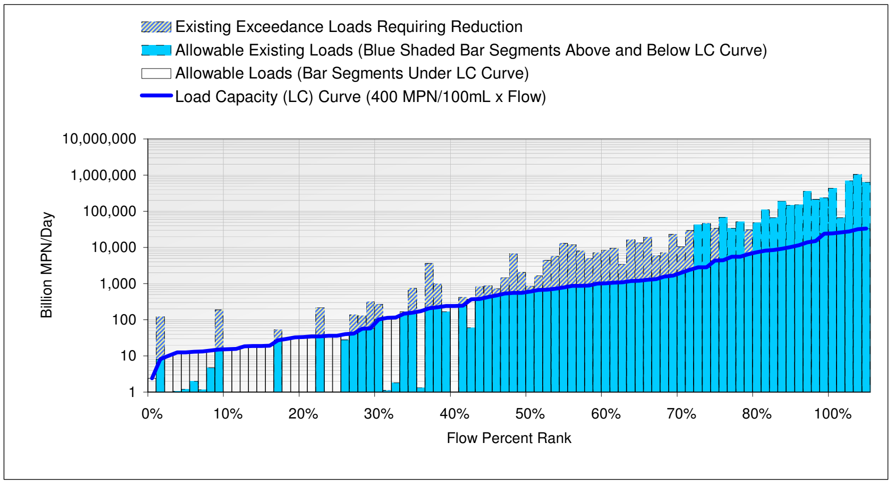
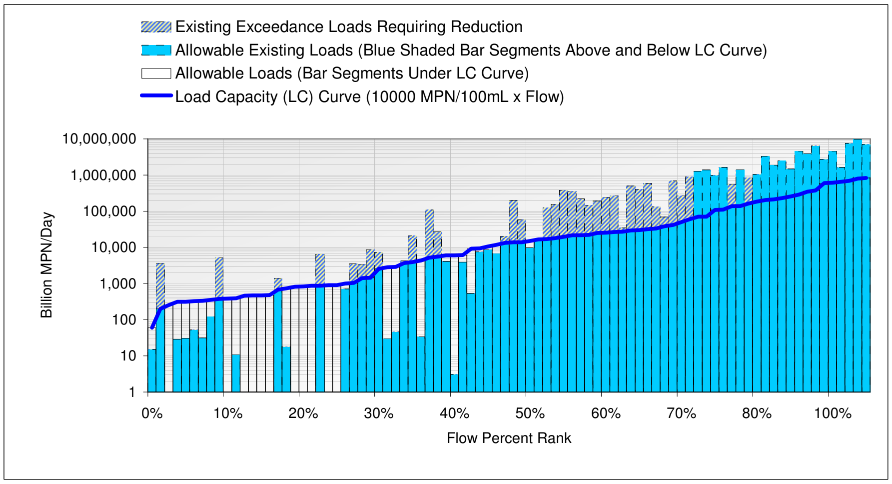
Table O-88. Subwatershed 1801 Fecal Coliform Load Duration Curve



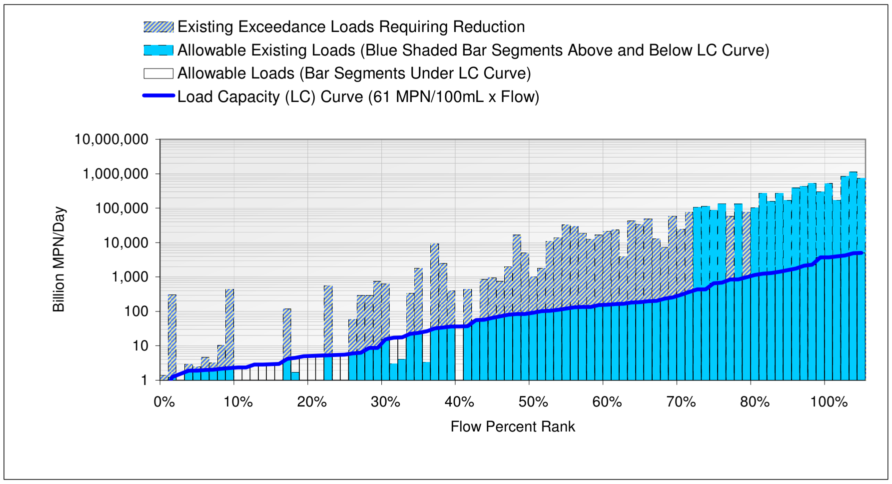
Subwatershed 1801 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	86	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	60	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	19	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	41	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**4,932,380**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	310,820	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	4,370,018	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**4,680,838**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**251,543**	**Billion MPN/Year**

Table O-89. Subwatershed 1801 Total Coliform Load Duration Curve



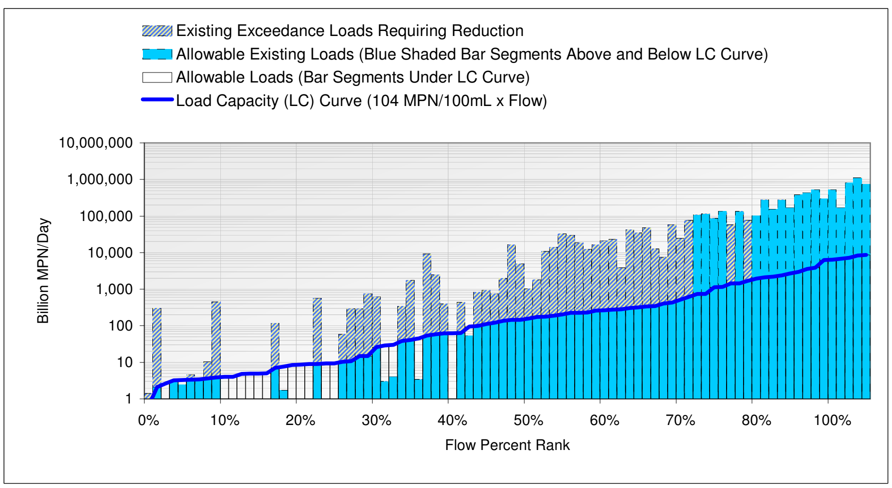
Subwatershed 1801 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	86	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	54	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	19	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	35	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**72,757,569**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	7,752,284	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	58,352,938	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**66,105,222**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**6,652,347**	**Billion MPN/Year**

Table O-90a. Subwatershed 1801 Enterococcus (61) Load Duration Curve



Subwatershed 1801 Enterococcus (61) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	86	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	68	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	19	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	49	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**7,255,759**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	47,479	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	6,543,487	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**6,590,966**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**664,794**	**Billion MPN/Year**

Table O-90b. Subwatershed 1801 Enterococcus (104) Load Duration Curve



Subwatershed 1801 Enterococcus (104) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	86	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	65	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	19	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	46	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**7,255,759**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	80,899	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	6,514,309	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**6,595,208**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**660,551**	**Billion MPN/Year**

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Load Duration Curves

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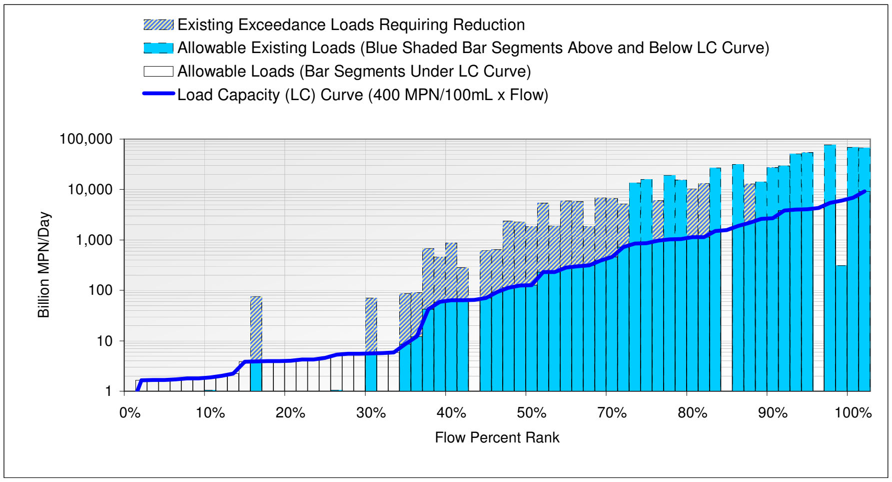
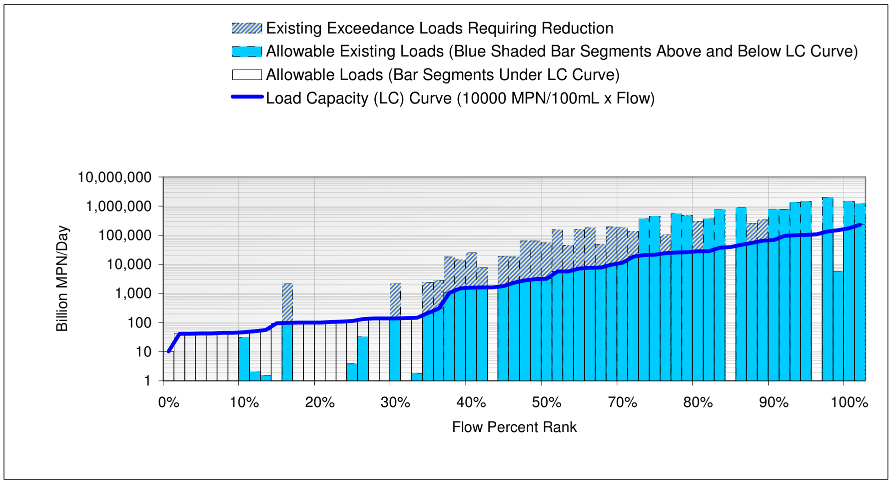
Table O-91. Subwatershed 1901 Fecal Coliform Load Duration Curve



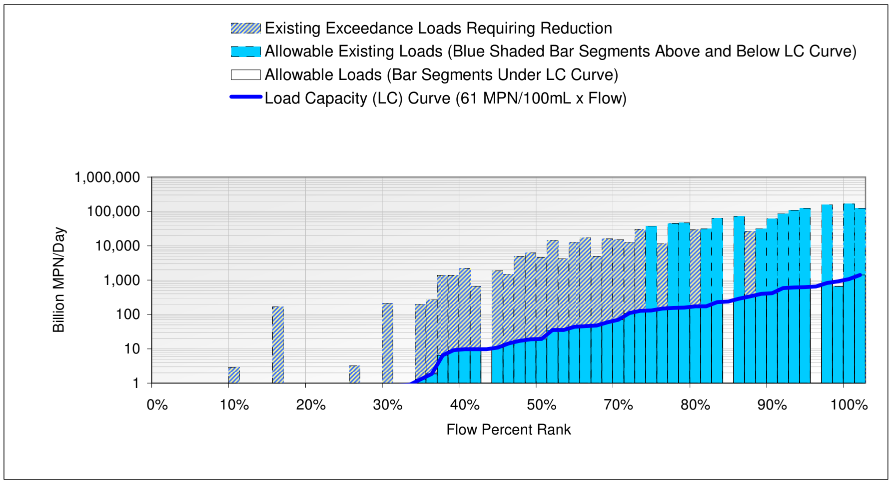
Subwatershed 1901 Fecal Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	65	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	39	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	14	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	25	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**603,863**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	55,516	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	464,924	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**520,440**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**83,423**	**Billion MPN/Year**

Table O-92. Subwatershed 1901 Total Coliform Load Duration Curve



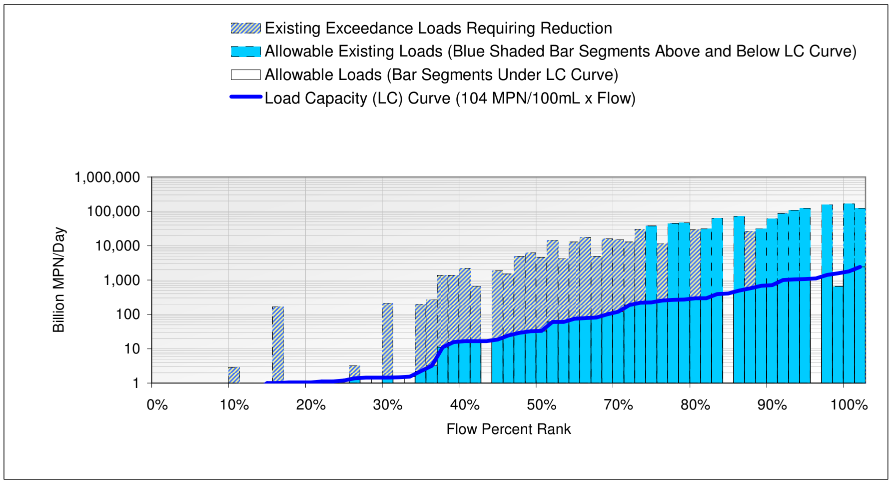
Subwatershed 1901 Total Coliform Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	65	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	39	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	14	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	25	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**15,390,608**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	1,386,037	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	11,861,589	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**13,247,626**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**2,142,982**	**Billion MPN/Year**

Table O-93a. Subwatershed 1901 Enterococcus (61) Load Duration Curve



Subwatershed 1901 Enterococcus (61) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	65	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	41	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	14	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	27	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**1,371,972**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	9,073	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,143,572	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**1,152,645**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**219,327**	**Billion MPN/Year**

Table O-93b. Subwatershed 1901 Enterococcus (104) Load Duration Curve



Subwatershed 1901 Enterococcus (104) Loading Summary	Value	Units
Total Wet Days During Critical Wet Year	65	Days
Total Wet Exceedence Days (Number of Bars with Segment Above LC Curve)	41	Days
Allowable Wet Weather Exceedance Frequency	22	Percentage
Allowable Wet Exceedance Days (Total Wet Days x Exceedance Frequency)	14	Days
Non-Allowable Wet Exceedance Days Requiring Load Reduction	27	Days
Total Existing Load for Existing Condition (Sum of All Shaded Bar Segments)	**1,371,972**	**Billion MPN/Year**
Allowable Load (Sum of Solid Outline Bar Segments Under LC Curve)	15,008	Billion MPN/Year
Allowable Exceedance Load (Sum of Blue Shaded Bar Segments Above LC Curve)	1,138,590	Billion MPN/Year
Total Allowable Load [TMDL] (Sum of Allowable Load and Allowable Exceedance Load)	**1,153,599**	**Billion MPN/Year**
Exceedance Load Requiring Reduction (Total Existing Load - Total Allowable Load)	**218,374**	**Billion MPN/Year**

Appendix P

~~Wet Weather Final~~
~~Bacteria Load Duration Curves~~
Recommended Components for Bacteria and Comprehensive Load Reduction Plans

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[Wet Weather Final Bacteria Load Duration Curves removed and replaced with the following:]

Introduction

Dischargers will be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the TMDLs in the receiving waters, acceptable to the San Diego Water Board, within 18 months after the effective date of these TMDLs.[1]

The Bacteria Load Reduction Plans or Comprehensive Load Reduction Plans are the dischargers' opportunity to propose methods for assessing compliance with the water quality based effluent limitations (WQBELs) that implement the TMDLs. The monitoring components included in the BLRPs or CLRPs should be formulated according to particular compliance assessment strategies. The monitoring components are expected to be consistent with, and support whichever compliance assessment methods are proposed. The San Diego Water Board will coordinate with the dischargers during the development of their proposed monitoring components and associated compliance assessment methods to ensure that the BLRPs or CLRPs will implement actions that can achieve the assigned wasteload allocations (WLAs) or load allocations (LAs), and meet the TMDLs in the receiving waters.

The BLRPs or CLRPs should be periodically re-evaluated and revised as additional data and information are collected. The BLRPs and CLRPs should be iterative and adaptive according to assessments and any special studies.

To provide guidance to the dischargers and San Diego Water Board in preparing BLRPs and CLRPs, components that should be considered for incorporation in the BLRPs and CLRPs are given in the following BLRP and CLRP outlines. The following outlines are components that are recommended at this time, but may be augmented or modified, as needed, to ensure that the dischargers can demonstrate that the actions implemented under the BLRPs or CLRPs will achieve the WLAs, LAs, and TMDLs.

[1] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.

Bacteria Load Reduction Plan Outline

Bacteria Load Reduction Plans (BLRPs) should include the following components:

I. Comprehensive Watershed Approach

A. Identify the Lead Watershed Contact for their BLRPs. The Lead Watershed Contact should serve as liaison between all other common watershed dischargers and the San Diego Water Board, where appropriate.

B. Describe a program for encouraging collaborative, watershed-based, land-use planning in their jurisdictional planning departments.

C. Develop and periodically update a map of the BLRP watershed, to facilitate planning, assessment, and collaborative decision-making. As appropriate, the map should include features such as receiving waters (including the Pacific Ocean); Clean Water Act section 303(d) impaired receiving waters; water quality projects; land uses; MS4s; major highways; jurisdictional boundaries; and inventoried commercial, industrial, and municipal sites.

D. Periodically assess the water quality of impaired water body in their BLRPs in order to identify all water quality problems within the impaired water body. This assessment should use applicable water quality data, reports, and analysis generated in accordance with the requirements of the applicable monitoring and reporting programs, as well as applicable information available from other public and private organizations.

E. Develop and implement a collective watershed BLRP strategy to meet the bacteria TMDL. The strategy should guide dischargers in developing a Bacteria Compliance Schedule (BCS) which includes BMP planning and scheduling as outlined below.

F. Collaborate to develop and implement the BLRPs. The BLRP should include a proposal for frequent regularly scheduled meetings among the dischargers in the impaired watershed.

G. Each BLRP and BCS should be reviewed periodically to identify needed modifications and improvements. The dischargers should develop and implement a plan and schedule, included in the BCS, to address the identified modifications and improvements. All updates to the BLRP should be documented in the BLRP, and submitted to the San Diego Water Board. Individual dischargers should also review and modify their jurisdictional ordinances and activities as necessary so that they are consistent with the requirements of the BLRP.

II. Bacteria Compliance Schedule - BMP Planning and Scheduling

The BCS should identify the BMPs/water quality projects that are planned for implementation and provide an implementation schedule for each BMP/water quality project.

The BCS should demonstrate how the BMPs/water quality projects will address all the bacteria TMDLs. The BCS, at a minimum, should include scheduling for the following:

A. Non-structural BMP phasing:

1. Initial Non-Structural BMP Analysis - Watershed data should be analyzed to identify effective non-structural BMPs for implementation. This should be completed and included in the BCS.

2. Scheduled Non-structural BMP Implementation - The above analysis should be used to identify BMPs that will be implemented and to develop an aggressive non-structural BMP implementation schedule. The BCS should include a schedule of the current BMP staffing for each impaired area, and provide a discussion on adjustments to staff scheduling to meet new non-structural BMP demands. Schedules should be realistic and justifiable.

3. Scheduled Periodic BMP Assessment and Optimizing Adjustments - As the nonstructural BMPs are being implemented, a scheduled in-depth assessment of the nonstructural BMPs' performance should follow. Non-structural BMPs that are found to be ineffective should be modified to incorporate optimizing adjustments to improve performance or be replaced by other effective non-structural BMPs. The results from this assessment should also be used to determine structural BMP selection and the schedule for structural BMP implementation. The BCS should include periodic schedule for in-depth non-structural BMP assessment and optimizing adjustments.

4. Scheduled Continuous Budget and Funding Efforts- Securing budget and funding for non-structural BMP staffing and equipment should be scheduled early and continue until the bacteria TMDLs are met. The BCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for non-structural BMP implementation.

B. Structural BMP phasing:

1. Scheduled Initial Structural BMP Analysis– Structural BMP analysis should utilize all available information, including the non-structural BMP assessment, to identify, locate, design and build structural BMPs, or a train of BMPs, to meet the these Bacteria TMDLs. The BCS should include a schedule for structural BMP analysis.

2. Scheduled BMP Construction - The BCS should include a projected general construction schedule with a realistic and justifiable timeline for BMP construction.

3. Scheduled Periodic BMP Assessment, Optimization Adjustments, and Maintenance - Assessment for structural BMPs should begin immediately upon initial BMP completion, followed by continuously scheduled BMP assessment, optimization adjustments, and maintenance, to both the individual structural BMPs and the

structural BMP program as a whole. The BCS should include a periodic schedule for in-depth structural BMP assessment.

4. Scheduled Continuous Budget and Funding Effort - Securing budget and funding for structural BMPs and additional maintenance staff should be scheduled early and continue until the bacteria TMDLs are met. The BCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for structural BMP implementation.

III. Reporting

Reports should be submitted periodically. Reports should assess and describe the effectiveness of implementing the Bacteria Load Reduction Plan. Effectiveness assessments should be based on a program effectiveness assessment framework, such as the one developed by the California Stormwater Quality Association (CASQA, no date). Using the CASQA framework as an example, the assessments should address the framework's outcome levels 1-5 on an annual basis, and outcome level 6 once every five years.[2] 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.

[2] Outcome level 1 assesses compliance with activity-based permit requirements. Outcome level 2 assesses changes in attitudes, knowledge, and awareness. Outcome level 3 assesses behavioral change and BMP implementation. Outcome level 4 assesses pollutant load reductions. Outcome level 5 assesses changes in urban runoff and discharge water quality. Outcome level 6 assesses changes in receiving water quality. See CASQA "An Introduction to Stormwater Program Effectiveness Assessment."

Comprehensive Load Reduction Plan Outline

Comprehensive Load Reduction Plans (CLRPs) should include the following components:

I. Comprehensive Watershed and Pollutant Approach

A. Identify the Lead Watershed Contact for their CLRPs. The Lead Watershed Contact should serve as liaison between all other common watershed dischargers and the San Diego Water Board, where appropriate.

B. Describe a program for encouraging collaborative, watershed-based, land-use planning in their jurisdictional planning departments.

C. Develop and periodically update a map of the CLRP watershed, to facilitate planning, assessment, and collaborative decision-making. As appropriate, the map should include features such as receiving waters (including the Pacific Ocean); Clean Water Act section 303(d) impaired receiving waters; water quality projects; land uses; MS4s; major highways; jurisdictional boundaries; and inventoried commercial, industrial, and municipal sites.

D. Periodically assess the water quality of impaired water body in their CLRPs in order to identify all water quality problems within the impaired water body. This assessment should use applicable water quality data, reports, and analysis generated in accordance with the requirements of the applicable NPDES MS4 monitoring and reporting programs, as well as applicable information available from other public and private organizations.

E. Identified water quality problems in the impaired water body to be addressed by the CLRP should include, in addition to bacteria, all CWA section 303(d) listings, persistent violations of water quality standards, toxicity, impacts to beneficial uses, water quality conditions for which water quality improvement projects are currently being implemented, and any other pertinent conditions. All impaired waters should be included. Impaired water bodies where bacteria is the only impairing pollutant are not eligible to submit a CLRP.

F. Develop and implement a collective watershed CLRP strategy to meet the bacteria TMDL and all other receiving water quality standards for all other pollutants being addressed in the CLRPs. The strategy should guide dischargers in developing a Comprehensive Compliance Schedule (CCS) which includes BMP planning and scheduling as outlined below.

G. Collaborate to develop and implement the CLRPs. The CLRP should include a proposal for frequent regularly scheduled meetings among the dischargers in the impaired watershed.

H. Each CLRP and CCS should be reviewed periodically to identify needed modifications and improvements. The dischargers should develop and implement a plan and schedule, included in the CCS, to address the identified modifications and improvements. All updates to the CLRP should be documented in the CLRP, and submitted to the San Diego Water Board. Individual dischargers should also review and modify their jurisdictional ordinances and activities as necessary so that they are consistent with the requirements of the CLRP.

II. Comprehensive Compliance Schedule - BMP Planning and Scheduling

The CCS should identify the BMPs/water quality projects that are planned for implementation and provide an implementation schedule for each BMP/water quality project. The CCS should demonstrate how the BMPs/water quality projects will address all water quality problems in the impaired water body and result in achievement of water quality standards. It should also demonstrate how comprehensive treatment of all the pollutants together justifies a longer compliance schedule for the bacteria TMDLs. The CCS, at a minimum, should include scheduling for the following:

A. Non-structural BMP phasing:

1. Initial Non-Structural BMP Analysis - After identifying and listing all the 303(d) listed impairing pollutants and other water quality problems in an impaired water body, the water body and data should be analyzed to identify effective non-structural BMPs for implementation. This should be completed and included in the CCS.

2. Scheduled Non-structural BMP Implementation - The above analysis should be used to identify BMPs that will be implemented and to develop an aggressive non-structural BMP implementation schedule. The CCS should include a schedule of the current BMP staffing for each impaired area, and provide a discussion on adjustments to staff scheduling to meet new non-structural BMP demands. Schedules should be realistic and justifiable.

3. Scheduled Periodic BMP Assessment and Optimizing Adjustments - As the nonstructural BMPs are being implemented, a scheduled in-depth assessment of the nonstructural BMPs' performance should follow. Non-structural BMPs that are found to be ineffective should be modified to incorporate optimizing adjustments to improve performance or be replaced by other effective non-structural BMPs. The results from this assessment should also be used to determine structural BMP selection and the schedule for structural BMP implementation. The CCS should include an annual schedule for in-depth non-structural BMP assessment and optimizing adjustments.

4. Scheduled Continuous Budget and Funding Efforts- Securing budget and funding for non-structural BMP staffing and equipment should be scheduled early and continue until the bacteria TMDLs are met, water quality objectives for other impairing pollutants are achieved, and the goals and objectives of other water quality

improvement projects are met.[3] The CCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for non-structural BMP implementation.

B. Structural BMP phasing:

1. Scheduled Initial Structural BMP Analysis– Structural BMP analysis should utilize all available information, including the non-structural BMP assessment, to identify, locate, design and build structural BMPs, or a train of BMPs, that restore water quality for all the 303(d) listed impairing pollutants and other water quality problems in an impaired water body. The CCS should include a schedule for structural BMP analysis.

2. Scheduled BMP Construction - The CCS should include a projected general construction schedule with a realistic and justifiable timeline for BMP construction.

3. Scheduled Periodic BMP Assessment, Optimization Adjustments, and Maintenance - Assessment for structural BMPs should begin immediately upon initial BMP completion, followed by continuously scheduled BMP assessment, optimization adjustments, and maintenance, to both the individual structural BMPs and the structural BMP program as a whole. The CCS should include periodic schedule for in-depth structural BMP assessment.

4. Scheduled Continuous Budget and Funding Effort - Securing budget and funding for structural BMPs and additional maintenance staff should be scheduled early and continue until the bacteria TMDLs are met, water quality objectives for other impairing pollutants are achieved, and the goals and objectives of other water quality improvement projects are met.[4] The CCS should include a schedule for staff time, including position and job description, authorized for securing budget and funding for structural BMP implementation.

III. Economic Justifications

The dischargers should show how the estimated cost of the structural BMPs, and the opportunity to tailor BMP implementation to include all the 303(d) listed impaired water bodies, and/or other water quality improvement projects in an affected area, will require more time to fund and schedule. Cost estimates for the construction of potential structural BMPs, while general at this stage in planning, should be realistic and justifiable.

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[3] In this case, achieving the "water quality objectives for other impairing pollutants" means that Caltrans must meet the Receiving Water Limitations requirements of their NPDES Stormwater WDRs. These Receiving Water Limitations include an iterative process requiring implementation of increasingly stringent BMPs that will result in achievement of water quality objectives. Caltrans NPDES Stormwater WDRs also contain monitoring requirements, which can be adapted to monitor, document, and assess BMP implementation. All proposals for CLRPs must include achievement of water quality objectives in receiving waters for all impairing pollutants, by meeting NPDES Receiving Water Limitations as verified through NPDES monitoring requirements, within the CCS timeframe.

[4] Please see footnote immediately above.

IV. Reporting

Reports should be submitted periodically. Reports should assess and describe the effectiveness of implementing the Comprehensive Load Reduction Plan. Effectiveness assessments should be based on a program effectiveness assessment framework, such as the one developed by the California Stormwater Quality Association (CASQA, no date). Using the CASQA framework as an example, the assessments should address the framework's outcome levels 1-5 on an annual basis, and outcome level 6 once every five years.[5] 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.

[5] Outcome level 1 assesses compliance with activity-based permit requirements. Outcome level 2 assesses changes in attitudes, knowledge, and awareness. Outcome level 3 assesses behavioral change and BMP implementation. Outcome level 4 assesses pollutant load reductions. Outcome level 5 assesses changes in urban runoff and discharge water quality. Outcome level 6 assesses changes in receiving water quality. See CASQA "An Introduction to Stormwater Program Effectiveness Assessment."

Appendix Q

Small Municipal Separate Storm Sewer Systems in the Revised Bacteria TMDLs Project I Watersheds

Agency	Facility	Address	City, State, Zip
California Community Colleges	Cuyamaca College	900 Rancho San Diego Parkway	El Cajon, CA 92019-4304
California Community Colleges	Grossmont College	8800 Grossmont College Drive	El Cajon, CA 92020-1799
California Community Colleges	MiraCosta College	1 Barnard Drive	Oceanside, CA 92056-3899
California Community Colleges	Palomar College	1140 West Mission Road	San Marcos, CA 92069-1487
California Community Colleges	Saddleback College	28000 Marguerite Parkway	Mission Viejo, CA 92692-3699
California State University	California State University San Marcos	333 S. Twin Oaks Valley Rd.	San Marcos, CA 92096
California State University	San Diego State University	5500 Campanile Drive	San Diego, CA 92182
Defense, Department of	Miramar Marine Corps Air Station	PO Box 452013	San Diego, CA 92145
Defense, Department of	Mission Gorge Recreational Facility	33000 Nixie Way Bldg 50, Suite 326	San Diego, CA 92147-5110
Defense, Department of	Navy Public Works Center, Taylor Street Facility	33000 Nixie Way Bldg 50, Suite 326	San Diego, CA 92147-5110
District Agricultural Association	San Diego County Fairgrounds	2260 Jimmy Durante Blvd	Del Mar, CA
San Diego Community Colleges	Mesa College	7250 Mesa College Drive Room J108	San Diego, CA 92111
School District, Alpine Union Elementary		1323 Administration Way	Alpine, CA 91901-2104
School District, Bonsall Union Elementary		31505 Old River Road	Bonsall, CA 92003-5112
School District, Cajon Valley Union Elementary		189 Roanoke Road	El Cajon, CA 92022-1007
School District, Capistrano Unified		32972 Calle Perfecto	San Juan Capistrano, CA 92675-4706
School District, Dehesa Elementary		4612 Dehesa Road	El Cajon, CA 92019-2922
School District, Del Mar Union Elementary		225 Ninth St.	Del Mar, CA 92014-2716
School District, Escondido Union Elementary		1330 E. Grand Ave.	Escondido, CA 92027-3099
School District, Escondido Union High		302 N. Midway Dr.	Escondido, CA 92027-2741
School District, Grossmont Union High		1100 Murray Dr.	La Mesa, CA 91944-1043
School District, Julian Union Elementary		1704 Hwy. 78	Julian, CA 92036-0337
School District, Julian Union High		1656 Hwy. 78	Julian, CA 92036-0417
School District, La Mesa-Spring Valley		4750 Date Ave.	La Mesa, CA 91941-5214
School District, Laguna Beach Unified		550 Blumont St.	Laguna Beach, CA 92651-2356
School District, Lakeside		12335 Woodside Ave.	Lakeside, CA 92040-

Agency	Facility	Address	City, State, Zip
Union Elementary			0578
School District, Lemon Grove Elementary		8025 Lincoln St.	Lemon Grove, CA 91945-2515
School District, Oceanside Unified		2111 Mission Ave.	Oceanside, CA 92054-2326
School District, Poway Unified		13626 Twin Peaks Road	Poway, CA 92064-3034
School District, Ramona City Unified		720 Ninth St.	Ramona, CA 92065-2348
School District, Saddleback Valley Unified		25631 Peter A Hartman Way	Mission Viejo, CA 92691-
School District, San Diego City Unified		4100 Normal St.	San Diego, CA 92103-2653
School District, San Marcos Unified		1 Civic Center Dr., Suite 300	San Marcos, CA 92069-
School District, San Pasqual Union Elementary		16666 San Pasqual Valley Road	Escondido, CA 92027-7001
School District, Santee Elementary		9625 Cuyamaca St.	Santee, CA 92071-2674
School District, Spencer Valley Elementary		4414 Hwys. 78 and 79	Santa Ysabel, CA 92070-0159
School District, Warner Unified		30951 Hwy. 79	Warner Springs, CA 92086-0008
University of California	University of California, San Diego	9500 Gilman Dr.	La Jolla, CA 92093
Veteran Affairs	VA San Diego Healthcare System	3350 La Jolla Village Drive	San Diego, CA 92161

Appendix R

Environmental Analysis and Checklist

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APPENDIX R: ENVIRONMENTAL ANALYSIS AND CHECKLIST

R.1 California Environmental Quality Act Requirements

The California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) must comply with the California Environmental Quality Act (CEQA) when amending the Water Quality Control Plan for the San Diego Basin (Basin Plan) as proposed in this project to adopt total maximum daily loads (TMDLs) for indicator bacteria in beaches and creeks 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 adoption of a Basin Plan amendment is an activity subject to CEQA requirements because Basin Plan amendments constitute rules or regulations requiring the installation of pollution control equipment, establishing a performance standard, or establishing a treatment requirement.[1] TMDL Basin Plan amendments normally contain a quantifiable numeric target that interprets the applicable water quality objective. TMDLs also include wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background. The quantifiable target together with the allocations may be considered a performance standard.[2] Sections 1.1 and 1.2 below describe in detail the statutory requirements and scope of this environmental analysis required by the CEQA for Basin Plan amendments.

R.1.1 Exemption from Requirement to Prepare Standard 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 State Water Resources Control Board's (SWRCB) and the Regional Water Quality Control Board's Basin Plan amendment process is a certified regulatory program and is therefore exempt from the CEQA's requirements to prepare such documents. [3]

The SWRCB's CEQA implementation regulations[4] 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. For this project, these documents are the Technical Report entitled *Total Maximum Daily Loads for Indicator Bacteria Project I – Beaches and Creeks in the San Diego Region* (Technical Report), an initial draft of the Basin

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[1] 14 CCR section 15187 (a).
[2] 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)].
[3] 14 CCR section 15251(g) and Public Resources Code section 21080.5.
[4] 23 CCR section 3720 et seq. "Implementation of the Environmental Quality Act of 1970."

Plan amendment (Appendix B) and an environmental checklist (section 4 below). These components fulfill the requirements of the CEQA for preparation of environmental documents for this Basin Plan amendment.[5]

R.1.2 Scope of Environmental Analysis

The CEQA has specific provisions that establish the scope of the environmental analysis required for the adoption of this TMDL Basin Plan amendment. The CEQA limits 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[6] 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. This amendment is described in section 2 of this appendix.

2. Reasonable alternatives to the proposed activity (discussed in section 8).

3. Mitigation measures to minimize any significant adverse environmental impacts of the proposed activity (discussed in section 5).

Additionally, the CEQA[7] and CEQA Guidelines[8] require the following components, some of which are repetitive from the list above:

1. An analysis of the reasonably foreseeable environmental impacts of the methods of compliance. These methods may be employed to comply with the TMDL Basin Plan amendment. Reasonably foreseeable methods of compliance are described in section 3. Sections 4 and 5 identify the environmental impacts associated with the methods of compliance.

2. An analysis of the reasonably foreseeable feasible mitigation measures relating to those impacts. This discussion is also in section 5.

3. An analysis of reasonably foreseeable alternative means of compliance with the rule or regulation, which would avoid or eliminate the identified impacts. This discussion is in section 5.1.

Additionally, the CEQA Guidelines require the environmental analysis take into account a reasonable range of:[9]

1. Environmental factors (section 5).

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[5] 23 CCR section 3777
[6] Ibid.
[7] Public Resources Code section 21159 (a)
[8] 14 CCR section 15187(c)
[9] 14 CCR section 15187(d),Public Resources Code section 21159 (c)

2. Economic factors (section 7).
3. Technical factors (section 6).
4. Population (section 6).
5. Geographic areas (section 6).
6. Specific sites. (section 6)

A "reasonable range" does not require an examination of every site, but a reasonably representative sample of them. The statute specifically states that the agency shall not conduct a "project level analysis."[10] Rather, a project level analysis must be performed by the dischargers that are required to implement the TMDLs.[11] Notably, the San Diego Water Board is prohibited from specifying the manner of compliance with its regulations,[12] and accordingly, the actual environmental impacts will necessarily depend upon the compliance strategy selected by the dischargers. In preparing this environmental analysis, the San Diego Water Board has considered the pertinent requirements of state law,[13] and intends this analysis to serve as a tier 1 environmental review.

Any potential environmental impacts associated with the TMDL depend upon the specific compliance projects selected by the dischargers, most of whom are public agencies subject to their own CEQA obligations. If not properly implemented or mitigated at the project level, there could be adverse environmental impacts from implementing these TMDLs. The substitute CEQA documents identify broad mitigation approaches that could be considered at the project level. Consistent with the CEQA, the substitute documents do not engage in speculation or conjecture, but rather consider the reasonably foreseeable environmental impacts of the reasonably foreseeable methods of compliance, the reasonably foreseeable mitigation measures, and the reasonably foreseeable alternative means of compliance, which would avoid, eliminate, or reduce the identified impacts.

[10] Public Resources Code section 21159(d)
[11] Public Resources Code section 21159.2
[12] Water Code section 13360
[13] Public Resources Code section 21159 and 14 CCR section 15187

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R.2 Description of the Proposed Activity

The Basin Plan designates beneficial uses of waterbodies, establishes water quality objectives for the protection of these beneficial uses, and outlines a plan of implementation for maintaining and enhancing water quality. The proposed amendment would incorporate into the Basin Plan TMDLs for indicator bacteria in the San Diego Region.

Three beneficial uses exist in San Diego Region that are sensitive to, and subject to impairment by elevated concentrations of bacteria in the water column. Water contact (REC-1) and shellfish harvesting (SHELL) require water quality suitable for the protection of recreational uses in or near water and aquatic habitat suitable for shellfish harvesting. The water quality in the beaches and creeks of the San Diego Region have exceeded the numeric water quality objectives (WQOs) for total, fecal, and/or enterococci bacteria. Other beaches were consistently posted with health advisories and/or closed to the public. These exceedances and postings threaten and impair water contact (REC-1) and shellfish harvesting (SHELL) beneficial uses.

The San Diego Water Board's goal in adopting the TMDL is to eliminate the water quality problems caused by bacteria in its beaches and creek. Although WQOs for REC-1, 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. The adoption of a TMDL is not discretionary; rather, it is compelled by section 303(d) of the federal Clean Water Act.

The TMDLs for indicator bacteria, and their derivation are discussed in the Technical Report, section 9. For point sources, the TMDLs will be implemented primarily through waste discharge requirements (WDRs) for urban runoff that implement federal National Pollutant Discharge Elimination System (NPDES) regulations. The primary dischargers are municipalities located in the watersheds, small municipal storm separate sewer systems (MS4s), and the California Department of Transportation (Caltrans). Dischargers will receive wasteload allocations that can be met over a phased compliance schedule that should result in attainment of water quality standards.

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, manure composting and soil amendment operations, and septic systems. The Implementation Plan and compliance schedule are discussed in the Technical Report, section 11.

R.2.1 Surrounding Land Uses and Setting

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) and ~~seven~~ eight watersheds in San Diego County. Most of the waterways flow directly to the Pacific Ocean, except Chollas and Tecelote Creeks, which flows to San Diego Bay and Mission Bay respectively. 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 occupied by open space or recreational land use, followed by low-density residential and agriculture/livestock land uses. Other major land uses are commercial/institutional, high-density residential, industrial/transportation, military, transitional, and water. More information is provided in section 3 of the Technical Report.

R.3 Analysis of Reasonably Foreseeable Methods of Compliance

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/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, picking up litter, 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.[14]

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.[15] The U.S. Environmental Protection Agency (USEPA) reports that the new vacuum assisted dry sweepers can achieve 50 to 88 percent overall reductions in the annual sediment loading for a

[14] USEPA, 1999, National Menu of Best Management Practices for Stormwater-Phase II, *http://cfpub.epa.gov/npdes/stormwater/menuofbmps*
[15] ibid

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.[16]

Enforcement of Local Ordinances: Develop and/or enforce municipal ordinances prohibiting the discard of litter, pet cleanup negligence, or lawn over-watering. Enforcement of such ordinances will decrease the likelihood of bacteria from controllable sources reaching storm drains.

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.

[16] ibid

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 /Treatment 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.

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R.4 Environmental Checklist

	ENVIRONMENTAL CHECKLIST	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant	No Impact
1.	**Earth. Will the proposal result in:**				
	a. Unstable earth conditions or in changes in geologic substructures?		X		
	b. Disruptions, displacements, compaction or overcoming of the soil?			X	
	c. Change in topography or ground surface relief features?		X		
	d. The destruction, covering or modification of any unique geologic or physical features?		X		
	e. Any increase in wind or water erosion of soils, either on or off the site?			X	
	f. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake?			X	
	g. Exposure of people or property to geologic hazards, such as earthquakes, landslides, mudslides, ground failure, or similar hazards?		X		
2.	**Air. Will the proposal result in:**				
	a. Substantial air emissions or deterioration of ambient air quality?		X		
	b. The creation of objectionable odors?		X		
	c. Alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally?				X

	ENVIRONMENTAL CHECKLIST	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant	No Impact
3.	**Water. Will the proposal result in:**				
	a. Changes in currents, or the course of direction or water movements, in either marine or fresh waters?			X	
	b. Changes in absorption rates, drainage patterns, or the rate and amount of surface water runoff?			X	
	c. Alterations to the course of flow of flood waters?		X		
	d. Change in the amount of surface water in any water body?		X		
	e. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen, or turbidity?		X		
	f. Alteration of the direction or rate of flow of ground waters?		X		
	g. Change in the quantity or quality of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?		X		
	h. Substantial reduction in the amount of water otherwise available for public water supplies?		X		
	i. Exposure of people or property to water related hazards such as flooding or tidal waves?		X		
4.	**Plant Life. Will the proposal result in:**				
	a. Change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, microflora and aquatic plants)?		X		
	b. Reduction of the numbers of any unique, rare or endangered species of plants?		X		

	ENVIRONMENTAL CHECKLIST	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant	No Impact
	c. Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?		X		
	d. Reduction in acreage of any agricultural crop?		X		
5.	**Animal Life. Will the proposal result in:**				
	a. Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, insects or microfauna)?		X		
	b. Reduction of the numbers of any unique, rare or endangered species of animals?		X		
	c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?		X		
	d. Deterioration to existing fish or wildlife habitat?		X		
6.	**Noise. Will the proposal result in:**				
	a. Increases in existing noise levels?		X		
	b. Exposure of people to severe noise levels?			X	
7.	**Light and Glare. Will the proposal:**				
	a. Produce new light or glare?		X		
8.	**Land Use. Will the proposal result in:**				
	a. Substantial alteration of the present or planned land use of an area?			X	
9.	**Natural Resources. Will the proposal result in:**				
	a. Increase in the rate of use of any natural resources?				X
	b. Substantial depletion of any nonrenewable natural resource?				X

	ENVIRONMENTAL CHECKLIST	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant	No Impact
10.	**Risk of Upset. Will the proposal involve:**				
	a. A risk of an explosion or the release of hazardous substances (including, but not limited to: oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?			X	
11.	**Population. Will the proposal:**				
	a. Alter the location, distribution, density, or growth rate of the human population of an area?			X	
12.	**Housing. Will the proposal:**				
	a. Affect existing housing, or create a demand for additional housing?			X	
13.	**Transportation/Circulation. Will the proposal result in:**				
	a. Generation of substantial additional vehicular movement?			X	
	b. Effects on existing parking facilities, or demand for new parking?		X		
	c. Substantial impact upon existing transportation systems?			X	
	d. Alterations to present patterns of circulation or movement of people and/or goods?			X	
	e. Alterations to waterborne, rail or air traffic?			X	
	f. Increase in traffic hazards to motor vehicles, bicyclists or pedestrians?			X	
14.	**Public Service. Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas:**				
	a. Fire protection?			X	
	b. Police protection?			X	

	ENVIRONMENTAL CHECKLIST	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant	No Impact
	c. Schools?				X
	d. Parks or other recreational facilities?			X	
	e. Maintenance of public facilities, including roads?		X		
	f. Other governmental services?		X		
15.	**Energy. Will the proposal result in:**				
	a. Use of substantial amounts of fuel or energy?				X
	b. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?				X
16.	**Utilities and Service Systems. Will the proposal result in a need for new systems, or substantial alterations to the following utilities:**				
	a. Power or natural gas?			X	
	b. Communications systems?				X
	c. Water?				X
	d. Sewer or septic tanks?			X	
	e. Storm water drainage?			X	
	f. Solid waste and disposal?		X		
17.	**Human Health. Will the proposal result in:**				
	a. Creation of, and exposure of people to, any health hazard or potential health hazard (excluding mental health)?		X		
18.	**Aesthetics. Will the proposal result in:**				
	a. The obstruction of any scenic vista or view open to the public?		X		

	ENVIRONMENTAL CHECKLIST	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant	No Impact
	b. The creation of an aesthetically offensive site open to public view?		X		
19.	**Recreation. Will the proposal result in:**				
	a. Impact upon the quality or quantity of existing recreational opportunities?		X		
20.	**Archeological/Historical. Will the proposal:**				
	a. Result in the alteration of a significant archeological or historical site, structure, object or building?		X		
21.	**Mandatory Findings of Significance**				
	Potential to degrade: Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		X		
	Short-term: Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time, while long-term impacts will endure well into the future.)				X
	Cumulative: Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)		X		
	Substantial adverse: Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?		X		

R.5 Discussion of Possible Environmental Impacts of Reasonably Foreseeable Compliance Methods and Mitigation Measures

As stated previously, the environmental analysis must include an analysis of the reasonably foreseeable environmental impacts of the methods of compliance and the reasonably foreseeable feasible mitigation measures relating to those impacts. This section, consisting of answers to the questions in the checklist, discusses compliance methods and mitigation measures as they pertain to the checklist.

In formulating these answers, the impacts of implementing the non-structural and structural BMPs/MMs listed in section 3 in the various watersheds were evaluated. At this time, the exact type, size, and location of BMPs that might be implemented to comply with the TMDLs is unknown. This analysis considers a range of non-structural and structural BMPs that might be used, but is by no means an exhaustive list of available BMPs. When BMPs are selected for implementation, a project-level and site-specific CEQA analysis must be performed by the responsible agency.

Potential reasonably foreseeable impacts were evaluated 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. Additionally, mandatory findings of significance regarding short-term, long-term, cumulative and substantial impacts were evaluated. Based on this review, we concluded that the potentially significant impacts can be mitigated to less than significant levels. The evaluation considered whether the construction or implementation of the BMPs would cause a substantial, adverse change in any of the physical conditions within the area affected by the BMP. In addition, the evaluation considered environmental effects in proportion to their severity and probability of occurrence.

A significant effect on the environment is defined in regulation as "*a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. A social or economic change by itself shall not be considered a significant effect on the environment. A social or economic change related to a physical change may be considered in determining whether the physical change is significant*."[17]

A significant effect on the environment is defined in statute as "*a substantial, or potentially substantial, adverse change in the environment*"[18] where "*Environment*" is defined as "*the physical conditions which exist within the area which will be affected by a proposed project, including air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance*."[19]

In this analysis, the level of significance was based on baseline conditions (i.e., current conditions). Short-term impacts associated with the construction of structural BMPs were considered less than significant because the impacts due to construction activities are temporary

[17] 14 CCR section 15382
[18] Public Resources Code section 21068
[19] Public Resources Code section 21060.5

and similar to typical capital improvement projects and maintenance activities currently performed by municipalities. The long-term impacts associated with structural BMPs were considered potentially significant, but only if they could have an adverse, or potentially adverse, impact on the environment.

Social or economic changes related to a physical change of the environment were also considered in determining whether there would be a significant effect on the environment. However, adverse social and economic impacts alone are not significant effects on the environment.

1. Earth. a. **Will the proposal result in unstable earth conditions or in changes in geologic substructure?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs would not create unstable earth conditions or changes in geologic substructure because none of these BMPs or MMs include earth moving activities.

For structural BMPs, infiltration of collected stormwater could potentially result in unstable earth conditions if loose or compressible soils are present, or if such BMPs were to be located where infiltrated stormwater flowing as groundwater could destabilize existing slopes. These impacts can be avoided by siting infiltration type BMPs away from areas with loose or compressible soils, and away from slopes that could become destabilized by an increase in groundwater flow. Infiltration type BMPs can also be built on a small enough scale to avoid these types of impacts.

If dischargers install facilities such as detention basins or waste treatment lagoons on a scale that could result in unstable earth conditions or in changes in geologic substructures, potential impacts could be avoided through proper geotechnical investigations, siting, design, and ground and groundwater level monitoring to ensure that structural BMPs are not employed in areas subject to unstable soil conditions.

1. Earth. b. **Will the proposal result in disruptions, displacements, compaction or overcoming of the soil?**

Answer**: Less than significant**

Discussion: Non-structural BMPs would not result in disruptions, displacements, compaction or overcoming of the soil because none of these BMPs include earth moving activities.

Depending on the structural BMPs selected in urbanized areas, the proposal may result in minor surface soil excavation or grading during construction of structural BMPs resulting in increased disturbance of the soil. However, much of the urbanized areas have already undergone soil compaction and hardscaping. Standard construction techniques, including but not limited to, shoring, piling and soil stabilization can mitigate any potential short-term impacts. In addition, structural BMPs can be designed and sited in areas where the risk of new soil disruption is minimal. Soil disruptions, displacements, compaction, or overcoming during construction activities would be similar to typical temporary capital improvement construction and maintenance activities currently performed by municipalities, and no long-term impacts to the soil are expected.

In non-urbanized areas, structural BMPs like fences or waste treatment lagoons have the potential to disturb soil during construction. However, the use of standard construction techniques discussed above, along with proper siting, will eliminate any erosion potential at the site.

1. Earth. c. **Will the proposal result in change in topography or ground surface relief features?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs would not affect topography or ground relief features because none of the non-structural BMPs would result in earth moving activities.

Implementation of structural BMPs could result in some change in topography or ground surface relief features; however, most of the potential BMPs are so small that changes to topography will not be noticeable. If the dischargers implement BMPs on a scale large enough to change topography or ground relief features, then potential adverse impacts could be avoided or mitigated through siting such topographic alterations in geologically stable areas, or by installing or designing structural BMPs with the least amount of impact to the topography.

1. Earth d. **Will the proposal result in the destruction, covering or modification of any unique geologic or physical features?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs would not cause the destruction, covering or modification of any unique geologic or physical features because none of these BMPs would result in earth moving activities.

Constructing structural BMPs in areas where doing so would result in the destruction, covering or modification of a unique geologic or physical features is not a reasonably foreseeable alternative that dischargers would choose. Furthermore, no impact is expected because foreseeable methods of compliance, including implementation of structural BMPs to control bacteria, would not be of the size or scale to result in the destruction, covering or modification of any unique geologic or physical features. In the unlikely event that dischargers might install facilities on a scale that could result in the destruction, covering or modification of any unique geologic or physical features, potential impacts could be mitigated by mapping these features to avoid siting facilities in these areas.

1. Earth. e. **Will the proposal result in any increase in wind or water erosion of soils, either on or off the site?**

   Answer**: Less than significant**

Discussion: Non-structural BMPs would not result in increase in wind or water erosion of soils, either on or off site because none of the non-structural BMPs would result in increased stormwater discharge, or in exposing soils to erosion by wind and water.

Depending on the structural BMPs selected, the proposal may result in minor soil excavation during construction of structural BMPs. However, construction related erosion impacts will cease with the cessation of construction. Wind or water erosion of soils may occur as a potential short-term impact. In urbanized areas, on-site soil erosion during construction activities will be similar to typical temporary capital improvement projects and maintenance activities currently performed by the municipalities. Typical established BMPs should be used during implementation to minimize offsite sediment runoff or deposition. Construction sites are required to retain sediment on site, both under general construction stormwater WDRs and through the construction program of the applicable MS4 WDRs; both of which are already designed to minimize or eliminate erosion impacts on receiving water. Over the long term, off-site erosion of canyons and natural channels could potentially be reduced if the structural BMPs divert stormwater from entering the canyons and channels, or reduce the runoff flow velocity, which may be considered a beneficial impact.

1. Earth. f. **Will the proposal result in changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake?**

   Answer**: Less than significant**

Discussion: Non-structural BMPs would not result in erosion of beach sands, or increases in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake; however, non-structural BMPs, such as increased street sweeping, may reduce siltation and sediment deposition in canyons and natural channels. Reduction in siltation and sediment deposition in the creeks is beneficial as bacteria and pathogens may adsorb to fine sediments.

Deposition of significant volumes of sediment to beaches occurs mostly during wet weather flows. Therefore, wet weather diversion and treatment BMPs that remove the stream's sediment load could impact deposition of sand on beaches. End of stream detention basins that capture sediment, resulting in possible changes in deposition or erosion, can be mitigated through sand replacement and importation.

1. Earth. g. **Will the proposal result in exposure of people or property to geologic hazards, such as earthquakes, landslides, mudslides, ground failure, or similar hazards?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs would not result in exposure of people or property to geologic hazards because none of these BMPs would result in earth moving activities.

For structural BMPs, infiltration of collected stormwater could possibly result in ground failure if loose or compressible soils are present, or if such BMPs were to be located where introduced groundwater movements could destabilize existing slopes. This may result in landslides, mudslides, ground failure, or similar hazards. However, complying with these TMDLs using structural BMPs in areas where doing so, or of a size or scale that would result in exposure of people or property to such geologic hazards is unlikely when other alternatives exist. In the unlikely event that dischargers might install facilities on a scale that could result in exposure of people or property to geologic hazards, a geotechnical investigation should be prepared at the project level to ensure that structural BMPs are not employed in areas subject to potential geologic hazards.

2. Air. a. **Will the proposal result in substantial air emissions or deterioration of ambient air quality?**

   Answer**: Less than significant with mitigation**

Discussion: Short term increases in traffic during the construction and installation of structural BMPs and long-term increases in traffic caused by non-structural BMPs and maintenance of structural BMPs are potential sources of air emissions that may adversely affect ambient air quality. Several mitigation measures are available to reduce potential impacts to ambient air quality due to increased traffic during short-term construction and long-term maintenance activities. Mitigation measures could include, but are not limited to, the following: 1) use of construction, maintenance, and street sweeper vehicles with lower-emission engines, 2) use of soot reduction traps or diesel particulate filters, 3) use of emulsified diesel fuel, 4) use of vacuum-assisted street sweepers to eliminate potential re-suspension of sediments during sweeping activity, 5) the design of structural devices to minimize the frequency of maintenance trips, and/or 6) proper maintanance of vehicles so they operate cleanly and efficiently.

The generation of fugitive dust and particulate matter during construction or maintenance activities could also impact ambient air quality. An operations plan for the specific construction and/or maintenance activities could be completed to address the variety of available measures to limit the ambient air quality impacts. These could include vapor barriers and moisture control to reduce transfer of particulates and dust to air.

The emission of air pollutants during short-term construction activities associated with reasonably foreseeable methods of compliance would not likely change ambient air conditions, because long-term ambient air quality would not change after short-term construction activities are completed.

Ambient air quality may change as a result of increased traffic due to an increase in street sweeping and/or structural BMP maintenance activities. However, the impact to ambient air quality can be reduced by using the mitigation measures described above for street sweepers and maintenance vehicles. The potential impact to ambient air quality can be further reduced if street sweeping and/or maintenance activities are scheduled to be performed at the same time as other maintenance activities performed by the municipalities, or at times when these activities have lower impact, such as periods of low traffic activity. In any case, the number of additional vehicles expected in the watersheds due to non-structural and structural BMPs is not expected to increase the level of pollutants in the air compared to current conditions, because various common managerial practices are available to mitigate the adverse effects. In fact, additional street sweeping could potentially reduce the amount of dust and particulates that may be available on the streets.

2. Air. b. **Will the proposal result in creation of objectionable odors?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs could result in the creation of objectionable odors in urbanized areas caused by exhaust from street sweepers or maintenance vehicles. Objectionable odors due to engine exhaust would be temporary and dissipate once the vehicle has passed through the area. Objectionable odors from exhaust could be reduced if gasoline or propane engines were used instead of diesel engines. Additionally, street sweepers and maintenance vehicles could be scheduled to be performed at the same time as other maintenance activities performed by the municipalities, or at times when these activities have lower impact, such as periods when there are fewer people in the area.

Construction and installation of structural BMPs may result in objectionable odors in the short-term due to exhaust from construction equipment and vehicles, but no more so than during typical infrastructure construction and maintenance activities currently performed by the municipalities. However, structural BMPs may be a source of objectionable odors if BMP designs allow for water stagnation or collection of water with sulfur-containing compounds. Stormwater runoff is not likely to contain sulfur-containing compounds, but stagnant water could create objectionable odors.

Mitigation measures to eliminate odors caused by stagnation could include proper BMP design to eliminate standing water, covers, aeration, filters, barriers, and/or odor suppressing chemical additives. Structural BMPs should be inspected regularly to ensure that treatment devices are not clogged, pooling water, or odorous. During maintenance, odorous sources should be uncovered for as short of a time period as possible. Structural BMPs should be designed to minimize stagnation of water and installed in such a way so as to increase the distance to sensitive receptors in the event of any stagnation.

2. Air. c. **Will the proposal result in alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally?**

   Answer**: No impact**

Discussion: Non-structural and/or structural BMPs would not be of the size or scale to result in alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally.

3. Water. a. **Will the proposal result in changes in currents, or the course of direction or water movements, in either marine or fresh waters?**

   Answer**: Less than significant**

Discussion: Most non-structural BMPs will not cause changes in currents, or the course of direction or water movements, in either marine or fresh waters because most of these BMPs would not introduce any physical effects that could impact these characteristics. Elimination of dry weather flows is the only foreseeable non-structural BMP that could have a physical impact in the watersheds due to a reduction in sediment and refuse discharge. However, any reduction of dry weather nuisance flows would bring the creeks to a more natural, pre-development condition with respect to currents, which is beneficial to the environment as discussed in the answer to question 4a.

Structural BMPs may change the currents in the watersheds by diverting flow away from the channels. However, streamflow in the urbanized lower watersheds are highly channelized, therefore none of the reasonably foreseeable structural BMPs would alter the direction or slope of the stream channels in the lower watersheds. The roughness coefficient may be reduced as sediment is kept out of the channels, which could increase the flow rate in the channels but would not change the direction of flow. The increase in flow rate in the channels could be offset by the reduction of peak flow, as a result of the installation of structural BMPs such as detention basins, sand filters or infiltration basins. Overland flow in the urbanized portion of the watershed is directed primarily to storm drains. This overland flow may change depending on the structural BMPs installed such as infiltration basins. If stormwater runoff flow is reduced, or is diverted to detention basins and not returned to the creeks, these changes would reduce the potential for erosion, which is beneficial to the environment.

In agricultural areas where creeks flow in more natural conditions, BMPs such as detention basins and waste treatment lagoons could change the currents in the watersheds by storing water that would otherwise reach creeks and/or conveyance systems; however, this could be mitigated through proper siting and planning, including the use of hydrologic models to ensure that sufficient flow is maintained in or returned to watersheds to avoid adverse impacts to currents.

3. Water. b. **Will the proposal result in changes in absorption rates, drainage patterns, or the rate and amount of surface water runoff?**

   Answer**: Less than significant**

Discussion: Non-structural BMPs would not result in changes in absorption rates, drainage patterns, or the rate and amount of surface water runoff because none of these BMPs would introduce any physical effects that could impact these characteristics.

Depending on the structural BMPs selected, absorption rates, drainage patterns, and surface water runoff may change. Grading and excavation during construction and installation of structural BMPs could result in alterations in absorption rates, drainage patterns, and surface water runoff. Several types of structural BMPs for both urban and agricultural areas collect and/or inhibit stormwater flow, which would likely alter drainage patterns, and also decrease the rate and amount of surface water runoff. For example, structural BMPs such as buffer strips would change drainage patterns by increasing absorption rates, which would reduce the amount of surface runoff to creeks. If stormwater runoff is diverted to wastewater treatment facilities, drainage patterns would be altered and surface runoff to the creeks could be reduced. If stormwater is diverted to wastewater treatment facilities, thereby reducing the overall flow, the erosion and scour that would normally be caused in the streams by stormwater runoff would be reduced. The amount of flow within the stream channel may change; however, the channelized drainage pattern would remain essentially unchanged.

In general, reducing stormwater runoff due to non-structural and structural BMPs would be beneficial to the environment because peak flows would be attenuated, reducing erosion and channel scour. Reduction in the amount of water in the stream channel may affect the ecology of the stream; however, all of these affects can be mitigated to less than significant levels as discussed below in the answers to questions 4 and 5 on Plant Life and Animal Life.

3. Water. c. **Will the proposal result in alterations to the course of flow of flood waters?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs are unlikely to alter the course of flow of flood waters because none of the BMPs would introduce any physical effects that could impact these characteristics.

The course of flow of flood waters may change depending on the structural BMPs selected. Structural BMPs, such as sand filters, could reduce a storm drain's ability to convey flood waters. This can be mitigated through proper design (including flood water bypass systems), sizing, and maintenance of these types of structural BMPs. Other structural BMPs, such as waste treatment lagoons, sewer diversions, detention basins or infiltration basins, could alter the volume of flood waters by diverting a portion of the flood waters, but these BMPs are unlikely to alter the course of flood waters.

3. Water. d. **Will the proposal result in change in the amount of surface water in any water body?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs such as ordinances that prohibit nuisance flows would result in a reduction in the amount of dry weather surface water in the watersheds. Because the reduction of nuisance flows would return the watersheds to a more natural, predevelopment condition, this impact is not significant. Waterbodies that are naturally occurring during dry weather are most likely groundwater fed and will not be impacted by nonstructural BMPs.

Depending on the structural BMPs selected, stormwater runoff may be retained and/or diverted for groundwater infiltration and/or to detention basins. Water that is retained or diverted would not flow into the canyons and stream channels. Because the surface water runoff to the creeks would be reduced, the adverse effects of channel scour and erosion of the creeks would also be reduced.

Reduction in the amount of water in the stream channels may affect the ecology of the streams; however, all of these affects can be mitigated to less than significant levels as discussed below in the answers to questions 4 and 5 on Plant Life and Animal Life.

3. Water. e. **Will the proposal result in discharge to surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen, or turbidity?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural and/or structural BMPs would not result in any additional discharge to surface waters. Depending on the structural BMPs selected, the current amount of runoff discharged to surface waters may actually be reduced if diverted for groundwater infiltration or to wastewater treatment facilities.

If non-structural and/or structural BMPs are implemented, the level of pollutants discharged to the watersheds would be reduced. Therefore, implementation of these TMDLs will improve the surface water quality.

During wet weather discharges, certain structural BMPs (including waste treatment lagoons, detention basins, infiltration basins, and sand filters) would reduce turbidity and increase dissolved oxygen, because these BMPs would remove sediment and bioavailable oxygen demanding substances from the surface water. Reduced turbidity, and increased dissolved oxygen is beneficial to the environment.

Onsite facilities may be employed for treatment of dry weather or storm flows that use oxidizing agents such as ozone for disinfection, which can result in decreased bacteria loads. If not used properly, use of these technologies can result in adverse alteration of surface water quality because of the production of disinfection by-products. For example, if a surface water has significant concentrations of bromide, reaction with ozone can cause the formation of brominated by-products that can cause both immediate and delayed toxicity to marine organisms even after relatively short periods of ozonation.[20] Mitigation measures could include removal of bromide before contact with ozone occurs, or not using this treatment method where high concentrations of bromide are present.

A reduction of dry weather discharges (i.e., a cessation or reduction in nuisance flows) would result in a reduction of overall water in the watersheds during the dry season. This would result in a water temperature increase, and a decrease of dissolved oxygen in dry weather pools in the watersheds. Reduction in the amount of water in the stream channels may affect the ecology of the streams; however, all of these affects can be mitigated to less than significant levels as discussed below in the answers to questions 4 and 5 on Plant Life and Animal Life.

[20] William Cooper et al. 2002. Final Report. *Ozone, seawater, and aquatic nonindigenous species: Testing a full-scale ozone ballast water treatment system on an American oil tanker.*

3. Water. f. **Will the proposal result in alteration of the direction or rate of flow of groundwaters?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs would not result in alteration of the direction or rate of flow of groundwaters because none of the BMPs would introduce any physical effects that could impact these characteristics.

Over the long term, infiltration of stormwater runoff via infiltration type BMPs such as vegetative strips could significantly alter the direction or rate of flow of groundwater. This could result in unstable earth conditions if such BMPs were to be located where infiltrated stormwater flowing as groundwater could destabilize existing slopes. As discussed in the answer to question 1.a, these impacts can be avoided by siting infiltration type BMPs away from areas with loose or compressible soils, and away from slopes that could become destabilized by an increase in groundwater flow. Infiltration type BMPs can also be built on a small enough scale to avoid these types of impacts. In the unlikely event that dischargers might install facilities on a scale that could result in unstable earth conditions, potential impacts could be avoided through proper groundwater investigations, siting, design, and groundwater level monitoring to ensure that structural BMPs are not employed in areas where slopes could become destabilized.

3. Water. g. **Change in the quantity or quality of groundwaters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not change the quantity or quality of groundwaters because none of these BMPs would introduce any physical effects that could impact these characteristics.

Infiltration type BMPs such as infiltration trenches may increase the quantity and degrade the quality of groundwaters. The increase in quantity is unlikely to have any adverse effects since, under pre-development conditions, infiltration rates of stormwater runoff to groundwater were most likely much higher than they are today due to the absence of hardscapes. However, as discussed in question 3.f above, increased infiltration of stormwater near steep slopes, such as canyon walls, could potentially destabilize these slopes by saturating the soils, making them more prone to sliding. Mitigation could include not siting large infiltration BMPs near canyon walls or other steep slopes.

In addition to bacteria, stormwater also contains dissolved pollutants such as nutrients, metals, pesticides, hydrocarbons, oil and grease. However, infiltration BMPs are not expected to degrade groundwater with respect to these pollutants for the following reasons.

Ambient nitrogen and phosphorus concentrations in groundwater are likely higher than nutrient concentrations in stormwater due to decades of over application of fertilizers on domestic and commercial landscapes, and agricultural areas, and deep percolation of applied irrigation water. Nonetheless, if stormwater nutrient concentrations are higher than ambient concentrations in the groundwater, mitigation could include education and outreach to homes and business to better manage fertilizer use. Fertilizer management plans could be required at commercial nurseries and agricultural operations. Phytoremediation can also be used to remove nutrients from stormwater runoff.

Bacteria and metals in stormwater runoff are not expected to degrade groundwater quality since they tend to adsorb to clay and organic particles in the soil. Likewise, oil and grease would become bound up in the soil and remain nearer to the surface due to lower densities. Pesticides and hydrocarbons are not expected to degrade groundwater quality because natural bacteria in the soil and groundwater tend to break down pesticides.

3. Water. h. **Will the proposal result in substantial reduction in the amount of water otherwise available for public water supplies?**

   Answer**: Less than significant with mitigation**

Discussion: For the most part, the structural and non-structural BMPs will not reduce public water supplies because most of the public water supplies for the watersheds included in these TMDLs are imported from outside the region. Exceptions are discussed below.

San Juan Creek Watershed: Elimination of dry weather nuisance flows could eliminate a source of recharge to the groundwater basin which is an important public water supply. However, if the elimination of nuisance flows is achieved through a decrease in water use, such as prohibiting runoff from landscaped areas, the reduction in demand should offset the decrease in supply. Stormwater infiltration basins could also increase recharge to the basin, thereby increasing the public water supply and offsetting any loss of supply due to elimination of dry weather nuisance flows.

San Luis Rey River Watershed: Lake Henshaw on the San Luis Rey River is an important water supply reservoir. This reservoir is located above urban areas, thus, urban BMPs will not affect the water supply in this reservoir. The reservoir is surrounded predominantly by grazing lands. Animal exclusion, the principal MM for grazing lands, will not reduce runoff into the reservoir. Therefore, the public water supply from this reservoir will not be reduced due to implementation of MMs. The City of Oceanside utilizes groundwater wells in the Mission Basin of the watershed for public water supply. The discussion above on the San Juan Creek Watershed groundwater basin applies here also.

San Dieguito River Watershed: Lake Hodges in the San Dieguito watershed is an important water supply reservoir. This reservoir is located above urban areas, thus, urban BMPs will not affect the water supply in this reservoir. The reservoir is surrounded predominantly by open space and grazing lands. Animal exclusion, the principal MM for grazing lands, will not reduce runoff into the reservoir. Therefore, the public water supply from this reservoir will not be reduced due to implementation of MMs.

San Diego River Watershed: San Vicente and El Capitan reservoirs are important water supply reservoirs. These reservoirs are located above urban areas, thus, urban BMPs will not affect the water supplies in this reservoir. These reservoirs are surrounded predominantly by open space and grazing lands. Animal exclusion, the principal MM for grazing lands, will not reduce runoff into the reservoir. Therefore, the public water supply from this reservoir will not be reduced due to implementation of MMs. The City of San Diego is planning to utilize groundwater wells in the Mission Valley Basin of the watershed for public water supply. The discussion above on the San Juan Creek Watershed groundwater basin applies here also.

3. Water. i. **Will the proposal result in exposure of people or property to water related hazards such as flooding or tidal waves?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in exposure of people or property to water related hazards such as flooding or tidal waves because none of these BMPs would introduce any physical effects that could impact these characteristics.

Installation of structural BMPs that are not properly designed and constructed to allow for bypass of stormwater during storms that exceed design capacity can cause flooding. However, this potential impact can be mitigated through proper design and maintenance of structural BMPs. Any modifications to the watershed hydrology should be modeled and accounted for in the design of BMPs.

4. Plant Life. a. **Will the proposal result in change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, microflora and aquatic plants)?**

   Answer**: Less than significant with mitigation**

Discussion: Most non-structural BMPs will not result in change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, microflora and aquatic plants) because most of these BMPs would not introduce any physical effects that could impact these characteristics. However, the creation and enforcement of ordinances to eliminate nuisance flows could result in a change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, microflora and aquatic plants), especially in the dry weather season. No adverse impacts are expected because the elimination of nuisance flows would return the creek's dry weather flows to a more natural, pre-development condition. This in turn would facilitate the return of the stream's plant community to a more natural, pre-development condition and could impede the propagation of water-loving non-native and invasive plant species. Impeding the propagation of invasive species is not a negative impact.

These flow reductions could lead to a reduction in total plant biomass along the creek's corridors. The reduced plant biomass could very well represent a significant decrease in the area of invasive and non-native plant species (such as *Arundo donax*) within the watersheds. A reduction in invasive species is necessary before the native plant populations could be restored to pre-development conditions.

The decrease in flow may result in an increase in native plant species. Native plant species that previously thrived in the watersheds may naturally repopulate the areas that are currently occupied by invasive species. Increased diversity or area of native plant cover also could be accomplished through restoration/mitigation projects within the watersheds. Regardless of the method, the opportunity for restoration/enhancement of the stream corridors to pre-development conditions is realistic.

Conversely, a decrease in flow may decrease plant diversity by reducing the number of species that require a more constant water supply. However, these plant species are likely non-natives to Southern California and would not be present in the watersheds absent the nuisance dry weather flows.

During the wet weather season, the installation of structural BMPs such as vegetated swales, buffer strips, engineered (bioretention) wetlands, or retention ponds could increase the diversity or number of plant species, which is beneficial to the environment by increasing available habitat. However, during storm events, structural BMPs could also divert, reduce, and/or eliminate surface water runoff discharge, which may reduce the number and/or diversity of plant species within the streams, by modifying the hydrology of the creeks, which could be adverse. This can be mitigated through proper project modeling, siting, and design so that the resulting creek hydrology mimics natural conditions.

Onsite facilities may be employed for treatment of dry weather or storm flows that use oxidizing agents such as ultraviolet radiation (UV) or ozone for disinfection, which can result in decreased bacteria loads. If not used properly, use of these technologies can be harmful to a number of plant and animal species. For example, disinfecting agents can be toxic to non-target marine and freshwater organisms, including phytoplankton and zooplankton. Mitigation should include avoiding these technologies in areas where these organisms propagate.

Use of oxidizing agents can also result in the production of harmful disinfection by-products. For example, if surface water has significant concentrations of bromide, reaction with ozone can cause the formation of brominated by-products that can cause both immediate and delayed toxicity to marine organisms even after relatively short periods of ozonation.[21]

[21] William Cooper et al. 2002. Final Report. *Ozone, seawater, and aquatic nonindigenous species: Testing a full-scale ozone ballast water treatment system on an American oil tanker.*

Mitigation measures could include removal of bromide before contact with ozone occurs, or not using this treatment method where high concentrations of bromide are present.

Construction activities could result in the elimination of plant cover in the construction zone. The number or diversity of plant species could be maintained by preserving them prior, during, and after the construction of structural BMPs, or by re-establishing and maintaining the plant communities post construction. Or, municipalities may choose to implement non-structural BMPs and/or structural BMPs that do not reduce the surface water runoff that would be discharged to the canyons and stream channels.

Should large impermeable detention basin be required, they could be constructed underground so as not to impact the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, microflora and aquatic plants).

4. Plant life. b. **Will the proposal result in reduction of the numbers of any unique, rare or endangered species of plants?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in a reduction of the numbers of any unique, rare, or endangered species of plants because these BMPs will not affect the habitat of any unique, rare, or endangered species of plants.

Depending on the structural BMPs selected, direct or indirect impacts to special-status plant species may occur during and after construction. Mitigation measures could be implemented to ensure that potential impacts to unique, rare or endangered plant species are eliminated. When the specific projects are developed and sites identified, a focused protocol plant survey and/or a search of the California Natural Diversity Database should be performed to confirm that any potentially sensitive or special status plant species in the site area are properly identified and protected as necessary. If sensitive plant species occur on the project site, mitigation is required in accordance with the Endangered Species Act. Mitigation measures should be developed in consultation with the California Department of Fish and Game (CDFG) and the United States Fish and Wildlife Service (USFWS). Additionally, according to the Basin Plan, the San Luis Rey River, San Dieguito, and San Diego watersheds support the RARE beneficial use. Specifically, these areas provide riparian habitat for the willowy monardella. Therefore compliance methods involving structural BMPs should avoid affecting habitat that is vital for the survival of this plant species.

Responsible agencies should avoid installing structural BMPs that could result in reduction of the numbers of unique, rare or endangered species of plants, and instead opt for non-structural BMPs and/or identify and install structural BMPs in areas that will not reduce the numbers of such plants.

4. Plant life. c. **Will the proposal result in introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?**

Answer**: Less than significant with mitigation**

Discussion: Most non-structural BMPs will not result in introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species because most of the BMPs would not introduce any physical effects that could impact these characteristics. However, the creation and enforcement of ordinances to eliminate nuisance flows could result in the introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species especially in the dry weather season. However, no adverse impacts are expected as discussed in the answer to question 4.a.

For structural BMPs that may include the use of plants, such as vegetated swales or engineered (bioretention) wetlands, new species of plants may possibly be introduced into the area. However, in cases where plants or landscaping is incorporated into the specific project design, the possibility of disruption of resident native species could be avoided or minimized by using only plants native to the area. The use of exotic invasive species or other plants listed in the Exotic Pest Plant of Greatest Ecological Concern in California (1999, California Invasive Plant Council, as amended) should be prohibited.

4. Plant life. d. **Will the proposal result in reduction in acreage of any agricultural crop?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs such as irrigation management plans will not result in a reduction in acreage of agricultural crops because establishing such BMPs does not necessitate area acquisition.

Structural BMPs could result in a reduction in acreage of agricultural crops. Dischargers should check the California Department of Conservation, Division of Land Resources Protection, Farmland Mapping and Monitoring Program, to see if there is Prime Farmland, Farmland of Statewide Importance, Unique Farmland or Farmland of Local Importance in the proposed project areas. Dischargers should avoid placing structural BMPs in areas that could affect the integrity of special status areas, and instead place them in areas that will have a minimal effect on crop production. If structural BMPs are installed, mitigation could include proper siting, design, or placement underground.

5. Animal Life. a. **Will the proposal result in change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, insects or microfauna)?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs, such as the creation and enforcement of ordinances to eliminate nuisance flows, could result in change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, insects or microfauna) due to a reduction of dry weather flows that could eliminate instream habitats dependant on those flows. However, this would return dry weather flows in the watersheds to a more natural, pre-development condition as discussed in the answer to question 4.a. Animal species that thrived in the creeks in the absence of nuisance flows should not be adversely impacted by habitat changes if the flows are eliminated. Impeding the propagation of invasive species is not a negative impact.

Nuisance flow supported stream riffle and run habitat would decrease in duration during dry weather conditions, thereby limiting aquatic-dependent species to pools during that time period. While migration of aquatic species would be limited during dry weather, migration would be possible during wet weather flows. However, this impact is probably not significant because migration could only occur during wet weather conditions before the existence of dry weather nuisance flows. Additionally, only San Juan Creek, the San Luis Rey River, the San Dieguito River, and San Diego River watersheds have aquatic species with life cycles that would be dependent upon riffle and run habitat.

The installation of structural BMPs such as vegetated swales, buffer strips, engineered (bioretention) wetlands, or retention ponds could increase the diversity or number of animal species, which is beneficial by creating habitat for those species. However, these types of structural BMPs could also increase the likelihood of vectors and pests. For example, constructed basins and vegetated swales may develop locations of pooled standing water that would increase the likelihood of mosquito breeding. Mitigation includes the prevention of standing water through the construction and maintenance of appropriate drainage slopes and through the use of aeration pumps.[22] Mitigation for vectors and pests should involve the use of appropriate vector and pest control strategies, maintenance, and frequent inspections.

Installation of non-vector producing structural BMPs can help mitigate vector production from standing water. Netting can be installed over structural BMPs to further mitigate vector production. Structural BMPs can be designed and sites can be properly protected to prevent accidental vector production. Vector control agencies may also be employed as another source of mitigation. Structural BMPs prone to standing water can be selectively installed away from high-density areas and away from residential housing and/or by requiring oversight and treatment of those systems by vector control agencies.

[22] http://www.cabmphandbooks.com/Muncipal.asp

Structural BMPs could also divert, or reduce stormwater runoff discharge, which could decrease the number and/or diversity of animal species within the stream channels by eliminating habitat dependant on those flows. Because the downstream portions of several watersheds are heavily developed with significant areas of impermeable surfaces, stormflow generated streamflow is very likely higher today than under pre-development conditions. Therefore, native communities of animals and the habitats they depend upon likely can thrive under lower streamflow conditions than what currently exist in the watersheds. Hydrologic modeling could be used to estimate the rate and volume of pre-development stormwater runoff to, and flow in, the watersheds. Using this information, BMPs could be selected and sized to not reduce streamflows in the watersheds below pre-development levels. BMPs that completely eliminate stormwater runoff are not reasonably foreseeable because of their cost and the availability of other feasible and less costly alternatives.

The current number or diversity of animal species could be maintained by minimizing the size of structural BMPs and limiting the encroachment and/or removal of animal habitat. Additionally, dischargers may choose to implement non-structural BMPs and/or structural BMPs that do not divert or reduce the stormwater runoff that would be discharged to the canyons and stream channels. Should an impermeable detention basin be required, it could be constructed underground so as to preserve habitat leading to a change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, insects or microfauna).

For a discussion of the adverse impacts caused by disinfection technologies such as ultraviolet light or ozone, please see the discussion under Question 4a).

5. Animal Life. b. **Will the proposal result in reduction of the numbers of any unique, rare or endangered species of animals?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in a reduction of the numbers of unique, rare or endangered species of animals because these BMPs will not cause a reduction in habitat for unique, rare, or endangered animals. However, the creation and enforcement of ordinances to eliminate nuisance flows could eliminate riparian habitat dependant on those flows. Some of the watersheds, such as the San Luis Rey River, are home to special status species dependant on riparian habitat, such as the least bell's vireo. If the elimination of dry weather nuisance flows threatens to eliminate the riparian habitat of a special status species, this can be mitigated by treating the water and returning it to the stream to ensure the stream hydrology remains intact. Alternatively, mitigation banking could be used to create new habitat or improve existing habitat in the watershed.

Depending on the structural BMPs selected, direct or indirect impacts to special-status animal species may possibly occur during and after construction. Special-status species are present in many of the watersheds. If special status species are present during activities such as ground disturbance, construction, operation and maintenance activities associated with the potential projects, direct impacts to special status species could result including the following:

- Direct loss of a special status species
- Increased human disturbance in previously undisturbed habitats
- Mortality by construction or other human-related activity
- Impairing essential behavioral activities, such as breeding, feeding or shelter/refuge
- Destruction or abandonment of active nest(s)/den sites
- Direct loss of occupied habitat

In addition, potential indirect impacts may include but are not limited to, the following:

- Displacement of wildlife by construction activities
- Disturbance in essential behavioral activities due to an increase in ambient noise levels and/or artificial light from outdoor lighting around facilities

Mitigation measures, however, could be implemented to ensure that special status animals are not negatively impacted, nor their habitats diminished. For example, when the specific projects are developed and sites identified, a focus protocol animal survey and/or a search of the California Natural Diversity Database should be performed to confirm that any potentially special-status animal species in the site area are properly identified and protected as necessary.

If special-status animal species are potentially near the project site area, as required by the Endangered Species Act (ESA), two weeks prior to grading or the construction of facilities and per applicable USFWS and/or CDFG protocols, pre-construction surveys to determine the presence or absence of special-status species should be conducted. The surveys should extend an appropriate distance (buffer area) off site in accordance with USFWS and/or CDFG protocols to determine the presence or absence of any special-status species adjacent to the project site. If special-status species are present on the project site or within the buffer area, mitigation would be required under the ESA. To this extent, mitigation measures shall be developed with the USFWS and CDFG to reduce potential impacts.

Additionally, habitat occupied by special status species could be negatively impacted if animal exclusion measures are placed in areas where cattle graze near streambeds.[23] Cattle grazing may help rather than hurt special status species by maintaining the suitability of vernal pool hydrological conditions.[24] Mitigation measures in areas where fencing is used to exclude cattle from the creeks include allowing cattle to graze along creek beds at set time intervals. Land owners could also provide water troughs near creeks to encourage cattle to drink from alternative sources, thereby minimizing the chances of cattle defecating directly into the creeks.

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[23] Cori Calvert, USDA NRCS, personal communication, March 6, 2007.
[24] Pyke, Christopher R. and Jaymee Marty, 2005. Cattle Grazing Mediates Climate Change Impacts on Ephemeral Wetlands. *Conservation Biology* (October 2005)19:5:1619-1625.

Finally, according to the Basin Plan, the San Luis Rey River, San Dieguito, and San Diego watersheds support the RARE beneficial use. Specifically, these areas provide riparian habitat to the southwestern willow flycatcher, and the least bell's vireo. Therefore compliance methods involving structural BMPs should avoid affecting habitat that is vital for the survival of these bird species.

5. Animal Life. c. **Will the proposal result in introduction of new species of animals into an area, or in a barrier to the migration or movement of animals?**

   Answer**: Less than significant with mitigation**

Discussion: Most non-structural BMPs will not result in introduction of new species of animals into an area, or in a barrier to the migration or movement of animals because most of the BMPs would not introduce any physical effects that could impact these characteristics. However, the creation and enforcement of ordinances to eliminate nuisance flows could result in a barrier to the migration or movement of animals especially in the dry weather season by eliminating habitat dependant on those flows. However, this would cause dry weather flows in the watersheds to return to a more natural, pre-development condition, as discussed in the answer to question 4a. Animal species that thrived in the creeks in the absence of nuisance flows should not be adversely impacted by habitat changes if the flows are eliminated. Impeding the propagation of invasive species is not a negative impact.

Structural BMPs would not foreseeably introduce new species. In urbanized areas, the potential installation sites would not act as a travel route or regional wildlife corridor. However, BMPs could potentially be constructed in agricultural areas or open space where travel routes or regional wildlife corridors exist. A travel route is generally described as a landscape feature (such as a ridgeline, canyon, or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and provide access to necessary resources such as water, food, or den sites). Wildlife corridors are generally an area of habitat, usually linear in nature, which connect two or more habitat patches that would otherwise be fragmented or isolated from one another. Construction of reasonably foreseeable structural BMPs likely would not restrict wildlife movement because the sizes of BMPs are generally too small to obstruct a corridor. For terrestrial animals, corridors would be maintained regardless of stream flow since reduced flows would not provide physical barriers for these animals. In the event that any structural BMPs built would hinder animals from moving throughout the stream corridor, a pathway around the BMPs could be constructed. Additionally, some wildlife migration may be impeded by the use of fencing to coral livestock. Mitigation for this BMP includes using fence gaps large enough to allow migrating wildlife to pass through.

A net loss of native animal species habitat in the stream corridor due to BMP installation should be mitigated. Initially, avoidance and minimization of habitat loss should be considered. In some cases, BMPs may actually provide important habitat for animals in the stream corridor. Examples of such BMPs include detention/ retention ponds, vegetated swales, and buffer strips.

Dischargers should avoid compliance measures that could result in significant barriers to the migration or movement of animals, and instead opt for non-structural BMPs and/or structural BMPs other than fences that would not change the migration or movement of animals. Potential project sites in open space areas that might be used to install structural BMPs should be evaluated in consultation with CDFG to identify potential wildlife travel routes. If a wildlife travel route is identified that could be impacted by the installation of structural BMPs, then the project should be designed to include a new wildlife travel route in the same general location.

Some migratory avian species may use portions of potential project sites, including ornamental vegetation, during breeding season and may be protected under the Migratory Bird Treaty Act (MBTA) while nesting. The MBTA includes provisions for protection of migratory birds under the authority of the USFWS and CDFG. The MBTA protects over 800 species including, geese, ducks, shorebirds, raptors, songbirds, and many other relatively common species. If construction occurs during the avian breeding season for special status species and/or MBTA-covered species, generally February through August, then prior (within 2 weeks) to the onset of construction activities, surveys for nesting migratory avian species should be conducted on the project site following USFWS and/or CDFG guidelines. If no active avian nests are identified on or within the appropriate distance of construction areas, further mitigation may not be necessary.

Alternatively, to avoid impacts, the agencies implementing the TMDL may begin construction after the previous breeding season for covered avian species and before the next breeding season begins. If a protected avian species was to establish an active nest after construction was initiated and outside of the typical breeding season (February – August), the project sponsor, would be required to establish a buffer as required by USFWS between the construction activities and the nest site.

If active nest for protected avian species are found within the construction footprint or within the proscribed buffer zone, construction would be required to be delayed within the construction footprint and buffer zone until the young have fledged or appropriate mitigation measures responding to the specific situation are developed in consultation with USFWS or CDFG. These impacts are highly site specific, and assuming they are foreseeable, they would require a project-level analysis and mitigation plan.

Finally, steelhead trout, a special status species, rely on riffle and run habitat, and annual breaching of creek mouth sand bars to migrate up freshwater creeks from marine waters in order to spawn. Additionally, young steelhead reared in freshwater creeks need riffle and run habitat, and breaching of sandbars to migrate to the ocean. Adequate storm flows in the creeks are needed to create good quality migration habitat, and to breach sand bars. Creek flow volumes and rates could be insufficient to create and maintain migration habitat and breach sand bars if storm flows are entirely diverted to wastewater treatment facilities or detention basins. Mitigation measures include allowing a sufficient amount of water to remain in the creeks during storm flows to maintain habitat for steelhead migration and sand bar breaching. Alternatively, diverted and treated water could be returned to the creeks at a flow rate and volume sufficient to maintain habitat and breach sand bars. Sand bars also can be artificially breached.

5. Animal Life. d. **Will the proposal result in deterioration to existing fish or wildlife habitat?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in deterioration to existing fish or wildlife habitat as discussed in the answers to questions 4 and 5.
Depending on the structural BMPs selected, direct or indirect impacts to existing fish or wildlife habitat may occur. In urbanized areas, the installation of structural BMPs would not likely result in the deterioration of existing fish and or wildlife habitat in the immediate area of a project. Nonetheless, potential effects on fish or wildlife habitat can be reduced by minimizing the size of structural BMPs and limiting the encroachment and/or removal of animal habitat.

Structural BMPs could also divert, reduce, and/or eliminate stormwater runoff discharge, which could potentially change the fish and wildlife habitat within the stream channels by changing the flow regime of the creeks. In urbanized creeks with significant areas of impermeable surfaces, stormflow generated streamflow is very likely higher today than under pre-development conditions. Therefore, native communities of animals and the habitats they depend on likely can thrive under lower stormflow generated streamflow conditions than what currently exists. Hydrologic modeling could be used to estimate the rate and volume of pre-development stormwater runoff to, and flow in, the watersheds. Using this information, BMPs could be selected and sized to avoid reducing streamflows in the watersheds below pre-development levels. BMPs that completely eliminate stormwater runoff are not reasonably foreseeable because of their cost and the availability of other feasible and less costly alternatives. The return to more natural, pre-development flow regimes in the watersheds could be beneficial to restoring native habitats in the creeks.

In agricultural areas, dischargers may choose to implement non-structural BMPs and/or structural BMPs that do not divert or reduce the surface water runoff that would be discharged to the creeks, and instead rely on source control. Options for source control include managing irrigation and fertilizer to ensure no excess water or pollutants leave the property site, or utilizing livestock fencing to ensure livestock do not approach riparian habitat.

Should an impermeable detention basin be required, this could be constructed underground so as not to result in deterioration to existing fish or wildlife habitat at the project site.

6. Noise. a. **Will the proposal result in increases in existing noise levels?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs could result in increases in existing noise levels due to increased traffic from street sweepers and/or maintenance vehicles which may increase the noise level temporarily as the vehicles pass through an area. However, the increase in noise levels would be no greater than typical infrastructure maintenance activities currently performed by municipalities and is therefore, less than significant.

The construction and installation of structural BMPs would result in temporary increases in existing noise levels, but this would be short term and only exist until construction is completed. Therefore, this noise impact is less than significant for humans. For some special status wildlife species, however, even temporary increases in noise levels could result in significant impacts. For example, special status birds might abandon nesting sites in response to the stress of noise impacts. Mitigation measures for increased noise levels that adversely affect rare and endangered species are discussed under question 5 b.

The noise associated with the construction and installation of structural BMPs would be the same as typical construction activities in urbanized areas, such as ordinary road and infrastructure maintenance and building activities. Contractors and equipment manufacturers have been addressing noise problems for many years and through design improvements, technological advances, and a better understanding of how to minimize exposures to noise, noise effects can be minimized. An operations plan for the specific construction and/or maintenance activities could be prepared to identify the variety of available measures to limit the impacts from noise to adjacent homes and businesses.

Severe noise levels could be mitigated by implementing commonly-used noise abatement procedures, such as sound barriers, mufflers, and limiting construction and maintenance activities to times when these activities have lower impact, such as periods when there are fewer people near the construction area. Applicable and appropriate mitigation measures could be evaluated when specific projects are determined, depending upon proximity of construction activities to receptors.

6. Noise. b. **Will the proposal result in exposure of people to severe noise levels?**

Answer**: Less than significant**

Discussion: Non-structural BMPs would not result in increases in exposure of people to severe noise levels because none of these BMPs would introduce any physical effects that could impact this characteristic. Increased traffic from street sweepers and/or maintenance vehicles may increase the noise level temporarily as the vehicles pass through an area, but these levels will not be severe.

There is the possibility that severe noise levels could be emitted during construction activities. The increase in noise levels could be mitigated by implementing commonly-used noise abatement procedures, such as sound barriers, mufflers, and limiting construction and maintenance activities to times when these activities have lower impact, such as periods when there are fewer people in the area. Applicable and appropriate mitigation measures should be evaluated when specific projects are determined, depending upon proximity of construction activities to receptors.

7. Light and Glare. **Will the proposal produce new light or glare?**

   Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not produce new light or glare because none of the BMPs would introduce any physical effects that could impact light and glare.

The construction and installation of structural BMPs could potentially be performed during evening or night time hours. If this scenario were to occur, night time lighting would be required to perform the work. Also, lighting could possibly be used to increase safety around structural BMPs. If temporary artificial lighting is required for construction purposes, this could be stressful for some rare and endangered species. For example, special status birds might abandon nesting sites in response to the stress of light and glare impacts. Mitigation measures for artificial light or glare that adversely affect rare and endangered species are discussed under question 5 b.

In the unlikely event that construction is performed during night time hours, a lighting plan should be prepared to include mitigation measures. Mitigation measures can include shielding on all light fixtures, and limiting light trespass and glare through the use of directional lighting methods. Other potential mitigation measures may include using screening and low-impact lighting, performing construction during daylight hours, or designing security measures for installed structural BMPs that do not require night lighting.

8. Land Use. **Will the proposal result in substantial alteration of the present or planned land use of an area?**

   Answer**: Less than significant**

Discussion: Non-structural BMPs will not result in alteration of the present or planned land use of an area because none of the BMPs would introduce any physical effects that could impact land uses.

Implementation of structural BMPs may potentially cause minor alterations in present or planned land use of an area. However, municipalities are not required or expected to change present or planned land uses to comply with the TMDLs, and are encouraged to seek alternatives that would have the lowest impact on the land use and the environment. Potential conflicts between complying with the TMDLs and other land uses can be resolved by standard planning efforts under which specific projects are reviewed by local planning agencies. Applicable and appropriate mitigation measures could be evaluated when specific projects are determined, and a cost-benefit analysis of proposed compliance alternatives should be performed.

More reasonable alternatives should be evaluated and implemented, such as non-structural BMPs and low impact and/or small scale structural BMPs, before considering an alternative that would create considerable hardship for the community in the area.

9. Natural Resources. a. **Will the proposal result in increase in the rate of use of any natural resources?**

   Answer**: No impact**

Discussion: Non-structural and/or structural BMPs will not increase the rate of use of any natural resources. Implementation of non-structural and/or structural BMPs should not require quarrying, mining, dredging, or extraction of locally important mineral resources. Operation of street sweepers, construction, and maintenance vehicles could increase the use of fossil fuels, and some types of equipment used in structural BMPs may consume electricity to operate pumps, etc. However, the relative amounts of additional fossil fuel and electricity that might be used would fall well within the capacity and expectations of the region's normal rate of use of natural resources. The additional use of fossil fuels and electricity could be mitigated and reduced if dischargers used alternative fuels and/or renewable energies to power their vehicles and equipment.

9. Natural Resources. b. **Will the proposal result in substantial depletion of any non-renewable natural resource?**

   Answer**: No impact**

Discussion: Non-structural and/or structural BMPs will not substantially deplete any non-renewable natural resource. Operation of street sweepers, construction, and maintenance vehicles could increase the use of fossil fuels, and some types equipment used in structural BMPs may consume electricity to operate pumps, etc. However, the relative amounts of additional fossil fuel and electricity that might be used would fall well within the capacity and expectations of the region's energy supply and natural resources. The additional use of fossil fuels and electricity could be mitigated and reduced if dischargers used alternative fuels and/or renewable energies to power their vehicles and equipment.

10. Risk of Upset. **Will the proposal involve a risk of an explosion or the release of hazardous substances (including, but not limited to: oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?**

Answer**: Less than significant**

Discussion: Non-structural and structural BMPs will not involve a risk of an explosion or the release of hazardous substances (including, but not limited to: oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions. The reasonably foreseeable non-structural and structural BMPs included in this evaluation would not be subject to explosion or the release of hazardous substances in the event of an accident because these types of substances would not be present. There is the possibility that hazardous materials (e.g., paint, oil, gasoline) may be present during construction and installation activities, but potential risks of exposure can be mitigated with proper handling and storage procedures. All risks of exposure would be short term and would be eliminated with the completion of construction and installation activities.

11. Population. **Will the proposal alter the location, distribution, density, or growth rate of the human population of an area?**

Answer**: Less than significant**

Discussion: Non-structural BMPs will not alter the location, distribution, density, or growth rate of the human population of an area because none of the BMPs would introduce any physical effects that could impact these characteristics.

Implementation of structural BMPs may potentially alter the location, distribution, density, or growth rate of the human population of an area. However, dischargers are not required or expected to change present or planned land uses to comply with the TMDLs, and dischargers are encouraged to seek alternatives that would have the lowest impact on the existing and planned population of an area. Potential conflicts between complying with the TMDLs and planned growth can be resolved by standard planning efforts under which specific projects are reviewed by local planning agencies. Applicable and appropriate mitigation measures could be evaluated when specific projects are determined.

More reasonable alternatives should be evaluated and implemented, such as non-structural BMPs and low impact and/or small scale structural BMPs, before considering an alternative that would create the need to relocate the population of parts of the watersheds.

12. Housing. **Will the proposal affect existing housing, or create a demand for additional housing?**

    Answer**: Less than significant**

Discussion: Non-structural BMPs will not affect existing housing, or create a demand for additional housing because none of these BMPs would introduce any physical effects that could impact housing.

Implementation of structural BMPs may potentially affect existing housing. However, dischargers are not required or expected to change present or planned land uses to comply with the TMDLs, and dischargers are encouraged to seek alternatives that would have the lowest impact on land use and the environment. Potential conflicts between complying with the TMDLs and other land uses can be resolved by standard planning efforts under which specific projects are reviewed by local planning agencies. Applicable and appropriate mitigation measures could be evaluated when specific projects are determined.

More reasonable alternatives should be evaluated and implemented, such as non-structural BMPs and low impact and/or small scale structural BMPs, before considering an alternative that would create considerable hardship for the community in the area.

13. Transportation/Circulation. a. **Will the proposal result in generation of substantial additional vehicular movement?**

    Answer**: Less than significant**

Discussion: Non-structural and/or structural BMPs will not result in generation of substantial additional long-term vehicular movement. There may be additional vehicular movement during construction of structural BMPs and during street sweeping and/or maintenance activities. However, vehicular movement during construction would be temporary, and vehicular movement during street sweeping and/or maintenance activities would be periodic and only as the vehicle passes through the area. This may generate minor additional vehicular movement.

In order to reduce the impact of construction traffic, a construction traffic management plan could be prepared for traffic control during any street closure, detour, or other disruption to traffic circulation. The plan could identify the routes that construction vehicles would use to access the site, hours of construction traffic, and traffic controls and detours. The plan could also include plans for temporary traffic control, temporary signage and stripping, location points for ingress and egress of construction vehicles, staging areas, and timing of construction activity which appropriately limits hours during which large construction equipment may be brought on or off site.

The potential impact to vehicular movement can be reduced if street sweeping and/or maintenance activities are scheduled to be performed at the same time as other maintenance activities performed by municipalities, or at times when these activities have lower impact, such as periods of low traffic activity.

13. Transportation/Circulation. b. **Effects on existing parking facilities, or demand for new parking?**

Answer**: Less than significant with mitigation.**

Discussion: Non-structural BMPs may affect existing parking facilities, or create demand for new parking structures, if increased street sweeping and/or maintenance is implemented in areas with parking along roadsides. Available parking in an area could be reduced during certain times of the day, week, and/or month, depending on frequency of street sweeping and/or maintenance events. Street sweeping and maintenance events should be scheduled to be performed at the same time as other maintenance activities performed by the municipalities, and/or at times when these activities have lower impact, such as periods of low traffic activity and parking demand.

Depending on the structural BMPs selected, alterations to existing parking facilities may occur to incorporate structural BMPs. This could reduce available parking in an area. However, structural BMPs can be designed to accommodate space constraints or be placed under parking spaces and do not have to occupy space in existing parking facilities. Available parking spaces can be reconfigured to provide equivalent number of spaces or provide functionally similar parcels for use as offsite parking to reduce potential impacts.

13. Transportation/Circulation. c. **Will the proposal result in substantial impacts upon existing transportation systems?**

Answer**: Less than significant**

Discussion: Non-structural BMPs will not result in significant impacts upon existing transportation systems. The only foreseeable impact would come from increased street sweeping, however long-term impacts are unlikely because any increase in maintenance vehicular activities would fall well within the present day activities in any municipality, and would therefore not qualify as substantial.

Depending on the structural BMPs selected, temporary alterations to existing transportation systems may be required during construction and installation activities. The potential impacts would be limited and short-term. Potential impacts could be reduced by limiting or restricting hours of construction so as to avoid peak traffic times and by providing temporary traffic signals and flagging to facilitate traffic movement.

13. Transportation/Circulation. d. **Will the proposal result in alterations to present patterns of circulation or movement of people and/or goods?**

Answer**: Less than significant**

Discussion: Non-structural BMPs will not result in alterations to present patterns of circulation or movement of people and/or goods, because none of the BMPs, including increased street sweeping, would introduce any physical effects that could impact these characteristics. No long-term impacts are expected because any increase in maintenance vehicular activities would fall well within the present day activities in any municipality.

Depending on the structural BMPs selected, temporary alterations to present patterns of circulation or movement of people and/or goods may be required during construction and installation activities. The potential impacts would be limited and short-term. Potential impacts could be reduced by limiting or restricting hours of construction so as to avoid peak traffic times and by providing temporary traffic signals and flagging to facilitate traffic movement.

13. Transportation/Circulation. e. **Will the proposal result in alterations to waterborne, rail or air traffic?**

Answer**: Less than significant**

Discussion: Non-structural and/or structural BMPs are not expected to result in alterations to waterborne, rail or air traffic because none of the BMPs would introduce any physical effects that could impact these characteristics.

Depending on the structural BMPs selected, temporary alterations to rail transportation could potentially occur during construction and installation activities. However, those potential impacts would limited and short-term and could be avoided through proper siting and design, and scheduling of construction activities.

13. Transportation/Circulation. f**. Will the proposal result in increase in traffic hazards to motor vehicles, bicyclists or pedestrians?**

Answer**: Less than significant**

Discussion: Non-structural BMPs could result in an increase in traffic hazards to motor vehicles, bicyclists or pedestrians due, for example, to increased street sweeping. However, any foreseeable impact from increased street sweeping would fall well within the present day conditions in any municipality, and would therefore not present new safety concerns.

Depending on the structural BMPs selected, a temporary increase in traffic hazards may occur during construction and installation activities. The specific project impacts can be reduced and mitigated by marking, barricading, and controlling traffic flow with signals or traffic control personnel in compliance with authorized local police or California Highway Patrol requirements. These methods would be selected and implemented by responsible local agencies considering project level concerns. Standard safety measures should be employed including fencing, other physical safety structures, signage, and other physical impediments designed to promote safety and minimize pedestrian/bicyclists accidents.

14. Public Service. a. **Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas: Fire protection?**

Answer**: Less than significant**

Discussion: Non-structural BMPs will not have an effect upon, or result in a need for new or altered fire protection services because none of the BMPs would introduce any physical effects that could impact this characteristic.

During construction and installation of structural BMPs, temporary delays in response time of fire vehicles due to road closure/traffic congestion during construction activities may occur. However, any construction activities would be subject to applicable building and safety and fire prevention regulations and codes. The responsible agencies could notify local emergency service providers of construction activities and road closures and could coordinate with local providers to establish alternative routes and appropriate signage. In addition, an Emergency Preparedness Plan could be developed for the construction of proposed new facilities in consultation with local emergency providers to ensure that the proposed project's contribution to cumulative demand on emergency response services would not result in a need for new or altered fire protection services. Most jurisdictions have in place established procedures to ensure safe passage of emergency vehicles during periods of road maintenance, construction, or other attention to physical infrastructure. In any case, the installation of structural devices would not create any more significant impediments than such other ordinary activities.

14. Public Service. b. **Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas: Police protection?**

Answer**: Less than significant**

Discussion: Non-structural BMPs will not have an effect upon, or result in a need for new or altered fire protection services because none of the BMPs would introduce any physical effects that could impact this characteristic.

During construction and installation of structural BMPs, temporary delays in response time of police vehicles due to road closure/traffic congestion during construction activities may occur. The responsible agencies could notify local police service providers of construction activities and road closures and could coordinate with local police to establish alternative routes and traffic control during construction projects. In addition, an Emergency Preparedness Plan could be developed for the proposed new facilities in consultation with local emergency providers to ensure that the proposed project's contribution to cumulative demand on emergency response services would not result in a need for new or altered police protection services. Most jurisdictions have in place established procedures to ensure safe passage of emergency vehicles during periods of road maintenance, construction, or other attention to physical infrastructure. In any case, the installation of structural devices would not create any more significant impediments than such other ordinary activities.

14. Public Service. c. **Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas: Schools?**

Answer**: No impact.**

Discussion: Non-structural and structural BMPs will not have an effect upon, or result in a need for new or altered schools or school services because none of the BMPs would introduce any physical effects that could impact this characteristic.

14. Public Service. d. **Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas: Parks or other recreational facilities?**

Answer**: Less than significant.**

Discussion: Non-structural BMPs will not have an effect upon, or result in a need for new or altered parks or other recreational facilities because none of the BMPs would introduce any physical effects that could impact parks or recreational facilities.

During construction and installation of structural BMPs, parks or other recreational facilities could be temporarily affected. Construction activities could potentially be performed near or within a park or recreational facilities. Potential impacts would be limited and short-term and could be avoided through siting, designing, and scheduling of construction activities.

In the unlikely event that the municipalities might install facilities on a scale that could alter a park or recreational facility, the structural BMPs could be designed in such a way as to be incorporated into the park or recreational facility. Additionally, should an impermeable detention basin be required, this could be constructed underground to avoid the need for new or altered parks or other recreational facilities.

14. Public Service. e. **Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas: maintenance of public facilities, including roads?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs may include additional road maintenance such as additional and/or increased street sweeping. Structural BMPs may require additional maintenance by dischargers to ensure proper operation. As discussed above for Questions 2, 6, and 13, additional or increased street sweeping and maintenance activities could affect air, noise, and transportation/circulation. The increase in air pollutants and noise levels would be no greater than typical street sweeping and maintenance activities currently performed by the municipalities. Street sweeping and maintenance events could be scheduled to be performed at the same time as other maintenance activities performed by the municipalities, or at times when these activities have lower impact, such as periods of low traffic activity and parking demand.

14. Public Service. f. **Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas: other government services?**

Answer**: Less than significant with mitigation**

Discussion: As discussed above, non-structural and/or structural BMPs may include increased street sweeping and/or additional maintenance by dischargers to ensure proper operation of newly installed structural BMPs. However, the potential impacts to air, noise, and transportation/circulation would be no greater than typical street sweeping and maintenance activities currently performed by municipalities. Street sweeping and maintenance events could be scheduled to be performed at the same time as other maintenance activities performed by the municipalities, or at times when these activities have lower impact, such as periods of low traffic activity and parking demand.

Implementation of the TMDLs will result in the need for increased monitoring in the watersheds and to track compliance with the TMDLs. However, no effects to the environment would be expected from these monitoring activities.

15. Energy. a. **Will the proposal result in use of substantial amounts of fuel or energy?**

Answer**: No impact**

Discussion: Non-structural and/or structural BMPs will not use substantial amounts of fuel or energy. As discussed above for Question 9, operation of street sweepers, construction, and maintenance vehicles could increase the use of fossil fuels, and some types equipment used in structural BMPs may consume electricity to operate pumps, etc. The additional use of fossil fuels and electricity could be reduced if the dischargers used alternative fuels and/or renewable energies to power their vehicles and equipment.

15. Energy. b. **Will the proposal result in a substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?**

Answer**: No impact**

Discussion: Non-structural and/or structural BMPs will not result in a substantial increase in demand upon existing sources of energy, or require the development of new sources of energy. As discussed for Questions 9 and 15a above, operation of street sweepers, construction, and maintenance vehicles could increase the use of fossil fuels, and some types of equipment used in structural BMPs may consume electricity to operate pumps, etc. The additional use of fossil fuels and electricity could be reduced if the dischargers used alternative fuels and/or renewable energies to power their vehicles and equipment.

If alternative sources of energy are used, sources of alternative energy and fuel may be needed. Equipment and components for renewable sources of energy such as solar or wind are readily available. Alternative fuels such as ethanol or biodiesel are commercially available and can be used. Sources of new energy are not required to be developed.

16. Utilities and Service Systems. a. **Will the proposal result in a need for new systems, or substantial alterations to the following utilities: power or natural gas?**

Answer**: Less than significant**

Discussion: Non-structural BMPs will not result in a need for new systems or alterations to power or natural gas utilities because none of the BMPs would introduce any physical effects that could impact this characteristic.

Installation of structural BMPs may require alterations or installation of new power or natural gas lines. Power and natural gas lines might need to be rerouted to accommodate the addition of structural BMPs. The degree of alteration depends upon local system layouts which careful placement and design can minimize. However, that the installation of structural BMPs will result in a substantial increased need for new systems, or substantial alterations to power or natural gas utilities, is not reasonably foreseeable, because none of these BMPs are large enough to substantially tax current power or natural gas sources. No long term effects on the environment are expected if alterations to power or natural gas utilities are required.

16. Utilities and Service Systems. b. **Will the proposal result in a need for new systems, or substantial alterations to the following utilities: communications systems?**

Answer**: No impact**

Discussion: Non-structural BMPs will not result in a need for new systems or alterations to communications systems because none of the BMPs would introduce any physical effects that could impact this characteristic. Current forms of communications used in street sweeping and maintenance vehicles could still be used.

New systems or alterations to communications systems are not necessarily required for structural BMPs. Structural BMPs can be manually inspected and maintained without any communications system required. However, that municipalities could install a remote monitoring system, which could include a new communications system, is possible. A telephone line or wireless communications system could be installed, which would not be a substantial alteration.

16. Utilities and Service Systems. c. **Will the proposal result in a need for new systems, or substantial alterations to the following utilities: water?**

Answer**: No impact**

Discussion: Non-structural and/or structural BMPs will not result in a need for new systems or alterations to water lines. The need for new municipal or recycled water to implement these TMDLs is not foreseeable.

16. Utilities and Service Systems. d. **Will the proposal result in a need for new systems, or substantial alterations to the following utilities: Sewer or septic tanks?**

Answer**: Less than significant**

Discussion: Non-structural and/or structural BMPs will not result in a need for new systems or alterations to sewer or septic tanks because none of the BMPs would introduce any physical effects that could impact this characteristic.

Depending on the structural BMPs selected, a portion or all of the surface water runoff may be diverted to wastewater treatment facilities. If stormwater is diverted for treatment at a wastewater treatment facility, new connections to existing sanitary sewer lines may be required, but no new major sewer trunks or substantial alterations to sewer system would be expected because BMPs utilizing the sewer would likely contribute small amounts of first flush storm water. Any environmental affects from associated construction activities would be small scale and short-term and similar to typical municipal capital improvement projects.

16. Utilities and Service Systems. e. **Will the proposal result in a need for new systems, or substantial alterations to the following utilities: stormwater drainage?**

Answer**: Less than significant**

Discussion: Non-structural BMPs will not result in a need for new systems, or substantial alterations to stormwater drainage systems because none of the BMPs would introduce any physical effects that could impact this characteristic.

In order to achieve compliance with the TMDLs, the stormwater drainage systems may need to be reconfigured and/or retrofitted with structural BMPs to capture and/or treat a portion or all of the stormwater runoff. The alterations and/or additions to stormwater drainage systems will depend on the compliance strategy selected by each discharger at each location where structural BMPs might be installed. Impacts from construction activities to retrofit or reconfigure the storm drain system as part of BMP installation, and mitigation measures have been considered and discussed in the previous responses to the questions.

16. Utilities and Service Systems. f. **Will the proposal result in a need for new systems, or substantial alterations to the following utilities: solid waste and disposal?**

Answer**: Less than significant with mitigation**

Discussion: Most non-structural BMPs will not result in a need for new systems, or substantial alterations to the solid waste and disposal systems because none of the BMPs would introduce any physical effects that could impact this characteristic. In urbanized areas, increased street sweeping would generate additional solid waste, but this additional waste is not expected to exceed the maintenance capacity of normal city operations. No new solid waste or disposal systems would be expected.

The installation of structural BMPs may generate construction debris. Additionally, installed structural BMPs may collect sediment and solid wastes that will require disposal. However, no new solid waste or disposal systems would be needed to handle the relatively small volume generated by these projects. Construction debris may be recycled at aggregate recycling centers or disposed of at landfills. Sediment and solid wastes that may be collected can be disposed of at appropriate landfill and/or disposal facilities. In the event that structural BMPs are placed in areas of intensive livestock, resulting in the collection of animal waste, mitigation includes composting and/or manure production to reduce the volume of solid waste going to landfills.

17. Human Health. a. **Will the proposal result in creation of, and exposure of people to, any health hazard or potential health hazard (excluding mental health)?**

Answer**: Less than significant with mitigation**

Discussion: As discussed above for Questions 2 and 13, non-structural BMPs such as street sweeping and maintenance vehicles could have an effect on air and transportation/circulation. Non-structural BMPs could increase the amount of pollutants emitted into the atmosphere above ambient conditions. Non-structural BMPs could also increase traffic, which could potentially decrease the safety of pedestrians. In both cases, potential impacts can be reduced or eliminated if street sweeping and/or maintenance activities are scheduled to be performed at the same time as other maintenance activities performed by the dischargers, or at times when these activities have lower impact, such as periods of low traffic activity.

As discussed above for questions 1, 2, 3, 5, and 13, the installation of structural BMPs could have an effect on earth, air, water, animal life, and transportation/circulation. Structural BMPs could increase the risk of unstable earth conditions, which could pose a physical risk to persons in the area should a slope fail. Construction, installation, and maintenance of structural BMPs could increase the amount of pollutants the air, which could have an effect on health. Structural BMPs could potentially result in additional habitat and/or standing water which can attract pests, such as flies, mosquitoes and/or rodents, which can be carriers of disease. Maintenance of structural BMPs could also increase traffic, which could potentially decrease the safety of pedestrians. Additionally, heavy machinery and materials that may be used during construction and installation of structural BMPs could pose physical and/or chemical risks to human health.

Potential impacts to earth could be avoided or mitigated through proper geotechnical investigations, siting, design, and ground and groundwater level monitoring to ensure that structural BMPs are not employed in areas subject to unstable soil conditions. Potential health hazards attributed to installation and maintenance of structural BMPs can be mitigated by use of OSHA construction and maintenance health and safety guidelines. Potential health hazards attributed to BMP maintenance can be mitigated through OSHA industrial hygiene guidelines. Installation of non-vector producing structural BMPs can help mitigate vector production from standing water. Netting can be installed over structural BMPs to further mitigate vector production. Structural BMPs can be designed and sites can be properly protected to prevent accidental health hazards as well as prevent vector production. Vector control agencies may also be employed as another source of mitigation. Structural BMPs prone to standing water can be selectively installed away from high-density areas and away from residential housing and/or by requiring oversight and treatment of those systems by vector control agencies. Potential impacts to transportation/circulation can be reduced or eliminated if maintenance activities are scheduled to be performed at the same time as other maintenance activities performed by the municipalities, or at times when these activities have lower impact, such as periods of low traffic activity. Appropriate planning, design, siting, and implementation can reduce or eliminate potential health hazards due to the installation of structural BMPs.

18. Aesthetics. a. **Will the proposal result in the obstruction of any scenic vista or view open to the public?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in the obstruction of any scenic vista or view open to the public because none of the BMPs would introduce any physical effects that could impact this characteristic.

That dischargers would comply with this TMDL by installing structural BMPs that would adversely affect a scenic vista or view open to the public is not reasonably foreseeable. Most structural BMPs that will likely be used can be constructed as subsurface devices, such as sand filters. Once completed, structural BMPs would not foreseeably obstruct scenic vistas or open views to the public. In the unlikely event that the dischargers might install facilities on a scale that could obstruct scenic views, such impacts could be reduced or eliminated with appropriate planning, design, and siting of the structural BMPs. Additionally, many structural BMPs can, if necessary, be constructed underground to eliminate aesthetic issues.

18. Aesthetics. b. **Will the proposal result in the creation of an aesthetically offensive site open to public view?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in the creation of an aesthetically offensive site open to public view because none of the BMPs would introduce any physical effects that could impact this characteristic.

The installation of structural BMPs could potentially create an aesthetically offensive site open to public view. Structural BMPs may create an aesthetically offensive site to the public during construction and installation, but this would be temporary until construction is completed. Once installation of the structural BMPs is complete, the site may continue to be aesthetically offensive to the public. However, many structural BMPs can be designed to provide wildlife habitat, recreational areas, and green spaces in addition to improving stormwater quality. Appropriate architectural and landscape design practices can be implemented to reduce adverse aesthetic effects. Screening and landscaping may also be used to mitigate adverse aesthetic effects. The adverse aesthetic effects could be reduced or eliminated and possibly improved with appropriate planning and design of the structural

BMPs. Additionally, many structural BMPs can, if necessary, be constructed underground to eliminate aesthetic issues.

19. Recreation a. **Will the proposal result in impact on the quality or quantity of existing recreational opportunities?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in impact on the quality or quantity of existing recreational opportunities because none of the BMPs would introduce any physical effects that could impact these characteristics.

During construction and installation of structural BMPs, parks or other recreational areas could be temporarily affected. Construction activities could potentially be performed near or within a park or recreational area. Potential impacts would be limited and short-term, and could be avoided through proper siting, design, and scheduling of construction activities.

In the event that the municipalities might install facilities on a scale that could alter a park or recreational area, the structural BMPs could be designed in such a way as to be incorporated into the park or recreational area. Additionally, any structural BMPs can, if necessary, be constructed underground to minimize impacts on the quality or quantity of existing recreational opportunities. Mitigation to replace lost areas may include the creation of new open space recreation areas and/or improved access to existing open space recreation areas.

Additionally, improvement of water quality could create new recreation opportunities in urbanized areas of the watersheds by providing the opportunity to recreate in and near a clean water body with a robust and diverse population of plants and animals.

20. Archeological/Historical a. **Will the proposal result in the alteration of a significant archeological or historical site, structure, object or building?**

Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in the alteration of a significant archeological or historical site, structure, object or building because none of the BMPs would introduce any physical effects that could impact these characteristics.

In the unlikely event that dischargers might install facilities on a scale that could result in significant adverse effects on a significant archeological or historical site, structure, object or building, a project level, site-specific environmental assessment should be performed to identify the mitigation measures that could be employed to minimize the potential effects on archeological or historical sites and identify alternatives that could potentially be used that would have less impact. The agencies responsible for implementing this TMDL could consult the relevant local archeological or historical commissions or authorities to identify these types of sites and determine ways to avoid significant adverse impacts. The potentially adverse effects on archeological or historical sites that might be present could be reduced or eliminated with appropriate planning, design, and siting of the structural BMPs.

21. Mandatory Findings of Significance - Potential to degrade: **Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?**

    Answer**: Less than significant with mitigation**

Discussion: Non-structural BMPs will not result in the substantial degradation of the environment for plant and animal species because none of the BMPs would introduce any physical effects that could impact these characteristics.

As discussed above in Questions 4 and 5, plant and animal species could potentially be adversely affected by the installation and operation of structural BMPs. Mitigation measures could be implemented to ensure that unique, rare or endangered plant and/or animal species and their habitats are not taken or destroyed. When specific projects are developed and sites identified, a focused protocol plant and/or animal survey and/or a search of the California Natural Diversity Database should be performed to confirm that any potentially sensitive or special status plant and/or animal species in the site area are properly identified and protected as necessary. If sensitive plant and/or animal species occur on the project site, mitigation is required in accordance with the Endangered Species Act. Mitigation measures should be developed in consultation with the CDFG and the USFWS. Dischargers should avoid installing structural BMPs that could adversely affect any unique, rare or endangered species of plants and/or animals, and instead opt for non-structural BMPs and/or identify and install structural BMPs that will have little or no impact such as underground BMPs.

Taken all together, the potential impacts of the project will not cause a significant cumulative impact in the environment. In any case, the implementation of this TMDL will result in improved water quality in the waters of the Region and will have significant beneficial impacts to the environment over the long term.

21. Mandatory Findings of Significance - Short-term: **Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time, while long-term impacts will endure well into the future.)**

Answer**: No impact**

Discussion: There are no short-term beneficial effects on the environment from the implementation of non-structural and/or structural BMPs that would be at the expense of long-term beneficial effects on the environment. The implementation and compliance with this TMDL will result in improved water quality in the waters of the Region and will have significant beneficial impacts to the environment over the long term.

21. Mandatory Findings of Significance - Cumulative: **Does the project have impacts which are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)**

Answer**: Less than significant with mitigation**

Discussion: Cumulative impacts, defined in section 15355 of the CEQA Guidelines, refer to two or more individual effects, that when considered together, are considerable or that increase other environmental impacts. Cumulative impact assessment must consider not only the impacts of the proposed bacteria TMDLs, but also the impacts from other TMDL, municipal, and private projects, which have occurred in the past, are presently occurring, and may occur in the future, in the watershed during the period of implementation.

Past and present projects may be regarded as the general construction (development and maintenance) which has brought several regional creeks from a natural, pristine condition, to the urban, developed setting which is present today. This provides a baseline level of construction with which to compare all water quality project requirements. The past and present baseline of construction in the urbanized watersheds will probably remain constant in the future. The increment of increase proposed by the cumulative requirements of all water quality requirements can be mitigated through scheduling, and is insignificant compared to the past and on-going baseline of typical municipal construction.

Present and future impacts will come from all of the water quality control programs and pollutant load reduction projects being implemented in the watershed or planned for the near future. This includes waterbodies for which other TMDLs are to be developed, and projects to comply with the WDRs in Order Nos. R9-2007-0001 and R9-2002-0001 (the San Diego County and Orange County municipal stormwater requirements).

Cumulative impacts of these bacteria TMDLs and other water quality control programs are not expected to be significant because effective non-structural BMPs, that have no adverse impacts, will most likely be an initial strategy for implementation of the bacteria TMDLs. For example, the bacteria TMDLs can be implemented through education and outreach, and enforcement of ordinances requiring pet owners to properly dispose of pet waste, ordinances prohibiting disposal of grease, food products, and other bacteria-laden waste products into the storm drain, and ordinances curbing nuisance flows into the stormdrain system. Another important bacteria load reduction program is to find and fix illegal cross-connections between the sanitary sewer system and the stormdrain system. Fixing cross connections between the stormdrain and sanitary sewer systems may increase the overall number of construction projects needed in the watershed to implement TMDLs. However, estimating the number of cross connections that might exist is purely speculative. Further, these types of construction projects are on a small scale and fall well within typical municipal capital improvement and maintenance activities. Additionally, some of these practices, such as curbing nuisance flows, will be effective at addressing other pollutants in addition to bacteria. Therefore the cumulative effects will not be considerable, and can be mitigated, if necessary, through scheduling.

The dischargers may opt to use structural BMPs to reduce bacteria and other pollutants to the watersheds, which would increase the likelihood of environmental effects that are cumulatively considerable. The City of San Diego funded an assessment of BMP strategies that would lessen the anticipated impacts and allow an integrated TMDL strategy that address both current and anticipated TMDLs in Chollas Creek. In this study,[25] the authors recommended a strategy that used a tiered approach that reduces the impact to the environment, and allows for more cost effective implementation of lower-impact BMPs. The tiered approach consists of three major components:

- Tier 1 – Control of Pollutants at the Source and Prevent Pollutants from Entering Runoff
- Tier 2 – Conduct Design Studies and Implement Aggressive Street Sweeping and Runoff and Treatment Volume Reduction BMPs
- Tier 3 – Infrastructure Intensive Treatment BMPs

Implementation of this BMP strategy, because it emphasizes BMPs with the least adverse impacts to the environment, should reduce cumulative impacts to less than significant levels. Although this study was specific to Chollas Creek, the recommended strategy is applicable to reducing pollutants in all watersheds.

Present and future specific TMDL projects may include structural BMP construction which must be environmentally evaluated for potential cumulative impacts by the implementing municipality. Present and future specific TMDL projects and other construction activities may result in short-term cumulative impacts as described below. However, appropriate and available mitigation measures, including scheduling, are available to reduce adverse

[25] Weston Solutions, 2006. *Chollas Creek TMDL Source Loading, Best Management Practices, and Monitoring Strategy Assessment,* September, 2006.

environmental impacts associated with construction to less than significant levels.

Noise and Vibration - Local residents in the near vicinity of installation and maintenance activities may be exposed to noise and possible vibration. The cumulative effects, both in terms of added noise and vibration at multiple bacteria BMP installation sites, and in the context of other related projects, are not likely to be cumulatively considerable due to the temporary nature of noise increases and the small scale of the projects. Noise mitigation methods including scheduling of construction are discussed above, and should be used to keep cumulative noise and vibration affects to acceptable levels.

Air Quality - Implementation of the bacteria TMDL program may cause additional emissions of air pollutants and slightly elevated levels of carbon monoxide during construction activities. Emission of air pollutants resulting from installation of TMDL compliance devices may exceed certain regulatory thresholds, and therefore the TMDL, in conjunction with all other construction activity, may contribute to the region's overall exceedance of certain regulatory thresholds during the installation period. However, because these installation-related emissions are temporary, compliance with the TMDL would not result in long-term cumulatively considerable air quality impacts. Short-term impacts can be avoided through scheduling.

Transportation and Circulation - Compliance with the bacteria TMDLs could involve installation activities occurring simultaneously at a number of sites along the creek included in this project. Installation of bacteria reduction BMPs may occur in the same general time and space as other related or unrelated projects. In these instances, construction activities from all projects could produce cumulative traffic effects depending upon a range of factors including the specific location involved and the precise nature of the conditions created by the numerous construction activities. Special coordination efforts may be necessary to reduce the combined effects to an acceptable level. Overall, cumulatively considerable impacts are not anticipated because coordination can occur and because transportation mitigation methods are available.

Public Services - The cumulative effects on public services due to the bacteria TMDLs would be limited to traffic inconveniences. These effects are not likely to be cumulatively considerable as long as alternative traffic route are available around construction sites.

Aesthetics - Construction activities associated with other related projects may be ongoing in the vicinity of one or more bacteria TMDL construction sites. To the extent that combined construction activities do occur, there would be temporary elevated adverse visual effects. However, these effects are not cumulatively considerable in the long-term because the effects will cease with the completion of construction. Short-term impacts can be avoided through scheduling.

As analyzed above, the construction of structural BMPs, along with other construction and maintenance projects, could have short-term cumulative effects; however, these effects can be mitigated through proper construction scheduling. In addition, these effects are not cumulatively considerable in the long-term because the effects will cease with the completion of construction. In summary, appropriate and available mitigation measures, including scheduling, are available to reduce adverse environmental impacts associated with construction to less than significant levels.

21. Mandatory Findings of Significance - Substantial adverse: **Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?**

    Answer**: Less than significant with mitigation**

Discussion: All of the potentially significant impacts to human beings, such as air quality, noise, aesthetics, alterations to utilities, fire protection, police protections etc., are either short-term in nature, or can be mitigated to acceptable levels as previously discussed.

R.5.1 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.[26] The dischargers can use the structural and non-structural BMPs described in section 3, or other structural and non-structural BMPs, 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 that the dischargers might use. Because there are innumerable ways to combine BMPs, all of the possible alternative means of compliance cannot be discussed here. However, because most of the adverse environmental effects are associated with the construction and installation of 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.

[26] 14 CCR section 15187 (c) (3)

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R.6 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 cited below correspond to the land uses that were utilized for watershed model development (the watershed models are discussed extensively in section 7 of the Technical Report and Appendices J and K). Land uses in this analysis include: dairies/intensive livestock/horse ranches, transitional (construction areas), agriculture, residential, parks/recreation, commercial/institutional, industrial/transportation, and military. These land uses represent a range of population densities and geographical settings found in the San Diego Region. Although all of these land uses generate bacteria, the ones that have the highest human and/or animal population densities are the most likely to produce human pathogens that can pollute surface waters and impair beneficial uses.

In this discussion of potential compliance methods, 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.

The following discussion involves a programmatic level review of specific site compliance methods, or combination of compliance methods that have been implemented in the subject watersheds, as well as other BMP examples that could potentially be implemented at additional sites. The dischargers are in no way limited to using the BMPs included here to achieve TMDL compliance, and may choose not to implement these particular BMPs.

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.

R.6.1 Potential BMPs for Dairy/ Intensive Livestock Areas and Horse Ranches

Livestock and horse ranch areas in the San Diego Region are usually found in rural areas with lower population densities than the urbanized areas. However, small horse ranches and individual horse corrals are sometimes found within urbanized areas with higher population densities.[27]

[27] The US Census Bureau's 2000 data reported the City of San Diego to have a population density of 3,771 people per square mile.

Examples of management measures to achieve TMDL compliance include ensuring that livestock and horse holding pens, paddocks, and corrals are properly sized and sited in areas that do not drain to surface streams. Additionally, animal waste should be properly managed (i.e., stored in a manner that prevents leaching pollutants into runoff and prevents runoff from reaching waterways during a rain event.

Examples of structural BMPs include the installation of roof gutters to prevent rain water from mixing with manure and causing erosion, or diversion structures, such as vegetative strips, that absorb runoff and prevent it from reaching waterways. Another example includes the construction of animal exclusion devices, such as fences or other physical barriers, to keep animals out of the creeks, as shown in Figures 1 and 2. Figure 1 depicts a galvanized fence that is useful for keeping dairy cows from the Konyn Dairy in Escondido, California, (background) out of the creek bed (foreground). However, this control would be more effective if set back farther from the creek bank and with a vegetative strip between the fence and the creek bank. Figure 2 shows a similar fencing device that is useful for keeping horses confined and away from surface waters. No adverse environmental effects are expected as a result of implementing these types of BMPs.

Figure R-1. Animal Exclusion Device at Konyn Dairy, Valley Center Road, San Dieguito Watershed.

Figure R-2. Animal Exclusion Device at Happy Trails Horse Ranch, Black Mountain Road, Penasquitos Watershed.

R.6.2 Potential BMPs for Construction Sites

Construction activities typically take place in various settings and existing land uses. In San Diego County, construction activities result in new residential units both in urban and suburban environments, as well as industrial and commercial sites, such as business parks and shopping malls. Population densities in the areas of construction vary greatly with the specific projects.

A potential strategy to achieve TMDL compliance includes the use of structural BMPs, such as fiber rolls as shown in Figure 3. Other examples include compost blankets, netting, silt fences, or filter berms. Such devices prevent pollutants such as bacteria and sediment from reaching stormwater and stormwater drainage pathways by allowing the water and contaminants to infiltrate into the surrounding soil. Still other BMPs that are appropriate to use at construction sites include the use of sandbags, such as the ones shown in Figure 4. Sandbags also prevent runoff containing pollutants from reaching stormwater drainage pathways.

Possible adverse environmental effects include the reduction or elimination of storm flows from the use of structural barriers that prevent flow from reaching creek beds. Although such devices prevent pollutants from reaching receiving waters, so do they prevent water from reaching areas that might depend on it to provide habitat. Additionally, infiltration devices could alter the flow rate of groundwater. For a complete discussion of possible adverse effects of these BMPs, see section 5.

Figure R-3. Use of Netting and Fiber Rolls at San Elijo Hills Construction Site, Northstar Way, Carlsbad Watershed.

Figure R- 4. Use of Sandbags upstream of Moonlight State Beach, Encinitas Blvd., Carlsbad Watershed.

R.6.3 Potential BMPs for Agricultural Areas

In the San Diego Region, there are few agricultural areas compared to other regions in the state, such as the Central Valley. Agricultural areas account for about 12 percent of the land in the region (see Table J-1 in Appendix J) and have lower population densities than urbanized areas.

Examples of reasonably foreseeable management measures to achieve TMDL compliance include irrigation practices that control the volume and flow rate of runoff water, thereby keeping the soil in place, and reducing soil transport (bacteria and pathogens can adsorb to sediment particles). This is especially important where manure fertilizers are applied to agricultural fields. Examples of structural BMPs include the use of sandbags (see Figure 5) to prevent runoff containing pollutants from agricultural fields, such as the strawberry fields located in Carlsbad, California, (background) from reaching the storm drains that protect flooding of the adjacent roadways (foreground). Possible adverse environmental effects include the reduction or elimination of storm flows from the use of structural barriers (sandbags) that prevent flow from reaching creek beds. Although such devices prevent pollutants from reaching receiving waters, so do they prevent water from reaching areas that might depend on it to provide habitat. For a complete discussion of possible adverse effects of these BMPs, see section 5.

Figure R-5. Use of Sandbags near Strawberry Fields, Cannon Rd. near Interstate 5, Carlsbad Watershed.

R.6.4 Potential BMPs for Residential Areas

Residential areas comprise about 15 percent of the land use in the San Diego Region. Population densities tend to be highest in the residential areas as compared to other land use categories. Thus, residential areas have the highest potential for producing human pathogens that can contaminate surface waters.

In order to achieve TMDL compliance, residential land use areas, like the area shown in Figure 6, may only require non-structural BMPs; however, structural BMPs could be retrofitted, if appropriate. Potential non-structural BMPs at this specific site include increased street sweeping, and development and enforcement of municipal ordinances prohibiting the discharge of bacteria and nuisance flows to stormwater and stormwater drainage pathways. Other potential BMPs include adoption and enforcement of ordinances to pick up pet waste, and regular inspections of storm drains for cross connections with the sanitary sewers.

Potential structural BMPs include the installation of storm drain filter sacks, which require routine maintenance. Newer residential areas, including the one shown in Figure 7, could be designed with vegetative strips to control the velocity of runoff, increase infiltration, and prevent pollutants from entering stormwater drainage pathways.

Possible adverse environmental effects include the reduction or elimination of storm flows by the use of structural barriers that prevent flow from reaching creek beds. Although such mechanisms prevent pollutants from reaching receiving waters, so do they prevent water from reaching areas that might depend on it to provide habitat. Additionally, infiltration devices could alter the flow rate and/or quality of groundwater. For a complete discussion of possible adverse effects of these BMPs, see section 5.

Figure R-6. Clean Storm Drain in Residential Area, D Street, Carlsbad Watershed

Figure R-7. Vegetative Strip in Residential Area, San Elijo Hills, Carlsbad Watershed

R.6.5 Potential BMPs for Park and Recreational Areas

Park and recreational areas make up less than 1 percent of the total land area in the San Diego Region. Because these areas do not have housing or industrial units, population densities in these areas are low. However, parks and recreational areas may have significant use as dog walking areas, and be at risk for accumulating pet wastes.

In order to achieve TMDL compliance, park and recreational areas, like the dog park shown in Figure 8, may only require non-structural controls to encourage responsible actions by pet owners, and efficient irrigation practices that do not result in runoff leaving the site. Potential non-structural controls at this specific site include the availability of pet waste plastic bags and garbage cans. Other non-structural BMPs include the enforcement of pet waste ordinances (see Figure 9). No adverse environmental effects are expected from such measures.

Figure R-8. Plastic Bag Dispenser at Mayflower Dog Park, Valley Center Road, San Dieguito Watershed.

Figure R-9. Municipal Code Signage at Mayflower Dog Park, Valley Center Road, San Dieguito Watershed.

Some park and recreation areas provide land that can be used to treat pollutants originating from the upstream watershed. For example, structural BMPs, such as the constructed wetlands shown in Figure 10, can be incorporated into a park setting. Such devices provide wildlife habitat, are visually pleasing, and are successful at reducing or removing a number of pollutants from the creeks. Figure 11 shows Cottonwood Creek Park in Encinitas, California, in the foreground, and the constructed wetlands in the background. Bioassessments performed in this manufactured wetlands before and after construction demonstrated that this project did not result in any adverse environmental effects.[28]

Figure R-10. Manufactured Wetlands at Cottonwood Creek Park, Encinitas Blvd., Carlsbad Watershed.

[28] Kathy Weldon, City of Encinitas, personal communication, February 6, 2007.

Figure R-11. Cottonwood Creek Park, Encinitas Blvd., Carlsbad Watershed.

R.6.6 Potential BMPs for Commercial/Institutional Areas

Commercial and institutional areas account for approximately 2.75 percent of the land use in the San Diego Region (commercial and institutional areas were analyzed as one land use in the watershed models). Population densities vary on an hourly basis but are relatively high in these areas, compared to other land uses.

A potential strategy to achieve TMDL compliance includes non-structural controls, which may be sufficient to limit bacteria discharges. Commercial businesses and keepers of school grounds should use cleaning practices that contain pollutants instead of allowing them to enter conveyance systems. For example, debris and other waste should be swept up and disposed of properly, and trash receptacles should be available and properly maintained. Potential structural BMPs include the installation of vegetative strips and grassy areas as part of landscaping to control the velocity of runoff, increase infiltration, and prevent pollutants from entering stormwater drainage pathways. Possible adverse environmental effects include alteration of the flow rate and/or quality of groundwater from the use of infiltration devices. For a complete discussion of possible adverse effects of these BMPs, see section 5.

Another potential structural BMP that could be utilized in areas where storm drains discharge directly into receiving waters with high recreational use is a dry weather diversion, which are widely used near popular swimming beaches. Dry weather diversions are effective at reducing or removing urban runoff, or nuisance flows, from reaching receiving waters by directing them into sewer systems. These BMPs are suitable in land use categories where the specific site has similar hydrologic settings (dry weather nuisance flows discharging directly into receiving waters).

R.6.7 Potential BMPs for Industrial and Transportation Areas

Industrial and transportation areas account for about 1.6 percent of the total land area in the San Diego Region. As with the previous discussion, population densities are variable, depending on time of day and also day of week.

Several industrial parks and roadways have adjacent landscaped areas where both management areas and structural BMPs could be designed to help reduce bacteria discharges to surface waters. Management measures include using manure fertilizers sparingly, and efficient irrigation practices that minimize the amount of runoff leaving the site. Landscaping can be designed to capture and control the velocity of runoff, increase infiltration, and prevent pollutants from entering stormwater drainage pathways. Additionally, pervious surfaces near transportation areas often have steep slopes. To prevent erosion and the transport of sediment and bacteria to stormwater drainage pathways, various structural BMPs can be used. Some examples are fiber rolls, netting, and compost blankets.

Possible adverse environmental effects include the reduction or elimination of nuisance dry weather flows from the use of structural barriers that prevent flow from reaching creek beds. Although such devices prevent pollutants from reaching receiving waters, so do they prevent water from reaching areas that might depend on it to provide habitat. Additionally, infiltration devices could alter the flow rate and/or quality of groundwater. For a complete discussion of possible adverse effects of these BMPs, see section 5.

R.6.8 Potential BMPs for Military Areas

Military areas account for about 1 percent of the land area in the San Diego Region and have relatively high population densities, as compared to most land uses. Although military areas are treated as an independent land use for TMDL analysis, military areas are actually comprised of the various aforementioned land uses. Military areas have residential, commercial, and transportation areas, for example. Therefore the applicable structural and non-structural BMPs mentioned for possible use in these land uses would also be suitable in military areas.

R.7 Economic Factors

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.

R.7.1 Legal Requirement for Economic Analysis

The San Diego Water Board must comply with CEQA when amending the Basin Plan.[29] 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."[30] 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.[31] 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.[32] 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 consider the factors in Water Code section 13241 (a) through (f).

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." Section 5.2.3 in this document addresses this requirement.

R.7.2 TMDL 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

[29] Public Resources Code section 21080
[30] 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)].
[31] Public Resources Code sections 21159 and 21159.4
[32] See Public Resources Code section 21159(c)

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.

R.7.3 Cost Estimates of Typical Controls for Urban Runoff 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 runoff 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 runoff.

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 R-1 for an example of capital cost savings (CASQA, 2003).

Table R-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 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/Treatment 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).

R.7.4 Cost Estimate Summary for Urban Runoff Controls

Table R-2 summarizes the estimated costs of non-structural urban runoff controls. Tables R-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 R-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 R-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 R-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 R-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

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

[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 R-3. Cost Estimates for Structural Controls for 10 Percent of Urbanized Areas, Continued

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

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

[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 R-3. Cost Estimates for Structural Controls for 10 Percent of Urbanized Areas, Continued

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

Tecolote Creek Watershed

BMP	Estimated Total Cost to Treat 10 % of an Urbanized Area (in acres) [1, 2, 3,4]	Estimated Yearly Maintenance Cost[2,4]
Vegetated Buffer Strip	$3.810,684 - $8,684,633	$83,763 - $83,763
Bioretention	$9,603,201 - $128,043,490	$628,247 - $8,376,677
Sand Filters	$14,254,587 - $56,371,165	$1,639,908 - $6,485,178
Infiltration Trench	$605,479 - $1,431,213	$100,913 - $238,536
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.
[4] Numbers adjusted to 2006 prices to account for inflation using, Sahr, R.C. 2006. Consumer Price Index Conversion Factors 1800 to Estimated 2016 to Convert to Dollars of 2005.

R.7.5 Costs 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[33] 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 R-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.

[33] 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 R-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 R-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 R-5. Environmental Quality Incentives Program,
San Diego MP Cost List for Addressing Runoff from Fields with Manure Application.

Management 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

R.7.6 Potential 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.

R.7.7 Cost 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.[34] 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.

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

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

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 R-6 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 R-6. 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

R.8 Reasonable Alternatives to the Proposed Activity

The environmental analysis must include an analysis of reasonable alternatives to the proposed activity.[35] 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~~,~~ and modifying water quality standards~~, and incorporating a Basin Plan amendment to establish a "Reference System Approach."~~. The alternatives are discussed in the subsections below.

R.8.1 No 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.[36] Therefore the "no action" alternative is not viable and cannot be considered an acceptable alternative.

R.8.2 Water Quality Standards Action

Another alternative to adopting the TMDL Basin Plan amendment is the modification of water quality standards. If the applicable standards are not appropriate, a plausible regulatory response may be to correct the standards through mechanisms such as a use attainability analysis (UAA) or a site-specific objective (SSO). If the REC-1 and SHELL beneficial uses are improperly designated for any of the beaches and creeks included in this project, or if SSOs for total coliform, fecal coliform, and enterococci would be less stringent than what is reported in the Ocean Plans and Basin Plan, the TMDLs might not be necessary, or the required pollutant load reductions might be lower. This alternative might lessen or eliminate the adverse impacts associated with constructing structural BMPs by eliminating the need for structural BMPs or reducing the number of structural BMPs necessary. This alternative should not be construed as implying that standards may be changed as a convenient means of "restoring" waterbodies. To the contrary, federal and state law contain numerous detailed requirements that in many cases would prevent modifications of the standards, especially if modifications would result in less stringent waste discharge requirements. However, modification of standards may be appropriate to make uses more specific, to manage conflicting uses, to address site-specific conditions, and for other such reasons.[37]

As a first step in developing TMDLs, the San Diego Water Board confirmed the impairment status of the beaches and creeks and determined, from the available evidence, that bacteria

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35 23 CCR section 3777

36 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*).

37 SWRCB. 2005. *A Process for Addressing Impaired Waters in California*, June 2005

densities exceeded water quality objectives that support REC-1 and SHELL beneficial uses. At this time, the San Diego Water Board has no evidence that REC-1 and SHELL beneficial uses were inappropriately designated for the beaches and creeks. Therefore based on the available information, an action to de-designate these beneficial uses may be harmful to the environment, and this option is not preferred.

Developing SSOs for total coliform, fecal coliform, and enterococci may be appropriate at specific sites if epidemiology or other scientific studies demonstrate that less stringent water quality objectives would still be protective of human health, or if better indicator(s) are identified. SSOs should be (1) based on sound scientific rationale; (2) protective of the designated beneficial uses of the beaches and creeks; and (3) adopted by the San Diego Water Board in a Basin Plan amendment.

There are no efforts currently underway or planned by interested persons to fund the scientific studies needed to develop SSOs for bacteria in the beaches and creeks. Furthermore, the development of SSOs for bacteria in the beaches and creeks, including the scientific and epidemiological studies necessary to support them, would be costly, time consuming, and resource intensive.

Even in the event that scientific studies were initiated and SSOs developed and adopted, the need for a TMDL likely would not be eliminated. If SSOs for bacteria were developed in the future and adopted, this TMDL Basin Plan Amendment would be modified accordingly. If interested parties were willing to fund and oversee development of scientific studies to investigate SSOs, the most effective and expeditious means to improve water quality would be to conduct these studies concurrent with actions necessary to achieve compliance with the current TMDL.

R.8.3Reference System Approach

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 bacteria 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 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.

R.8.4R.8.3 Preferred Alternative

Because the previous three alternatives discussed 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.

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R.9 CEQA Determination

The implementation of these TMDLs will result in improved water quality in the San Diego region, but it may result in temporary or permanent localized significant adverse impacts to the environment. Specific projects employed to implement the TMDLs may have significant impacts, but these impacts are expected to be limited, short-term, or may be mitigated through careful design and scheduling. The Technical Report, the draft Basin Plan amendment, and the Environmental Checklist and associated analysis provide the necessary information pursuant to state law[38] to conclude that properly designed and implemented structural or non-structural methods of compliance will not have a significant adverse effect on the environment, and all agencies responsible for implementing the TMDLs should ensure that their projects are properly designed and implemented. Any of the potential impacts need to be mitigated at a subsequent project level because they involve specific sites and designs not specified or specifically required by the Basin Plan amendment to implement the TMDLs. At this stage, any more particularized conclusions would be speculative.

Specific projects that may have a significant impact would be subject to a separate environmental review. The lead agency for subsequent projects would be obligated to mitigate any impacts they identify, for example, by mitigating potential flooding impacts by designing the BMPs with adequate margins of safety.

Furthermore, implementation of the TMDLs is both necessary and beneficial. If at some time, it is determined that the alternatives, mitigation measures, or both, are not deemed feasible by those local agencies, the necessity of implementing the federally required TMDLs and removing the indicator impairment from the San Diego Region (an action required to achieve the express, national policy of the Clean Water Act) remains.

The benefits of meeting water quality standards to achieve the expressed, national policy of the Clean Water Act far outweigh the potential adverse environmental impacts that may be associated with the projects undertaken by persons responsible for reducing discharges of bacteria to beaches and creeks of the San Diego Region. Meeting water quality standards and the national policy of the Clean Water Act 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 (REC-1),and shellfish harvesting (SHELL) are beneficial uses of water that serve to promote the social and environmental goals of the people of the San Diego Region and require water quality suitable for the protection of human health, aquatic life and aquatic dependent wildlife.

[38] Public Resources Code, section 21159

In addition, implementation of the TMDLs will have substantial benefits to water quality and will enhance beneficial uses. Enhancement of the REC-1 and SHELL beneficial uses will have positive, indirect social and economic effects by increasing the natural habitat and aesthetic value of the 12 watersheds. These substantial benefits outweigh any unavoidable temporary adverse environmental effects.

In accordance with state law,[39] the San Diego Water Board finds that, although the proposed project could have significant effect on the environment, revisions in the project to avoid or substantially lessen the impacts, can and should be made or agreed to by the project proponents. This finding is supported by the evidence provided in the impact evaluation section of this document, which indicates that all foreseeable impacts are either short-term or can be readily mitigated.

On the basis of the initial environmental review checklist and analysis, and Technical Report for these TMDLs, which collectively provide the required information;

- ☐ I find the proposed Basin Plan amendment could not have a significant effect on the environment.
- ☒ I find that the proposed Basin Plan amendment could have a significant adverse effect on the environment, but that those impacts should be mitigated. This substitute environmental documentation constitutes a program-level analysis. The Water Boards cannot specify manner of compliance. Any impacts that might occur as a result of specific implementation projects can and should be mitigated by the entity carrying out or permitting that project. However, there are feasible mitigation measures that would substantially lessen any significant adverse impacts. These mitigation measures are discussed above and in the Technical Report for the TMDLs.
- ☐ I find the proposed Basin Plan amendment may have a significant effect on the environment. There are no feasible alternatives and/or feasible mitigation measures available which would substantially lessen any significant adverse impacts. See the attached written report for a discussion of this determination.

____________________________________ __________________
David W. Gibson ~~John H. Robertus~~ Date
Executive Officer

[39] Public Resources Code, section 15091

Appendix S

Responses to Comments

For Bacteria TMDLs Project I
Adopted by the San Diego Water Board on
December 12, 2007

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1 List of Persons Submitting Comments

The following persons submitted comments on one or more of the versions of the Total Maximum Daily Loads (TMDLs) for Indicator Bacteria Project I—Beaches and Creeks in the San Diego Region. The table in section 2, below, links the commenter with the comment number, and version of the TMDL documents on which the comment was made.

- California Department of Transportation
- City of Dana Point
- City of Encinitas
- City of Laguna Beach
- City of Laguna Niguel
- City of Oceanside
- City of Poway
- City of San Diego
- County of Orange
- County of San Diego
- Department of the Navy
- San Diego Coastkeeper
- San Diego Farm Bureau
- Sierra Club
- U.S. Environmental Protection Agency
- Heal The Bay

2 Comment Numbers and Categories

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3 Introduction

This report provides responses to public comments received on the Total Maximum Daily Loads (TMDLs) for Indicator Bacteria Project I—Beaches and Creeks in the San Diego Region. Draft TMDL documents distributed for public review and comment included the Technical Report, Resolution No. R9-2007-0044, and the Basin Plan amendment. The draft documents were made available to the public for formal review and comment for three comment periods, through the website of the California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) and at the San Diego Water Board office. The first public comment period opened December 9, 2005, and continued for 62 days. The second comment period opened August 4, 2006, and continued for 45 days. The third comment period opened March 9, 2007, and continued for 47 days.

The San Diego Water Board received many comments in testimony, letters, and emails from interested persons on the draft TMDL documents. The letters were not reproduced in this document. Individual comments were excerpted from the letters and testimony, and organized by subject. The comments are numbered sequentially in this report. Individual commenters are identified in the "List of Persons Submitting Comments" on page S-4 of this appendix.

Additional information requested by members of the San Diego Water Board is described in section 4 below. Individual comments and responses are discussed in section 5.

4 Additional Information Requested by the San Diego Water Board

4.1 Load Reductions Required for Discharger Categories and Recalculation of Allocations

Comment: At the December 14, 2005 meeting, Board Member Johnson commented that the percent reductions for wet weather discharges reported in the draft Technical Report were for all dischargers collectively in each watershed, thereby making it difficult to ascertain the percent reductions required from each discharger category (municipal MS4s, Caltrans, controllable nonpoint sources such as agriculture and animal facilities, and uncontrollable sources). He also noted that the watershed-wide load reduction percentages were misleading because they were smaller than the load reduction percentages for the individual discharger categories.

Response: We revised the tables in section 9 of the draft Technical Report to show the percent load reductions required for each of the discharger categories, instead of showing the percent reduction needed on a watershed-wide basis, as was reported previously.

4.2 Cost Estimates for Virus Surface Water Monitoring

Comment: At the February 8, 2006 meeting, Board Member Anderson requested information regarding cost estimates for monitoring pathogens.

Response: Pathogens are defined as agents that cause disease, and include microorganisms like bacteria, viruses, or fungi. In response to this comment, we analyzed the costs associated with monitoring viruses, since this analysis has been done (although not widely used), and information is readily available.

Industry standards for virus detection are not available, and methods that have been used to date are expensive. However, expenses are expected to decrease significantly within the next few years due to new techniques that are being developed. Two types of viruses should be considered for water quality monitoring: the coliphages and human adenoviruses. Adenoviruses can cause large-scale epidemics of respiratory illness, however, they also are the second leading cause of gastroenteritis in children. Adenoviruses are consistently found in raw sewage throughout the world and are considered hardy, with a 2-log increase in population size in 99 days.[1]

Although adenoviruses were detected in the majority of samples collected from urban waterways and polluted coastal areas, one researcher reported that hepatitis A and enteroviruses were found in water samples where adenoviruses were absent. Therefore, the author concluded that adenoviruses alone cannot serve as an index for human viral contamination in Southern California.[2] Hence, two measurements of viral populations/ communities are provided in the present report. A quantitative test using polymerase chain reaction (PCR) techniques for one species of human adenovirus costs approximately $2,000/sample.[3]

Coliphages are viruses that infect Esherichia coli (E. coli) bacteria. Coliphages are found in high concentrations in sewage, with concentrations typically ranging from 100 to 10,000 infectious units per milliliter.[4]

A quantification technique for coliphages, applying traditional microbiological techniques, involves growing coliphages using E. coli concentrated on an agar medium. The water sample, which possibly contains coliphages, is then incubated in the agar plate.[5] The 28-day assay test is very expensive, approximately $1,500/sample. Conversely, a simple presence/absence test for coliphage costs between $50 to $100/sample, but provides limited information.[6]

Despite the possible high concentrations, viruses can be very difficult to isolate and usually require sampling large volumes of water (20 to 40 liters) quoted prices include concentration of viruses from the water samples, which can be time-intensive. Assuming that a two-person sampling team can collect samples at 5 sites per day, at 100 miles

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[1] 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.

[2] Jiang, S. 2002. Adenovirus as an Index of Human Viral Contamination. Microbiological Source Tracking Workshop, February 5, 2002, Irvine, CA. National Water Research Institute, Fountain Valley, CA.

[3] Ken Schiff, SCCWRP, personal communication, March 15, 2006

[4] Sobsey, M. 2002. Coliphage Tracking to Identify Sources of Fecal Contamination. Microbiological Source Tracking Workshop, February 5, 2002, Irvine, CA. National Water Research Institute, Fountain Valley, CA.

[5] Ibid.

[6] Ken Schiff, SCCWRP, personal communication, March 15, 2006.

round trip, using the PCR technique for adenovirus and the 28-day standard methods test for coliphage, the total cost for one day of sampling would be $18,974.

Table 1. Cost Estimates for Surface Water Monitoring for Viruses

Expenditure	Cost per Unit
Laboratory Analyses	
Adenovirus, one species, PCR	$2,000/sample
Coliphage, 28-day test	$1,500/sample
Coliphage, presence/absence test	$50 - 100/sample
Field Sampling Costs – two people	$1,440 per day
Vehicle Costs	$34 per 100 mi

4.3 Adaptability of TMDLs and Compliance Schedules Based on New Data or Information

Comment: At the February 8, 2006 meeting, several Board Members requested clarification regarding the adaptability of TMDLs and associated compliance schedules if new data or information becomes available.

Response: As with all TMDLs, the development of the bacteria TMDLs was characterized by data gaps and uncertainties. Scientific uncertainty is a reality within all water quality programs, including the TMDL program, and this uncertainty cannot be entirely eliminated. The TMDL program must move forward in the face of these uncertainties if progress in attaining water quality objectives (WQOs) in impaired waters is to be made.

The National Research Council addressed this issue in their report for the U.S. Congress entitled Assessing the TMDL Approach to Water Quality Management (2000) and concluded that

> "… the ultimate way to improve the scientific foundation of TMDLs is to incorporate the scientific method, and not simply the results from analysis of particular data sets or models, into TMDL planning. The scientific method starts with limited data and information from which a tentatively held hypothesis about cause and effect is formed. The hypothesis is tested, and new understanding and new hypotheses can be stated and tested. By definition, science is this process of continuing inquiry. Thus, calls to make policy decisions based on the "the science," or calls to wait until "the science is complete," reflect a misunderstanding of science. Decisions to pursue some actions must be made, based on a preponderance of evidence, but there may be a need to continue to apply science as a process (data collection and tools of analysis) in order to minimize the likelihood of future errors."

We have structured an adaptive implementation plan in the draft Technical Report that simultaneously makes progress toward achieving bacteria WQOs while relying on monitoring data to reduce uncertainty and fill data gaps as time progresses. This monitoring data can be used to revise and improve the initial TMDL forecast over time. This type of approach will help ensure that implementation of TMDLs is not halted because of a lack of data and information, but rather progresses while better data are collected to verify or refine assumptions, resolve uncertainties, and improve the scientific foundation of the TMDLs.

Once adopted, modifications to TMDLs can be incorporated with a subsequent Basin Plan amendment, if appropriate. The request to initiate the amendment process may be voiced by interested persons to the San Diego Water Board at any time.

One option for revising these TMDLs, once adopted into the Basin Plan, is the Triennial Review process. During the Triennial Review, the public may recommend issues that the San Diego Water Board should address in the near future that will result in Basin Plan amendments. The San Diego Water Board develops and adopts a prioritized list of Basin Plan issues that may be investigated over a span of three years. These issues include interpretation of WQOs and incorporation of implementation plans. Initiation of the Basin Plan amendment process can take place during the Triennial Review or upon the San Diego Water Board's direction to staff at any time.

4.4 Addressing Beaches and Creeks Simultaneously

Comment: At the February 8, 2006 meeting, former Board Member Kraus requested that clarification be provided concerning the need to address both beaches and creeks simultaneously, rather than in separate analyses.

Response: One TMDL for each indicator bacteria was calculated for each of the five freshwater creeks (Aliso Creek, San Juan Creek, the San Diego River, Forrester Creek, and Chollas Creek) and their downstream ocean beaches because the beaches and creeks are connected hydrologically, and sources of bacteria to both beaches and creeks are the same; namely urban and stormwater runoff. Thus reducing bacteria loading from urban and stormwater runoff should restore water quality both in the creeks and at the beaches.

The watershed models predicted the accumulation of bacteria on the watershed surfaces and the loading at the critical points, which are model nodes representing the bottom-most point in each watershed before the creeks discharge to the beaches, and before intertidal mixing takes place. The critical point is a modeling tool that theoretically represents the exact point where the freshwater creek ends and the marine water beach environment begins. Because each watershed is unique in terms of hydrological conditions, the point where the freshwater creek system ends, and the marine system begins does not exist in the same location in each watershed. Although useful for calculating bacteria loads and TMDLs, the critical point in the watershed models does not necessarily represent a point in the watershed where TMDL compliance will be measured.

In terms of calculating TMDLs, we chose the more stringent of the marine or freshwater WQO for each indicator bacteria as the numeric target for the five beach/creek watersheds. For total coliform, the more stringent WQO is associated with the SHELL beneficial use for marine beaches. For fecal coliform, the more stringent WQO is associated with the REC-1 beneficial use for marine beaches. For enterococci, the more stringent WQO is associated with the REC-1 beneficial use for freshwater creeks.

Several dischargers expressed concern that calculating one TMDL per indicator bacteria per watershed erroneously imposes creek WQOs onto beaches, and beach WQOs onto creeks. However, this is not the case. The TMDLs do not require that saltwater SHELL total coliform, nor saltwater REC-1 fecal coliform objectives, be met throughout the creek, or that freshwater enterococci WQOs be met at the beach. We revised the text in the draft Technical Report to make this clear.

In terms of protecting creek water quality, we chose the more stringent enterococci WQO for creeks because the creek is the upstream receiving water. Even though the marine beaches have less stringent enterococci WQOs associated with them, dischargers have no more of a burden to meet this standard at the beach, since the more stringent WQO already has been met upstream.

In terms of protecting beach water quality, we used the more stringent total and fecal coliform targets (these WQOs are more stringent than the WQOs associated with creeks). In taking this approach, we assumed that attainment of the WQOs at the point where the creeks discharge to the beaches will result in attainment of the WQOs at the downstream beach. If WQOs are met at the mouth of the watershed, then WQOs likely also are met at the beach because dilution with the wavewash has taken place. This approach is justified because (1) the beach ocean shorelines are the ultimate receiving waterbodies. All creeks included in this project discharge to the ocean or San Diego Bay which are designated with REC-1 and SHELL uses, (2) the beaches have more recreational users than creeks, and (3) the beaches are designated with the most sensitive beneficial use, shellfish harvesting, whereas creeks are not.

In terms of measuring compliance with TMDLs, the mouths of the watersheds, represented in the models by the critical point, are not necessarily the location where compliance will be measured. The compliance monitoring points for freshwater and marine water TMDLs have not been determined at this time. Appropriate compliance points will be determined on a watershed-by-watershed basis with input from the stakeholders, when the implementing orders for these TMDLs are developed. Compliance will likely be assessed in three categories; 1) load reductions, 2) changes in urban runoff and discharge quality, and 3) changes in receiving water quality. These categories correspond to Levels 4, 5, and 6 in the California Stormwater Quality Association's paper "An Introduction to Stormwater Program Effectiveness Assessment." Dischargers will not be held accountable for achieving SHELL WQOs in the freshwater creeks. The dischargers will be held accountable for reducing total coliform loads at the mouths of the creeks to levels that do not cause the SHELL total coliform WQO to be exceeded at the beaches.

4.5 Nurseries as a Potential Bacteria Source

Comment: At the April 25, 2007 meeting, Board Member Anderson requested that clarification be provided concerning the identification of nurseries as a possible source of bacteria to surface waters.

Response: The Technical Report seeks to describe all controllable nonpoint sources that have the potential to be significant sources of bacteria. Due to their fertilizer storage and usage, nurseries have the potential to discharge bacteria in storm water runoff.[7] As such, the inclusion of nurseries in the Technical Report as a potential significant nonpoint source of bacteria is appropriate. This is consistent with how the TMDL addresses all other controllable nonpoint sources, such as agriculture, dairy/livestock, and horse ranch facilities. However, the inclusion of nurseries in the TMDL as a potential source of bacteria does not mean that nurseries are in fact a significant source. Rather, the Technical Report only requires that to the extent that nurseries are a source of bacteria, that those sources of bacteria be controlled, even though, properly composted manure fertilizers should be devoid of human and animal pathogens.

Regardless of whether or not nurseries are a significant source of bacteria, the TMDLs do not result in a change in how discharges from nurseries are managed or regulated. Waste discharge requirements (WDRs), the WDR Waiver Policy, and the NPS Implementation and Enforcement Policy will continue to apply to nurseries where appropriate. The TMDLs require that nurseries continue to comply with these regulations and requirements. Therefore, if nurseries are currently in compliance with these regulations and rules, the TMDLs will not result in a change in nursery operations. This is especially true if nurseries are determined to not be a source of bacteria. In such a case, the nurseries will have no problem meeting the load allocations prescribed in the Technical Report.

[7] San Diego Stormwater Copermittees, 2005. Baseline Long-Term Effectiveness Assessment. P. C-69.

5 Comments and Responses

5.1 Reference System Approach Basin Plan Amendment

Comment 1

Compliance with contact recreation standards. In all but one watershed, the load allocations for the background/non-controllable sources exceed the TMDL for the watersheds; therefore, the watershed will never attain the water quality standards. The Department strongly supports the Regional Board's adoption of a basin plan amendment to allow implementation provisions for a reference system approach as used to develop the interim limits within the TMDL. We encourage the Regional Board to obtain sufficient data needed for proper characterization of a reference watershed within the San Diego Region. The TMDL provides for 22% of samples during wet weather to exceed standards based on the reference watershed in the Los Angeles Region; however, reference watersheds indicate natural exceedances up to 50% of the time (Table 4-1).

Response: One important difference between the data sets mentioned by Caltrans is that the purpose for acquiring the data was different. In the case of the data from the Arroyo Sequit watershed in Los Angeles, the data were gathered to characterize and quantify a suitable reference system. In contrast, the data from San Onofre Creek and San Mateo Creek watersheds (Table 4-1) were collected by the San Diego County Department of Environmental Health (DEH) during routine monitoring as part of a wider beach monitoring program. These data were not collected for the purposes of characterizing a reference watershed. Additionally, San Mateo Creek beach was rejected as a reference beach for study by the Southern California Coastal Water Research Project (SCCWRP) because of too much development in the watershed. The Technical Report has been modified to discuss this important distinction.

Comment 2

Uncontrollable Sources of Natural Background Bacteria: There are now several studies supporting the fact that year-round natural bacteria sources and re-growth contribute to high bacteria levels and exceedances of water quality standards. The TMDL document states this fact. We recommend the TMDL document include a reasonable allowance for uncontrollable sources of bacteria and re-growth, based on the best available information, in the wet and dry season and for the final TMDLs. This allowance may be adjusted to actual watershed specific conditions over time as special study and monitoring data become available.

We suspect that by not including a reasonable allowance for natural sources, this may cause the negative impact of requiring agencies to spend significant public funds to install systems to treat uncontrollable natural sources of bacteria that have not been proven to impair beneficial uses or be a public health risk.

Response: The interim wet weather TMDLs include a reasonable allowance for uncontrollable sources of bacteria and re-growth based on the reference system approach. A Basin Plan amendment has been initiated to authorize the use of a reference system/natural sources exclusion approach for the purpose of calculating final TMDLs. Since re-growth on wrack lines and other natural and uncontrollable sources are accounted for in the reference system approach, final wet weather TMDLs will be recalculated using this approach following adoption and subsequent approvals of the reference system approach Basin Plan amendment. The allocations and percent reductions calculated using the reference system approach are expected to be similar to interim wet weather TMDLs. Dischargers will be required to reduce current loading by approximately 22 percent in all watersheds, with the biggest reduction of 53 percent required in the San Diego River watershed. Upon adoption of this Basin Plan amendment, we will recalculate the bacteria TMDLs using the appropriate exceedance frequency.

As opposed to the wet weather approach for calculating TMDLs, a reference system approach will not be utilized for dry weather applications. A reference system approach is not applicable to these 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 does not apply to a geometric mean because the geometric mean is an average value over the course of 30 days. Further, evidence from reference systems show that during dry weather, single sample maximum WQOs are rarely exceeded. However, if significant relevant data become available from reference watershed studies to justify modification of dry-weather TMDLs with a reference system approach, we will consider re-evaluation of the TMDLs. The current dry-weather TMDLs are based on the 30-day geometric mean WQOs, which should be included when considering relevancy of reference conditions. For wet weather, reference conditions were incorporated into the TMDL based on allowable daily exceedances of the single sample maximum WQO. Similar assumptions are not directly transferable to the dry-weather approach, so new approaches for consideration of reference conditions will be required for dry weather.

As stated above, the Basin Plan amendment will incorporate a natural sources exclusion approach for implementing the REC-1 and SHELL WQOs. The natural sources exclusion approach will essentially authorize exceedances of WQOs as long as all anthropogenic sources of indicator bacteria are controlled. Under the natural sources exclusion approach, after all anthropogenic sources of indicator bacteria have been controlled, a certain frequency of exceedance of the WQOs can be authorized based on the residual exceedance frequency in the specific water body. The residual exceedance frequency can be used to calculate an allowable exceedance load for TMDL calculation. Therefore, to the extent that natural background conditions are causing exceedances of WQOs, the dischargers will not be held responsible for those exceedances. Alternatively, a TMDL could also be calculated without an exceedance frequency based simply on the existing bacteria loading after anthropogenic sources have been adequately controlled.

To take advantage of the natural sources exclusion approach, dischargers must control all anthropogenic sources of indicator bacteria. Examples of measures that can be taken by dischargers to control anthropogenic sources of indicator bacteria include enforcement of ordinances requiring pet owners to properly dispose of pet waste, enforcement of ordinances prohibiting disposal of grease, food products, and other bacteria-laden waste products into the municipal separate storm sewer system (MS4), prevention of nuisance flows from entering the MS4, correction of sanitary sewer/MS4 cross-connections, prevention of infiltration from the sanitary sewer into the MS4, control of or sanitation for homeless encampments in and near water bodies, control of sanitary sewer overflows, etc.

The dischargers expressed a legitimate concern regarding planning and implementing costly controls for the final wet weather TMDLs, and final dry weather total coliform TMDLs as the San Diego Water Board has every intention of revising them. Thus, the dischargers will not be required to submit Bacteria Load Reduction Plans (discussed in sections 11.5.2 and 11.5.3 of the Technical Report) for the final wet weather TMDLs and final dry weather total coliform TMDLs until after we have considered the reference system/natural sources exclusion approach Basin Plan amendment, and considered revisions to those TMDLs. We have committed to considering the Basin Plan amendment and revisions to the TMDLs within one year of the effective date of this TMDL Basin Plan amendment. When we revise the TMDLs, we will also revise the compliance schedule for meeting final wet weather TMDLs, and the final dry weather total coliform TMDL. The revised final wet weather enterococci and fecal coliform TMDLs will likely be similar to the interim TMDLs. Thus, the revised final compliance schedule for these TMDLs likely will not be longer than 10 years. Similarly, we intend to revise the final wet and dry weather total coliform TMDLs for SHELL using the natural sources exclusion approach, and will revise the compliance schedule accordingly based on the estimated time needed to control sources of bacteria associated with human and domesticated animal wastes.

We recognize the concern that dischargers must spend significant resources to reduce bacteria discharges, when pathogens such as viruses are recognized as the causative agent. For this reason, the discussion of special studies described in section 11.6 has been modified to include the need to search for an appropriate and affordable pathogenic indicator of water quality. However, we must emphasize that whether or not natural sources pose a public health risk in and of themselves is not well known. Pathogens from wildlife hosts such as *giardia* have been found in areas where there is little anthropogenic impact.

Comment 3

The text needs to include a reasonable allowance for uncontrollable sources of bacteria and re-growth, based on best available information for wet and dry seasons and for the final TMDLs. As stated in the text, natural bacterial sources and re-growth contribute to high bacteria levels. This allowance may be adjusted to watershed specific conditions, based on special studies and monitoring data as it accumulates over time.

The City's concern is that if reasonable allowances are not made for natural sources of bacteria, cities may be required to spend significant public funds to install systems to treat uncontrollable natural sources of bacteria that have not been proven to impair beneficial uses or be a public health risk.

Response: Please see the response to Comment 2 in regards to the commenter's claim that uncontrollable sources will need to be treated. In terms of public health risk, an important consideration is that illness rates associated with enterococci densities can be costly to beachgoers. In a recent study,[8] scientists investigated the economic impacts associated with contracting gastrointestinal illness from swimming at contaminated coastal waters at beaches in southern California. Authors used water quality data (specifically enterococci) from the year 2000, along with beach attendant data from 28 beaches, spanning 160 km of coastline in Los Angeles and Orange Counties, as input into two epidemiological dose-response models. The authors estimate that approximately 1 million excess gastrointestinal illnesses occur at beaches in Los Angeles and Orange Counties each year due to coastal contamination. Considering loss of time at work, doctor visits, and medicine for each occurrence, this equates to expenditures of about $36 million annually. This number is conservative because it does not include expenses associated with contracting other types of waterborne illnesses, nor does it account for lost recreational value, a swimmer's willingness to pay to avoid getting sick, or loss to coastal market economies that depend on contribution from beachgoers. Although this study focused specifically on beaches in Los Angeles and Orange Counties, we believe the results are applicable to the San Diego Region. Therefore, although we recognize the significant expenses associated with implementing BMPs, we also assert that efforts to abate bacteria contamination are necessary to avoid the likewise significant expenses associated with recreating in contaminated waters.

Comment 4

Section 9.1.2, Tables 9-1 through 9-6, should include Dry Weather wasteload allocations for Caltrans, as well as Dry Weather Controllable Load Allocations for agricultural uses and Dry Weather Non-Controllable Load Allocations for open space/natural background, in parallel to the Wet Weather TMDLs. An identifiable percentage of Caltrans' property features large landscape irrigation systems with potential to discharge runoff during dry weather, and agricultural land is also widely irrigated. Since the model's total annual load is theoretically based on a "critical wet year", it is particularly unreasonable to assume that natural streams in undeveloped watersheds would not be flowing or producing non-controllable background loads except on rainy days. A study in the Aliso watershed suggested that the anthropogenic component of dry weather baseline flow may be in the range of 46 to 87%. The Report text should include a commitment to incorporating flow and bacteria data from SCCWRP's ongoing Natural Loadings project, when these analyses become available, to update the Non-controllable Load Allocation.

Response: Calculation of flows/loads for the critical wet period is a separate issue than for dry periods. The critical period applied to wet weather TMDLs only and consisted of the wet weather days of and hydrology modeled from 1993 rainfall, an extremely wet year. For consistency sake, 1993 rainfall was used to select dry weather days for dry weather TMDL development; however, dry weather loading was estimated as a function

[8] Given, Suzan, Linwood H. Pendleton, and Alexandria B. Boehm. 2006. Regional Public Health Cost Estimates of Contaminated Coastal Waters: A Case Study of Gastroenteritis at Southern California Beaches. *Environmental Science and Technology* (July 2006) 40 (16), 4851 -4858.

of steady-state flows derived from an analysis of average dry weather flows. There is no critical dry period identified. Although the wet days identified in the TMDL were based on those occurring during the critical year 1993, dry days were assumed to occur during low-flow periods when baseflow resulting from preceding wet events are limited and the resulting assimilative capacity of the streams is reduced. Therefore, estimation of dry-weather loads is independent of antecedent periods and the potential presence of residual baseflows from previous rainfall events. Although the occurrence of such dry flows absent of groundwater baseflows is questionable during a wet year such as 1993, the dry day is defined independent of the seasonal or annual conditions, and is specifically defined to protect beneficial uses of receiving waters during periods when the assimilative capacity of the waters is limited due to reduced dilution from non-urban flows.

We did not develop dry weather allocations for Caltrans, agricultural areas, and open space areas for the reasons discussed in the response to Comment 23.

Comment 5

Section 9.1.2, Summary of Dry Weather TMDLs- Dry weather flow included a contribution of groundwater seepage into the stream bed. This baseflow may be affected by bacteria from natural sources such as bird and other wildlife feces. If the upcoming reference creek watershed study will consider these sources, the City of San Diego requests that the reference creek watershed approach be used to modify the bacteria dry weather loads in this TMDL.

Response: Please see the response to Comment 2.

Comment 6

Section 9.1.2 – Summary of Dry Weather TMDLs- Dry weather flow includes a contribution of groundwater seepage into the stream bed. This baseflow may be affected by bacteria from natural sources such as bird and other wildlife feces. If the upcoming reference watershed study demonstrates this, the County of San Diego requests that the reference watershed approach be used to modify the bacteria dry weather loads in this TMDL.

Response: Please see the response to Comment 2.

Comment 7

Section 11.5.7 – This section states that *" 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. This is higher that the 22 percent found at Arroyo 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 City of San Diego and other dischargers participated in the reference beach study. The 27% exceedance rate should be used in the calculation for interim allowable exceedance rate.

Response: We plan to permanently implement an allowable exceedance frequency for wet weather TMDL calculations, but only after a Basin Plan amendment to incorporate the reference system approach has been adopted and approved. The 27 percent exceedance frequency cited in the SCCWRP report may not be appropriate for the wet weather TMDLs because it applies to the 24 hours after cessation of rainfall. However, wet weather in the TMDLs is defined as up to 72 hours after a rainfall event. Samples collected at the 72-hour mark probably exceed the WQOs at a much lower frequency than 27 percent.

Comment 8

The way certain dry weather data have been used to set targets is not logical. In some instances, shoreline data have been used to support the assumption that there is no loading of indicator bacteria from watersheds during dry weather, despite the fact that creek mouths were sealed by sand berms. Because the berms blocked creek flow, it is not possible to use shoreline data to say anything about bacteria levels on the inland, or creek, side of the berms. They are two physically separate systems. There may or may not have been substantial levels of indicator bacteria in the creeks but it is impossible to determine this. The response that this represents a "margin of safety" is flawed in two respects. First, it is a dangerous precedent to base a margin of safety on an obviously faulty interpretation of system behavior. Second, margins of safety are usually set by applying a multiple of some measured or estimated risk or design parameter. Simply applying an irrelevant measurement and setting a parameter at zero is not an appropriate approach for establishing a margin of safety. While the staff contends that treating this issue differently would not change the overall TMDL targets, the use of an obviously false premise does not inspire confidence that the TMDL is using a systematic and logical approach to dealing with key issues and uncertainties.

Response: The commenter's assertion that dry weather data have been used to set targets is incorrect. For all three indicator bacteria, dry weather numeric targets were based on the geometric mean WQOs described in the Ocean Plan and Basin Plan. The geometric mean was used because dry weather flow is more steady-state in nature than wet weather flows, and a geometric mean represents an average over 30 days. Dry weather beach data from near the outlets of San Mateo and San Onofre Creeks (relatively undeveloped watersheds) were used in this project to show that single sample maximum WQOs are rarely exceeded during dry flow conditions. In contrast, SCCWRP showed that single sample maximum WQOs are frequently exceeded at beaches near the outlets of undeveloped (reference) watersheds during wet weather, or storm flow conditions. Thus, a TMDL that allows some exceedance of single sample WQOs is appropriate for storm flow conditions, but not for dry flow conditions.

In addition, 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.

The low percentage of exceedances of the single sample WQOs could be due to the existence of berms that prohibit creeks from flowing all the way to the ocean. Because the berms are in place, we recognize that there may be substantial levels of indicator bacteria in the creeks, and that the absence of data in the creeks represents an unknown. When berms are in place, exceedances measured in the downstream beaches are likely caused by local sources on the beach that exist downstream of the mixing zone such as birds, marine mammals, or re-growth in the wrack line.

More data should 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, are sufficient for use as dry weather TMDL targets. The discussion in section 4.2 of the Technical Report has been clarified to this effect.

Setting the numeric targets equal to WQOs, with no application of a reference system is not a margin of safety. The decision not to apply a reference system approach to dry weather was based on the method of TMDL calculation, namely the use of the geometric mean as the numeric target, and the inappropriateness of an exceedance frequency to be applied to the geometric mean. However, the natural sources exclusion approach could be used for achieving dry weather TMDLs.

Comment 9

P. 37, Section 4.2 Dry Weather Targets

a) The document states that "…exceedances of WQOs during dry weather conditions are uncommon in these relatively undeveloped watersheds." The bacteria data utilized were collected either at the mouth of San Mateo Creek or at San Onofre State Beach and shows that there were no dry weather exceedances (Table 4-5). This finding is used to support the decision to make no allowance for reference bacterial loads during dry weather. However, this conclusion is flawed in two ways. First, the Creek apparently does not flow to the beach during the vast majority of the dry weather period. Thus, establishing targets for creeks using samples taken from locations with no physical connection to a creek is not appropriate. Second, assuming the Creek does flow to the beach during dry weather, using samples from the mixing zone at the mouth of the Creek or from a nearby beach to establish targets for a creek itself does not allow for potential dilution due to mixing of the creek water with the ocean. Dry-weather targets for creeks should be established with data from a creek itself, not from the ocean.

b) There is no discussion of whether the data from the Santa Monica reference watershed discharging to Leo Carillo Beach had any dry-weather exceedances. It would be useful to compare dry-weather conditions at the San Mateo and Leo Carillo watersheds, both at the mouth of each and inland.

Response (a): As stated in the response to Comment 2, the data collected at the shoreline of San Onofre and San Mateo Creeks was not used to establish an acceptable exceedance frequency for dry weather. The data was used merely to demonstrate that local beach sources, such as birds, marine mammals, and re-growth in the wrack line, are not sufficient to cause exceedances of single sample maximum WQOs during dry weather conditions.

We recognize that there is essentially no data at this point to quantify bacteria loading from a reference watershed during dry weather. However, a reference system approach will not be used to calculate dry weather TMDLs for the reasons described in the response to Comment 8.

TMDLs were calculated at the critical point in the models for both beaches and creeks. The critical point is a node in the model that represents the bottom of the watershed, before any inter-tidal mixing (dilution) takes place. The critical point was chosen as a conservative measure to protect the downstream beach, where the majority of REC-1 use occurs. If WQOs are met at the bottom of the watershed, then they are most likely met at the beach, after dilution occurs. Dischargers should not rely on dilution to achieve REC-1 WQOs, since beneficial uses apply throughout all segments of a waterbody including creek mouths.

Response (b): Dry weather samples from Leo Carillo beach taken during the winter season showed a 3 percent exceedance frequency. Comparing Leo Carillo beach to San Mateo is improper because the watershed draining to Leo Carillo beach is around 95 percent undeveloped, whereas the watershed draining to San Mateo beach is around 85 percent undeveloped. Because of this, SCCWRP rejected the San Mateo watershed and beach as a reference system for its studies.

Comment 10

P. 69, Section 9.1.2: As stated in Comment 2, the data collected in the local reference system does not adequately represent the level of naturally occurring bacteria in creeks and therefore should not be used to evaluate the rate of exceedances in local reference systems during the dry season. San Mateo Creek apparently does not flow to the beach during the vast majority of the dry weather period. Thus, establishing targets for creeks using samples taken from locations with no physical connection to a creek is not appropriate. Second, assuming the Creek does flow to the beach during dry weather, using samples from the mixing zone at the mouth of the Creek or from a nearby beach to establish targets for a creek itself does not allow for potential dilution due to mixing of the creek water with the ocean. Dry-weather targets for creeks should be established with data from a creek itself, not from the ocean.

Response: Please see the response to Comment 8.

Comment 11

The City is concerned that these TMDLs are moving through the adoption process without sufficient consideration given to whether the proposed WLAs are necessary to protect appropriate beneficial uses. The City suggests that these issues should be resolved prior to adoption of the TMDLs. For example, Regional Board staff is in the process of conducting a reference study which is expected to show that the current proposal to allow zero anthropogenic bacteria in urban runoff is more stringent than necessary to protect Basin Plan-adopted beneficial uses (the State Department of Health standard for drinking water is higher than the final WLAs proposed in the Bacti-1 TMDL). This approach is similar to the "reference system approach" alternative described in the Bacti-1 environmental analysis. This alternative would result in less significant impacts and should therefore be selected for approval.

Similarly, the City has previously presented evidence which suggests that the beneficial uses SHELL and REC-1 have been improperly ascribed to Chollas Creek, resulting in proposed WLAs for metals that are orders of magnitude lower than those permitted at the Point Loma Wastewater Treatment Plant outfall. This approach is similar to the "Water Quality Standards Action" alternative described in the Chollas Dissolved Metals environmental analysis. This alternative would result in less significant impacts and should therefore be selected for approval.

Response: We appreciate the City's concern. However, the approach that we have taken is the most conservative approach that will be protective of the beneficial uses for each water body in the Basin Plan. The beneficial uses and WQOs are established in the Basin Plan, and the bacteria TMDLs were calculated based on these established water quality standards. There may be evidence to suggest that beneficial uses have been improperly ascribed, but the Basin Plan would have to be amended to remove or alter those beneficial uses, which is a process that is separate from a TMDL Basin Plan amendment.

The final wet weather TMDLs and WLAs that were calculated are the most protective of beneficial uses without regard to uncontrollable (natural or background) sources. In contrast, the interim wet weather TMDLs and WLAs were calculated using a reference system approach which allows a 22 percent exceedance frequency of the single sample maximum WQOs for REC-1. The purpose of the exceedance frequency is to account for the natural, and largely uncontrollable sources of bacteria in the wet weather loads generated in the watersheds and at the beaches which can, by themselves, cause exceedances of WQOs.

The dischargers have been provided 10 years to meet the interim TMDLs and final dry weather fecal coliform and enterococci TMDLs. An additional 10 years have been provided in the compliance schedule to meet the final wet weather and total coliform TMDLs. We are currently in the process of developing a Basin Plan amendment to permanently allow the use of the reference system approach in calculating TMDLs and WLAs. The reference system approach Basin Plan amendment is a high priority for us.

We fully expect to adopt the reference system approach Basin Plan amendment before the dischargers must comply with the final TMDLs.

Once the reference system approach Basin Plan amendment is adopted, region-wide, bacteria-specific, and/or watershed-specific allowable exceedance frequencies may be developed, and the TMDLs and WLAs will be revised accordingly. The region-wide, bacteria-specific, and/or watershed-specific allowable exceedance frequencies that are developed are expected to be close to the 22 percent exceedance frequency that was used in the interim wet weather TMDL calculations. Therefore, after the reference system approach Basin Plan amendment is adopted, the final wet weather TMDLs will likely become similar to the interim wet weather TMDLs that were calculated. In the Implementation Plan, the San Diego Water Board has committed to considering the reference system/natural sources exclusion approach Basin Plan amendment, and revised final wet weather and dry weather total coliform TMDLs within one year of the effective date of the amendment for this TMDL project.

The reasonable alternatives to the TMDL Basin Plan amendment are discussed in section R.8 of Appendix R. One alternative is to correct the water quality standards ascribed to the beaches and creeks through a use attainability analysis. However, the appendix states that the San Diego Water Board has no evidence that REC-1 and SHELL beneficial uses were inappropriately designated for the beaches and creeks.

The City of San Diego did provide the San Diego Water Board with information showing that parts of Chollas Creek and the San Diego Bay shoreline at the mouth of Chollas Creek were substantially modified from their natural conditions prior to November 28, 1975. This date is significant because according to the Clean Water Act, beneficial uses that existed in waterbodies on or after this date must be designated for the waterbody in the Basin Plan. Much of Chollas Creek was hydromodified into concrete channels while the natural San Diego Bay shoreline was industrialized with rip rap and vertical concrete seawalls. The City of San Diego suggested that, because of the modifications to the channel and shoreline, the beneficial uses ascribed to Chollas Creek and the SHELL use ascribed to San Diego Bay at the mouth of Chollas Creek might not have existed on or after November 28, 1975.

The fact that the hydromodification took place before November 28, 1975 alone is not enough evidence to rebut the presumption that one or more of the beneficial use designations was improper. More definitive information is needed on whether or not the pre-1975 hydromodifications precluded the WARM, WILD, potential REC-1, and REC-2 beneficial uses of Chollas Creek, and the REC-1 and SHELL beneficial uses of San Diego Bay at the mouth of Chollas Creek, and whether or not water quality in Chollas Creek and San Diego Bay at the mouth of Chollas Creek has ever been at a level to support these uses since November 28, 1975. We suggest that the City of San Diego continue to investigate this issue and provide us with more complete information. This issue can also be submitted for consideration during the next Triennial Review of the Basin Plan.

Comment 12

Why doesn't Regional Board staff complete the bacteria reference study before recommending adoption of the Bacti-1 TMDL?

Response: Adoption of these bacteria TMDLs do not rely upon the reference system approach Basin Plan amendment. These TMDLs already include a reference system approach in its calculation of an interim wet weather TMDLs. The reference system/natural sources exclusion approach Basin Plan amendment will only change the final wet weather TMDLs.

Delaying adoption of the TMDLs until adoption of the reference system/natural sources exclusion approach Basin Plan amendment will result in added and unnecessary delays in implementing the interim wet weather TMDLs and the final dry weather fecal coliform and enterococci TMDLs. The revised final wet weather TMDLs (per the reference system/natural sources exclusion amendment) are likely to be very similar to the interim wet weather TMDLs, and the dry weather fecal coliform and enterococci TMDLs will not be affected by the reference system/natural sources exclusion approach Basin Plan amendment. Therefore, the dischargers should be compelled to take actions to meet the interim wet weather TMDLs, and dry weather fecal coliform and enterococci TMDLs without further delay.

The final wet and dry weather SHELL TMDLs will be revised pursuant to the natural sources exclusion approach Basin Plan amendment, however, this revision of the TMDLs will occur after bacteria load reduction BMPs have successfully controlled anthropogenic sources of bacteria associated with human and domestic animal wastes. At that time, the TMDLs can be recalculated based on the actual bacteria loading to the watershed, or on the actual WQO exceedance frequency at the beach with the bacteria reduction BMPs in place and functioning.

The dischargers have a legitimate concern regarding planning and implementing costly controls for the final wet weather TMDLs since the San Diego Water Board has every intention of revising them. Thus, providing additional time in the compliance schedule to meet the final wet weather TMDLs is reasonable so that the dischargers will not have to engage in implementation planning for TMDLs that will be revised. Extending the compliance schedule for the final wet weather and final dry weather total coliform TMDLs to 20 years and not requiring the dischargers to submit pollution control reduction plans for these TMDLs until after the San Diego Water Board has considered the reference system/natural sources exclusion approach Basin Plan amendment, and considered revisions to these TMDLs should provide sufficient time and flexibility for achieving the final TMDL requirements.

Comment 13

The acceptability of the Draft TMDL is predicated on the prior or concurrent approval of a companion Basin Plan Amendment (BPA) allowing the use of the "reference system approach" to natural source exclusions for wet and dry weather, which would allow the "interim" targets in the Draft TMDL to become "final" targets. Although the 'reference system' BPA was given priority for funding in the last Triennial Review cycle and the amendment process was actually initiated, it has been brought to the SAG's attention that RWQCB staff have subsequently been diverted and the BPA process has been effectively put on hold. The TMDL is not acceptable or implementable without the BPA. Approval of the TMDL accompanied by delays in the BPA approval could force the Permittees to prepare Bacteria Load Reduction Plans based on the Final targets instead of the Interim ones. More ominously, if EPA ultimately upheld the TMDL but not the BPA, every MS4 and Agricultural land use will be required to implement 100% reduction of all wet-weather bacteria loads within 10 years – a feat that is technically and economically infeasible and counter to the expressed intent of the TMDL (see Section 11.5.7: "A Basin Plan Amendment to authorize the reference system approach… is required to avoid the need to attain the final TMDLs." It is critical that the 'reference system' BPA be put back on the front burner so it can move through the required Regional, State and Federal EPA approvals prior to, or at least concurrently with, the TMDL. This may mean that the TMDL approval should be deferred while the BPA catches up; or that the TMDL approval should be explicitly contingent on BPA approval and that the TMDL's forwarding for SWRCB and EPA approval should be delayed accordingly.

Response: The San Diego Water Board is actively working on the reference system approach Basin Plan amendment at this time. However, as previously stated, adoption of these bacteria TMDLs do not rely upon the reference system approach Basin Plan amendment. These TMDLs already include a reference system approach in its calculation of interim wet weather TMDLs. The reference system approach Basin Plan amendment will only change the final wet weather TMDLs. Please see the responses to Comments 2 and 12 for additional explanation.

Comment 14

Section 11.5.7 discusses the Reference Watershed Basin Plan Amendment and indicates that the RWQCB will "investigate and process the proposed reference system Basin Plan amendment in accordance with local priorities and resources." The Basin Plan amendment process, although given priority for funding in the current Triennial Review, is already substantially behind schedule. This wording leaves open the possibility of substantial and indefinite delays in processing the reference system amendment and completely ignores the potential impact of any such delay on the dischargers, who would be compelled in the meantime to prepare and begin implementing Bacteria Load Reduction Plans based on Final targets currently shown as up to 100% reductions. This is not an appropriate use of resources. There may be several alternatives to resolve this problem, including: 1) the approval of this TMDL could be delayed until the Basin Plan amendment catches up to it in the approval process; 2) approval and implementation of the TMDL could be made contingent on the approval of the Basin Plan amendment; or 3) a final sentence could be added to this section specifying:

> *In the interim, Bacteria Load Reduction Plans will be allowed to provide for phased Plan development; dischargers will not to be required to include provisions for attaining the Final targets until after the Basin Plan amendment is approved and the re-calculations are incorporated into the TMDL.*

In any case, prudence would dictate that the Reference System Basin Plan amendment needs to be completed as soon as possible. The RWQCB should make a specific timing commitment in this regard.

Response: Please see the responses to Comments 2 and 12.

Comment 15

Section 11.5.7 makes reference to SCCWRP's Natural Loading Studies and describes natural exceedances of Total Coliform, but neglects to mention that these data also identified significant natural exceedances of Enterococci and E. coli (a subset of Fecal Coliform) under both wet and dry conditions. SCCWRP's "reference" bacteria studies for both wet and dry weather are ongoing and substantially more local exceedance-rate data will be available by Summer 2007. The EPA representative (in preliminary meetings with RWQCB staff and the SAG relating to the Reference System Basin Plan amendment) has already preliminarily concurred that naturally-occurring dry-weather bacteria need not be controlled and that the Basin Plan amendment could reflect this policy. Section 11.5.7 indicates that "After this [Reference System] Basin Plan amendment is adopted, TMDLs included in this project can be re-calculated to reflect an appropriate exceedance frequency." Given the SCCWRP findings and the EPA concurrence, this sentence should be revised to read, " …TMDLs included in this project will be re-calculated to reflect appropriate wet- and/or dry-weather exceedance frequencies"; or other wording to acknowledging dry-weather natural bacteria occurrence. The text should also identify who will be doing this re-calculation and what procedural requirements there will be to incorporate the new findings as the new Final targets. The text should also indicate that exceedance rates used for the re-calculations may vary among the different waterbodies if local reference data provide sufficient justification.

Response: At this time, the reference system approach will only be applied to the wet weather TMDLs. However, the natural sources exclusion approach could be used for attainment of dry weather TMDLs. The natural sources exclusion approach will allow the San Diego Water Board to develop TMDLs that result in exceedances of WQOs for both REC-1, REC-2, and SHELL uses, as long as all bacteria sources associated with human and domesticated animal wastes are controlled. Under the natural sources exclusion approach, after all such sources of bacteria are controlled, a certain frequency of exceedance of the WQOs can be authorized based on the residual exceedance frequency in the specific water body. The residual exceedance frequency can be used to calculate an allowable exceedance load for the purpose of a TMDL. Alternatively, a TMDL could also be calculated without an exceedance frequency based simply on the existing bacteria loading after anthropogenic sources have been adequately controlled.

Comment 16

Section 11.5.7 discusses the Reference Watershed Basin Plan Amendment and indicates that the RWQCB 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."

The acceptability of the Draft TMDL is predicated on the prior or concurrent approval of a companion Basin Plan Amendment (BPA) allowing the use of the "reference system approach" to natural source exclusions for wet and dry weather, which would allow the "interim" targets in the Draft TMDL to become "final" targets. Although the 'reference system' BPA was given priority for funding in the last Triennial Review cycle and the amendment process was actually initiated, it has been brought to the SAG's attention that RWQCB staff have subsequently been diverted and the BPA process has been effectively put on hold. The TMDL is not acceptable or implementable without the BPA. Approval of the TMDL accompanied by delays in the BPA approval could force the Permittees to prepare Bacteria Load Reduction Plans based on the Final targets instead of the Interim ones. More ominously, if EPA ultimately upheld the TMDL but not the BPA, every MS4 and Agricultural land use will be required to implement 100% reduction of all wet-weather bacteria loads within 10 years – a feat that is technically and economically infeasible and counter to the expressed intent of the TMDL (see Section 11.5.7: "A Basin Plan Amendment to authorize the reference system approach… is required to avoid the need to attain the final TMDLs." It is critical that the 'reference system' BPA be placed as a high priority for RWQCB so it can move through the required Regional, State and Federal EPA approvals prior to, or at least concurrently with, the TMDL. This may mean that the TMDL approval should be deferred while the BPA catches up; or that the TMDL approval should be explicitly contingent on BPA approval and that the TMDL's forwarding for SWRCB and EPA approval should be delayed accordingly.

Response: Please see the responses to Comments 2 and 12.

Comment 17

Conceptually, the use of the reference system approach for wet weather is appropriate and your Board should consider adopting a Basin Plan Amendment allowing the use of the reference system approach in bacteria TMDLs. However, the methodology of combining the reference system approach developed by the Los Angeles Regional Board to allow a specific exceedance frequency with the wet weather loading approach above to estimate required load reductions during wet weather, is without technical basis. Further, we are very concerned with the lack of sensitivity analysis associated with the current reference system approach. Local reference stations, based on limited data show exceedances of up to 50%, yet the allowable frequencies specified in the TMDL, based on data from the Los Angeles Regional Board, are 22%. We believe that the potential impacts associated with characterizing the sensitivity of reference watersheds to variability justify rigorous and prioritized investigation. Finally, the reference system approach should also be applied to winter dry weather as is the case in TMDLs conducted by the Los Angeles Regional Board.

Response: In developing the reference system approach, there will be variation in exceedance frequencies from reference watershed to reference watershed. There will also be variation in exceedance frequencies based on the method used to determine an acceptable exceedance frequency (e.g., minimum, mean, maximum).

The commenter notes that local reference stations show exceedances of up to 50 percent. However, the commenter fails to note that there are data from reference watersheds that have exceedances as low as 0 percent.

We used a conservative approach when developing the TMDLs. Until evidence is provided that demonstrates a less conservative approach is warranted, the TMDLs that are developed must be protective of the beneficial uses of the receiving waters. At this time, we determined that an allowable exceedance frequency of 22 percent, based on data from the Los Angeles Water Board to be acceptable by the San Diego Water Board for purposes of developing interim TMDLs. When the reference system/natural sources exclusion approach Basin Plan amendment is adopted, region-wide, bacteria-specific, and/or watershed-specific allowable exceedance frequencies will be developed. In regards to applying the reference system approach to winter dry weather, please see the response to Comment 8.

Comment 18

At various points in the document, there is discussion about the use of reference systems. In general, the technical authors appear to justify the use of reference conditions for comparisons of the wet weather data. There is considerable precedence for this technical approach. Although the authors present data using the reference system approach, they explain that the Basin Plan does not yet permit such an approach (i.e., that the TMDL program would need to wait for a potential lengthy public review process of the Basin Plan to consider it). Considering that the TMDL program was established to provide comprehensive protection and regulation of watershed and waterbody aquatic ecosystems, it is unfortunate that it can be undermined by the failure to integrate it with the legacy regulatory programs. This should be a simple fix during the next Basin Plan update.

Response: The reference system approach Basin Plan amendment is a high priority for the San Diego Water Board and is currently being developed. TMDLs will be recalculated and the compliance schedule adjusted once the Basin Plan amendment has been adopted. We have committed to considering the Basin Plan amendment and revisions to the TMDLs within one year of the effective date of this TMDL Basin Plan amendment.

Comment 19

Considering reference system comparisons in the document, there should be more justification provided for the use of the Los Angeles region, which provides the 22% exceedance value. For the limited data set established regionally, the values are considerably higher. It seems that the Board would want to find reference conditions close to the sites of concern rather than further away.

Response: Since the interim TMDLs were developed, the SCCWRP has characterized three additional reference beaches, and is in the process of characterizing reference subwatersheds. We intend to consider all the available reference system data when we recalculate the final wet weather TMDLs.

Comment 20

We are also concerned about the fact that the wet weather allowable load for controllable nonpoint sources is zero. This puts farmers in the untenable position of controlling one-hundred percent of indicator bacteria when, as mentioned above, there is a lack of evidence for the need for control. It is critically important that this TMDL return to the reference stream approach as used in the interim TMDL. At a minimum, farmers should be granted the load that is given to like acreages of uncontrollable nonpoint sources. This is given the fact that if the farm didn't exist and the land was in its natural state an allocation would be granted.

Response: We do not agree that farmers should be granted a load that is given to similar acreages of uncontrollable nonpoint sources. Bacteria loads from uncontrollable nonpoint sources (i.e., open spaces) are different than from farmers (i.e., agriculture/livestock). For open spaces, the assumption is that there are no human activities, and the bacteria loads originate from the wildlife fauna.

However, farmers and their activities (e.g., livestock maintenance and manure management, application of amendments and/or mulches to soil) have an anthropogenic influence on the land, which can have a significant impact on the potential bacteria loads that can be transported in storm water runoff. If farmers implement proper management measures and practices, bacteria loads can be eliminated from storm water that runs off from agricultural lands to receiving waters. Another important point is that farmers are not required to take additional pollutant load reduction actions beyond what is required in WDRs and waivers.

As discussed above, the reference system approach Basin Plan amendment is a high priority for us and is currently being developed. The dischargers have been provided 10 years to meet the interim TMDLs. An additional 10 years have been provided in the compliance schedule to meet the final TMDLs. Upon adoption of the reference system Basin Plan amendment, we will recalculate TMDLs and adjust the compliance schedule appropriately.

Comment 21

Reference System Basin Plan Amendment Appropriately Follows TMDL Adoption.

We support the use of a reference system approach, as is envisioned in the TMDL through the interim targets. We understand that staff is now working on a Basin Plan Amendment (BPA) to allow those interim targets to replace the final targets. The reference system approach is the most appropriate way to develop a TMDL that will ensure beneficial uses are attained without requiring control of natural sources.

We are well aware of the stated concerns of some municipalities that the BPA and Bacteria TMDL are not coming forward at the same time. Both Regional Board staff and SAG members understand that our mutual goal is to adopt the interim targets as final once the BPA has been prepared. However, we must begin the TMDL process. There is no sense in delaying the TMDL in order to bring it to you concurrently with the BPA. Rather, the TMDL should move forward, followed closely by the BPA. Municipality concerns that the BPA process will never move forward to approval are unfounded, as that very act is the stated goal in the TMDL. Conversely, there are very real concerns that should the TMDL not be adopted now, it and the BPA may be severely delayed. Without the pressure of an approved TMDL, municipalities will not have incentive to begin this cleanup and reduction process. The affected waters have been on the 303(d) list of impaired waterbodies for years. We cannot afford to wait while public health and safety continue to be at risk.

Response: We agree that dischargers should not delay implementing bacteria load reduction BMPs. Adoption of these bacteria TMDLs do not rely upon the reference system approach Basin Plan amendment. Once these TMDLs are adopted, dischargers must begin or continue to meet load allocations and wasteload allocations in accordance with the compliance schedule for the reasons discussed in the response to Comment 12. However, once the reference system Basin Plan amendment is adopted, we will recalculate some of the TMDLs and adjust the compliance schedule appropriately.

Comment 22

An appropriate reference site should be selected in the San Diego Region.

An important modification that needs to occur in the SD beaches and streams TMDL is the usage of the 22% allowable exceedances as a target. The 22% allowable exceedance value was not determined as acceptable by Region 4, but the approach based on the number of exceedances at a reference beach during the 90th percentile storm year was approved. We strongly urge the SD Board to modify their approach and determine allowable exceedances based on the number of exceedances at a reference beach during the 90th% storm year. This is an easy analysis with the extensive monitoring data base that exists in the SD region.

There has been a great deal of concern expressed about how an exceedance based approach is not consistent with the current SD Region Basin Plan. The Los Angeles Region routinely modifies the Basin Plan with Basin Plan amendments concurrently with approval of their TMDLs. We strongly encourage the San Diego region to move forward with a Basin Plan amendment concurrently with TMDL approval to ensure that public health protection and Rec-1 waters beneficial use attainment occur as soon as feasible.

The Santa Monica Bay fecal bacteria approach was utilized in San Pedro Bay, Marina Del Rey and Malibu Creek as well.

Response: The commenter incorrectly states that these TMDLs are not consistent with an exceedance frequency based approach. Interim TMDLs were calculated using exactly this approach (see Technical Report, section 8). Assuming the commenter is referring to how TMDL compliance will be assessed, this statement is also incorrect for the reasons stated in the response to Comment 147. The TMDL process will not be put on hold while we develop the reference system approach Basin Plan amendment because it is imperative that dischargers begin load reductions immediately.

5.2 Technical Analysis

Comment 23

The TMDL needs to develop load and waste load allocations for all identified sources of bacteria for both dry and wet weather. Only wet weather loadings have been developed for Caltrans and non-point sources from open recreation, open space and confined animal feeding operations based on the assumption that loading will only occur during rain events and that rain water is the only source of water for creeks. This assumption erroneously ignores irrigation practices by Caltrans and on open space and agricultural areas during dry weather and documented base flow in perennial creeks in the watersheds. Since irrigation is seen as the cause of the majority of loading from urban areas, this reasoning should be applied equally to Caltrans, managed open space and agricultural/animal feeding operation lands where irrigation also occurs. Additionally, a load allocation should be developed to reflect the natural level of bacteria in creek base flows during dry weather.

Response: The lack of a WLA for Caltrans and LAs for agricultural dischargers for dry weather is premised on the assumption that these sources are unlikely to discharge significant bacteria loads during dry weather. Irrigation runoff from these sources was assumed to be minimal compared to irrigation practices within urbanized watersheds that drain to MS4s owned and operated by municipalities.

Transportation land use areas used in the model only include hardscape areas. Although Caltrans-owned right of ways encompass landscaped areas, these areas were included with other land use types and attributed to the Municipal dischargers. The total irrigated right-of-way area is small compared to the other urban land use areas that produce nuisance flows into the MS4s. Table I-2 shows that the Caltrans occupied areas in the 12 watersheds of this TMDL project range in size from 0.00 square miles to 1.94 square miles. Assuming that the irrigated right-of-ways are twice the area of the impermeable highway areas, the largest irrigated area would be just less than 4 square miles. This value is for the San Diego River watershed. These areas are so small relative to the rest of the urban areas that a dry weather wasteload allocation is not justified. Although no load reductions are required from Caltrans, bacteria discharges should not increase above current loading. For this reason, the Technical Report was modified to state that we will recommend that the State Board develop WQBELs to establish an upper limit on bacteria loading equal to the current loading. Load reductions are not required; conversely, no increases in loading are allowed.

Under the Waiver Policy, discharges from controllable nonpoint sources such as discharges from animal feeding operations and agricultural and nursery irrigation return water are not allowed to cause nuisance conditions to receiving waters or violations of applicable WQOs. Thus, if dischargers are abiding by the conditions stated in their WDRs and waivers, then no exceedances of WQOs are occurring, and the initial assumption that dry weather loading is insignificant is correct. The Implementation Plan states that the San Diego Water Board will enforce facility specific WDRs and waivers with respect to discharges from animal feeding operations, manure composting and soil amendment operations, and agricultural and nursery irrigation return flow in the watersheds with significant agricultural sources of bacteria (the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds). If, upon enforcement of the waivers, nuisance conditions or exceedances of WQOs still occur from agricultural bacteria sources then WDRs can be issued to violators.

We did not consider loading from creek base flows in TMDL calculations. Base flows from groundwater can be associated with residual flows from wet weather events. Since dry weather modeling is distinct from wet weather modeling, we did not include contribution from base flows. A conservative approach for assessing dry weather loads is to exclude dilution factors such as base flows. Appendix L has been modified to include a discussion of this conservative assumption.

Comment 24

Section 9.1.2, Tables 9-1 through 9-5 - Overspray from the irrigation of roadside landscapes contributes to dry weather flows. Caltrans should be allocated a dry weather flow load to reflect this contribution.

Response: Please see the response to Comment 23.

Comment 25

P. 9, Section 1.4; para. 5: The statement "…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 off of Caltrans highways during dry weather." ignores the irrigation practices which are cited as the prime source of urban runoff attributed to the MS4 system. Irrigation of landscaped areas in Caltrans right-of-ways provides a flow source for the wash off of bacteria during dry weather and should be included in the dry weather waste load allocation.

Response: Please see the response to Comment 23.

Comment 26

Page 4, last paragraph describes the wasteload allocations for Caltrans using the impermeable surfaces of the Caltrans owned highways. During dry weather the report states that there is no significant urban runoff from the highways. Accordingly on page 69, dry weather WLA's were not distributed to Caltrans. There is a potential bacterial runoff from the irrigated landscape areas immediately adjacent to the highways and maintained by Caltrans during wet and dry weather. It is known that Caltrans uses where it is available, reclaimed water for irrigation. Even though the reclaimed water is disinfected address the potential for re-growth of bacteria. Also address the fertilizers applied to the landscape as a source of bacteria. The total bacterial runoff from impermeable highway surfaces and irrigated landscapes should be evaluated and WLAs assigned as required.

Response: Please see the response to Comment 23.

Comment 27

The TMDL should distribute load and waste load allocations to all identified sources of bacteria for both dry and wet weather. To date, only wet weather loadings have been developed for Caltrans and non-point sources from open recreation, open space and confined animal feeding operations based on the assumption that loading will only occur during rain events and that rain water is the only source of water for creeks. This assumption erroneously ignores irrigation practices by Caltrans and on open space and agricultural areas during dry weather and documented base flow in perennial creeks in the watersheds. Since irrigation is seen as the cause of the majority of loading from urban areas, this reasoning should be applied equally to Caltrans, managed open space and agricultural/animal feeding operation lands where irrigation also occurs.

Response: Please see the response to Comment 23.

Comment 28

Wet weather modeling. The technical report's definition of wet weather conditions is not appropriate for many types of storms. In relatively undeveloped watersheds, 0.2 inches of rain will produce little or no direct runoff, and any impact on water quality is unlikely to persist for 72 hours. Consequently, many of the observed values at monitoring sites throughout the watershed may not be representative of true wet weather conditions.

The use of basin-wide summary statistics for model calibration and verification is not appropriate. For instance, water quality measurements from 59 sites in the Aliso Creek watershed are averaged together for comparison with predicted data. Model results should be compared only to single sites that correspond to the locations of the predicted values.

To assess model fit with available data, the time series model output was graphically compared to the observed data. This is not an appropriate test for model calibration and verification. A quantitative test using root mean square error or other comparable methodology would be preferred. The horizontal and vertical scales of the figures presented in Appendix N preclude any meaningful visual assessment of the match between observed and predicted values.

Figures 12 through 25 in Appendix N depict the average and range for observed and modeled fecal coliform, total coliform, and enterococcus concentrations in the basins. In contrast to the conclusion of the report, these graphs indicate that the model does a poor job in many of the watersheds of predicting bacteria concentrations. Even where observed and predicted values appear to be relatively close together because of the logarithmic scale, the observed and predicted values often differ by a factor of 5 to 10 or more.

Response: We recognize the discrepancy between the assumption for defining a wet-weather event and the occurrence of actual wet flows. Wet days, identified based on the defined storm (0.2 inches of rainfall and the following 72 hours) may not be entirely accurate for identifying wet-weather monitoring data. Regardless, observed data were used only for model validation, and comparison did not result in modification of bacteria modeling parameters. Recall that the bacteria build-up/wash-off modeling parameters were assumed "previously calibrated" based on robust analysis at land-use-specific sites in the Los Angeles Region. Similar detailed land use runoff data were not available in the San Diego Region. Therefore, for this study the bacteria modeling parameters were "validated" through comparison with local data, but not enough data were considered available in the San Diego Region to justify adjustment of modeling parameters through additional calibration. As a result, selection of wet-weather data in the region for comparison to model-predicted bacteria densities may have impacted analysis, but did not result in adjustment of modeling parameters potentially caused by unrepresentative wet-weather data.

Where data were not collected at consistent locations of model subwatershed outlets, data collected throughout the subwatersheds were pooled and relative ranges of observed bacteria densities were compared with ranges predicted by the models at the subwatershed outlet. The results shown in Figures N-12 through N-24 provide an analysis of the general trends, but were not used to support or justify calibration of modeling parameters. Regardless, comparisons in Figures N-12 through N-24 were provided in an attempt to utilize all data collected in the region, although these datasets may not be suitable for robust model calibration, nor was the purpose for their collection associated with watershed model development. However, results of these comparisons show the dependence of both model results and observed data on flow magnitudes, which were normalized in these figures based on watershed area. Except for lower flow ranges, the general trend of model results and observed data appear to be consistent relative to the flow ranges shown. To address low-flow periods that were not predicted with accuracy based on LSPC, a separate modeling approach was developed.

Model calibration and validation can be performed using both quantitative and qualitative techniques. Qualitative calibration and validation are often performed using graphical analysis, as was reported for both hydrology and water quality for the dry- and wet-weather models of the report. Quantitative evaluation of model uncertainty of bacteria predictions based on the recommended methods requires a robust set of observed data to provide meaningful comparison to model predictions and result in statistical significance. Such large datasets were not available for most watersheds used for model validation in this study. In addition, the extreme variability of bacteria densities (often exceeding orders of magnitude) further impacts statistical calculations.

To present the graphical comparison of model results with observed data, logarithmic scales were used on the y axis for bacteria densities. Given the logarithmic variability of bacteria levels, accuracy of a model within an order of magnitude is generally considered successful. In addition, logarithmic comparisons of bacteria concentrations are typical. It should be noted that if bacteria levels were reported on a normal scale, visual inspection of model results and observed data would be even more difficult, as much of the smaller concentrations would be practically impossible to read and evaluate due to the extreme vertical range.

Comment 29

Table 1-2 indicates that beaches and creeks included in this TMDL project are to meet more rigorous requirements than beaches that are not listed as impaired. Beaches must exceed standards more than 4% of the time to be listed as impaired; whereas, listed beaches will be allowed "no" exceedances**.** What is the rationale for this difference?

Response: We assume that this comment refers to the 4 percent allowable exceedance percentage allowed for beach monitoring data on page 5 of the *Water Quality Control Policy for Developing California's Clean Water Act 303(d) List* (Listing Policy). Comparing the allowed exceedance percentage in the binomial test in the Listing Policy to the exceedance frequencies allowed in the TMDL calculations is off base. The TMDL is a plan for attaining bacteria WQOs and restoring beneficial uses in receiving water. Conservative assumptions and margins of safety are utilized in the TMDL to ensure that water quality supports beneficial uses in the receiving water at all times. The binomial test is applied to a monitoring data set for a water body to determine whether or not the waterbody is impaired and a TMDL should be calculated for the waterbody. Exceedances in the binomial test are allowed to account for potential transient effects, errors, bias, and outliers in the data.

Comment 30

Page 33 of the draft Technical Report explains how staff determined the TMDL for beaches and creeks. Total coliform was used for numeric targets in the TMDLs to determine the required load reductions needed to ensure that the REC-1 and SHELL beneficial uses will be protected. Some stakeholders have expressed a concern that the selection of the same numeric targets for beach and creeks would enforce salt water total coliform limits in the creeks. Coastkeeper does not believe that this concern is valid. It is possible, however, that in order to meet the SHELL standard in the saltwater, a more stringent creek WQO may be required. We suggest that the draft Technical Report be revised to state that the intent is not to impose the salt water coliform limits on creeks. Rather, the modeling used to determine the TMDLs includes an implicit margin of safety. As staff responded in peer review, the location of the critical point and the use of total coliform provide, at least in part, the margin of safety.

Response: The Technical Report was clarified in the March 9, 2007 version regarding the use of the total coliform WQOs as numeric targets for TMDLs applied at the mouths of the creeks. As the commenter suggests, our intent is not to impose total coliform WQOs for SHELL uses throughout the creeks, but to ensure that water quality in the creeks where they discharge to coastal waters is protective of SHELL beneficial uses at the beaches and in San Diego Bay. For further discussion regarding the simultaneous technical analysis of beaches and creeks, please see section 4.4.

Comment 31

The technical analysis is based on the assumption that all bacteria loading from sewage spills will be reduced to zero and thus this source of bacteria receives a 100% reduction in the TMDL. This assumption is not realistically achievable.

Response: Whether or not publicly owned treatment works (POTWs) can reduce sewage spills to zero, such spills are prohibited in their waste discharge requirements and prohibited by the Basin Plan. Therefore, sewage spills were not included in the source analysis, and therefore were not assigned a WLA. However, as the comment notes, WLAs for POTWs are essentially zero. Water quality data used for model calibration and validation were cross-referenced with sewage spill information. Any exceedances in bacteria WQOs associated with sewage spills were removed from the data set, ensuring that model calibration, validation, and output consisted of loading from urban runoff from the watersheds.

POTWs, and other potential dischargers not mentioned in section 10 of the Technical Report, are allowed zero discharge. Should a sewage spill occur, loads associated with the discharge would not be counted against the LAs and WLAs assigned to dischargers. Loads associated with sewage spills are regulated under San Diego Water Board Order No. R9-2007-0005.

Comment 32

The technical analysis is based on the assumption that all bacteria loading from encampments of homeless individuals will be reduced to zero and thus this source of bacteria receives a 100% reduction in the TMDL. This assumption is probably not achievable and addresses a wide-reaching societal issue that is germane to the [Water Code section] 13241 requirement that affordable housing is considered.

Response: Bacteria discharges from direct deposition of human feces into and near receiving waters did not receive an allocation in these TMDLs. Unlike urban runoff, bacteria loading from human feces is completely from human sources and carries a higher risk of association with human pathogens. Like pet waste, deposition of human feces where it can be transported to storm drains or receiving water should be highly discouraged in the municipal dischargers' storm water programs. Attainment of WQOs and the requirements of this project will take place in part through enforcement activities by municipalities to discourage a range of discharges or illegal activities, including direct deposition of human feces where it can be transported to storm drains or receiving waters.

Water Code section 13241 is not applicable to this TMDL project since section 13241 only applies when new WQOs are established. The bacteria TMDLs interpret existing WQOs as stated in the Basin Plan, but do not promulgate new objectives.

Comment 33

The document does not appear to have been developed in accordance with the Revised Draft Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure & Options (June 2005) or the Draft State of California S.B. 469 TMDL Guidance (March 2005). Attachment A: Impaired Waters Regulatory Decision Tree of the Regulatory Structure and Options guidance outlines the regulatory options available to address impaired waters, many of which have not been evaluated for the bacteria-impaired water bodies covered by the Technical Draft. Prior to developing a TMDL, the following steps should be taken:

a) The original listing of the water body should be re-evaluated based on current, existing data. According to Regulatory Structure and Options policy, "If the water body is neither impaired nor threatened, the appropriate regulatory response is to delist the water body." Several Laguna Beach area beaches are currently included in the TMDL despite the fact that they have been meeting water quality standards since 1999. Data and statistical evaluations to support the delisting has been provided to Regional Board staff. Based on the 303(d) List De-listing criteria, the following sites should be de-listed and removed from the TMDL: Cameo Cove at Irvine Cove/Riviera Way; Heisler Park North; Main Laguna Beach; Laguna Beach at Ocean Avenue; Laguna Beach at Laguna Avenue; Laguna Beach at Cleo Street; Arch Cove at Bluebird Canyon Road; Laguna Beach at Dumond Drive; Laguna Beach at Lagunita Place/Blue Lagoon Place; Aliso Beach at West Street; Aliso Beach at Table Rock Drive; 1000 Steps Beach at PCH/Hospital/9th.

b) The appropriateness of the Water Quality Standards should be investigated, including whether a Use Attainability Analysis, Site-Specific Objective, or finding of Anti-degradation would be more appropriate. In particular, we are concerned about the appropriateness of the Shellfish beneficial use which is applied to all ocean waters irrespective of whether the area could support, is supporting or has ever supported shellfish populations. We would also request review of the REC-1 designation of all areas of the affected creeks, particularly with respect to the use definition which includes the statement "where ingestion of water is reasonably possible". There are many areas of the listed creeks which do not support, and have not supported this level of recreation; and

c) Alternative Regulatory Action consideration: The Regulatory Structure and Options policy states, "If a solution to an impairment is being implemented by a regulatory action of another state, regional, local or federal agency, and the Regional Board finds that the solution will actually correct the impairment, the Regional Board may certify that the regulatory action will correct the impairment and if applicable, implement the assumptions of the TMDL, in lieu of adopting a redundant program." The Aliso Creek watershed is currently under a 13225 Directive for bacterial indicators. The document does not address or recognize the redundancy of the TMDL and the requirements of the directive. Since there is an alternative enforceable program in place for this watershed, consideration should be given to removal of Aliso Creek from the TMDL process.

Response (a): Orange County, along with other municipal dischargers are commended for their success in restoring water quality at the beach segments listed in item a) above. Whether or not these beach segments meet WQOs during storm events is unclear, since the data submitted by the City of Laguna Beach consisted strictly of dry weather samples.

In a letter to the SWRCB dated January 31, 2006, the San Diego Water Board recommended that all waterbodies, regardless of quality during dry weather, remain listed if no wet weather data is available to demonstrate support of beneficial uses.

Even if the waterbodies in question are de-listed in the 2008 list evaluation, they will be included in this TMDL project. Please see the response to Comment 190 for further discussion.

Response (b): The Ocean Plan bacteria WQOs were revised in January 2005 by the SWRCB following a public review process. The San Diego Water Board has no basis to reject the Ocean Plan WQOs and use different ones. The State and Regional Water Boards are in the process of developing statewide bacteria WQOs for freshwater. The CEQA Scoping meeting and first public workshop for these statewide WQOs should be scheduled for the fall of 2007. Once adopted by the SWRCB, the San Diego Water Board will amend its Basin Plan to incorporate the statewide bacteria WQOs. If needed, the bacteria TMDLs will be revised to reflect any changes to the Basin Plan bacteria WQOs resulting from this statewide effort. We highly recommend that Orange County and all affected dischargers participate in the public review process on this action.

A Use Attainability Analysis (UAA) is not appropriately addressed in the TMDL process. States may remove a designated use, which is not an existing use, or establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible. To change existing Beneficial Uses there is a need to rebut the presumption that the use existed on or after November 28, 1975. The bacteria indicator WQOs are the benchmarks that will be used unless scientific studies show that alternative site-specific water quality objectives (SSO) are appropriate for the waterbodies involved in this TMDL project. At this time, we have no plans to change the beneficial uses of the creeks involved in this TMDL.

For the San Diego Water Board to consider SSOs, the SSOs would need to (1) be based on sound scientific rationale; (2) protect the designated beneficial uses of the waterbodies; and (3) be adopted by the San Diego Water Board in a Basin Plan amendment. Dischargers or other interested parties would need to fund and initiate the scientific studies to develop the SSO. As stated in the previous comment, progress on these TMDLs would not stop for the development and adoption of SSOs. The bacteria TMDL would proceed as outlined in the Implementation Plan and SSOs could be incorporated into the TMDL when they are adopted by the San Diego Water Board.

We disagree with the concern of the appropriateness of the SHELL beneficial use. As stated in section 3 of the Technical Report, SHELL includes uses of water that support habitats suitable for the collection of filter-feeding shellfish for human consumption, commercial, and sport purposes. Collection of shellfish for consumption along California's coasts and bays is well documented for both commercial and sport purposes. Pismo (*Tivela stultorum*) and 7 species of Littleneck clams (*Chione californiensis, Chione fluctifraga, Chione undatella, Protothaca laciniata, Protothaca staminea, Protothaca tenerrima,* and *Tapes philippinarum*) are commonly collected by sport fishers and regulated by the Department of Fish and Game.[9] The Pismo clam's historic range is from Half Moon Bay, CA to Socorro Island, Mexico and five of the seven mentioned species of Littleneck clams are found in Southern California (DFG, 2001). Department of Fish and Game biologists concur with the SHELL use designation for the entire Pacific Ocean coastline in the San Diego Region.[10]

Response (c): We can only take the action suggested in this comment if the regulatory action is being implemented by another State, federal, regional, or local agency, not the San Diego Water Board. Since the efforts in the watershed have not been successful in attaining and maintaining WQOs, or evidence submitted that *anthropogenic* bacteria sources have been abated, we are not compelled to remove the watershed from the TMDL process.

Comment 34

The modeling of the TMDL does not appear to have followed the guidance prepared by USEPA's Council for Regulatory Environmental Modeling. This guidance describes best modeling practices needed to determine when a model can be appropriately used to inform a decision (USEPA, 2003). Using best modeling practices allows decision makers be more informed about the confidence that can be placed in model results. A model's quality to support a decision becomes known when specific information is available to assess these factors. The guidance specifies that model developers: 1) subject their model to credible, objective peer review; 2) assess the quality of the data they use; 3) corroborate their model by evaluating the degree to which it corresponds to the system being modeled; and 4) perform sensitivity and uncertainty analyses. The model used in this TMDL did not conform to the guidance in the following ways:

a) Data Quality Objectives for the modeling were not set. There was no discussion on how good the model needed to perform to inform the decision. There are "recommended criteria" for modeled hydrology shown in a table without a corresponding discussion on how these DQOs were set. In addition, model predictions were still used even when these "recommended" criteria were exceeded.

b) Model performance was not quantified. Calibration and validation of model performance are presented only as figures for a visual inspection. Some error analysis was conducted for the wet-weather hydrology, but not discussed. There are several statistical tests that could be used to describe model performance. Bias can be described with the median scaled residual. Precision can be described with root mean square error, median absolute deviation, scaled residuals, or relative error.

Response: Data Quality Objectives, as defined by the USEPA guidance document, refer to the quality and quantity of data used to develop and corroborate models.

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[9] Department of Fish and Game. 2001. California's Living Marine Resources: A Status Report. December, 2001.
[10] Robin Lewis and Bill Paznokas, Department of Fish and Game, personal communication, November 3, 2006.

Section 3.1.3.1 of this report states, "this guidance uses the term data uncertainty to refer to the uncertainty that is caused by measurement errors, analytical imprecision and limited sample sizes during the collection and treatment of data." Data Quality Objectives do not refer to pre-determined margins of error that the models must meet to be sufficient for regulatory decision-making.

The "recommended criteria" for quantification of model error in predicting hydrology were obtained from a U.S. Geological Survey report.[11] These were reported to provide a reference for evaluation of model error and were used as a guide for model calibration. However, these criteria were not used for determining whether model output was acceptable for prediction of historic flows and watershed loadings.

Model calibration and validation can be performed using both quantitative and qualitative techniques. Qualitative calibration and validation are often performed using graphical analysis, as was reported for both hydrology and water quality for the dry- and wet-weather models of the report. For hydrology, several analyses were reported (35 pages of results) for multiple watersheds that included graphical and tabular comparison of measured and observed flows and volumes. Additional statistical quantitative analysis can be performed for hydrologic results, but such an analysis would provide no indication of the conditions (e.g., high flows or baseflows) or time periods (e.g., seasonal storms) that impact model results, and include specific modeling parameters for characterization. The analysis of hydrologic model error based on volumetric comparisons provided sufficient evaluation of model error for purposes of this study.

Comment 35

Sensitivity and uncertainty analysis was not conducted. Sensitivity analysis evaluates the effect of changes in input values or assumptions on a model's results. The report does a good job of identifying all the modeling assumptions (Appendix L), but does not provide any information on the significance of these assumptions to the model results. Uncertainty analysis investigates the effects of lack of knowledge and other potential sources of error in the model. In this case, uncertainty analysis could be conducted on the empirical relationships used to estimate flows and bacteria concentrations. Due to the high variability, the model should be run using input values representing high and low confidence interval values. This approach would give a range of predicted values and could be used to explicitly define the margin of safety (MOS). Similarly, the simple empirical relationship used between fecal coliform with enterococci and total coliform should also undergo uncertainty analysis. Additional examples of areas where an analysis of variability and uncertainty should be presented include:

a) How sensitive are the results to the critical wet year assumption?

b) How sensitive are the results to the model's estimates of wet season bacterial loadings?

[11] Lumb, A.M., McCammon, R.B., and Kittle, J.L., Jr. 1994. Users Manual for an Expert System (HSPEXP) for Calibration of the Hydrologic Simulation Program--Fortran: U.S. Geological Survey Water-Resources Investigations Report 94-4168.

c) How sensitive are the results to seasonal changes and other site-specific conditions (such as temperature, UV light intensity, salinity, etc.) relative to the first order die-off coefficient for the bacterial indicators?

d) How is the variability and uncertainty of the MPN unit of measure accounted for?

Response: In the guidance document prepared by USEPA's Council for Regulatory Environmental Modeling, Section 3.1.3.3 states the following:

> "Uncertainty analysis investigates the lack of knowledge about a certain population or the real value of model parameters. Uncertainty is sometimes reducible through further study and with the collection of additional data. Existing Agency guidance distinguishes uncertainty analysis from methods that are used to account for variability in input data and model parameters. Variability in model parameters and input data can be better characterized through further study but is usually not reducible."

Evaluation of the sensitivity of modeling parameters was a key consideration during the model calibration process to provide modelers insight regarding parameters requiring adjustment. The LSPC model used for estimation of wet-weather flows and bacteria loads includes several parameters based on typical vales reported in literature and similar modeling studies in Southern California, as well as calibration to local datasets. To provide information recommended by the commenter on model uncertainty based on sensitivity analysis, many model input parameters would require adjustment based on high and low confidence interval values. However, such confidence intervals are not available for each parameter, which would result in an arbitrary selection of a confidence range (e.g., +/- 50% of the parameter value). As a result, sensitivity analyses would be informative regarding sensitivity of each input parameter, but ranges of predictive values are not directly transferable for determination of model uncertainty and a numeric MOS with confidence. Moreover, additional non-modeling assumptions were considered in the implicit MOS of the TMDL, and quantitative measures of each of these assumptions relative to modeling assumptions will also require further study.

The uncertainty in the modeling is acceptable for the regulatory decisions required in this TMDL which is based on the best available data and method of analysis. We acknowledge that the development of the bacteria TMDLs is characterized by data gaps and uncertainties. Scientific uncertainty is a reality within all water quality programs, including the TMDL program, and it cannot be entirely eliminated. The TMDL program must move forward in the face of these uncertainties if progress in establishing TMDLs and attaining WQOs in impaired waters is to be made.

However, we recognize that the additional sensitivity analyses, as recommended by the commenter, would provide additional information regarding variability and potential error in key model assumptions. To effectively measure these uncertainties, additional data collection and further study will be required. This is a typical procedure for model development and continued refinements to better quantify model uncertainty and focus future study on addressing key data gaps and information required for model refinement.

Most previous monitoring studies in the region were not focused on providing data for model development. Although sufficient for development of the models for the purpose of this TMDL, future refinements in monitoring efforts can focus on collection of datasets specific to addressing uncertainty analyses and quantification of a numeric MOS. If additional datasets become available, evaluation of model uncertainty can be considered in future study and may result in re-evaluation of the TMDL and the MOS.

Comment 36

The conservative modeling assumptions used for an implicit MOS should be quantified. The assumption of not applying mixing zone in the surf zone is significant to the allocations. This approach applies the marine SHELL standard to the mouths of the freshwater streams. The report should explicitly list each of the conservative assumptions used to form the MOS and (at least) discuss the relative magnitude of the assumption on the estimated loading capacity.

Response: The implicit MOS of this TMDL included both modeling and non-modeling assumptions outlined in Appendix L and section 8.1.7. For example, the assumption mentioned by the commentator regarding the lack of mixing zone in the surf zone was not a modeling assumption and is therefore not quantifiable using either the wet- or dry-weather model. All conservative assumptions used for the MOS are listed in Appendix L and section 8.1.7. To explicitly list relative magnitudes of each assumption on the estimated loading capacity would require an explicit, quantifiable MOS. An explicit MOS is not required for calculation of TMDLs.

Comment 37

Dry weather loading was estimated based on 'average' dry weather flows. Flow distributions are almost always log-normal with a left skew. Average (or mean) values do not represent the central tendency of the distribution. Median flow values should be used since mean flow values will greatly increase the loading due to higher assumed flow.

Response: The average flows calculated for the dry-weather model were based on dry-weather monitoring data collected from Aliso Creek, Rose Creek, and Tecolote Creek. These average flows were relatively small, ranging from 0.007 to 0.23 cfs. The differences between calculated median and average (mean) flows are less than 0.05 cfs, which are negligible. Moreover, the monitoring data are unlikely to be accurate within this range. Thus, average flows are acceptable for estimation of dry-weather flows in this study.

Comment 38

P. 5, Section 1.2, para. 3: the identification of MS4s as the primary source of bacteria does not acknowledge the fact that MS4s often act as conduits for background sources of coliforms such as wildlife and soils. The presence of bacteria in an MS4 does not automatically mean that all such bacteria derive from urban sources.

Response: We recognize that MS4s act as conduits for background sources of bacteria. Although MS4s are identified as the primary transport mechanism of bacteria discharges, we did not assume that all bacteria are derived from urban sources. The reference system approach, which will be incorporated into the Basin Plan permanently, accounts for discharges of bacteria from background sources. Loads that are generated by background sources were quantified for each watershed. These loads are assumed to be generated by the open space, open recreation, and water land uses. Loading from background sources was found to vary by watershed. For example, background sources account for about 60 percent of the fecal coliform loading to the Aliso Creek watershed, while only about 8 percent in the San Marcos watershed (Figures I-5 and I-10, Appendix I).

Dischargers are not required to reduce loads caused by background sources, even though these loads are eventually transmitted to receiving waters via MS4s. For each watershed, a total existing load was calculated that included loading from background sources. Dischargers are not required to reduce loads identified as originating from background sources (the highest loads demonstrated in the load duration curves in Appendix O). Dischargers are required to reduce the loads from urban sources (the remaining loads in the load duration curves that exceed the numeric target line and therefore exceed the assimilative capacity of the waterbody.) In this approach, the San Diego Water Board assumed that the highest loads generated in each watershed during a wet weather event are caused by natural sources, and therefore are not the responsibility of the dischargers.

Comment 39

The document apparently misses an opportunity to improve understanding of the reference watershed approach by comparing data from the San Mateo Creek and Arroyo Sequit watersheds. Such a comparison could have shown whether patterns of dry- and wet-weather exceedances differed. Conversely, if the data were not comparable (e.g., because sampling locations were fundamentally different), then this could provide guidance for the design of additional reference watershed sampling.

Response: The discussion regarding the San Mateo and San Onofre Creek watersheds suggested that these watersheds could be explored for the purpose of establishing a reference system applicable to the San Diego Region. Once a reference system is properly characterized and exceedance frequencies are quantified for wet weather flows, then a Basin Plan amendment will be adopted to establish implementation provisions for the purpose of calculating final TMDLs.

The data provided in Tables 4-1 and 4-5 were collected by the San Diego County DEH during routine monitoring as part of a wider beach monitoring program. These data were not collected for the purposes of characterizing a reference watershed during stormflow conditions and were for the most part collected during dry weather. In contrast, the data collected at Leo Carillo Beach at the mouth of the Arroyo Sequit watershed was collected primarily for the purpose of quantifying exceedance frequencies for this relatively undeveloped watershed during storm flow conditions.

Since the first draft of the Technical Report was available for peer review in February 2004, SCCWRP has completed one study looking at potential reference watersheds in southern California.[12] San Mateo Creek watershed did not meet the criteria for a reference watershed because it does not have less than 95 percent undeveloped open space (more than 5 percent of the watershed has been urbanized).

In light of this newer information, comparing the data from the Leo Carillo Beach to the DEH data from beaches at the mouths of the San Mateo and San Onofre Creeks is not appropriate.

Comment 40

P.50, Section 5.3: The "statistical comparison of flow versus bacterial density" referred to here is exceptionally weak, with conclusions based on simple visual inspection rather than statistical analysis. In particular, Figures 5-5 and 5-6 are interpreted to mean that bacteria sources must be assessed during both wet and dry weather periods. However, other more important implications of the data are not addressed. For example, the right-hand portion of both figures shows little if any relationship between seasonal changes in river flow and bacteria levels at nearby beaches. In fact, for the riverine flow to consistently be the major source of the observed bacteria levels would almost require an inverse relationship between flow and loads. Because of the implications of the assumptions regarding flow versus bacterial density underlying this TMDL, such relationships should be investigated with formal statistical analysis.

Response: We agree that Figures 5-5 and 5-6 suggest that little if any relationship exists between seasonal changes in river flow and bacteria levels at nearby beaches. In fact, the purpose of including these figures was to demonstrate this variability. Because such variability exists between flow conditions and bacteria loading, evaluating this relationship using two distinct modeling platforms were necessary. By doing so, better modeling results were attained for dry weather flows.

The modeling analysis does not assume that there is a consistent relationship between flow and bacteria loads. Bacteria loads are assumed to be a function of land use types comprising each watershed, as discussed in the source analysis.

Comment 41

P. 51 Section 6.1 para. 4: The statement about the dependence of bacteria concentrations on land use is essentially lacking in content, and therefore not useful in evaluating the modeling approach and results. The description of the watershed model in the Appendix refers to a SCCWRP study and a Regional Board publication, but presents no actual data on bacteria loads from different land uses. Because these data are so key to the model results, this paragraph, or the Appendix, should present the estimates of loads from specific land uses and discuss their implications. For example, there should be a logical relationship between the relative magnitude of loads from urbanized and open space land

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[12] 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.

uses, the proportion of each watershed in open space, and the size of the background allowance for each watershed. In general, there is a lack of such internal consistency checks in the validation of the modeling assumptions.

Response: The SCCWRP modeling study referenced in the text provides documentation of the differences in monitoring data and resulting development of land-use-specific modeling parameters. The pie charts referenced in section 6.1.1 and provided in Appendix I provide much information regarding the relative magnitude of loads from land uses. These load estimates are based on model estimates that are impacted by land-use-specific modeling parameters, spatial distribution of rainfall and sources, and land use area in each watershed. Although allocation of loads to background allowances is relevant to the Source Analysis, quantification of these loads and discussion of identification of allowances are discussed fully in section 8 (Allocation and Reduction Calculations).

Validation of modeling assumptions specific to land uses was limited by the lack of land-use-specific water quality data collected in the San Diego Region. For this reason, modeling parameters were obtained from monitoring and modeling studies performed in the Los Angeles Region, and validated at a watershed scale for the present study. If sufficient land-use-specific monitoring data are collected in the San Diego Region to provide acceptable validation of modeling assumptions for each land use, the model can be validated further in the future.

Comment 42

P. 54, Section 7: This section, which describes the rationale for choosing between the steady-state and dynamic modeling approaches, is internally inconsistent. Steady-state models are described as best suited to streams dominated by point source inputs with impairment only under low-flow conditions. Dynamic models, in contrast, are more suited to streams affected by nonpoint sources or rainfall-driven flow and pollutant contributions. Preceding sections make it clear that the bacteria problem in watersheds in the San Diego Region occurs in both dry and wet weather and the document argues that bacteria loading is driven by the rainfall-mediated washoff of bacteria accumulated on land surfaces, a notably variable process. This would suggest that a steady-state model is not appropriate. However, on the basis of an unsupported assumption that the Region is “dominated by nonpoint sources that are generally constant on an hourly time step and deposit directly to drains,” a steady-state modeling approach is chosen. There is no documentation given for this assumption about the behavior of nonpoint sources, nor is there any reference to more detail in an Appendix. In fact, available data show strong variability in flow and bacteria levels over the course of a day. The conclusion that the nonpoint sources can be treated as point sources is thus simply an assertion, and it seems that this decision may have been motivated instead by the availability of data. Given the rather significant management implications of the TMDL targets, which are based on modeling results, this level of justification for a major technical decision is inadequate. The evidence for the “generally constant” behavior of nonpoint sources should be presented and the sensitivity of the modeling results to different technical approaches should be investigated.

Response: The statement that the "document argues that bacteria loading is driven by the rainfall-mediated washoff of bacteria accumulated on land surfaces, a notable variable process" refers to wet weather conditions when rainfall occurs. The steady-state model is used to represent streams during periods of no rainfall when flows are less variable. We have acknowledged that under dry conditions, dry-weather flows also exhibit variability that is not simulated by a steady-state model. Regardless, the steady-state model provides simulation of average conditions that are comparable to the dry-weather numeric target based on the 30-day geometric mean WQOs. If variable minimum and maximum daily dry-weather flows and bacteria concentrations were predicted, this would also require comparison to numeric targets based on single sample maximums. Such variability is expected to be watershed-specific, and therefore should be based on data collected in each watershed for accurate estimation of ranges. If additional data are collected through further study to provide prediction of daily ranges of bacteria loads for each watershed, we will consider re-evaluation of the TMDL.

The assumption in the comment that the Region is "dominated by nonpoint sources that are generally constant on an hourly time step and deposit directly to drains" refers to wet weather, for which a LSPC model was developed that provides hourly predictions of flow and bacteria concentrations assumed constant during each hourly time step. This does not refer to an assumption used in selecting a dry-weather modeling approach, as stated by the comment. The text has been clarified to this effect.

For all models, simulation of receiving waters such as rivers requires assumptions for specific locations for inflows and associated bacteria loading from watershed runoff. In the current study, model development for wet and dry periods required estimation of sources from runoff that were simulated as discharges to the receiving waters (rivers) at specific locations. In this way, nonpoint sources are treated like point sources within the modeling domain. This is a basic assumption for model development and is not based on data availability, nor does such a basis need to be established since this is a basic concept for model development.

The steady-state approach for defining dry-weather flows and bacteria loads is acceptable and adequate for loading assessment and TMDL calculation. A steady-state approach for prediction of dry-weather flows is typical for source assessments used in TMDLs. Similar modeling approaches have been used for calculation of TMDLs in the Los Angeles Region where dry-weather runoff is also common, including TMDLs for Ballona Creek and Los Angles River, and models currently under development by USEPA for estimation of dry-weather loads to San Gabriel River and Los Angeles and Long Beach Harbors.

Comment 43

P. 58 Section 8.1.1, para. 3: The selection of the baseline year for modeling wet year loads is critical. It would be useful to see model runs that show the sensitivity of the TMDL targets to different rainfall years. As it stands, the choice of this particular year seems arbitrary.

Response: The critical wet year was the wettest year of the model simulation period based on rainfall data used to develop the wet-weather model. The model simulation period was from 1990 through 2002. Year 1993 was characterized with the most rainfall, and produced more flows and resulting loading of bacteria to receiving waters than any other year during the simulation period. Since the TMDL must provide protection of receiving waters during all periods when the designated use is applicable, including periods most impacted by watershed flows, the wettest year was used as the critical period for TMDL calculation. Reduction in bacteria loads calculated based on the critical wet year provides assurance that load reductions will be sufficient during all periods. The same critical wet year was used in calculation of TMDLs for Santa Monica Bay Beaches in the Los Angeles Region. Therefore, selection of this critical period was not arbitrary.

Comment 44

This section reflects an incompletely developed conceptual model of background or natural sources of bacteria. The conceptual model implicit here and in other places in the document is that bacteria from natural sources enter receiving waters either directly (e.g., waterfowl) or as the result of runoff directly into receiving waters from open space. The possibility that bacteria from natural sources could enter MS4s is apparently not considered and/or accounted for. The only way the statements in the document can be understood to be logically consistent is as follows:

- Natural sources are uncontrollable.
- Sources from urban runoff associated with MS4s are controllable. Therefore, natural sources do not contribute to urban runoff in MS4s.

However, this does not account for observations that:

- Wildlife (e.g., rabbits, skunks, coyotes, birds) frequent developed areas and bacteria from their droppings enters the MS4 via runoff after rain
- MS4s in many locations drain combinations of urbanized and open space, for example, where development abuts open space and runoff from the open space flows onto streets and then into the MS4
- Portions of the MS4 (e.g., stormdrains and channels) are used as habitat by some species of wildlife.

Assuming that these sources are controllable simply because they end up in the MS4 is simplistic and is unrealistic.

Response: This comment incorrectly states that the possibility that bacteria from natural sources could enter MS4s is not considered or accounted for. Bacteria loading was modeled as a function of land use, and all land uses have both natural sources (wildlife) and anthropogenic sources of bacteria. Once pollutants are washed into an MS4, municipalities are responsible for these pollutants in the waste stream discharged from the MS4s. The commenter misunderstands the application of the reference system approach. See the response to Comment 38.

We recognize that MS4s act as conduits for background sources of bacteria. Although MS4s are identified as the primary source of point source discharges, that all bacteria are derived from urban sources is not assumed. The reference system approach allows the San Diego Water Board to adopt a TMDL that allows a certain exceedance of WQOs attributed to natural sources. The TMDLs also allocate loads to uncontrollable non-point sources assumed to be generated mostly on open space land. If a significant portion of the loads generated on open space are transmitted to receiving waters via MS4s, then that portion of the load allocated to uncontrollable non-point sources could be reallocated to the municipal dischargers. Information is needed to quantify such a reallocation.

Comment 45

P. 58, Section 8.1.1: The justification for the selection of the critical wet-weather condition is not logical. Flows in creeks and rivers in southern California during "extreme wet conditions" are high and rapid, the ocean environment off creek and river mouths is turbulent and dangerous, and REC1 use at these places and times is highly unlikely. In fact, anyone engaging in body contact recreation under these conditions might well run a much higher risk of drowning than of illness from exposure to contaminated water. Standard risk management approaches typically focus on circumstances in which risk is highest, generally assessed as a combined function of the level of hazard and the number of people exposed. While the level of the hazard in the wet-weather critical period is high, the number of people exposed is most probably extremely limited. Therefore, the justification for using this period to set the TMDL targets, with their attendant consequences for management policies and implementation costs, is weak.

Response: We disagree that the selection of the critical wet-weather condition is not logical. The bacteria TMDLs must ensure that WQOs are met in all conditions and at all times. The critical wet-weather condition was selected because this period would produce the highest possible load from the watershed. Furthermore, the scientific peer review panel did not have any issues with the use of critical wet weather conditions. Both reviewers commented that the use of a single-sample maximum for the wet weather targets is a reasonable approach. See Appendix A, responses to Item 4.

The REC-1 beneficial use is a component of a water quality standard and is not intended to be used as a risk management index that calculates a level of risk. The bacteria TMDLs will not address issues dealing with the appropriateness of existing REC-1 beneficial uses or the bacteria water quality standards in the Ocean Plan. These types of issues are more appropriately addressed by amending the WQOs in the Ocean Plan through the formal amendment process.

The commenter should also keep in mind that the wet weather TMDLs address not just the period of the storm, but the 72 hours after cessation of rainfall when bacteria levels remain high at beaches. Weather can improve significantly within 1 to 3 days of a storm, so the assumption that inclement weather keeps swimmers out of the water during storm flow conditions is not entirely correct.

Comment 46

P. 59, Section 8.1.4: The fundamental assumption underlying the location of the critical point, i.e., that "bacterial densities are assumed to be greatest" at the "mouths of the watersheds" is not supported by reference to any data presentation or process model. If this is a prediction of the modeling, it should be so referenced. However, this is not consistent with available monitoring data. For dry weather, the extensive Aliso Creek monitoring data showed that densities were consistently higher in the upper reaches of the watershed, where the ratio of discharge input to ambient flow is highest and where die-off has not yet had much opportunity to affect bacteria populations. Given the Aliso Creek data, it is not logical to assume that compliance with WQOs must be "maintained for all segments of a waterbody to ensure that impairments of beneficial uses are not observed." There are many plausible scenarios in which a combination of spatially heterogeneous bacteria input combined with progressive die-off might lead to meeting WQOs at the mouth of the watershed.

Response: The assumption for the critical point was not a modeling assumption, but rather a conservative assumption specific to TMDL calculation. The higher bacteria concentrations referred to at the mouths of watersheds refer to data collected at beaches and creeks. A robust analysis of these data is discussed in section 5.2, with maps presented in Appendix H showing spatial variation in observed ranges of indicator bacteria. These results showed that higher bacteria densities are common in the vicinity of the mouths of creeks and major stormwater outfalls.

We agree that concentrations within streams throughout a watershed are not likely consistent with concentrations at the mouths of watersheds at the critical point used for TMDL calculation. The longitudinal variation of bacteria densities within streams resulting from various sources and instream die-off was considered in development of models for dry and wet weather. Regardless, a single point for TMDL calculation was determined for each watershed, thus resulting in a "watershed approach" for calculation of the TMDL, wasteload allocations, and necessary load reductions. Otherwise, separate TMDLs would require calculation for each subwatershed throughout the region shown in Appendix E, which would create unnecessary detail and confusion since this includes over a hundred subwatersheds.

Comment 47

P. 68, Section 9.1.1: The text states "Comparing the final wet weather allowable loads to the loads allocated to uncontrollable sources 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." This being the case, water quality objectives will not be met during wet weather regardless of control efforts taken by dischargers to control urban discharges. This calls into question the need for designating wet weather reductions and the benefit to be gained from the expense incurred through BMP installation and maintenance.

Response: Bacteria loading from urban creeks should be reduced even though open space loading exceeds the capacity of the creeks and beaches because pet waste and human sewage are more likely to occur in urban runoff. We recognize that it will be difficult for dischargers to meet final allocations and WQOs during wet weather. Therefore, we are developing a Basin Plan amendment to permanently incorporate a reference system/natural sources exclusion approach for implementing bacteria WQOs, as described in the response to Comment 2.

Comment 48

P. 94, Section 10.2.3: The text states, "Excess fertilizers and **irrigation runoff** (emphasis added), as well as rainfall runoff, can wash bacteria and sediments off properties into nearby waterways." This contradicts previous statements that dry weather allocations for sources other than MS4s were not necessary due to the lack of flow to transport bacteria to waterways. Dry weather allocations should be developed for identified nonpoint source dischargers. This comment applies to Agricultural fields, orchards, and dairy/intensive livestock and horse ranch facilities.

Response: The statement that irrigation runoff can wash bacteria into nearby waterways is meant to identify a potential, not actual, bacteria source and/or transport mechanism. Whether or not bacteria loads are definitively generated by irrigation runoff is unknown.

Dry weather allocations may be developed for nonpoint source dischargers if it is found that irrigation runoff volume is comparable to urban runoff volume. Such a determination will be made only after steps are taken to enforce applicable WDRs and waivers. Please see the response to Comment 23.

Comment 49

Table 5-5 – Summary of Enterococci Data for Impaired Creeks – The County of San Diego requests the removal of Pine Valley Creek as it is not part of this TMDL.

Response: Table 5-5 has been modified as requested.

Comment 50

Executive Summary. Numeric Target Selection. We recommend that this section be revised for clarity. The use of the Interim TMDL is introduced in the second sentence and should be explicitly defined here; that it allows for the natural, largely uncontrollable sources of bacteria. A measurement of a reference watershed, one that is minimally impacted by human activities, serves to determine the natural sources of bacteria. The details of the interim TMDL then can be explained in the third paragraph by first stating that it is based on the reference system in Los Angeles County and then citing the 22% exceedance frequency of occurrence for the WQOs. The report should indicate whether the Los Angeles County reference system will be used or whether a San Diego based reference system will be developed and used instead. We question the use of the Los Angeles County reference system without adequate validation for this region. The Board has announced that a CEQA scoping meeting is scheduled in March of this year for an amendment to the Basin Plan to incorporate the reference system. The selection of a validated, specific reference system would have to be in the amendment.

Response: The Executive Summary has been modified for clarity. In particular, the text has been modified to state that, if the proposed Basin Plan amendment authorizing the use of a reference system approach is adopted and approved, final TMDLs will be recalculated that will allow WQOs to be exceeded based on the frequency of exceedance of WQOs in a reference system. The Basin Plan amendment will not specify which reference watershed(s) or exceedance frequencies are appropriate for wet weather TMDL calculations. Designation of an appropriate reference watershed, for purposes of calculating TMDLs, will take place in a case-by-case basis. As more reference systems are studied and characterized, the San Diego Water Board will be better able to match an urbanized watershed with an appropriate reference system.

Comment 51

The report should address the bacteria loads from onsite wastewater treatment systems (e.g., septic systems). The State Water Resources Control Board has recently conducted hearings on the provisions of AB 885 and has prepared several reports. One that is of interest is the "Onsite Wastewater Treatment System Repair of Failure/Malfunction Survey, January 2003". The survey reports that 500 systems in San Diego County required repairs. We can expect an increase in housing along with the number septic systems in the rural areas of the County. Consequently, the implementation plan should have measures to minimize septic system failures to assure conformance with the load allocations. This is a different situation from POTWs as there is no formal, regular monitoring of these septic systems.

Response: The Technical Report was revised in the March 9, 2007 version to address septic systems. Section 10.2.3 now includes a discussion of septic systems as a potential nonpoint source of bacteria, and owners of individual septic systems are identified as persons responsible for controllable nonpoint source discharges in section 10.4. Additionally, section 11.5.5 has been modified to state that the San Diego Water Board will implement load reductions from nonpoint sources by enforcing waivers with respect to conventional septic systems, subsurface disposal systems for residential units, commercial/industrial establishments, and campgrounds, and waivers for alternative individual sewerage systems.

Comment 52

Section 8.1 Wet Weather Loading Analysis refers the reader to Appendix N for a comparison of the modeling results to observed bacteria densities. Figures N-1 to N-11 compare the time series of observed and modeled data. These results do not reveal very good model fidelity. Figures N-12 to N-24 chart the percentile unit area flow per day for the observed with the modeled data for fecal coliform, total coliform and enterococcus. Here the fidelity of the model varies from poor to good. The text should provide the reader with a candid evaluation of the modeling results. What are the expected errors? Does the margin of safety assigned in the TMDL account for the model errors?

Response: The comparisons of model results to observed bacteria densities shown in Figures N-1 through N-11 of Appendix N show acceptable model fidelity for this study. Recall that bacteria modeling parameters were obtained from a robust calibration process performed by SCCWRP based on detailed storm-specific water quality data collected from homogeneous land use sites in Los Angeles. Similar detailed datasets are currently not available in the San Diego Region to provide consistent evaluation of model simulation of land use sources. Therefore, the present study relied on the previously calibrated values, which were validated based on instream data shown in Appendix N. All bacteria data collected in modeled watersheds were utilized for this validation process, although datasets consisted of grab samples or storm composite samples at locations and frequencies that were not sufficient for detailed comparison with model output. In addition, data collected at specific locations, often at the bottom of a watershed below a large area with multiple land uses, did not include significant datasets to justify refinement of land-use-specific modeling parameters.

Where data were not collected at consistent locations of model subwatershed outlets, data collected throughout the subwatersheds were pooled and relative ranges of observed bacteria densities were compared with ranges predicted by the models at the subwatershed outlet. The results shown in Figures N-12 through N-24 provide an analysis of the general trends, but were not used to support or justify calibration of modeling parameters. Regardless, comparisons in Figures N-12 through N-24 were provided in an attempt to utilize all data collected in the region, although these datasets may not be suitable for robust model calibration, nor was the purpose for their collection associated with watershed model development. However, results of these comparisons show the dependence of both model results and observed data on flow magnitudes, which were normalized in these figures based on watershed area. Except for lower flow ranges, the general trend of model results and observed data appear to be consistent relative to the flow. To address low-flow periods that were not predicted with accuracy based on LSPC, a separate modeling approach was developed.

Previous monitoring plans were not focused on collection of data required for calibration or validation of watershed models. Regardless, results of the model validation for water quality were reported in Appendix N to provide indication of the accuracy of the model. Not enough water quality data were available in each watershed to provide meaningful evaluation and quantification of model error based on statistical calculation. Evaluation of model error is also confounded by the highly variable bacterial concentrations (levels often vary by multiple orders of magnitude), which impact statistical calculations. Hydrologic model uncertainty also impacts model error in load prediction, which were evaluated separately in Appendix M. Due to the complexity in evaluating model error for each watershed, model error is not included explicitly in the TMDL margin of safety. Rather, an implicit margin of safety was assumed resulting from multiple conservative assumptions listed in Appendix L and section 8.2.5.

Comment 53

Section 6.2, 6.3, Point/non-point sources. Landfills, active and post closure, are not listed. Solid wastes contain animal wastes, pathogens, and may contain sewage sludge.

A review of the monitoring and reporting requirements of several landfills in this region do not contain bacterial monitoring of surface runoff. Explain why landfills should not be listed as a source.

Response: We concur that landfills are a potential bacteria source, therefore, the Technical Report was revised in the March 9, 2007 version to include a discussion pertaining to the possibility of landfills as a bacteria source.

Comment 54

Source analysis and bacteria re-growth issue. During the SAG meetings, bacteria re-growth in wrack lines, storm drains, culverts, and streams was discussed. The report, section 7.1.1.d, Constituents, states that bacteria concentrations are influenced by several factors including re-growth. However, Appendix L Assumptions states that the wet and dry weather models assume zero re-growth based on lack of data or literature. Were computer studies conducted to evaluate the influence of re-growth on the results? Were sensitivity studies conducted with bacteria die-off rate set to zero? A study conducted at the University of Alabama at Birmingham on the survivability of pathogens indicates that computer models using first order die-off rate of indicator bacteria may be an oversimplification. A report by the Regional Cooperation for Water Quality Improvement in Southwestern Pennsylvania in Southwestern Pennsylvania indicates that re-growth of bacteria adsorbed in sediments occurs and indicator bacteria concentrations can rise sharply with resuspension of sediment in streams in warm climes.

Response: Bacteria re-growth is a complex process that must consider site-specific features of a watershed for estimation (e.g., temperature, organic material). Information for quantification of re-growth is not available for all watersheds in the region modeled in this study. As a result, assumptions were required to provide consideration of potential re-growth in the models.

We assumed bacteria re-growth occurs predominately during dry periods when stream velocities are low and travel times are longer, providing sufficient opportunity for re-growth to occur before discharge to coastal waters. Therefore, wet-weather models did not include re-growth, but rather assumed a first-order die-off rate based on literature values. For dry weather, the steady-state models were calibrated to determine a "net" die-off rate to assume for all streams (Appendix K). This calibration process was based on changes of observed bacteria levels occurring longitudinally in streams (where/when bacteria data were available), which are subject to many complicating factors that can enhance or impede die-off rates, or even be offset by potential re-growth. Regardless of these complicating factors, a net reduction rate of bacteria was calibrated. Although these net rates are assumed to result primarily from die-off, additional factors such as re-growth are also assumed to be incorporated implicitly within these values. As a result, if re-growth is present within those streams used for calibration of net die-off rates in the dry-weather model, this will essentially result in net die-off rates that include both die-off and re-growth in their value.

As additional data are collected through further study to determine site-specific bacteria die-off and re-growth rates for each stream modeled in the region, the dry-weather model can be updated. Until such data is available, we believe that the present assumptions for bacteria die-off and re-growth are sufficient for both wet and dry conditions.

Comment 55

Section 10.3, 10.4. Landfill operators, both active and post closure, should be listed as dischargers.

Response: Section 10 of the Technical Report describes the legal authority for the implementation plan, including identification of dischargers. This section has been revised in the March 9, 2007 version of the Technical Report to identify landfill operations as potential (not known) bacteria sources. Because landfills are potential bacteria sources, landfills are discussed in section 11 under "Additional Actions" by the San Diego Water Board. This section describes actions we will take to determine whether or not landfills contribute significant bacteria loads to impaired waters.

Comment 56

Page 101, Section 11.3.3 states that only one WLA is assigned to the municipal dischargers in each watershed. This requires the municipal dischargers to be collectively responsible for meeting the WLA. Because computer modeling was used in developing the WLAs, will these municipal dischargers have access to and assistance in using the computer models as a tool to evaluate their management strategies and BMPs?

Response: The municipal dischargers, and other interested persons, will have access to the computer models as a tool to evaluate their management strategies and BMPs.

Comment 57

The USEPA is concerned that the units for the TMDL and allocations are expressed as number of bacteria colonies "per year" rather than "per month" or "per day."

Response: Wet weather TMDLs are best expressed as an annual load because of the extremely high daily variability in storm flow magnitude and loading in the watersheds addressed by these TMDLs. The variability in the modeled daily loads is evident in the load duration curves in Appendices O and P.

We agree that the dry weather TMDLs are better expressed as monthly loads rather than annual loads. This approach makes sense because the numeric targets are equal to the 30-day geometric mean WQOs, and the dry weather model simulates average flows. Tables 9-3, 9-6, 9-7, and 9-10 were updated or created in the August 4, 2006 version of the Technical Report to express the dry weather TMDLs as monthly loads.

Comment 58

The TMDL needs to develop load and waste load allocations for all identified sources of bacteria for both dry and wet weather. Only wet weather loadings have been developed for controllable and uncontrollable non-point sources. This erroneously ignores irrigation practices on agricultural areas during dry weather and documented

natural dry-weather base flow and bacteria in perennial creeks in the watersheds. Despite this consensus, no change was made for dry-weather conditions in the Revised Draft, presumably due to perceived data gaps. Substantial research efforts on natural uncontrollable wet- and dry-weather loads are currently being conducted by the Southern California Coastal Water Research Project, and full findings will be available within another two to three years. For example, the SCCWRP work will help address the need for determining a natural exceedance-day percentage for *creeks* under wet-weather conditions (the exceedance-days allowance currently incorporated is based only on *beach* data). Based on the Final TMDL modeled calculations of uncontrollable natural loads, the natural *creek* wet-weather exceedance rate could be expected to be closer to 100% than to 22%. It is critical that this and many other data gaps and scientific findings, such as land use changes since 2000 and improvements in tracking actual pathogens, be acknowledged. As concurred by the entire SAG, ***the Implementation Plan should include a time period to collect the data necessary to enable the model to simulate a more accurate representation of each watershed. Once the additional data have been collected, the plan should commit to a recalibration of the model and a re-evaluation of the TMDL targets, load and waste load allocations. The Report should clearly establish a commitment to re-evaluate and re-calculate the TMDLs on a five-year schedule.*** Establishing a pre-set re-evaluation commitment would avoid the probability of individual watershed stakeholders requesting piecemeal reviews and straining the time and resources of both the RWQCB and the public. Without a specific commitment in the Report to re-calculating the TMDLs, permittees cannot be assured that RWQCB resources will be committed to this effort. This issue is critical enough that we anticipate that the MS4 permittees would be more than willing to commit their own resources to the re-evaluation efforts.

Response: We developed LAs and WLAs only for the significant sources of bacteria (allocations were not developed for insignificant sources of bacteria for dry weather TMDLs). The rationale for doing so is explained in the response to Comment 23. Nonetheless, the Implementation Plan requires that agricultural operations comply with WDRs or the waivers of WDRs for irrigated agriculture. Enforcement of WDRs and waivers should ensure that loading from this source is minimized.

We recognize that the models used for TMDL analysis could be improved with additional data, and that the models produce the most accurate results when the latest and best information, such as the results of SCCWRP's reference watershed study, is utilized. However, attempts to restore water quality and meeting the TMDLs as calculated must not be delayed for acquisition of new information. Even as new information is being sought, attempts to decrease existing bacteria levels must take place, since bacteria contamination is indicative of a public health risk. Available information indicates that high bacteria densities have persisted in the beaches and creeks included in this project. Even if new data and information is obtained that result in more accurate model and TMDL results, chances are that significant load reductions would still have to take place. As the waterbodies included in this project have been on the List of Water Quality Limited Segments for years, there is no reason why dischargers cannot begin or continue with attaining load reductions immediately.

We will recalculate TMDLs after the reference system approach/natural sources exclusion Basin Plan has been adopted. However, we cannot commit to reevaluating the watershed models. TMDL recalculation based on new models will occur when data exist to fill gaps and in accordance with San Diego Water Board resources and priorities. However, interested persons can request the San Diego Water Board to initiate the Basin Plan amendment process to incorporate new information at any time, as described in section 2.3 of this appendix.

Alternatively, dischargers are encouraged to formulate a workplan for model refinement. The purpose of this workplan would be to identify and generate information that could be used to refine the models used to calculate TMDLs. This information could consist of, for example, water quality data, flow data, and land use data. This workplan would be written and executed by dischargers, with oversight participation by the San Diego Water Board. Additionally, if San Diego Water Board resources are not available to prepare a TMDL Basin Plan amendment, workplan participants could lead a third-party TMDL effort. For example, the SAG could draft the TMDL documents, leaving staff the job of taking the TMDLs through the Basin Planning process.

Information obtained in a Model Refinement Workplan may or may not overlap with information obtained as required by the Bacteria Load Reduction Plans discussed in section 11.5 of the Technical Report. A suggested series of steps involved with a Model Refinement Workplan is discussed below.

1. **Development of Workplan and Identification of Participants**. Dischargers in watersheds subject to this TMDL who are interested in model refinement would submit a Model Refinement Workplan that describes what information is to be gathered, who is participating in the effort, and how this information is to be utilized for model refinement and TMDL recalculation.
2. **Identify Funding Sources**. Participants in the Model Refinement Workplan would identify funding sources for the needed work, including grant opportunities from the State Water Resources Control Board or the USEPA.
3. **Data Collection**. Participants in the Model Refinement Workplan would collect data to fill identified data gaps in the TMDL models. This could consist of, for example, flow data, water quality data, and land use data.
4. **Model Execution**. Once a sufficient amount of data has been collected, workplan participants could reconfigure and/or re-run the computer models, or hire a contractor to perform this task.
5. **Lead a third-party TMDL effort**. If staff resources from the San Diego Water Board are not available to prepare a Basin Plan amendment to incorporate modified TMDLs, then the workplan participants could coordinate this effort via a third-party agreement with the San Diego Water Board.

Refinements to the computer models as a result of such efforts would not necessarily be limited to recalculation of bacteria TMDLs. The computer models used for development of the bacteria TMDLs could also be used to calculate TMDLs for other pollutants. For this reason, we encourage the collection of data for other impairing pollutants in addition to bacteria.

Comment 59

Page 33, the document indicates that WQOs are expressed as the most probable number (MPN) of bacteria, many of the existing monitoring programs which are referenced in the document express indicator bacteria in CFUs. In terms of evaluating compliance, we consider these equivalent, unless otherwise advised.

Response: We agree with the comment and therefore consider the alternate metric for measuring bacteria, "colony forming units" (CFU), equivalent to "most probable number" (MPN).

Comment 60

It is unclear how the Total Maximum Daily Loads correspond to each of the Model Subwatersheds and Hydrologic Descriptors identified in Tables in Section 9.

Response: The TMDLs do not correspond directly to each model subwatersheds, but rather are the sums of the allowable loads for each of the model subwatersheds. An "allowable loading" was calculated for each of the subwatersheds (the delineations of the subwatersheds are shown in Appendix E). The subwatershed identification number originates from the numbering system used in model development for tracking the routing of flows and bacteria loads through the watersheds. For example, the San Clemente hydrologic area is composed of subwatershed numbers 501-506. The allowable bacteria loading calculated for each subwatershed was then summed to produce a TMDL for the entire watershed, which are reported in Tables 9-1 through 9-12.

Comment 61

The maps provided in Appendix E should include more information, such as jurisdictional boundaries, major roadways for reference, waterbody names for reference, etc. The County may be able to provide this information.

Response: The subwatersheds were modeled to calculate allowable bacteria loading for each watershed as a whole. The maps in Appendix E show the subwatershed boundaries only. Although additional information on the maps may be desirable, the maps are adequate for their purpose. Considering the time constraint, we will not update these figures.

Comment 62

The Report should reflect all current work/studies as of date of writing, for example, the reference beach study for the San Diego Region should be included in this TMDL document at this time.

Response: The reference beach study to which the commenter refers has been cited in the Technical Report. All relevant work to date that has a direct impact on these TMDLs has been cited.

Comment 63

Wet Weather Model Selection. The EPA supported LSPC watershed runoff model, based on the Hydrologic Simulation Program Fortran (HSPF) (Bicknell et al., 1997; 2001), was used to simulate a continuous multi-year time series of streamflow, land use dependent bacterial loading and bacterial transport and fate in the streams of the San Diego Region watersheds of the study. The watershed model framework of LSPC, and its predecessor model (HSPF), is well known and has been subject to several peer reviews to ascertain the technical credibility of the mechanistic and empirical approaches adopted in the model.

The selection of *LSPC as the wet weather model for bacterial loading, transport and fate is appropriate for the data sets available, the determination of TMDLs and the load allocation objectives of the analysis.*

Response: Comment noted.

Comment 64

Regional Land Use Data. Watersheds of the San Diego Region were delineated as 16 sub-watersheds with 13 of the watersheds containing impaired reaches. Three watersheds were included because of an abundance of bacterial data that could be used to support calibration of the model. Land use was represented using data obtained from 3 different data sources. San Diego County (SANDAG) land use was the primary source with land uses as of 2000. The San Diego database was supplemented with data obtained from the Southern California Association of Governments (SCAG) for Orange County and portions of Riverside County. The effective year identified for this land use data source is not given in Appendix J. Minor data gaps in land use coverage were assigned using a 1993 USGS Multi-Resolution Land Characteristics database.

Of the numerous land use categories reported in the databases, detailed land uses with similar characteristics were combined for a total of 13 land use categories defined for the San Diego Region model. The 13 land uses represented in the study consisted of the following non-urban categories: agriculture, livestock, horse ranches, open space and surface water. Urban categories included low-density residential, high- density residential, commercial/industrial, industrial/transportation, Caltrans (roads), military facilities, parks and recreation, and construction sites (transitional).

The temporal resolution of the land use data sources (i.e., ca. 2000) is typical of many watershed modeling studies and appears appropriate for development of a regional scale watershed model. As more recent land use data becomes available, the land use distributions used in the model framework can be adjusted, if needed, to revisit the TMDL calculations in the future. For the regional scale model, t*he level of detail of the various land uses appears adequate to represent watershed runoff and bacterial loading in this region. More importantly, the level of detail of the land use categories appears adequate to provide the information needed to municipal officials and other land owners to design and implement BMPs to achieve the waste load allocations and load allocations determined from the TMDL modeling study.*

Response: Comment noted.

Comment 65

Local Scale Land Use Data for San Marcos Basin (1101). *For Cottonwood Creek in Encinitas, included in the San Marcos Watershed (1101), the land use characterization of agricultural uses (0.06 square miles; 4.2 %) and livestock/dairy operations (0.25 square miles; 17.5%) extracted from the land use data sources may not accurately reflect contemporary land use conditions in this small sub-watershed (1.43 square miles). Land use in this watershed is dominated by urban uses with the heavily used I-5 corridor running north-south in the central portion of the sub-watershed. Although agricultural land uses were historically important in this area, there has been pronounced transformation of once agricultural lands to urbanized uses over the past several years. The assignment of the correct drainage areas for agricultural and livestock dairy operation land uses in this small watershed is a critical issue to resolve since the 53% proportion of fecal coliform bacterial loading estimated for these non-urban land uses is quite high (see Table I-12) and affects the calculation of load reductions for this watershed. It is recommended that more recent land use data be collected and compiled to match the 13 land use categories adopted for the San Diego Region watershed model.*

Response: The model results for the San Marcos watershed can be revised with updated land use information in a future refinement of the TMDLs. Time and resources do not permit us to remodel the San Marcos watershed at this point.

Comment 66

Hydrologic Calibration of Watershed Model. The hydrologic model is calibrated to flow data collected from 1991-1996. The model is then validated to data collected from 1997-2001. Model performance targets are also given in Appendix M as relative error statistics for the 10% highest flows (15%) and the total storm volume (20%) to document the ability of the hydrologic model to represent high flow/wet weather conditions.

As shown in time series plots of model results (Appendix M), the hydrologic model appears to be well calibrated to simulate daily and monthly high flows, the winter-summer pattern of high and low flows, and the seasonal variation of monthly streamflow for many of the watersheds of the study. For most of the watersheds, the performance targets are achieved for both the calibration and validation periods. The ready availability of hydrologic parameters values calibrated for other Southern California watershed models of the San Jacinto River and Santa Monica Bay undoubtedly were of great assistance to the model developers in calibrating parameter values for the hydrologic model of the San Diego Region watersheds.

In addition to the time series plots of the model-data comparisons for the different watersheds, flow duration curves for model results should be shown to allow for comparison to the observed flow data. This information would help to determine if low flow characteristics, such as baseflow, of the watersheds were adequately represented by the calibration parameters of the hydrologic model. A detailed analysis of urban runoff in Cottonwood Creek (City of Encinitas, 2002), for example, concluded that a *considerable component of dry weather flow in the lower reaches of Cottonwood Creek was groundwater derived (i.e., baseflow). A hydrologic model that is run continuously for multiple year time scales, as was the San Diego Regional model, should be capable of adequately reproducing seasonal cycles of wet and dry periods to represent the complete range of flows from low to high flows. A simple visual comparison of the time series model-data plots suggests that the hydrologic model does, in fact, represent the lower flows fairly well. Presentation of the relative error statistics to show the model performance at all flow ranges, including mid and low flows, would be desirable. The presentation of model-data flow duration curves then serves to visually support the model performance statistics over the entire flow range for a watershed.*

Response: Flow duration curves were developed for calibration and validation and were used internally for verification of necessary model refinements, but were not included in the report in an effort to reduce unnecessary volume of appendices, and ease the review process. Regardless, these flow duration curves are only relevant for assessment of wet flows, as dry flows associated with urban runoff were not simulated by the model for the TMDL. Instead, a separate model was developed to account for dry conditions, which was discussed in the report. To provide representation and review of LSPC model performance across multiple flow magnitudes, we considered time series plots to be sufficient.

Comment 67

Hydraulic Reach Model. Each of the 16 delineated sub-watersheds was represented by a single, completely mixed one-dimensional computational segment. A representative stream reach was selected from the NHD database streams shown for each sub-watershed. Stream length and channel slope were computed from NHD and DEM data. Stream width and depth for each representative channel of a sub-watershed were estimated using regression curves relating upstream drainage area and stream geometry.

Information given in Appendix J (Section J.2.6) does not document the mathematics of the regression relationships used for the computation of drainage area dependent depth and width of a stream channel. Appendix J also does not document the citation or published source of the regression relationships or technical study. Since a trapezoidal cross-section is used to represent the stream channels, the side slopes of the bankfull channel and the floodplain must be assigned as model input. What are the numerical values and what is the basis of the assumptions used to assign side slopes for the waterbody representations? The City of Encinitas would specifically like to see the mathematical relationship used and the numerical estimates of stream width and depth used to represent the hydraulic properties of Cottonwood Creek in the San Marcos Basin (1101).

Response: Estimation of bankfull widths and depths were based on regional curves reported in *Applied Stream Morphology*[13], with coefficients developed specifically for southern California based on regression analyses of depth and width data collected from

[13] Rosgen, D. 1996. *Applied River Morphology*. Wildlife Hydrology, Pagosa Springs, CO.

53 USGS streamflow stations in the region. Results of this analysis were not included in the report due to the insignificance of assumptions on overall model simulations, and the unnecessary attention that would result in peer review of modeling assumptions. Channel dimensions do not impact flow or water quality computations, other than insignificant impacts on stream velocity that would only influence time of travel calculations within the stream in terms of minutes. At the daily time step used for hydrology calibration/validation, the minor impacts on timing of storm peaks were not noticeable. Furthermore, since model results used for TMDL analysis were based on daily loads, the effects of timing resulting from stream geometry assumptions were not considered critical.

Comment 68

Channel Geometry Data Sources. FEMA Flood Insurance Studies (FIS) have been performed for many urban areas of the nation over the past two decades. As a component of a FEMA study, hydraulic models, such as HEC-2 and HEC-RAS, are often constructed to delineate flood boundaries. Stream channel cross-section data that was used for input to the hydraulic models is often available from FEMA archives.

Was FEMA contacted as a potential source of stream geometry data for development of the watershed model to identify if such data would be available for the San Diego Region to supplement stream geometry estimates determined from the drainage area regression?

Response: FEMA Flood Insurance Studies are focused on flood events and therefore cross-sections used for model development are specific to the flood plain. However, these cross-sections often do not provide sufficient information at the much smaller scale required for assessment of typical flow conditions confined to the bankfull width and depth of the channel. Regardless, for reasons consistent with the response to Comment 69, investigation of methods for estimating stream geometry was focused on techniques for establishing regional assumptions due to the number of stream segments modeled**.**

Comment 69

Bacteria Loading Rates**.** Section J.2.5 and Table J-3 documents the Santa Monica Bay watershed model land use dependent bacteria accumulation rates used for determining bacteria loads from each watershed for the San Diego Regional model. The availability of such a data set is a valuable source of information for development of the San Diego Regional model. Table J-3 presents loading rates for 8 land uses. The San Diego Regional model accounts for 13 land uses.

Table J-3 should show the loading rates assigned to each of the 13 land uses defined for the San Diego Regional model. Table J-3, for example, defines a loading rate for 'agriculture' as the largest—by two orders of magnitude-- area based component of bacteria loading. In the San Diego Regional model, as shown in Table J-1, additional agricultural land uses are defined explicitly for 'dairy/intensive livestock' and 'horse ranches'. It is not likely that the bacteria loading rate from an agricultural field of crops, nursery operations or citrus tree groves, is the same as the bacteria loading rate from *'livestock' land uses. 'Agriculture' and 'Livestock' land uses of 0.06 (4.2%) and 0.25 (17.5%) square miles of the San Marcos (Cottonwood Creek) Basin, for example, are admittedly small, but not insignificant components of the total drainage area of the San Marcos Basin (1.43 square miles) sub-watershed (data from Table J-1).*

Agricultural land uses in the San Marcos Basin in Encinitas have been transformed into urbanized land uses in the past several years. Since the loading rate for 'Agriculture' land uses is the highest of all the urban and non-urban land uses listed in Table J-1, it is critical that the assumptions used to characterize the bacterial loading rates for the actual 'Agricultural' and 'Livestock' land uses of the San Marcos basin accurately differentiate agricultural uses such as nursery operations from other agricultural related land uses. It is understood that loading rates for some of the land uses might be similar. Justification is needed, however, to support the assumption of similar loading characteristics for 5 of the land uses that are obviously lumped somehow into the 8 land uses shown in Table J-3.

Response: Specific modeling parameters associated with 'dairy/intensive livestock' and 'horse ranches' have not been developed for southern California due to lack of land-use-specific monitoring data to provide calibration. Therefore, their modeling parameters were based on 'agriculture' parameters listed in Table J-3. However, we recognize that these land uses likely represent different loading conditions, so they were included independently in the model although consistent with 'agriculture' modeling assumptions. As new data are collected that justify calibration of specific modeling parameters for these land uses, the model can be easily updated. We encourage all stakeholders to collect necessary monitoring data to improve assumptions for 'dairy/intensive livestock' and 'horse ranches' represented in the model.

Comment 70

***Bacteria Loading Parameters*.** Table J-3 documents the land use dependent accumulation loading rates of bacteria. The watershed model also requires the specification of washoff rates and maximum accumulation rates.

The calibrated values assigned for each of these two additional parameters need to be documented for each of the 13 land uses assigned for the San Diego Regional watershed model. These three parameters, in particular, would be adjusted in the watershed model to simulate the effectiveness of BMP alternatives such as street sweeping.

Response: The maximum accumulation rate (SQOLIM) and the washoff rate (WSQOP) in the model were not adjusted for calibration purposes, but were instead held constant using consistent assumptions used by SCCWRP in their original calibration for Santa Monica Bay drainage areas, as reported in Appendix J. The maximum accumulation rates for each land use and indicator bacteria were assumed a concentration 1.8 times their respective build-up rates reported in Table J-3. The washoff rate, or the rate of surface runoff that removes 90% of the pollutant stored on the surface, was assumed 0.5 inches for all land uses and indicator bacteria. These assumptions, including sensitivity analysis, were reported fully in the Santa Monica Bay modeling reported referenced in Appendix J. We encourage a complete review of this preliminary work that formed the basis of the modeling assumptions for this TMDL. Because these assumptions are consistent for each land use and indicator bacteria, they are not considered critical to Table J-3.

Comment 71

Bacterial Die-Off Kinetics. In addition to the land use dependent bacteria loading rates, an effective die-off rate of 0.8 per day was assigned to represent bacterial mortality, net settling and other losses in the wet weather model. Bacterial mortality is strongly dependent on water temperature.

It is not indicated in the report, or the technical appendices, if water temperature dependence of bacterial mortality is represented in the water quality model. A water temperature dependent bacteria die-off rate should be employed in the model framework for technical credibility. The die-off rate should be defined at a reference temperature of 20 C and a temperature coefficient value of 1.08 should be defined for bacterial die-off.

Response: Water temperature was not modeled in LSPC, so a temperature dependent assumption for bacteria die-off could not be simulated. Regardless, due to the velocity and overwhelming flows during wet weather and the dependence of die-off kinetics on time of travel (or time provide for die-off to occur), the impact of temperature dependent die-off rates are considered extremely small for wet weather flows.

Comment 72

Regional Scale Model-Data Comparison for Bacteria. The water quality model for bacteria was calibrated to data collected during 1991-1996 and validated to data collected during 1997-2001. A mix of dry, normal and wet flow conditions characterized the years used for calibration and validation. The definition of 'wet weather conditions' was used to split out wet weather data from the observed data sets and the model results for the critical year results generated for 1993. Figures N-1 through N-11 of Appendix N show the time series results for bacterial densities for the watersheds with observed data records.

The definition of wet conditions appears reasonable; it is a simple matter to adjust the definition to revise the TMDL calculations if a better definition is proposed and accepted.

The model-data comparisons for bacteria appear to be good although the log scale, which has to be used to show the bacterial density data, can be visually misleading. It would be beneficial to the readers to present regression plots of log scale modeled vs. log scale observed bacteria to show performance of the model where data is available for comparison. The availability of bacterial data is obviously limited but appears to be adequate to support model calibration for some watersheds. It would be helpful to clarify the availability of bacterial data for calibration and validation by presenting a table listing each sub-watershed to document the presence/absence of data from 1991-2001 for the calibration and validation years. Separate tables should be presented for Fecal Coliforms, Total Coliforms and Enterococcus. Inventory tables should also be compiled to document the availability of data for wet weather conditions and dry weather *conditions. It is noted that bacteria data does not seem to be available for model calibration for 1993. This was the year that was selected as the critical year for wet weather conditions computation of the existing loads and maximum allowable loads.*

Response: Presentation of comparisons of model results with observed data presently includes 24 figures (15 pages) representing different locations and time periods. These results were specifically designed to provide the reviewer a detailed view of varying locations and timing. Sufficient opportunity was provided to the Stakeholder Advisory Group (SAG) and public to offer suggestions for presentation of model comparisons, but this comment was not received until well after model development and documentation was complete. We had already addressed comments by the SAG to provide further documentation addressing how monitoring data were used in model development, which are reflected in previous changes to the draft TMDL and modeling report.

It is important to note that no calibration was performed for bacteria modeling parameters. The present study provided validation of modeling parameters previously calibrated for the Los Angeles Region. Insufficient data were determined available to provide meaningful calibration of land use parameters for the San Diego Region. For this reason, a detailed presentation of model comparisons with observed data was determined unnecessary. Once sufficient land use monitoring data is collected in the San Diego Region, detailed results of model calibration and validation can be performed and more-detailed assessment of model accuracy can be provided, including additional presentation of comparisons of model results and observed data using a number of graphical and statistical techniques.

It is not necessary to show validation of the model for all years simulated, including the critical year used for TMDL calculation. Model calibration and validation is a separate process specific to the period data is available. Once validated, the model can be used to simulate all other years for which data is not available. This is one of the primary purposes for a model – to develop the model based on periods that data is available and subsequently use the model to predict conditions where/when data is unavailable.

Comment 73

Regional Scale Bacteria Model-Data Results in Appendix N. Figures N-12 through N-24 of Appendix N show the model-data results grouped by watershed basins and sorted by flow ranges.

*The text in Appendix J on page J-12 states that the unit area flow is inches/acre. The plots shown in Appendix N, however, show the units as in/day. The units, whatever they are, need to be correct, and in agreement, in both appendices. The legend in these figures indicates observed average and modeled average of the bacteria data. The documents do not indicate if the average values are based on arithmetic or geometric calculations. Averages of bacteria data, since both the observations and model results span several orders of magnitude, should be based on geometric averages rather than arithmetic averages. *

Response: The rate (1/day) was not indicated on page J-12. The unit area flow was changed to inches/acre-day on page J-12. All averages reported in Figures N-12 through N-24 were calculated as geometric means.

Comment 74

Model Performance Statistics for Bacteria Results. Model performance statistics as relative errors are presented in Appendix M for the hydrologic model calibration and validation results for streamflow.

Comparable model performance statistics are not presented for the bacteria model results since the limited data sets that were available did not warrant the calculation of relative errors as is typically done for other watershed modeling studies.

It is unfortunate that sufficient bacteria data records are not available to allow the calculation of model performance statistics for the bacteria model. In the absence of an observed data base that can be used to evaluate statistics of the performance of the model, calibration and validation of the bacteria model, instead, relies solely on a visual comparison of the time series plots of model vs. data for the sub-watershed that have water quality monitoring data. Since there is no presentation of an uncertainty analysis of the watershed model results to indicate how the results might change with different sets of input parameters, it is difficult to infer the credibility of the watershed model framework as a tool for wet weather TMDL determinations.

Response: It is important to note that no calibration was performed for bacteria modeling parameters. The present study provided validation of modeling parameters previously calibrated for the Los Angeles Region. The reviewer should review additional model calibration results reported by SCCWRP for Santa Monica Bay drainage areas, included as an appendix to the bacteria TMDL for Santa Monica Bay beaches.

If sufficient data were available for calibration of bacteria modeling parameters, it is important to note that presentation of statistical evaluation of mode uncertainty is not a requirement to justify the model's use for TMDL calculations.

Comment 75

San Marcos Basin Local Scale Model-Data Comparison for Bacteria. *For the City of Encinitas, it is a concern that wet weather bacterial data was not available in Cottonwood Creek to provide convincing evidence that the bacteria loading rate assumptions taken from Table J-3, particularly the 53% of the total estimated load contributed by 'Agriculture' and 'Livestock', would in fact, result in good agreement to actual in-stream bacterial counts. If the assumptions regarding the land use dependent loads for the San Marcos Basin are inappropriate, then the model results would not provide good agreement to observed bacterial counts in Cottonwood Creek at the confluence with the Pacific Ocean at Moonlight State Beach. In the absence of bacterial data collected in the lower reaches of Cottonwood Creek that can be compared to watershed model results, the City of Encinitas does not have any convincing model-data results that can be used to support the investment that will be needed for implementation* *of the final TMDL determinations (i.e. 92-99% removal documented in Appendix P) and the construction of BMPs designed to reduce bacterial loading in our small watershed. It is recommended that wet weather and dry weather bacteria data be collected in conjunction with stream flow measurements in Cottonwood Creek near the confluence with the Pacific Ocean. This new data can be used for future watershed model-data comparisons for the San Marcos basin (1101).*

Response: It is not necessary to calibrate the model in all watersheds to prove that modeling parameters are valid regionally or for each land use. We agree that additional bacteria data should be collected in all watersheds addressed by this TMDL to verify model performance. We encourage the City to collect bacteria data from various land uses to provide update of modeling parameters and possible refinement of the TMDL. We also encourage the City to collect data from Cottonwood Creek to provide comparison to model predictions, and provide assurance of model performance to justify implementation of BMPs.

Comment 76

Selection of 1993 as Critical Wet Year and Calculation of Existing and Allowable Maximum Loads. *While the methodology is appropriate for calculating existing and estimated maximum allowable loads, the limited amount of bacterial data prevents robust model calibration/validation. This raises questions regarding the validity of the loading estimates simulated for the critical year of 1993.*

Response: Please see the response to Comment 74.

Comment 77

Selection of Downstream Confluence with Pacific Ocean as Critical Location for Determination of TMDL. *The use of the most downstream location in each sub-watershed as the critical location for extraction of model results to compute existing and allowable bacteria loads is appropriate for the analysis to provide protection to the nearshore ocean beach sites.*

Response: Comment noted.

Comment 78

Dry Weather Model Approach and Source Term Methodology. Appendix K provides the rationale for development of a separate steady state model framework for determination of a dry weather TMDL for bacteria loading. The report states that: "The variable nature of bacteria sources during dry weather required an approach that relied on detailed analyses of flow and water quality monitoring data to identify and characterize sources. This TMDL used data collected from dry weather samples to develop empirical equations 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 concentrations. A statistical relationship was established between areas of land use and flow and bacteria concentrations".

Streamflow data, not available for many sub-watersheds, was estimated using a step-wise regression technique to empirically assign stream flow as a function of the land uses contributing to flow measurements recorded at streamflow gages in the study area. In-stream bacteria data sets available from water quality monitoring stations was used to infer a relationship between land uses contributing dry weather loading to a stream and the geometric mean of observed *in situ* bacteria counts. Multiple step-wise regression techniques were used to define Fecal Coliform Bacteria concentrations as an empirical function of contributing land uses. Total Coliforms and Enterococcus densities were estimated as a function of Fecal Coliform Bacteria estimates.

It is not clearly stated in the documentation of the methodology in Appendix K how the empirically derived bacteria concentration estimates were then used as input to the steady state model. Presumably, land use dependent flow estimates were multiplied by land use dependent bacteria concentrations to derive land use dependent loading rates. The loading rates were then assigned as either (a) upstream boundary condition for headwater stream reaches or (b) lateral tributary inflows for stream reaches downstream of headwater reaches. Mass balance calculations were then performed at the upstream end of a reach to compute the initial concentration at the upstream end of the reach. The concentration at the downstream end of the reach was then calculated as a function of the calibrated die-off coefficient and travel time within the reach. The model was calibrated by adjusting the in-stream die-off rate to match observed bacteria data and adjusting infiltration rates to improve the match to observed flow data. The model was then validated using data sets extracted from watersheds that were not used to determine the empirically defined regression relationships.

As shown in the figures presented in Appendix K, the spatial distribution of observed flow and bacteria counts are reproduced fairly well in the sub-watershed reach segments. It is not particularly noteworthy, however, that the dry weather model results provide a good match to the observed dry weather flow and bacteria data. This is to be expected since the observed flow and bacteria data was used to derive the land use dependent source loading terms assigned as input to the model.

Although we agree that the use of a steady-state model is appropriate for an analysis of dry weather flow and bacteria distributions to determine the dry weather assimilative capacity of the streams for bacteria, the dry weather source term methodology developed for the San Diego Region TMDL study has some flaws. Consequently, the approach and the results are lacking. The methodology, as documented in Appendix K, essentially seems to include what might be considered circular reasoning to compute the in-stream bacteria concentrations. In-stream flows and bacteria measurements are averaged, compiled for several sub-watersheds and empirically related with a multiple regression technique to contributing land uses and watershed area. Upstream boundary conditions for headwaters and tributary inflows are then computed from the composite empirical relationships for flow and bacteria and assigned as flow and bacteria source loading terms for each reach based on land uses and catchment areas contributing to a reach.

Response: The reviewer summarized the linkages and configuration of the dry-weather mode accurately, indicating that the documentation was sufficient for explaining the methodology. However, the reviewer is incorrect in stating that data used for regression analysis and development of loading estimates were also used for model calibration. Data used for regression analysis and development of equations to predict watershed runoff flows and water quality were independent of datasets used to calibrate instream infiltration and bacteria die-off.

It is true that some data from monitoring stations used in the regression equations were also used in calibration of instream infiltration and bacteria die-off. However, a detailed discussion is provided on page K-12 that addresses this issue and explains how circular reasoning is not considered an issue.

Comment 79

Equations used for Dry Weather Model. Appendix K presents the analytical solution that was coded as the steady state, one-dimensional stream model as a series of plug flow reactors. Each stream reach segment (reactor) is assigned a constant source of flow and bacteria at the upstream end of the computational segment. Flow and bacteria concentrations assigned as model input data were empirically estimated from the regression relationships discussed in Comment 78.

In addition to the questionable methodology used to derive the source loading terms for the dry weather model, we do not believe that the analytical model itself correctly represents the water quality response within a reach to a uniformly distributed nonpoint source input of flow and bacteria. The analytical model, as presented in Appendix K, is appropriate for the representation of a point source discharge at the upstream end of a reach and the subsequent exponential decay (die-off) based on travel time along the length of the reach. The model, as structured, assigns the distributed flow and bacteria load that accumulates over the length of a reach as a "point source" discharge at the upstream end of the reach.

Thomann and Mueller (1987) (page 61-69) present the analytical solution for a steady state stream model that includes the water quality response to point source discharges at the upstream boundary end of a reach and distributed nonpoint source inputs contributed along the entire length of a reach. The differential equation for a mass balance at steady state with constant flow (Q) in a reach is given as:

$$U\frac{dS}{dx} + K.S = \frac{w}{A}$$

where: w is the uniformly distributed source with units of mass/length-time and A is the cross-sectional area of the reach. The solution of the model is given as:

$$S(x) = S_o \exp(-K\frac{x}{u}) + (\frac{w}{A.K})[1 - \exp(-K\frac{x}{u})]$$

where: S_o is the completely mixed concentration determined from the mass balance computation based on of the upstream boundary and the lateral inflow at the upstream end of a reach; K is the die-off rate (day^{-1}); x is distance along the length of the reach where x = 0 is the upstream end of the reach and x=L at the downstream end of a reach of length L; u is the velocity in the reach $u = \frac{Q}{A}$ *; and S(x) is the concentration as a function of distance, x, along the reach.*

The approach used in the dry weather model defined in Appendix K essentially incorporates all the bacteria load into the S_o term of the solution as a point source at the upstream end of a reach rather than assigning a bacteria load that is parameterized as a line source. It appears that calculations have not been performed for this review to determine how much of a numerical difference would result from the use of the correct analytical model to represent nonpoint source loading of bacteria. Regardless of the numerical differences between the approach adopted for the dry weather model described in Appendix K and what we believe to be the more appropriate approach identified above, the technical credibility of the dry weather model is lacking without the use of the distributed nonpoint source term in the model framework.

Response: The commenter is correct that the distributed loading equation is likely more representative of actual conditions than the point source version used. However, it is important to note that the distributed loading equation, as defined by the commenter, does not incorporate the increased complexity due to decreasing flows resulting from infiltration and the resulting reduced assimilative capacity of loads along the stream length. Also, urban runoff loads are unlikely to be evenly distributed along a stream length, and as with wet flows, are likely to increase in magnitude as the watershed size and tributaries increase downstream. Moreover, as flows increase, so does the stream's cross-sectional area, wetted perimeter, and resulting ability of flows to infiltrate via a wider stream bottom. In most "gaining" streams, or streams that are supplied water by groundwater baseflow, the general distributed loading equation is most useful and can be based directly on the formulation outlined by the reviewer. However, in urban streams of arid environments such as southern California, where the majority of flow is provided by urban runoff and the streams are generally "losing" water due to infiltration, the true formulation of the distributed loading equation is much more detailed than the version outlined by the reviewer. Even more important, the distributed loading equation would require additional assumptions for distributing the load and losses through infiltration, without additional information to justify or define these assumptions. Therefore, the best equation was determined to be the simplest approach that provides representation of the most processes considered critical to TMDL calculation, with sufficient data to base assumptions. For this reason, the point source form of the equation was considered the most technically credible given the amount of data available to base assumptions and provide calibration/validation of key parameters.

Comment 80

Selection of Dry Weather Model Approach for TMDL Determination.

Over and above the questionable representation of the water quality response of nonpoint sources in the dry weather steady state model, the larger issue, however, is that it is not at all clear why a separate steady state modeling approach was even adopted for the dry weather TMDL evaluation. Appendix K notes that the large spatial variability of dry weather bacteria data necessitated the use of a "different approach" to define more detailed source functions. Based on the hydrologic model results given in Appendix M, the watershed runoff model seems to do a reasonable job of representing low flow conditions during the April-May through October months. The wet weather model-data results given in Appendix M clearly show a seasonal cycle of high and low flow conditions with low flow conditions occurring during April/May through October/November. Although model performance statistics are not presented, the hydrologic model appears to adequately represent streamflow during the seasonal low flow conditions. Although land use dependent bacteria loading rates (Table J-3) were calibrated for the wet weather TMDL analysis, the time variable results of the watershed runoff model were apparently <u>*not*</u> *extracted either for generation of load duration curves or statistical analyses of the model vs. data response for days defined by dry weather conditions. The watershed runoff model presumably could have been used for the dry weather TMDL evaluation if a slightly different conceptual model was adopted to account for chronic, dry weather constant loading of bacteria in addition to the wet weather storm event driven loading of bacteria where both dry and wet weather loads are dependent on land uses.*

Using a modified conceptual model, calibration of the bacteria model would have first focused on dry weather measurements of flow and in-stream bacteria to calibrate a set of land use dependent "export coefficients" to represent constant bacteria loading from the sub-watersheds. Export coefficients would be adjusted for the different land uses until the weighted mix of loading rates resulted in a good match to observed dry weather bacteria data. The calibrated dry weather model results would then be used to derive load duration curves for each sub-watershed using the identical approach adopted for the wet weather analysis. Existing dry weather load duration curves would be compared to maximum allowable load duration plots based on dry weather numeric target criteria for bacteria and model flow data. The total load reductions for dry weather conditions would then be computed as the difference between the existing dry weather load and the maximum allowable TMDL.

Following calibration of the bacteria model to dry weather conditions, the model would be calibrated to wet weather conditions. The dry weather export coefficients used to define chronic constant loading would be imposed as a component of the wet weather evaluation since by definition, dry weather loading is essentially constant over time. Presumably, wet weather in-stream bacteria measurements reflect both the dominant *storm-driven loading as well as the chronic constant loading that is present during dry weather conditions.*

The technical credibility of the dry weather TMDL evaluation would be greatly enhanced if the LSPC watershed runoff model was applied within an internally consistent model framework for both dry weather and wet weather conditions.

Response: LSPC is insufficient for modeling dry-weather flows and bacteria loads for a number of reasons. Although LSPC calibration results show a good comparison to dry seasonal volumes, it is important to note that "seasonal" includes any rainfall event that occurred during this period. As a result, these seasonal volumes are not confined to dry-weather flows. It is important to note that flows simulated by LSPC are only produced by rainfall-runoff processes. The model does not include capability for estimation of dry urban runoff resulting from anthropogenic sources unrelated to natural hydrology (e.g., car washing, lawn irrigation runoff). Since the model does not include runoff volume from dry urban runoff, it is impossible to assign an associated load of bacteria. LSPC also does not provide sufficient resolution for simulation of instream infiltration that is a major factor for dry flows.

The approach recommended by the reviewer for estimation of dry flows and instream bacteria loads using "export coefficients" is flawed due to the inability of LSPC to predict dry urban runoff. Essentially, there is no flow predicted by LSPC to calibrate to dry weather measurements. It is unclear how the reviewer would intend to use "export coefficients" to represent constant bacteria loading from the subwatersheds. Such 'constant' loads are steady-state and do not provide variability of loading estimates during dry weather. If the dry loads do not vary, then it is impossible to produce dry weather load duration curves (dependent on a range of small to large flows) recommended by the reviewer. If the dry flows and loads are constant and steady-state, then it is unclear how this approach provides any advantage over the approach used in the TMDL.

Comment 81

The proposed TMDL affects approximately 356,733 acres of land within the City of San Diego, runoff from which enters receiving waters via approximately 4,660 storm drain outfalls. The proposed TMDL allows for zero discharge of human-generated indicator bacteria from these outfalls (i.e., before the storm water reaches receiving waters) regardless of weather conditions.

Response: Final wet weather allocations for controllable sources are zero. We are aware that identifying specific sources of bacteria, and differentiating between human generated and non-human generated, is difficult and costly. The TMDL relies on WQOs for indicator bacteria, meaning that receiving waters should not have bacteria densities in excess of WQOs. As long as WQOs are met, the source of the bacteria is not necessarily a determining factor for TMDL compliance.

The purpose of established WQOs is to ensure conditions that are safe for recreational swimming and shellfish harvesting. We recognize that there may be shortcomings with using indicator bacteria to measure water quality instead of pathogens directly. For example, if bacteria re-grow in the environment, this does not necessarily correlate to an increase in public health risk. For that reason, we encourage the elimination of human-generated sources of bacteria, and the verification of these accomplishments wherever possible. Please see the response to Comment 2.

Comment 82

Significant concerns with the project are as follows:

- Recent data provided to the Regional Board at its February, 2006 workshop on this project suggest that indicator bacteria are not indicative of public health threats at southern California beaches. Indicator bacteria standards in the Basin Plan were established in the 1970s based on older and inapplicable epidemiological studies.
- Recent studies conducted by the City of San Diego have concluded that bacterial contamination at beaches is largely due to kelp, birds, and flies on beaches.
- The Basin Plan standard for bacteria in relation the beneficial use “SHELL” was established in the 1970s to protect human health from consumption of shellfish. However, the State Department of Health Services, which actually has regulatory control over bacteria levels in commercial shellfish, uses a less conservative standard than that in the proposed TMDL.
- The Basin Plan erroneously applied SHELL to the mouth of Chollas Creek since the mouth of Chollas Creek has been dredged and surrounded by commercial uses since the 1920s.
- The Basin Plan erroneously applied REC-1 as a potential beneficial use throughout the Chollas Creek watershed since significant portions of the creek were channelized for flood control purposes prior to adoption of the Basin Plan.
- The only known technologies that will eliminate bacteria in storm water are diversion (to eliminate the storm water via, for example, infiltration) and treatment with chemicals (such as chlorine and ozone) or ultraviolet light. The TMDL requires maintenance of existing hydrology in receiving waters; therefore, treatment of at least dry weather flows is required.
- Diversion and treatment will both result in the removal of sediment from storm water discharges. The impact of sediment removal on creeks and beaches should have been documented during TMDL development.
- Allowing zero bacteria in storm water discharges, coupled with bacterial re-growth in storm drains, means that diversions and treatment facilities must be located in areas as close as possible to storm drain outfalls. Most of these areas are privately owned and developed.
- The potential for widespread use of infiltration, which is based on soil types in the watersheds, is unknown but should have been documented during TMDL development.
- The environmental impacts associated with the massive public works that must be undertaken for compliance are not disclosed in the Regional Board’s CEQA analysis.

- The financial impacts associated with the massive public works that must be undertaken for compliance are not disclosed in the Regional Board's technical report.
- Many water bodies affected by this TMDL are currently listed as impaired. The City must address all pending TMDLs when it complies with this TMDL; therefore, the City recommends that this TMDL be integrated with other TMDLs on a watershed by watershed basis.
- The 10-year implementation schedule sets up the City of San Diego for non-compliance, the financial penalties associated therewith, and lawsuits from other stakeholders.

Response: The numerous comments above are addressed separately below.

Indicator bacteria. As previously stated, we recognize that there may be shortcomings with using indicator bacteria to measure water quality instead of pathogens directly, and that the accuracy of the correlation of bacteria densities to health risks is the subject of recent discussions. For this reason, several studies have been completed or initiated to examine the health risks associated with indicator bacteria, as well as potentially new indicators of health risks.

We are obligated to proceed with utilizing WQOs consisting of total coliform, fecal coliform, and enterococci bacteria to calculate TMDLs because they are the established indicators of risk to public health. Under Clean Water Act (CWA) section 303(d), the San Diego Water Board is obligated to develop TMDLs for waters not meeting WQSs (WQOs and the beneficial uses they are designated to protect). TMDL calculations must be based on existing WQOs.

The administrative proceedings at the San Diego Water Board level are not the appropriate forum for investigating the validity of the bacteria WQOs. Reevaluation of water quality criteria that are the basis for WQOs cited in the Basin Plan takes place at the USEPA level. Should USEPA promulgate new water criteria, then the WQOs in the Basin Plan will be updated accordingly and TMDLs recalculated.

Kelp as source. We are aware that much of the bacterial contamination at beaches is largely due to kelp, birds, and flies on the beach. For that reason, interim wet weather TMDLs were calculated using the "reference system approach," which takes into account bacteria densities caused by such sources. The reference system approach allows a 22 percent exceedance frequency of the single sample WQOs for REC-1. TMDLs were calculated taking this exceedance frequency into account. Although the reference system approach only applies to interim TMDLs, a Basin Plan amendment has been initiated to permanently incorporate a reference system approach for the purpose of calculating TMDLs. After this takes place, final wet weather TMDLs will be recalculated to allow exceedances of single sample WQOs during wet weather due to natural background loads including bacteria from kelp, birds, and flies. The reference system approach was not used for dry weather for the reasons outlined in response to Comment 2.

Shellfish and REC-1 designations and WQOs. According to section 303(d) of the Clean Water Act, we are obligated to calculate TMDLs for all impaired waterbodies using the existing applicable WQOs. We realize that not all stakeholders agree that TMDLs should be based on WQOs designed to be protective of shellfish harvesting, nor do all stakeholders think the beneficial use should be designated across all ocean waters of the Region. However, just as we are obligated to calculate TMDLs using indicator bacteria for REC-1 use, so are we obligated to calculate TMDLs for the SHELL beneficial use. Whether or not the use is appropriate at the mouth of Chollas Creek, or anywhere else, is a discussion that can only take place when evidence is produced demonstrating that the SHELL use was not occurring on or after November 28, 1975, and that water quality necessary to support SHELL use has not been attained in the water body since November 28, 1975. Although the City of San Diego has produced some evidence to support its contention, more definitive evidence is needed before the San Diego Water Board can change the SHELL use from "existing" to "potential" and conduct a use attainability analysis. To de-designate channelized portions of Chollas Creek for REC-1, the San Diego Water Board needs evidence that a use attainability analysis is appropriate.

Maintenance of existing hydrology. The commenter incorrectly states that the TMDLs require maintenance of existing hydrology in receiving waters. We agree that treatment of dry weather flows may be a suitable option for reducing bacteria. The environmental analysis (Appendix R) has been revised to clarify this issue.

Sediment removal on creeks and beaches. Appendix R has been revised to address this comment.

Location of treatment facilities. Although a concern, the siting of structural BMPs, whether in private or public land, is a project level issue the dischargers will have to address.

Widespread use of infiltration. Whether or not the use of infiltration is feasible in terms of complying with TMDL requirements is the responsibility of the dischargers to investigate. We cannot speculate on the manner of compliance with the TMDLs.

Environmental impacts of massive public works. Appendix R has been revised to include a more extensive discussion of the adverse environmental impacts and financial impacts associated with the reasonably foreseeable methods of compliance.

Integrated TMDLs. The City of San Diego put forth a specific 20 year compliance schedule for metals and bacteria TMDLs in Chollas Creek. We have incorporated a modified version of that schedule in these TMDLs, and added an option for extending the compliance schedule if dischargers propose addressing all water quality problems in a watershed in their pollutant load reduction plans. These revisions can be found in section 11.4.2 of the Technical Report.

Comment 83

The City of San Diego questions the rationale for not providing Caltrans, General Industrial Permittees, other Phase II Municipal Storm Water Permittees (MS4s) and non-point sources with a waste load allocation (WLA). It may appear that their contribution is minimal; however, with 100% reductions required, all sources need to reduce their loading. This concept is particularity important with those entities that hold an existing NPDES permits and/or Waste Discharge Requirements (WDRs). It is improper that the

Regional Board place the responsibility and liability to comply with this TMDL Phase I MS4s.

The City of San Diego again requests a time line regarding when the Regional Board will contact the Phase II MS4 permittees for inclusion into this TMDL Program. Currently, University of California, San Diego, San Diego State University, University of San Diego, the Community College District's facilities and the San Diego Unified School District's facilities have not been included in this process. These Phase II MS4s and others are contribute loading to the listed impaired waterbodies and should be notified of their requirement to participate by the Regional Board. The City believes that, since bacteria reproduce in storm drains, all storm drains, including Caltrans', have a substantial potential for introducing bacteria into receiving waters. In addition, the City has documented issues with the discharge of food waste from outdoor eating areas at schools. These discharges also constitute potentially substantial contributions of bacteria that should be considered in the TMDL.

Response: As indicated in the final wet weather TMDL tables in section 9 of the Technical Report, Caltrans, municipal dischargers, and controllable nonpoint source dischargers all receive a WLA or LA of zero, or 100 percent reduction. Table 11-2 describes the responsible municipalities in each jurisdiction, which includes small MS4s in each watershed. We recognize that it will be difficult for dischargers to meet final allocations and WQOs during wet weather. Therefore, we are developing a Basin Plan amendment to permanently incorporate a reference system/natural sources exclusion approach for implementing bacteria WQOs as described in the response to Comment 2.

We have contacted by phone the small MS4s listed in Appendix Q to make them aware of these TMDLs. Steps to regulate small MS4s will begin after we have initiated steps to regulate Phase I municipal dischargers in accordance with the discussion in section 11.5.3 of the Technical Report.

Comment 84

In good faith members of the Stakeholders Advisory Group participated in the Reference Beach Bacteria Study at San Mateo and San Onofre Creeks. The purpose of the study was to help Southern California Coastal Waters Research Project (SCCWRP) gather data from beaches that have minimal human development. This data was to be used to develop a baseline for natural bacteria background concentrations. Many SAG members volunteered staff time and resources. The City of San Diego volunteered many man hours to collect some samples and processed all the samples. How was this data used in the development of the TMDL?

Response: The effort to which the commenter refers is being used to develop the reference system approach/natural sources exclusion Basin Plan amendment. The data retrieved in this effort is not being used for development of the current TMDLs. However, these TMDLs will be recalculated once the Basin Plan amendment authorizing the reference system/natural sources exclusion approach has been adopted.

Comment 85

The City of San Diego understands that Margin of Safety (MOS) is a required component for the development of TMDLs. This TMDL uses an implicit MOS that applies conservative assumptions throughout the development of the TMDL. However, the application of this conservative MOS is on top of the MOS the US Environmental Protection Agency (EPA) applied when they developed the REC1 standards. The City of San Diego questions the application of the implicit MOS with its conservation assumptions when another MOS Watershed already has been applied to this TMDL indirectly. The City of San Diego believes the use of an explicit MOS is more appropriate for this TMDL.

Response: Please see the response to Comment 36.

Comment 86

The label on “Table 9-3: Interim/Final Dry Weather TMDLs for Fecal Coliform as a Monthly Load” shows that both the interim and final loads are the same; therefore, a decision needs to be made as to whether this monthly load requirement is for interim or final compliance.

Response: Final TMDLs are based on WQOs for SHELL, and therefore are only meaningful for total coliform. Therefore for fecal coliform and enterococci, final TMDLs are the same as interim TMDLs. We deleted the term “interim” from the title.

Comment 87

Table 9-5 Interim Wet Weather TMDLs for Total Coliform Expressed as an Annual Load’s percentage of reduction appears to be in conflict with Table 11-4: Compliance Schedule and Interim Goals for Achieving waste load reductions.

Response: The comment is unclear as to how the information in Table 9-5 is in conflict with Table 11-4. We assume the conflict involves the zero WLA for controllable sources. Please see the response to Comment 2.

Comment 88

Table 9-8: Interim Wet Weather TMDLs for Enterococcus Expressed as an Annual Load’s percentage of reduction appears to be in conflict with Table 11-4: Compliance Schedule and Interim Goals for Achieving Waste Load Reductions.

Response: The comment is unclear as to how the information in Table 9-8 is in conflict with Table 11-4. We assume the conflict involves the zero WLA for controllable sources. Please see the response to Comment 2.

Comment 89

The label on Table 9-10: Interim/Final Dry Weather TMDLs for Enterococcus as a Monthly Load shows that both the interim and final loads are the same; therefore, a decision needs to be made as to whether this monthly load requirement is for interim or final compliance

Response: Please see the response to Comment 86.

Comment 90

Section 9 Total Maximum Daily Loads and Allocations: Greater wet weather loading reductions for all indicators should be required from identified agriculture/livestock dischargers due to the fact that these relatively small facilities lend themselves to the opportunity for water quality control. As calculated in Table 9-1, the load allocation assigned to agriculture/livestock in the San Juan Creek watershed is 2,856,458 billion MPN/year. This is more than twice the 1,155,725 billion MPN/year waste load allocation assigned to the MS4 dischargers. Yet both allocations are assigned the same percent reduction. The loadings from the agricultural areas come from a small defined land area and most likely, easily identifiable sources (manure stockpiles, fertilizers, etc.). In contrast, the loading from the MS4 system comes from diffuse and unknown sources spread over the entire watershed area. Greater loading reductions should be more easily achievable from the agricultural/livestock land areas.

Response: The commenter is correct in saying that the percent reduction for the agriculture/livestock dischargers is the same as the percent reduction required for MS4 dischargers. The methodology used to develop allocations in the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds was designed to produce proportional load reductions among the two main discharger categories. In formulating this methodology, we attempted to use a fair approach to developing load allocations and reductions. Setting allocations *proportional* to existing loading was the way we chose to accomplish this.

We agree that agricultural and livestock practices lend themselves to the opportunity for water quality control. Agricultural and livestock dischargers may be able to meet their allocations easier or faster than MS4 dischargers, or achieve that load reductions in excess of 13 percent. This could create an opportunity for trading pollution credit. Municipal dischargers could meet their reductions by paying for BMPs to achieve higher load reductions from agricultural and livestock facilities.

Comment 91

The interim wet weather numeric target for the indicator bacteria incorporates the reference beach concept to allow for natural sources of the indicator bacteria. While we do endorse this method there may be potential public perception issues that could arise when a wet weather monitoring report for a given beach indicates that the samples exceed the numeric targets but are below the 22% exceedence frequency limit. A beach warning would be posted. The first issue would require public outreach to explain the intent of the 22% exceedence frequency allowance should this matter arise. The exceedence should in no way detract from the required beach warning and closure per AB 411. The second issue follows and this deals with the health risk associated with the natural sources of the fecal indicator bacteria. Section 11.6.2 discusses this matter and we strongly support that studies should be conducted to determine the health risks to humans from the potential pathogens from animal sources. We also support research to provide rapid response indicators of pathogens as in Section 11.6.3.

Response: The allowable exceedance frequency to account for natural sources of bacteria will not affect the beach warnings and closure protocol described in this comment. The protocol is outlined in Health and Safety Code 15880 (commonly referred to as "AB 411") and is independent of these TMDLs.

Comment 92

The term "bacteria" is generally used in the report to mean indicator bacteria. However, we recommend revisions to Investigate Landfills as a Potential Bacteria Source on page 134, section 11.5.6 Additional Actions, in order to clarify the distinction between the potential pathogens in the landfills, indicator bacteria, and the bacteria that are associated with the generation of methane during the decomposition of organic matter. We recommend that in the topic heading and the first sentence replace "Bacteria" with "Pathogens". The second paragraph incorrectly infers the presence of indicator bacteria because evidence of methane gas. Different types of bacteria are involved methane gas formation. See for example, the cited references on methane gas formation. Therefore, we recommend that this paragraph be deleted because generation of methane gas is not germane to investigating the presence of indicator bacteria and pathogens in the landfills.

We disagree with the third sentence in the third paragraph that states that landfills are an "unlikely source of bacteria with respect to these TMDLs". Presumably, these are the fecal indicator bacteria. If this is correct, then does this mean that the sewage sludge that are allowed in landfills do not contain fecal bacteria? Furthermore, opportunistic mammals visit landfills and it is reasonable to assume that they deposit feces. Other sources include discarded residential pet wastes and soiled diapers. The last sentence of this paragraph should be deleted for clarity as these are the methane forming bacteria explained above.

In the fourth paragraph we recommend that "bacteria" in the first sentence be replaced by "indicator bacteria".

Other pathogens not related to indicator bacteria could potentially be in solid wastes that are discarded in the landfills and enter into the waters of the state. We concur with the recommended investigations to determine if landfills are a potential source of indicator bacteria discharges into surface waters on page 135. We further would recommend that these investigations include pathogens not related to the indicator bacteria.

Response: We have modified the Technical Report for clarity in response to this comment. Please see section 11.

Comment 93

Table 11-3, the Prioritized list of Impaired Waters for TML Implementation, was developed by the SAG in consultation with RWQCB staff, and has appeared in prior versions of the Draft Technical report. However, in the current draft the RWQCB staff unilaterally changed the Priority designation of San Juan Creek from 3 to 1, and added San Juan Creek mouth as a Priority 1 location, contrary to the input from the SAG. The Priority designation of San Juan Creek and the beach at its mouth should be returned to the previously concurred Priority 1. These waterbodies should be the same priority as they will have to be managed together. As we learn more about the dynamics and interrelationship of the creek mouth and beach water quality, it would be futile to treat them independently.

Response: Previously, the San Juan creek mouth was not included in this project because it was to be included in the TMDLs for bays and lagoons, a separate effort from the beaches and creeks TMDLs. The creek mouth was later included in the beaches and creeks TMDLs because the characteristics of the mouth were better suited for the beaches and creeks TMDLs than it was for the lagoons TMDLs (the computer modeling in both TMDL projects were different). Because the mouth of the creek discharges to a heavily populated beach, we gave the creek mouth a 1 priority. Since, achieving WQOs at the mouth/beach is dependent on the water quality of the creek; we changed the priority for the creek from 3 to 1. This decision was made in consultation with SAG member Amanda Carr from the County of Orange.

Comment 94

Section 11.6.1 indicates that "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." It seems likely that the refined modeling could result in different estimates of Existing Load than currently shown in the Tables in Section 9; and that the Wasteload Allocations and Percent Reductions would therefore also be different. The text should identify who will be doing this model refining work and what procedural requirements there will be to incorporate the findings of the refined models as updated TMDL targets and updated Bacteria Load Reduction Plans.

Response: The Technical Report has been updated to clarify that either the San Diego Water Board or a stakeholder, through a Memorandum of Understanding, could update the watershed models used for TMDL development. TMDLs would need to be updated through the Basin Planning process. We recommend stakeholders review USEPA's guidance for third-party led TMDLs for procedural requirements.

Comment 95

On page B-7, Allocations and Reductions: "……..Although considered a controllable source, load reductions from the California Department of Transportation (Caltrans) are not necessary because in all watersheds, loads from Caltrans are a minor contributor to the total existing loads." The City requests documentation to support this statement, please. The City did not see any Caltrans data sources in Appendix G that may help support this statement.

Response: The methodology for allocating TMDLs amongst dischargers is described in Appendix I. The assertion that Caltrans is a minor contributor of bacteria is supported by the relatively low bacteria loads originating from the industrial/transportation land use (see Tables I-12 through I-14). Furthermore, Caltrans occupies only a fraction of the industrial/transportation land use area (see Table I-2).

Comment 96

During dry weather, application of the loading-based approach effectively puts in place water quality standards that are more stringent than those in the Basin Plan. (The loading based approach requires the arithmetic average concentration to be equal to the geometric mean value specified in the Basin Plan. Because fecal indicator data are known to be lognormally distributed, the average is always greater than the geometric mean, thus this approach puts in place more stringent requirements).

Response: Dry-weather loads were not predicted based on the arithmetic average bacteria densities, but were based on the regression analyses of the geometric mean of bacteria densities observed in multiple streams throughout the San Diego Region, as discussed on page K-7 of Appendix K.

Comment 97

We urge the Board to thoroughly review the comments summarized above and consider revising the TMDL to address our comments. In this regard, an appropriate starting point would include a thorough evaluation of the appropriateness of the TMDL's loading-based approach, a reconsideration and thorough explanation for the use of SHELL WQOs for total coliform as the appropriate numeric target for creeks and rivers even though they do not support the SHELL use, and much more thorough evaluation of the potential public health and environmental benefits and likely costs associated with implementation of the TMDL.

Response: We have thoroughly reviewed all comments received and made modifications to the Technical Report as appropriate. We have discussed these issues at length with the Stakeholder Advisory Group (SAG) since its inception in 2003. Some changes to the Technical Report have been made as a result of suggestions from the SAG, and some suggestions resulted in no changes because they were in conflict with the underlying goal of these TMDLs.

The rationale behind the loading based approach is described in the response to Comment 147. The explanation of the SHELL WQOs as the numeric target for total coliform TMDLs can be found in section 4.3 of this appendix. A discussion of the potential health and environmental benefits that are compromised because of poor water quality is described in the response to Comment 3. Likely costs associated with structural and nonstructural BMPs to achieve bacteria load reductions are discussed in Appendix R.

Comment 98

Inconsistency between Department WLAs and current Department loads – We appreciate that the Regional Board acknowledges that Department's discharges constitute a small fraction of the total bacteria indicator load for this TMDL. We understand that it is the

Regional Board's intent to maintain the Department's current pathogen indicator load as the Department's final waste load allocation (WLA). However, we are concerned that, as presented, the WLAs might be open to interpretation. The Department would like to be assured that the WLAs accurately reflect the Department's load. If subsequent bacteria issues arise within these subject watersheds, such as uncharacteristically high levels of bacteria from Department facilities, the Department will address them on a case-by-case basis.

The inconsistency between the loads calculated for the different watersheds covered by the TMDL is one reason for our concern. For example, the WLA assigned to the Department at the Miramar watershed is very small compared to other similar sized watersheds throughout the TMDL (please refer to Table I-15), as illustrated by the following cases:

- The WLA assigned to Industrial/Transport runoff (including the Department) in the San Dieguito River watershed is 4.2 trillion MPN/year, whereas that assigned to Miramar is 1 billion MPN/year. The area used for Industrial/Transport in Miramar is about 50% larger than that within the San Dieguito watershed. The staff report should explain this inconsistency or the WLAs should be adjusted.
- The WLA assigned to the Department in the Dana Point watershed is 0 MPN per year. The Department has a drainage area less than 40 acres in this watershed and, as a result, a pathogen indicator load will most likely be discharged from the Department roadways. Even though the load is expected to be relatively small, it should be accounted for in the staff report.

Response: The discrepancy between the two WLAs in this example is due to the difference in size, and bacteria loads, washing off of the two watersheds. The San Dieguito River watershed is roughly 346 square miles, and the Miramar watershed is roughly 93 square miles (Table J-1). This translates into a sizeable difference between the bacteria loads washing off the watersheds. The total existing fecal coliform load washing off the San Dieguito River watershed is 21,286,909 billion MPN/year, and the total existing fecal coliform load washing off the Miramar watershed is 10,392 billion MPN/year (Table I-12). Therefore, because these two watersheds vary greatly with size and bacteria generation, the estimated loads generated by the industrial/transportation land uses likewise varies.

The industrial/transportation land use is responsible for about .02 percent of the total existing load in the San Dieguito watershed, or about 4,257 billion MPN/year. The industrial/transportation land use is responsible for about .01 percent of the total existing load in the Miramar watershed, or about 1 billion MPN/year (Table I-12).

Once the loads generated by the industrial/transportation land use are quantified, then a portion of that total load was attributed to Caltrans, and the rest was attributed to municipal dischargers. For example, in San Dieguito, 35 percent of the industrial/land use area is attributed to Caltrans, therefore Caltrans generates about 1,496 billion MPN/year (Table I-15). The WLA for Caltrans is the same as the total existing load generated by Caltrans, so the WLA for Caltrans in this watershed in 1,496 billion MPN/year. In the Miramar watershed, the full allocation is given to municipal dischargers. This is because the total existing fecal coliform load, 1 billion MPN/year, is small compared to loads in the remaining watersheds. We did not divide the WLA smaller than 1 billion MPN/year.

Table I-15 describes the existing fecal coliform loads generated by the industrial/transportation land use and Caltrans. To the order of magnitude used in our analysis, 1 billion MPN/year, we found that there is no significant discharge of fecal coliform originating from these sources relative to other land uses in the Dana Point watershed. Therefore Caltrans is allotted a zero WLA of fecal coliform, the same as their existing load.

Comment 99

Final and interim WLAs – We are concerned with data presented in Tables 9-2, 9-5, and 9-9. The tables list the Department's final wet weather WLAs for fecal coliform, total coliform, and enterococci as 0 MPN per year. The wet weather WLAs for the Department are identified to be 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". In contrast, Tables 9-1, 9-4, and 9-8 contain the interim WLAs for the Department that have been set to existing WLAs. Since the Department will be responsible for maintaining existing loads, the final loads should be the same as the interim loads.

Response: As indicated in the final wet weather TMDL tables in section 9 of the Technical Report, Caltrans, municipal dischargers, and controllable nonpoint source dischargers all receive a WLA or LA of zero, or 100 percent reduction. We recognize that it will be difficult for dischargers to meet final allocations and WQOs during wet weather. Therefore, we are developing a Basin Plan amendment to permanently incorporate a reference system/natural sources exclusion approach for implementing bacteria WQOs as described in the response to Comment 2.

Comment 100

Simple loading of bacteria, whether by monitoring data or modeling simulations, does not completely address whether "downstream" shellfish beds in nearby embayments (e.g., San Diego Bay) or the coastal shorelines of the Pacific Ocean may be impacted. It would be more complete and realistic to combine the loading scenario with a waterbody dispersion (hydrodynamic) model or in-situ monitoring – to determine whether the bacterial populations remain viable and harmful after mixing in the receiving system.

Response: At the time of TMDL development, we explored the use of such dispersion models but found that estimating external loading from shoreline processes was difficult due to limited data. We chose a watershed based approach because this provided effective information regarding bacteria loading into receiving waters from both controllable and uncontrollable sources in the watersheds. We can consider using dispersion models in future TMDL refinement if more data is collected regarding shoreline sources such as marine mammals, birds, and sediment resuspension.

Comment 101

Page 3, Section 1.1, Why was a reference system from Los Angeles County used vice a reference system from the San Diego watershed? What are the details of the LA county reference system (beach and upstream watershed) that matched the San Diego watershed?

Response: The Arroyo Sequit watershed in Los Angeles County was used for TMDL development in the San Diego Region because, at the time that this project began, this was the only suitable reference watershed in southern California for which data were available. The criteria for a watershed to be considered for use as a "reference" watershed, for both the Los Angeles and San Diego regions, are that the watersheds consist of primarily open space (> 95 percent).

SCCWRP has characterized three other reference beaches, and is characterizing several reference watersheds. Upon adoption of the reference system approach Basin Plan amendment, we will recalculate TMDLs considering all available reference system data.

Comment 102

In sum as written, the San Diego Creek and Beach Bacteria TMDL will not lead to water quality standards attainment. Instead, the San Diego Regional Board should follow an approach similar to the Los Angeles Region approach in the Santa Bay Beaches Bacteria TMDLs and the Malibu Creek Bacteria TMDL. The approach taken in the development of these TMDLs has been accepted by the State Water Resources Control Board and the US Environmental Protection Agency.

Response: We disagree that the proposed TMDLs will not lead to water quality standards attainment, in part because the technical approach for wet weather was essentially identical to the approach used in developing the TMDLs in Santa Monica Bay. We assume the commenter is referring to the use of loads, instead of exceedance days, for expressing TMDLs as the main difference between the two projects. The "load" metric will not necessarily be used as the metric for determining TMDL compliance. We discussed this issue at length with our Stakeholder Advisory Group, which led us to add clarification in various places in the Technical Report (see section 11.5.1, for instance). We believe expressing TMDLs and WLAs as "loads" is appropriate for the reasons outlined in the response to Comment 147.

5.3 Water Quality Objectives/Indicator Bacteria

Comment 103

Section 3.2 of the Report states, "the waterbodies included in this project were listed as impaired primarily because of non-attainment of the indicator bacteria WQOs associated with contact recreation [REC-1]." Why, then, are Total Coliform objectives associated exclusively with SHELL use in marine waters added into this TMDL; and in fact applied at a critical point in freshwater upstream of any saltwater influence? Current science, EPA guidelines and local REC-1 objectives fully acknowledge that there is ***no*** epidemiological correlation between Total Coliform and public health risk for contact recreation. Furthermore, inclusion of the SHELL Total Coliform objectives has led to a flagrant logical absurdity in the final numeric targets (Tables 4-2, 4-3, and 4-6): Fecal Coliform is a *subset* of Total Coliform, but the final targets for Fecal Coliform are listed as *higher* than for Total Coliform.

Response: Water quality objectives for total coliform were used to calculate TMDLs because, although some waterbodies were specifically listed for impairment of the REC-1 beneficial use, all marine waters (shoreline and some estuarine) have the SHELL beneficial use designation. Since all inland surface waters eventually drain to these marine waters, bacteria densities of inland surface waters must be protective of the downstream SHELL beneficial use. Calculating TMDLs for total coliform in freshwater creeks and rivers using the SHELL WQO as a numeric target ensures that the SHELL beneficial use is protected at the shoreline. Prior to the point of discharge to the Pacific Ocean, the creeks and rivers are only required to meet the REC-1 WQOs.

We disagree that local REC-1 objectives acknowledge that there is no epidemiological correlation between total coliform and public health risk for contact recreation. Effective February 14, 2006, the SWRCB updated the Ocean Plan to maintain WQOs for total and fecal coliform. (Although the USEPA recommends using enterococci and *E. coli* as WQOs, states have the ability to use more stringent criteria.) The Ocean Plan contains the WQOs that are relevant to these TMDLs.

We are aware that fecal coliform is a subset of total coliform. Since total coliform are driven by the more stringent SHELL WQOs, the result is that total coliform numeric targets are lower than fecal coliform numeric targets. The apparent discrepancy between total coliform and fecal coliform TMDLs disappears when beneficial uses are taken into account.

Comment 104

P. 36, Section 4.1.2: For both the interim and final wet weather numeric targets the total coliform values are less than the fecal coliform values. This illogical discrepancy (total coliform values should be inevitably be greater than fecal coliform values since by definition total coliforms are the sum of fecal plus all other coliforms) will by default create a stricter bacteria standard that will be impossible to meet.

Response: Please see the response to Comment 103.

Comment 105

P. 38, Section 4.2.1: For both the interim and final dry weather numeric targets the total coliform values are less than the fecal coliform values. This illogical discrepancy (total coliform values should be inevitably be greater than fecal coliform values since by definition total coliforms are the sum of fecal plus all other coliforms) will by default create a stricter bacteria standard that will be impossible to meet.

Response: Please see the response to Comment 103.

Comment 106

The technical analysis is based on a policy decision made by the staff that 303(d) listings must be determined from an exceedance of any of three bacterial indicator organisms. The best available science clearly indicates that 2 of the 3 indicator organisms employed by staff (total and fecal coliform) are uncorrelated with risk to human health and thus, to the protection of the beneficial use. We believe that the Regional Board should consider the policy implications of this assumption relative to current and future listings, as well as the implications of this assumption as it constrains the ability of the staff to evaluate impairment based on the best available scientific information. Staff efforts should be focused on the indicators that have the strongest link to public health issues and that will result in true protection of beneficial uses. Limited staff and resources should not be wasted on researching and controlling indicators that will not result in a measurable improvement of protecting public health.

Response: That a listing decision is determined by exceedance of any of the three bacteria indicator organisms is not a policy decision made by staff; listing decisions are based on the procedures in the Listing Policy. Since the Basin Plan and Ocean Plan include WQOs for total and fecal coliform, we are required to develop TMDLs for waterbodies not meeting these WQOs. This TMDL process is not the forum for revising objectives. We agree that efforts by all parties should be focused on the indicators that have the strongest link to public health issues and will result in true protection of beneficial uses; therefore we encourage dischargers to focus their efforts on abating anthropogenic sources of bacteria. The discharges may choose to conduct special studies to identify controllable anthropogenic bacteria sources to help focus their load reduction efforts. We believe that focusing on controllable sources may prove effective at protecting beneficial uses, as was the case with Mission Bay. In this waterbody, diversion of urban runoff and other management measures essentially eliminated significant threats to human health during dry weather conditions.

Comment 107

It is becoming more and more widely acknowledged that the traditional indicator bacteria can provide unreliable estimates of potential public health impacts. EPA is developing improved indicators and others are developing new methods that identify specific contamination sources and/or pathogens. Thus, the TMDL targets are based on measurements that we cannot confidently link to the desired policy outcome (i.e., lowering public health risk). Admittedly, the Regional Board is operating under certain constraints in terms of the TMDL schedule and is not able to delay implementation until these improved indicators and methods are available. However, simply stating that the TMDL targets may be reviewed and revised as better information becomes available is an inadequate policy response. Municipalities and other entities must soon start to make costly, irreversible, and long-term decisions about how to meet the TMDL targets. There is a large amount of uncertainty about whether and to what extent these decisions will actually reduce health risks.

Response: We disagree that traditional indicator bacteria provide "unreliable" estimates of potential public health impacts; however, we recognize that the accuracy of the correlation of bacteria densities to health risks is the subject of recent discussions. For this reason, several studies have been completed or initiated to examine the health risks associated with indicator bacteria, as well as potentially new indicators of health risks.

We are obligated to proceed with utilizing WQOs consisting of total coliform, fecal coliform, and enterococci bacteria to calculate TMDLs because they are the established indicators of risk to public health. Under Clean Water Act (CWA) section 303(d), the San Diego Water Board is obligated to develop TMDLs for waters not meeting water quality standards (WQOs and the beneficial uses they are designated to protect). TMDL calculations must be based on existing WQOs.

The administrative proceedings at the San Diego Water Board level are not the appropriate forum for investigating the validity of the bacteria WQOs. Reevaluation of water quality criteria that are the basis for WQOs cited in the Basin Plan takes place at the USEPA level. Should USEPA promulgate new water criteria, then the WQOs in the Basin Plan will be updated accordingly and TMDLs recalculated.

The SWRCB is considering the adoption of statewide bacteria criteria for inland surface waters. Although the bacteria indicator WQOs will be under review by the SWRCB, adoption and implementation of these TMDLs should move forward. Mechanisms exist to modify the bacteria TMDLs if and when the regulatory framework changes.

We further disagree with the commenter that achieving the TMDL targets might not result in the desired outcome, i.e. lowering public health risk. If the numeric targets are overly conservative in terms of lowering risk to public health, then the desired policy outcome (sufficiently high receiving water quality) has been achieved if WQOs have been attained. At the same time, we recognize that reducing bacteria loads is costly. Therefore, we will continue to work with our stakeholders to refine the TMDLs to ensure that public health is protected and that public money is prudently spent.

Comment 108

The City is pleased to see that the Report had been revised to acknowledge the potential value of future efforts, such as the recently funded epidemiology and microbial source tracking study at Doheny State Beach and potential role that the study results may have on recalculating WQOs, if necessary.

Response: The commenter refers to section 11.6 of the Technical Report, which describes how future studies can be used to fill in data gaps related to TMDL analysis. TMDLs can be recalculated for a number of reasons, including the availability of new data for model calibration and validation, or the establishment of new WQOs, on which TMDLs are based. WQOs are not recalculated by the San Diego Water Board. WQOs are based on water quality criteria developed by USEPA, which are in turn based on epidemiology studies.

Comment 109

The City of San Diego coordinated with Weston Solutions regarding the Bacterial Monitoring and Source Tracking for Pacific Beach Point (CD attached). The study objective was to design and implement a bacterial investigation that would identify sources of bacterial contamination impacting the receiving waters at PB Point and subsequently recommend management actions to reduce or eliminate those sources. The study found that the bacterial sources from the wrackline, birds and flies, not sewage or urban runoff. This study points to the need for addition research to determine the human health risk for REC1 use when there is no human sewage and urban runoff sources. This information can also be used to help develop a natural sources exclusion approach to be included in the Basin Plan.

Response: Comment noted. This type of information could be used to recalculate TMDLs based on the natural sources exclusion approach. We strongly encourage additional research and special studies that can be used to improve the TMDLs.

Comment 110

Since EPA's Fecal Coliform and Enterococcus WQOs represent statistically equivalent health risks for contact recreation, the TMDL should allowance for compliance to be determined with either the FC or the ENT targets, not necessarily both of them.

Response: The commenter points out that the EPA's fecal coliform and enterococcus WQOs represent statistically equivalent health risks for contact recreation. This means that exceeding the fecal coliform **or** entrococcus WQOs would present an increased health risk for water contact recreation. In other words, if the entrococcus target is exceeded, but the fecal coliform target is not exceeded, or vice versa, there is an increased risk to human health. Therefore, allowing compliance with either fecal coliform or enterococcus would not be protective of the REC-1 beneficial use if one bacteria indicator is exceeded, and the other is not. Compliance with the WQOs for all indicator bacteria is required to be protective of health risks for REC-1 beneficial uses.

Comment 111

The TMDLs should be based on the California Department of Health Services beach bathing water standards.

The Santa Monica Bay Beach Bacteria TMDLs were developed over a three year period with extensive scientific analysis of monitoring databases and epidemiology studies. The

TMDL has been in place for nearly four years and has already resulted in dramatic improvement in beach water quality during the AB 411 months between April and October. The Santa Monica Bay approach is as follows:

- TMDL targets are based on allowable exceedances of all seven of the state's beach water quality standards in the California Ocean Plan:
- Single sample
  - Total coliform 10,000 MPN
  - Fecal coliform 400 MPN
  - Enterococcus 104 MPN
  - Total/fecal ratio <= 10
- Geometric mean
  - Total coliform 1,000 MPN
  - Fecal coliform 200 MPN
  - Enterococcus 35 MPN

Response: The bacteria TMDLs are calculated using the same numeric targets as the WQOs described in this comment. The WQOs described in this comment are applicable to beaches, therefore where WQOs for freshwater are more stringent, these are used instead. Single sample maximum values are used for wet weather TMDL calculation, and geometric mean WQOs are used for dry weather TMDL calculation. The total/fecal ratio was not used because TMDLs are expressed on a loading basis as described in the response to Comment 147.

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. Please see sections 4.1.2 and 4.2.1 of the Technical Report for a summary of the numeric targets.

Comment 112

The TMDL requires bacterial reductions in the watershed based on occurrence of three bacterial indicators during both wet and dry seasons. Scientific evidence available since 1986[14,15,16] clearly indicates that there is no scientifically valid relation between the

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[14] U.S. EPA Ambient water quality criteria for bacteria; EPA440/5-84-002; 1986;

[15] Pruss, A., Review of Epidemiological Studies on Health Effects from Exposure to Recreational Water. Int J Epidemiol. 1998, 27, (1),1-9.

[16] Wade, T.J., Pai, N., Eisenberg, J. & Colford, J.M., Do US EPA water quality guidelines for recreational waters prevent gastrointestinal illness? A systematic review and meta-analysis. Environ. Heal. Perspec. 2003, 111, (8), 1102-09.

occurrence of two (total coliform and fecal coliform) of the three indicators employed and adverse human health effects, and thus protection of the REC-1 beneficial use.

Response: Please see the response to Comment 107.

Comment 113

The single sample maximum value water quality objective is used as the basis for the wet weather TMDL analyses. However, careful review of the original documentation that explains the derivation of the single sample maximum[17] clearly indicates that this value was not intended to apply during wet weather events in general, and particularly not in the case of stormwater dominated waterbodies.

Response: We are familiar with the documentation that the commenter refers to, but we do not agree that it indicates that the single sample maximum was not intended to apply during wet weather events in general. The original documentation states that "To set the single sample maximum, it is necessary to specify the desired chance that the beach will be left open when the protection is adequate."

In southern California and the San Diego Region, the beaches are open year-round, even during wet weather conditions. There are many members of the public that may recreate in the water during wet weather (e.g., surfers). Therefore, protection must be adequate year-round and during wet weather conditions.

Many of the creeks in the Region only flow during stormflow conditions. However, the levels of bacteria that are transported in storm flow by the creeks are often elevated. Because the creeks in the Region ultimately flow out to ocean during wet weather conditions, the bacteria levels in the creeks, and ultimately the ocean must meet either the geometric mean or the single sample WQOs to be protective of recreational swimmers.

A geometric mean objective cannot be used for wet weather because a storm even doesn't last for 30 days. A geometric mean must be calculated with several data points, ideally equally spaced over 30 days. Storm events in southern California are typically short term and episodic, and collecting enough samples to calculate a geometric mean would be difficult and costly, nor would it make sense to do so because of the short duration. The sampling results would likely result in exceedances of the geometric mean more frequently than exceedances of the single sample maximum WQOs. 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, the single sample maximum is the most appropriate WQO for the wet weather TMDL analysis.

Comment 114

California's overall technical approach for addressing bacterial issues appears to be outdated and not in line with the latest EPA guidance. EPA has moved away from the use of Total Coliforms, and towards Enterococci for effects to bathers and swimmers (REC-

[17] U.S. EPA Ambient water quality criteria for bacteria; EPA440/5-84-002; 1986.

1) in marine waters [note E-Coli for same in freshwater]. For SHELL, they recommend fecal coliform. Consideration should be given for using these as the indicator parameters.

Response: The commenter correctly states that USEPA recommends using only enterococci and *E. coli* to evaluate potential health risks for water contact recreation uses. However, states have option of adopting more stringent criteria. The existing Basin Plan and the Ocean Plan both have WQOs for total coliform, fecal coliform, and enterococci for REC-1, and total coliform for SHELL.

We are obligated to proceed with utilizing WQOs consisting of total coliform, fecal coliform, and enterococci bacteria to calculate TMDLs because they are the established indicators of risk to public health. Under Clean Water Act (CWA) section 303(d), the San Diego Water Board is obligated to develop TMDLs for waters not meeting the existing water quality standards in the Basin Plan and/or Ocean Plan (WQOs and the beneficial uses they are designated to protect). TMDL calculations must be based on existing WQOs.

Comment 115

The technical basis/rationale should be provided for the bacterial standards used, particularly in relation to the interim and final numbers (review of the Executive Summary and the document through Section 8 [p.72] did not uncover this). Review of the Basin Plan also failed to uncover the basis for these values.

Response: The technical basis/rationale for the bacterial standards used is not required to develop the TMDLs. However, the rationale for the use of the WQOs for TMDL development is discussed in the response to Comment 107.

Comment 116

As mentioned in our letter of September 6, 2005, we remain concerned about building a TMDL while an acknowledged gap exists in the link between indicator bacteria and human pathogens. The lack of epidemiological studies that might establish a link, or lack thereof, between nonhuman sources of bacteria and the risk of illness must be resolved. The Revised Technical Report states, “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 failure to establish this critical link will lead to expensive and costly testing, structural investments, and changes to accepted cultural practices by farmers that might not be needed. While the authority to establish the TMDL is clear, there is a responsibility to the public not to do it in a manner that is arbitrary and capricious.

Response: As discussed in the response to Comment 107, we are obligated to proceed with utilizing WQOs consisting of total coliform, fecal coliform, and enterococci bacteria to calculate TMDLs. Under Clean Water Act (CWA) section 303(d), the San Diego Water Board is obligated to develop TMDLs for waters not meeting the existing water quality standards in the Basin Plan and/or Ocean Plan (WQOs and the beneficial uses they are designated to protect).

While the risk of contracting a water-born illness from contact with runoff free of sewage discharges is not known, there are some pathogens (e.g., *giardia* and *cryptosporidium*) that originate from animal hosts, such as domesticated animals (e.g., cows, sheep, horses, etc.), which are known to cause human illness. Until epidemiological studies establish that there is no link between nonhuman sources of bacteria and the risk of human illness, the WQOs in the Basin Plan and/or Ocean Plan and the conservative nature of the TMDL calculations are appropriate.

5.4 Beneficial Uses

Comment 117

SHELL Beneficial Use and Water Quality Objectives (WQO): We are concerned that the SHELL total coliform WQO has been inappropriately applied in the final TMDLs. The TMDL document states that "final dry weather total coliform TMDLs utilize the SHELL WQO as a numeric target because this WQO is more stringent than the REC-1 WQO for total coliform". There is no basis provided in the document that justifies using the more stringent SHELL WQO in place of the REC-1 WQO.

It is our understanding that the San Diego Region waters are 303(d) listed as impaired for REC-1 beneficial uses, not SHELL. In this case, we believe the REC-1 WQO should be utilized in the final TMDLs for waters that are 303(d) listed as impaired for REC-1 beneficial uses.

Response: The bacteria TMDLs were calculated from modeled flow at the bottom of the watershed at critical points. These critical points are nodes in the model representing locations just before inter-tidal mixing occurs in the surf zone. The basis for using the SHELL water quality objective as the numeric target for total coliform TMDLs, is justified because the flow from the watershed will end up discharging to the Pacific Ocean shoreline or San Diego Bay. All beneficial uses of a waterbody must be protected and for the Pacific Ocean and San Diego Bay, this includes SHELL which also is the most sensitive water quality objective for total coliform bacteria.

In the 2006 update of the List of Water Quality Limited Segments, the State Board did not evaluate data with respect to the SHELL water quality objective for bacteria. Thus, the 2006 list is likely not accurate with regard to water quality supporting the SHELL use at Pacific Ocean shorelines. The information presented in the Technical Report show a significant number of exceedances of the SHELL water quality objective. See Appendix H, Figures H-3 and H-4.

Comment 118

TMDLs for impaired saltwater beaches should be expressed separately from TMDLs for impaired Freshwater creeks for both wet and dry weather. Specifically, Interim Beach TMDLs should be defined in terms of allowable exceedance days along the beaches, which have already been calculated for wet weather (Table 8-2), so little additional effort is needed to make this change in the text, and which offer a useful, easily-understandable metric. Separation of saltwater and freshwater TMDLs is supported by the lack of established linkage between creek loads and beach exceedances. The wet-exceedance allowances in the TMDL Report were based on studies only at reference pristine saltwater beaches – with *no* data available within the creeks discharging to those beaches. In some cases, sand berms had formed naturally at the creek mouth, so that beach exceedances sometimes occurred despite *no creek discharge at all*. For both wet and dry weather, the "critical point" of the model is located in freshwater upstream of many factors (salt vs. fresh; dilution/assimilation; beach bacteria sources such as sea birds and wrack line; single-sample vs. geomean criteria; natural exceedance allowance, etc.) that confound the creek/beach relationship. This has all contributed to ***model results that defy common sense: at Aliso, for example, the daily maximum load of fecal coliform bacteria on one of the 15 allowable wet-weather exceedance days is 8,000 times higher than the daily allowable load of bacteria on any one of the 296 dry-weather days***.* Separation of the beach and creek TMDLs would be a simple and practical way to rectify these modeling discrepancies *now* without requiring significant supplemental staff time. Better research data from ongoing reference-beach and creek-natural-loading studies will soon be available to better inform our understanding of actual beach/creek bacteria-load relationships. The report already makes provision for future updating and correcting of the TMDLs as these findings are developed.

*Calculated as 968,920 billion/15 days divided by 2,383 billion/296. If we attempt to guesstimate the more obvious correction factors (x2 for numeric target of 400 vs. 200; x9 for 90% natural bacteria not accounted under dry weather, and x3 for 2/3 of dry weather flows being anthropogenic), that would still be a predicted wet:dry load relationship of only x54, not x8,000.

Response: The rationale for calculating one TMDL for each indicator bacteria for a creek and its downstream beach is discussed in section 4.4 of this Appendix. Additionally, the WLAs are expressed as loads (billion MPN/year) as opposed to exceedance days for the reasons outlined in the response to Comment 147.

As stated in the comment, the exceedance frequency during wet weather described in the Technical Report were based on studies only at a reference saltwater beach, with no data available within the creek discharging to the beach. The 22 percent allowable exceedance frequency for wet weather was based on measurements in the wavewash at Leo Carillo beach (downstream of the Arroyo Sequit watershed) in Los Angeles County. In this situation, creeks were not obstructed from flowing to the beach; therefore bacteria loading was presumed to originate mostly from the watershed. However, other local beach sources downstream of the mixing zone such as birds, marine mammals, and bacteria re-growth on the wrack line, likely contributed to exceedances of the WQOs.

There is little data at this point regarding exceedances of the single sample maximum WQOs in a reference system during dry weather. Some exceedances have been observed at San Onofre beach in San Diego County, even though berms separating the creeks from the beaches are in place most of the time. However, these exceedances are very few (exceedances for enterococci are 1 percent, zero for total and fecal coliform). Monitoring results from weekly beach sampling are presented in Table 4-4. Because the berms are in place, exceedances are most likely caused by local sources on the beach, downstream of the mixing zone. More recently, weekly data from the winter-dry beach and creek monitoring conducted by the SAG at San Onofre and San Mateo beaches from November 2004 through March 2005 showed that the bacteria densities at the creek sampling locations were typically higher or similar to bacteria densities at the ocean sampling locations. Although this data set is limited, it does support the dischargers claim that natural sources in the watershed may be causing exceedances, which may not be detected with beach sampling.

SCCWRP has initiated a study to quantify background loading from a reference watershed(s) during both wet and dry weather (Eric Stein, SCCWRP, personal communication, April 3, 2006). The goal of the study will be to characterize the background loading of bacteria from a number of reference watersheds under various hydrological conditions. The watersheds vary by size, location, and other parameters. Despite the quantification of loading during dry weather conditions, a reference watershed approach will not be used to calculate dry weather TMDLs. While most studies quantify the frequency of exceedances of the single sample maximum WQOs, TMDL calculation during dry weather makes use of the geometric mean WQOs. An allowable exceedance frequency does not apply to a geometric mean because the geometric mean is an average value over the course of 30 days.

We disagree that model results defy common sense. The reason for the sizeable difference between the TMDLs for wet and dry weather is due to the difference in magnitude between these two types of flows. Wet weather flows are typically orders of magnitude higher than dry weather flows, thus the wet weather bacteria loads are orders of magnitude higher. For example, in Aliso Creek, wet weather flows were predicted to be about 1,650 cubic feet per second (cfs) in the critical wet year, while dry weather flows were estimated at 1.6 cfs. Since the flow rate increases by 3 orders of magnitude during wet flows, so does the assimilative capacity of the waterbody. The waterbody can receive significantly higher loads during wet weather events because the additional volume provides dilution and the ability to assimilate the pollutant.

Comment 119

TMDLs for impaired saltwater beaches should be expressed separately from TMDLs for impaired Freshwater creeks for both wet and dry weather. Specifically, Interim Beach TMDLs should be defined in terms of allowable exceedance days along the beaches, which have already been calculated for wet weather (Table 8-2), so little additional effort is needed to make this change in the text. Separation of saltwater and freshwater TMDLs is supported by the lack of established linkage between creek loads and beach exceedances in the reference data. The wet-exceedance allowances in the TMDL Report were based on studies only at reference pristine saltwater beaches – with *no* data available within the creeks discharging to those beaches. In some cases, sand berms had formed naturally at the creek mouth, so that beach exceedances sometimes occurred despite *no creek discharge at all*. For both wet and dry weather, the "critical point" of the model is located in freshwater upstream of many factors (salt vs. fresh; dilution/assimilation; beach bacteria sources such as sea birds and wrack line; single-sample vs. geomean criteria; natural exceedance allowance, etc.) that confound the creek/beach relationship. This has contributed to questionable model results: at Aliso, for example, the daily maximum load of fecal coliform bacteria on one of the 15 allowable wet-weather exceedance days is 56 times higher than the daily allowable load of bacteria on any of the 296 dry-weather days**.** Separation of the beach and creek TMDLs would be a simple and practical way to rectify these modeling discrepancies *now* without requiring significant supplemental staff time. Better research data from ongoing reference-beach and creek-natural-loading studies will soon be available to better inform our understanding of actual beach/creek bacteria-load relationships, but the report already makes provision for future updating and correcting of the TMDLs as these findings are developed.

Response: Please see the response to Comment 118.

Comment 120

TMDLs for impaired saltwater beaches should be expressed separately from TMDLs for impaired freshwater creeks for both wet and dry weather. Interim Beach TMDLs should be defined in terms of allowable exceedance days along the beaches, which have already been calculated for wet weather (Table 8-2) and which would be consistent with locally-established precedent in RWQCB Region 4. In keeping with the saltwater/freshwater separation, SHELL Total Coliform WQOs should not be applied to freshwater creeks. Separation of saltwater and freshwater TMDLs is supported by:

- Lack of established linkage between creek loads and beach exceedances in the reference data. The wet-exceedance allowances in the TMDL Report were based on studies only at reference pristine saltwater beaches – with no data available within the creeks discharging to those beaches. In some instances, sand berms had formed naturally at the creek mouth, so that beach exceedances sometimes occurred despite no creek discharge at all. Years of data at Aliso Creek and Beach indicate that more typically (especially in dry weather) freshwater creek exceedances far outnumber saltwater beach exceedance days, and the magnitude of creek exceedances is also much higher.
- The TMDL Report's stacking-up of reference beach exceedance days, freshwater bacteria load calculations, and multiple unquantified margin-of-safety assumptions has produced model results so skewed as to be profoundly implausible. The Total Maximum Daily Load is supposed to represent the amount of a pollutant that a water body can assimilate without exceeding water quality objectives. Why would a beach's maximum daily load vary by 4 orders of magnitude (10,000 times) between wet and dry weather? Consider the one example of Aliso Creek: The TMDL Report (Table 9.1) says, in effect, that 968,920 billion fecal coliform bacteria (the 90.1% of creek total wet-weather bacteria load defined as non-controllable non-point "natural background") are needed to cause 15 days (per Table 8.2) of allowable "natural background" fecal coliform exceedance at the beach annually. On average, that's a load of at least 64,595 billion bacteria to produce one exceedance day at the beach. How can it be plausible that the daily TMDL load for dry weather (8 billion bacteria for each of the 296 dry days per year per Table 8-3) would be only 0.012% (8/64,595th) of the daily TMDL load needed to produce one beach exceedance day in wet weather? Or that the dry weather load for the entire 296-day dry season would be only 3.7% (2,383/64,595) of the allowable load for one wet-weather day?
- Separation of the beach and creek TMDLs would be a simple and effective way to rectify these discrepancies now without requiring significant supplemental staff time. The report already makes provision for future updating and correcting of

the TMDLs and Basin Plan as better research data from current reference-beach and creek-natural-loading studies lead to better understanding of actual beach/creek bacteria-load relationships.

Response: Please see response to Comment 118.

Comment 121

SHELL Total Coliform numeric targets should not be selectively forced onto the impaired freshwater creeks. SHELL Total Coliform Water Quality Objectives apply to marine salt waters, not to inland surface freshwaters. Tables 4-3 and 4-6 explicitly and wrongly place Total Coliform numeric targets on Aliso Creek and the San Diego River. The excuse is given that this is necessary for officially-impaired creeks in order to protect the impaired downstream beach. But Total Coliform TMDLs (Tables 9-3 and 9-4) are calculated for every creek mouth and storm drain outfall to all the impaired beaches, regardless of whether the creeks or storm drains are specifically 303(d) listed as impaired. The implicit effect of singling out Aliso Creek and the San Diego River in Tables 4-3 and 4-6 is to force Total Coliform WQOs onto the two freshwater creeks' entire waterbodies, not just the mouths. This is inappropriate and improper.

Response: The comment that we are singling out Aliso Creek and the San Diego River as being the only fresh waterbodies with a need to protect a downstream SHELL beneficial use is incorrect. For this reason, the discussion of numeric targets pertaining to these waters was modified in sections 4.1 and 4.2 to avoid the misunderstanding that they are being singled out.

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 at a level that support SHELL use at the approximate point where the creeks and rivers discharge at the shorelines. Thus, the SHELL WQO for total coliform is the appropriate numeric target for the TMDLs for impaired 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 for SHELL must be met only at the bottom of the watershed in the marine waters where creeks and rivers discharge to the Pacific Ocean.

Please see section 4.4 of this appendix for a discussion about the difference between the critical points used to model TMDLs and potential points that may be selected for compliance with the TMDLs.

Comment 122

SHELL Total Coliform numeric targets should not be selectively applied to the impaired freshwater creeks. SHELL Total Coliform Water Quality Objectives apply to marine salt waters, not to inland surface freshwaters. Tables 4-3 and 4-6 explicitly and wrongly place Total Coliform numeric targets on Aliso Creek and the San Diego River. The reason given is that this is necessary for officially-impaired creeks in order to protect the impaired downstream beach. But Total Coliform TMDLs (Tables 9-3 and 9-4) are calculated for every creek mouth and storm drain outfall to all the impaired beaches, regardless of whether the creeks or storm drains are specifically 303(d) listed as impaired. The implicit effect of singling out Aliso Creek and the San Diego River in Tables 4-3 and 4-6 is to force Total Coliform WQOs onto the two freshwater creeks' entire waterbodies, not just the mouths. This is inappropriate and imposes stricter water quality standards than those identified in the Basin Plan.

Response: Please see the response to Comment 121.

Comment 123

The technical analysis is based on the assumption that REC-1 is appropriate in all segments of all waterbodies at all times of the year. Due to the variable nature of bacterial contamination, seasonal and frequency of use/potential exposure based considerations should be addressed. This is especially evident at Aliso and Chollas Creeks, where the beneficial use for the creek is designated not as REC-1, but as REC-2 (potential REC-1) in the Basin Plan. The "potential" designation indicates that (although there may be plans, possibilities or desires for REC-1 use), actual existing or pre-existing REC-1 use has not been established. Compared to popular public ocean beaches where heavy dry-weather use justifies using the "designated beach" water quality objectives, compliance within Aliso and Chollas Creeks should be judged by the REC-2 objectives; and the REC-1 creeks or creek segments should be selectively subject to "moderate full contact recreation", "lightly used full body contact recreation", or "infrequently used full body contact recreation" designations and objectives depending on site-specific usage conditions, as recommended by US EPA and referenced in the Basin Plan. Similarly, wet-weather targets for ocean beaches should utilize the "lightly used" or "infrequent use" objectives (depending on location) to reflect much lower usage rates during rain.

Response: The TMDLs make no assumption about the water quality standards. The standards are established in the Basin Plan and Ocean Plan. The Clean Water Act (CWA) requires that the TMDLs ensure that water quality supports existing and potential uses. Use of the "designated beach" water quality objective as a TMDL numeric target is reasonable due to the high-density population along the Southern California coast and the general appeal of the ocean and beaches for contact and non-contact recreation.

The dischargers must provide evidence to justify classifying an ocean beach as a "moderately or lightly used area." If compelling evidence is provided, the "moderately or lightly used area" enterococci WQOs could be used as the wet weather numeric target to revise the TMDLs.

Comment 124

The technical analysis is based on the assumption that the Regional Board's policy is that REC-1 is appropriate in all segments of all streams in all watersheds at all times of the year. Due to the variable nature of bacterial contamination, seasonal and frequency of use/potential exposure based considerations should be addressed.

The technical analysis is based on the assumption that it is the Board's policy throughout the entire Region that all segments of all waterbodies in all watersheds are subject to "designated beach" water quality objectives rather than applying "moderate full contact recreation", "lightly used full body contact recreation", or "infrequently used full body contact recreation" designations, as recommended by US EPA and referenced in the Basin Plan.

Response: Please see the response to Comment 123.

Comment 125

Table 9-4 - Final TMDLs for Total Coliform – The total coliform load assigned to Chollas Creek appears to reflect the SHELL fecal coliform water quality objective standard instead of the REC 1 water quality objective. This is inconsistent with the statement in Section 4.2.1 that SHELL beneficial use would not be assigned to Chollas Creek and other creeks. Please modify Table 9-4.

Response: The commenter correctly states that there is an inconsistency with the text of section 4.1.2 and Table 9-4. Although the text omits the application of SHELL numeric targets to Chollas Creek TMDLs for total coliform, Table 9-4 contains total coliform TMDLs for Chollas Creek (total coliform WQOs only pertain to SHELL beneficial use). As opposed to modifying Table 9-4, the text in section 4.2.1 has been modified so that the total coliform WQOs associated with the SHELL beneficial use are the indicated numeric targets for TMDLs for the impaired creeks, including Chollas Creek (the Technical Report previously applied the SHELL WQOs only to Aliso Creek and the San Diego River).

Although SHELL is not a designated use in freshwater creeks and rivers, the total coliform density in these waters where they discharge to the coastal waters must support the SHELL use at the approximate point where the creeks and rivers discharge at the shorelines. Thus, the SHELL WQO for total coliform is the appropriate numeric target for the creeks and rivers even though they do not support SHELL use. Although REC-1 WQOs for fecal coliform and enterococci must be met throughout the watersheds, the total coliform TMDLs for SHELL use must be met only at the bottom of the watershed in the marine waters where creeks and rivers discharge to coastal waters. See section 4.4 of this appendix.

Comment 126

The technical approach assumes that there is a direct relationship between the control of bacteria loading during rainfall events and the protection of recreational uses. The technical approach estimates the total bacterial loading to watersheds, and computes a required bacterial reduction from those loading values. The vast majority of the bacterial loadings occur during rainfall events. Presumably, these rainfall events correspond to times of the year when the actual beneficial use is at its minimum (the number of recreators is least during rainfall events). The technical approach assumes in effect that to protect the use, bacterial loadings must be reduced during these storm events. A much more practical approach, and one consistent with Porter-Cologne would be to prioritize the reduction of bacterial concentrations during the times when the beneficial use is at its maximum.

Response: We agree that rainfall events correspond to times of the year when the REC-1 beneficial use is at its minimum. However, beneficial uses apply at all times, and therefore must be protected at all times, regardless of season or hydrological conditions. Despite poor water quality, or even dangerous oceanographic conditions, REC-1 use is still occurring during wet weather events and the following 72 hours. The technical approach does assume that to protect the use, bacterial loading must be reduced during these storm events.

We agree that reduction strategies should be prioritized according to when the use is highest, namely the summer dry season. However, this does not obviate the need to eventually address wet weather loads. The compliance schedule does not preclude dischargers from addressing dry weather loads before addressing wet weather loads.

Comment 127

Table 9-4 – Final TMDLs for Total Coliform – The total coliform load assigned to Forrester Creek appears to reflect the SHELL fecal coliform water quality objective standard instead of the REC 1 water quality objective. This is inconsistent with the statement in Section 4.2.1 that SHELL beneficial use would not be assigned to Forrester Creek. Please modify Table 9-4.

Response: The error in Table 9-4 has been corrected as a result of this comment. Only 1 TMDL for each indicator was calculated at the critical point for the San Diego River watershed. Separate TMDLs for the lower San Diego River and Forrester Creek were not calculated. In addition, the text in section 4.1 and 4.2 was modified to show that the SHELL total coliform WQOs was used as a numeric target for TMDLs for bacteria loading from all inland surface waters, including the San Diego River which includes Forrester Creek.

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 approximate point where the creeks and rivers discharge at the shorelines. Thus, the SHELL WQO for total coliform is the appropriate numeric target for the TMDLs for beaches even though the creeks that discharge to the beaches 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 in the marine waters where creeks and rivers discharge to the Pacific Ocean. See section 4.4 for further discussion.

Comment 128

In response to previous critiques regarding the inappropriate application of SHELL saltwater Total Coliform water quality objectives (WQOs) discriminately onto inland freshwater Aliso Creek and the San Diego River, the Revised Draft Report exacerbates its problems by lumping *all* the freshwater creeks *and* their downstream saltwater beaches into Table 4-3. This change results in A) forcing the more-stringent freshwater Enterococci WQOs to be applied inappropriately to saltwater sites, in addition to B) inappropriately forcing the SHELL Total Coliform WQO onto creeks, for wet weather conditions. The Revised Draft Report also *expands* its inappropriate application of SHELL Total coliform WQO to apply to *all* creeks (not just Aliso and San Diego) for the Dry Weather targets (Table 4-5). The Revised Draft Report attempts to justify these moves by citing the need to control discharge of creeks to protect the beaches, but this argument works in diametrically conflicting directions relative to Total Coliform WQOs (which are more stringent at saltwater) and Enterococci WQOs (which are more stringent at freshwater). The Revised Draft Report also still retains the logical absurdity of the final dry-weather Total Coliform targets being less than the Fecal Coliform targets (despite Fecal Coliform being a subset of Total Coliform biologically).

Response: Please see section 4.4 of this appendix, which explains why one TMDL for each indicator bacteria was calculated for each impaired creek and its downstream beach and where WQOs are applicable. In response to the total coliform/fecal coliform discrepancy, the reason for this discrepancy is that final numeric targets for total coliform are based on the SHELL beneficial use, which is more stringent than WQOs for REC-1. There are no WQOs for fecal coliform for SHELL. Because the WQOs associated with SHELL are more stringent than the WQOs for REC-1, then this results in final numeric targets showing a discrepancy between values for total coliform and fecal coliform.

The result of this discrepancy is that, although the numeric target of 400 MPN/mL is reported for fecal coliform, in practice a lower fecal coliform density will have to be met in order to meet the total coliform target of 230 MPN/mL. This apparent lack of logic disappears when beneficial uses are taken into account.

Comment 129

The Enterococci conundrum could be readily solved by correcting the single-sample wet-weather numeric Enterococci target for creeks to reflect the most appropriate criterion in the Basin Plan. The Basin Plan divides the single-sample Enterococci objectives, used in the TMDL for wet weather, based on "designated beaches", "moderately or lightly used areas", or "infrequently used areas". The appropriate (in fact, generous) description of actual REC-1 use of creeks under wet weather conditions should be "moderately or lightly used" with a single-sample freshwater Enterococci target at 108 CFU/100 ml; or (more realistically) "infrequently used" with a freshwater Enterococci target at 151 CFU/100 ml. But the Draft Report currently uses the "designated beach" freshwater criterion, which does not realistically describe actual use under wet weather conditions along any of the creeks, many of which are actually designated (even under dry-weather conditions) as REC-2 (with only *potential* for REC-1). The freshwater "designated beach" single-sample WQO is 61 CFU/100 ml, which is unnecessarily *over-protective* relative to the "designated beach" single-sample saltwater criterion, which is 104 CFU/100 ml. Correcting the creek freshwater wet-weather Enterococci criterion to 108 CFU/100 ml would be adequately protective of recreation use at downstream saltwater beaches, given the assimilative capacity and reference-beach allowable exceedances discussed under Comment #1 above. Making this correction could require the separation calculation of creek and beach TMDLs (for example, separating the "Aliso Creek" TMDLs from the "Aliso Beach" TMDLs), as previously discussed under Comment #2 above. Or more simply and since the difference is slight, **the single-sample 104 CFU saltwater criterion should be applied to both beaches *and* creeks for wet weather.**

Response: The Basin Plan does include saltwater and fresh water enterococci single sample objectives for "designated beaches," "moderately or lightly used area," and "infrequently used area." The Basin Plan does not provide criteria for assigning these categories to beaches. We must use the most conservative WQOs to protect REC-1 users.

To use the saltwater designated beach WQO of 104 MPN/100mL, and assume it supports the REC-1 use in Aliso Creek, we need substantial evidence supporting a conclusion that REC-1 uses of Aliso Creek are moderate to light. However, in response to this comment, the wet weather TMDLs for enterococci were calculated using both 61 MPN/100mL and 104 MPN/mL as the numeric target. The more stringent TMDL applies, unless dischargers provide the San Diego Water Board with substantial evidence that REC-1 use in Aliso Creek, San Juan Creek, Forrester Creek, the San Diego River, and Chollas Creek are at the "moderately or lightly used area" level. See revisions to section 9 of the Technical Report.

Comment 130

The "problem" of Total Coliform targets exceeding Fecal Coliform targets could be solved by recognizing that the broad application of the SHELL Total Coliform numeric targets as currently shown in this Draft Report is unlikely to pass muster as legally supportable:

a. Most of the 303(d) listings to coastal waters were for impairments to REC-1 beneficial use, not SHELL beneficial use. It is improper to require TMDLs for beneficial use impairments that have not been 303(d) listed.
b. Even where the 303(d) beach listings were for SHELL, there is no SHELL beneficial use designation in the Basin Plan for any inland surface water, so SHELL Total Coliform objectives could not properly be applied directly to their tributary freshwater creeks. **Separate calculation and labeling of creek vs. beach-discharge TMDLs for wet and dry weather would enable this Total Coliform issue to be corrected.**
c. Although SHELL is designated for coastal waters at the "Pacific Ocean", it is specifically *not* designated for coastal lagoons at San Dieguito, the mouth of the San Luis Rey River, and the mouth of Aliso Creek (Basin Plan Table 2-3), so these sites could not even be 303(d) listed for SHELL. Total coliform SHELL objectives therefore would not be applicable at these coastal locations.
d. The SHELL Total Coliform WQO of 70 MPN/100 ml in the Basin Plan (compared to 1,000 MPN/100 ml for REC-1 in the Ocean Plan) was originally "borrowed" as a single parameter cherry-picked from a longer list of parameters

> in the State's Shellfish Sanitation standards as they are applied to "Approved" commercial shellfish growing grounds. An "Approved Area" means the site is free enough from sewage impacts to mass-propagate shellfish suitable for direct human consumption without cooking or other processing. The only State-authorized commercial shellfishing site in Region 9 is in Agua Hedionda Lagoon, but even this authorization is on a "Restricted" basis (meaning harvested shellfish must be processed or cooked before marketing). The applicable Total Coliform Shellfish Sanitation standard for a "Restricted Area" is 700 MPN/100 ml. Commercial shellfish propagation at any site in Region 9 other than Agua Hedionda is actually prohibited by the State. Furthermore, due to the possibility of biotoxins completely unrelated to Total Coliform, *any* harvesting in Region 9 (by anyone) for raw consumption is prohibited by the State from at least May to October annually (comprising the bulk of the "Dry Weather" period). The Shellfish Sanitation standards also allow for "Conditional" harvesting restrictions based on predictable bacteria-generating events, such as stormwater flows. In the recently-approved Bacteria TMDL for Tomales Bay (an "Approved Area" actively commercially harvested), the TMDL provided for an annual bacteria natural-exceedance allowance for stormflows; and devised a model-calculated Total Coliform standard (95 MPN/100 ml) for dry-weather tributary discharges to account for assimilative processes within the Bay. Within Tomales Bay, the Shellfish Sanitation standard for Fecal Coliform (14 MPN/100 ml geomean) was also applied as necessary to protect the use. The San Diego Region Basin Plan makes no acknowledgement of the Shellfish Sanitation Fecal Coliform standard, which is better correlated to actual fecal contamination and is dramatically more restrictive than the REC-1 standard. Due apparently to the reaction to the Tomales Bay TMDL and the contradictions between Regions with regard to the SHELL WQOs, RWQCB staff have advised the SAG that the State has put a moratorium on adding any new SHELL impairments to the 303(d) list.

Given this context, **a moratorium on enforcing Final Total Coliform TMDLs for SHELL should be explicitly stated in the Report, and considerations for enforcement should be deferred until the related beneficial use questions and appropriate WQOs are better resolved State-wide. For the interim, the Total Coliform target for beaches should be set at the REC-1 Ocean Plan standard for beaches, and Total Coliform should be deleted from the impaired-creek targets. The beach-discharge TMDLs for Total Coliform should be calculated/labeled separately from creeks. No Total Coliform targets or TMDLs should be specified for impaired creeks.**

Response: The development of TMDLs is not strictly limited to the water bodies on the List of Water Quality Limited Segments. The water bodies on the List of Water Quality Limited Segments have been given the highest priority for development of TMDLs. However, at some point in the future, TMDLs will be developed for all water bodies in the San Diego Region based on the beneficial uses and WQOs in the Basin Plan and/or Ocean Plan.

Whether or not shellfish harvesting is taking place for commercial or non-commercial purposes, the fact remains that the entire Pacific Ocean shoreline in the San Diego Region is designated for the SHELL beneficial use. The WQOs are established in the Basin Plan and Ocean Plan and must be used in the development of the TMDL. However, the commenter is correct that the SHELL WQOs only apply where the SHELL beneficial use has been designated in the Ocean Plan, which is in the marine waters of the Pacific Ocean shoreline and San Diego Bay. Thus, the SHELL WQOs are not required to be met in inland freshwater segments. Please see section 4.4 of this appendix for additional explanation about where WQOs are applicable.

The SWRCB chose not to evaluate bacteria data with regard to SHELL WQOs in the update of the 2006 List. However, this does not mean that water quality supports the SHELL use in our region. Whether or not a beach segment is specifically listed for SHELL impairment, SHELL is the most sensitive beneficial use in the watersheds of these TMDLs, and TMDLs were appropriately calculated for total coliform to protect the use.

According to the California Department of Fish and Game, native shellfish populations exist and harvesting is occurring in some coastal areas within the San Diego region,[18] therefore the argument that this use is not valid is unsubstantiated. However, the appropriateness of any standard or WQO must be addressed as a Basin Planning issue, not a TMDL issue. The Triennial Review process is the most appropriate forum for questioning the appropriateness of a beneficial use and/or a WQO.

Comment 131

SHELL Total Coliform numeric targets should not be applied to freshwater creeks. SHELL Total Coliform Water Quality Objectives apply to marine salt waters, not to inland surface waters. This approach wrongly places SHELL Total Coliform numeric targets on fresh waters in the region. This change results in requiring more stringent Total coliform requirements on the creeks. The justification for this approach is to protect the SHELL beneficial use at the downstream beaches. The effect of this is to force the extremely low SHELL Total Coliform WQOs onto entire watersheds, not just the mouths. This is inappropriate, improper, and not fully accounted for in the CEQA analysis.

Based upon evaluation of the data from studies conducted by the City of San Diego, we question the appropriateness of applying REC1 and SHELL beneficial use Water Quality Objectives (WQO) to entire watersheds. The Mission Bay Source Identification Study, funded by the State Water Resources Control Board Proposition 13 funding, found that the majority of the problems at the beaches were from the wrackline and birds. The City conducted the Bacterial Monitoring and Source Tracking for Pacific Beach Point, which built upon the Mission Bay study. This study was a source identification study and concluded that the problems at this beach were attributed to the wrackline, birds, and flies, not sewage or urban runoff.

[18] Robin Lewis and Bill Paznokas, personal communication, November 3, 2006.

The Basin Plan SHELL designation is for the protection of human health from the consumption of shellfish. However, the California Department of Health Services is the state's designated authority regarding the regulation the harvesting and sale of shellfish for human consumption. Their regulations have higher levels of allowed bacteria than the Basin Plan and this TMDL. Therefore, the experts in this field need to be included in the design of the SHELL component of the TMDL to ensure that the numeric limit is appropriate and not overly-conservative. For example, the Tomales Bay TMDL requirements are not as strict as this TMDL and shellfish are commercially harvested in that bay. If the San Diego Regional Board will not unilaterally support an appropriate standard, the City of San Diego recommends that this issue be addressed on a statewide basis.

Because the Regional Board is not funded to do so, the City of San Diego intends to pursue Basin Plan amendments to eliminate SHELL as a beneficial use at the mouth of Chollas Creek and REC-1 as a potential beneficial use throughout the watershed. Review of historical documents indicates that the harvesting of shellfish for human consumption was not occurring at the mouth of Chollas Creek on or after November 28, 1975. The mouth of Chollas Creek has been dredged and surrounded by commercial sites since the 1920's. Additionally, the City of San Diego has provided the Regional Board with documentation that large areas of the creek were channelized prior to the November 1975 Basin Plan adoption date. This documentation will be incorporated into a submittal to the Regional Board requesting the removal of the potential REC1 beneficial use of Chollas Creek.

Response: The commenter incorrectly states that the effect of the TMDL is to force the extremely low SHELL total coliform WQOs onto entire watersheds, not just the mouths. Please see section 4.4 of this appendix, which explains why one TMDL for each bacteria indicator was calculated for each impaired creek and its downstream beach and where WQOs are applicable.

The comment overstates the findings of the Mission Bay Source Identification Study. Keep in mind that this study was conducted during dry weather conditions, not storm flow conditions. Further, since dry weather urban runoff from the surrounding neighborhoods is diverted before reaching Mission Bay, that the predominate bacteria source was birds is not surprising. We would not expect the same finding at a coastal area with no dry weather diversion BMPs. We will work closely with the City of San Diego as it develops information for a Basin Plan amendment regarding REC-1 and SHELL use in Chollas Creek/mouth of Chollas Creek. Please also see the response to Comment 130.

Comment 132

Section 4 Numeric Target Selection: Assigning the marine water quality objectives for shellfishing to fresh water creeks sets overly strict and inappropriate standards for both fecal and total coliform for freshwater systems. The assumptions leading to this assignment are flawed from both a policy and scientific perspective:

a) The Shellfishing beneficial use (SHELL) only applies to coastal marine waters. Freshwater creeks do not support shellfishing habitat or species and are not assigned the SHELL beneficial use nor water quality objectives to support shellfishing activities;

b) Water quality objectives for freshwater were developed with a margin of safety to protect downstream uses. Therefore, the protection of downstream marine habitat has already been considered and accounted for in the development of freshwater bacteria standards. If it was necessary for freshwater discharges to meet shellfish water quality objectives, such objectives would have been applied by the SWRCB to all creeks discharging to the Pacific Ocean through the Ocean Plan;

c) In applying the shellfish water quality objective to freshwater, the resulting total coliform levels are set below fecal coliform levels, which is scientifically impossible, since fecal coliform is a sub-set of the total coliform group.

On a related issue, Board Member Kraus requested staff to, "…provide more clarification with regard to the linkage between creek loads and beach exceedences to help justify why we are addressing beach and creek --- combining beach and creek TMDLs." (February 8, 2006 Regional Board Meeting Transcript, p. 154). This information is necessary to address the shellfish water quality objective issue and has not been provided

Response (a): Please see section 4.4 of this appendix.

Response (b): Downstream beneficial uses are not considered in the establishment of a WQO or its margin of safety; the margin of safety accounts for scientific uncertainty in the WQO in the immediate waterbody to which it is applied. Therefore, WQOs established for freshwaters are designed to protect the beneficial uses of freshwaters, and do not consider downstream marine beneficial uses.

In calculating TMDLs, we are not imposing marine beneficial uses onto freshwaters. Rather, we are protecting both types of waterbodies and associated beneficial uses by regulating discharges so that both freshwater and downstream marine WQOs are considered and maintained.

Response (c): Please see the response to Comment 103.

Comment 133

Table 4-2- This table applies a reverse tributary rule that does not exist in the Basin Plan. The text on page 38 indicates "Specifically, the water quality objectives for Enterococci are more stringent for creeks than beaches. Since beaches are downstream of creeks, and numeric targets are equal to WQOs (water quality objectives), TMDLs for beaches are calculated using the more stringent Enterococci standard on the downstream beaches will result in waste load allocations that are overly conservative. Please revise the table appropriately.

Response: Please see section 4.4 of this appendix, which explains why the creek enterococci WQO was used as the numeric target for TMDLs for San Juan Creek, Aliso

Creek, the San Diego River, and Chollas Creek, instead of the less stringent ocean enterococci WQO.

Comment 134

Tables 4-2, 4-3, 4-4, and 4-5, SHELL Total Coliform numeric targets should not be used for the mouth of San Luis Rey River, the coastal lagoon of San Dieguito, and the mouth of Aliso Creek, which do not have a SHELL designation in Table 2-3 (pages 2-47, 2-48) of the Water Quality Control Plan for the San Diego Basin (9), September 8, 1994. Although SHELL is designated for coastal water of the Pacific Ocean, the tributary rule does not apply to the ocean, which is covered by the Ocean Plan, not the inland Basin Plan. These changes will also require changes to the waste load allocations in Appendix B.

Response: The commenter is correct in saying that the waterbodies mentioned do not have a SHELL designation in the Basin Plan, and that the tributary rule does not apply to the ocean. However, all of the waterbodies included in this project eventually discharge to a beach, and all beaches have a SHELL designation. TMDLs are based on numeric targets that protect the most sensitive downstream beneficial use. In order to accomplish this, numeric targets based on WQOs for SHELL must be used. Dischargers will not be held accountable for meeting SHELL WQOs in freshwater creeks.

Comment 135

Section 11.4.1 of the Bacti-1 TMDL incorrectly identifies the "priority" of some creeks. The Bacti-1 applies the water quality standards throughout the watershed. On page 41 the enterococcus standard is listed as 61 most probable number (MPN)/100 milliliters (ml). This standard was taken from the Basin Plan, page 3-6 for a freshwater designed beach. We question the application of freshwater "beach" standards to the rivers and creeks in this TMDL. In the Basin Plan there are also designations for moderately or lightly used areas at 108 MPN/ml or infrequently used areas at 151 MPN/ml. We request the Regional Board revisit the designation of freshwater water quality standards and concern the application of moderately or lightly used areas that is similar to the saltwater standards.

Response: The TMDLs were calculated using numeric targets that were selected from the most conservative WQOs in the Basin Plan and/or Ocean Plan. The Basin Plan does include saltwater and freshwater enterococci single sample maximum objectives for "designated beaches," "moderately or lightly used area," and "infrequently used area." However, the Basin Plan does not provide criteria for assigning these categories to beaches. We must use the most conservative WQOs to protect REC-1 users. Thus, we selected the "designated beaches" WQOs for enterococci. For enterococci, 61 MPN/100 mL is the most conservative water quality objective for freshwater or saltwater. This water quality objective is protective of both freshwater and marine water REC-1 beneficial uses.

The dischargers must provide evidence to justify classifying a beach as a "moderately or lightly used area." If compelling evidence is provided, the "moderately or lightly used area" enterococci water quality objective could be used as the wet weather numeric target to revise the TMDLs. We calculated enterococci TMDLs using the less stringent numeric target in addition to the stringent numeric targets as described in the response to Comment 129. Therefore, if dischargers provide compelling evidence that the creek usage frequency is at the level of a "moderately to lightly used area," the less stringent enterococci TMDLs can be implemented. This information must be received by the San Diego Water Board prior to the adoption of implementing orders.

Comment 136

The comments and recommendation previously expressed remains unanswered and valid: The single-sample 104 CFU saltwater criterion for Enterococcus should be applied to both beaches and creeks for wet weather. The comments and recommendations under Comment 126 were partially answered with the new Draft's clarification that "total coliform TMDLs must be met only at the bottom of the watershed where creeks and rivers discharge to the Pacific Ocean", and the new provisions for time extensions contingent on shellfishing surveys. One of the 4B recommendations still stands: A moratorium on enforcing Final Total Coliform TMDLs for SHELL should be explicitly stated in the Report, and considerations for enforcement should be deferred until the related beneficial use questions and appropriate WQOs are better resolved State-wide.

Response: Please see the responses to Comments 129 and 130.

Comment 137

On Page B-8 Compliance Schedule: "Full implementation of the TMDLs for indicator bacteria shall be completed within 12 years from the effective date of the Basin Plan amendment in areas where shellfish is known or suspected of occurring, and 17 years in areas where shellfishing is known not to occur………" The City has a concern of implementing a costly compliance program where a particular Beneficial Use is "suspected" of occurring, when this term is so ill-defined. Per a memo to Julie Chan from Christina Arias, subject: Meeting with Department of Fish & Game, dated November 3, 2006 (attached), it appears the although there is documentation of shellfish harvesting in specific areas of San Diego County, there are no observations nor definitive documentation of shellfish harvesting in southern Orange County, within the SDRWQCB region. The City requests that the RWQCB define, clarify and provide documentation of where the shellfish harvesting areas are known or "suspected" so we know the extent of our compliance requirements.

Page 8 of the Technical Report states, "Shellfishing determinations must be made by execution of special studies or surveys." A study of this nature was conducted in Orange County and was extremely costly. The economic analysis does not account for these studies, but it needs to. This report does not identify who is responsible for conducting these studies. Please clarify.

Response: Regardless of whether or not shellfish harvesting is taking place, the fact remains that the entire Pacific Ocean shoreline in the San Diego Region is designated for the SHELL beneficial use. The WQOs are established in the Basin Plan and Ocean Plan. Please see the response to Comment 130.

Comment 138

With respect to the technical underpinning that has been used for the development of the Project I Bacteria TMDL, our concern is that the selected technical approach for the TMDL could require substantial bacteria loading reduction in the watersheds of interest and expenditure of significant public funds, without commensurate enhancement in beneficial use protection. These concerns apply to both wet and dry seasons.

Response: Beneficial uses are supported when the WQOs are met for those beneficial uses. Any reduction in bacteria loads will improve water quality and restore and/or support beneficial uses.

Under Clean Water Act (CWA) section 303(d), the San Diego Water Board is obligated to develop TMDLs for waters not meeting water quality standards (water quality objectives and the beneficial uses they are designated to protect). TMDL calculations must be based on existing WQOs, and the dischargers must comply with the TMDLs.

The compliance schedule provides the dischargers 10 years to comply with the interim TMDLs, and 20 years to comply with the final TMDLs. Within that time period, the dischargers can implement measures in a phased approach, beginning with the least expensive measures, such as source control. If water quality does not sufficiently improve, additional measures must be implemented until compliance with the TMDLs is achieved. Even if WQOs are relaxed and the necessary load reductions are subsequently reduced, reductions will likely still be required. Given that these waters have been listed for years, strategies to reduce bacteria should begin immediately.

Comment 139

During wet weather, the TMDL is based on estimated bacteria loadings which are proportional to the flow (and thus amount of rainfall). Therefore, those days with the highest flows are disproportionately weighted in the TMDL calculations compared to days with lower flows. These days are also the ones in which the likely level of recreational use is the lowest. In terms of actual use protection, this approach appears to be fundamentally flawed (that is, why do the days in which recreation is least likely count the most, and, is there any science or policy basis for weighting any particular day more than another?).

Response: There is no disproportionate weighting in the TMDL calculations. The numeric targets are fixed. The calculations are proportional to the flow. The more flow there is, the more assimilative capacity is available, thus the more load is allowed in the discharge.

We agree that rainfall events correspond to times of the year when the REC-1 beneficial use is at its minimum. However, beneficial uses apply at all times, and therefore must be protected at all times, regardless of season or hydrological conditions. Despite poor water quality, or even dangerous oceanographic conditions, REC-1 use is still occurring during wet weather events and the following 72 hours.

Comment 140

The dry weather total coliform numeric targets for beaches are based on the unjustified assertion that the SHELL WQO for total coliform is appropriate for creeks and rivers even though they do not support the SHELL use. The draft report indicates that the SHELL WQOs must be met at the bottom of the watershed where creeks and rivers discharge to the Pacific Ocean (which does have a SHELL designated use). This assumption is faulty, given that the SHELL use is designated for the Shoreline, not the point at which creeks and rivers discharge to the Ocean. Given the low dry weather volume of water discharging from the creeks and rivers (relative to the Pacific Ocean), a prioritized investigation is needed to determine the relative impact of the creeks on the SHELL use on the Shoreline (i.e. if dilution of greater than ~15:1 occurs, the effective WQOs in creeks for the REC-1 use and on the shoreline for the SHELL use would be similar for total coliform).

Response: The commenter is correct that the SHELL beneficial use is designated for the shoreline, not the creeks and rivers. However, there is a location on the shoreline where the creek or river eventually discharges to the ocean. In the watershed models, this is called the critical point. The critical point is a node in the watershed model, and does not necessarily reflect an actual location in the watershed.

The dry weather watershed model assumes an average flow and load for dry weather days, and calculates a TMDL in terms of a monthly load. However, there may not be dry weather discharge to the shoreline every day in a given month. If there is no discharge on a given day, the bacteria loads from the creek or river to the shoreline and ocean would be zero on that day. On dry weather days when the creek or river does discharge to the ocean, there is a bacteria load that is discharged to the shoreline. Conceptually, the sum of the bacteria loads from the creek or river at the shoreline from every day in a given month must be less than or equal to the dry weather TMDL.

The dry weather watershed models included several conservative assumptions to ensure that the beneficial uses of the creeks and beaches are supported. However, if there is a concern that the TMDL is too conservative, the discharger may choose to perform an investigation or special study to determine the relative impact of the creeks on the SHELL beneficial use at the shoreline. If the discharger can provide compelling evidence that the TMDL should include a dilution factor, the TMDLs can be revised to do so. However, until that evidence is provided, the assumptions that are included in the TMDL calculations will result in water quality that supports all beneficial uses designated for the creeks and beaches.

Comment 141

The Water Board may wish to consider revisiting the Beneficial Uses of certain water bodies. Regulations permit the following actions after Uses have been established:

(1) Change the Use (40 CFR 131.10(e)),
(2) Remove the Use (131.10(g)),
(3) Revise the Use (131.10(i)), or
(4) perform a Use Attainability Analysis (UAA, 131.10(j)/(k))

Response: A water quality standards action was evaluated in the environmental analysis (Appendix R, section R.8 Reasonable Alternatives to the Proposed Activity). The San Diego Water Board does not have sufficient evidence that REC-1 and SHELL beneficial uses were inappropriately designated for the beaches, creeks, and San Diego Bay. The appropriateness of any water quality standard (including beneficial uses or water quality objectives) must be addressed as a Basin Planning issue at this time. The Triennial Review process is the most appropriate forum for raising this Basin Planning issue if the dischargers have sufficient evidence that a use was improperly designated.

Comment 142

Section 1.1, Pages 2 & 3, first paragraph; This section of the draft bacteria TMDL states, "*Numeric targets for the TMDL calculations were equal to the WQO's 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.*"

Not all creeks within this Region, Chollas Creek as an example, discharge directly to the Pacific Ocean. Given the above quoted basis for requiring SHELL bacteria limits, creeks and rivers that do not discharge to the Pacific Ocean should not have SHELL (Shellfish harvesting) bacteria limits applied to them. Additionally, some of the creeks and rivers listed in the draft bacterial TMDL do not hold a REC-1 designation use nor are they accessible to the public, i.e. they are restricted waters. Chollas Creek and 7th Street Channel are examples of such creeks.

Using a blanket assumption of REC-1 or SHELL WQOs for the TMDL numeric target is in appropriate. Targets should be developed for the WQOs that the creeks or the nearby receiving waters support.

Response: The commenter is correct that Chollas Creek does not discharge directly into the Pacific Ocean. However, Chollas Creek does discharge into San Diego Bay, which also has been designated with the SHELL beneficial use.

According to the Basin Plan, Chollas Creek is designated as having a REC-1 potential beneficial use. The Clean Water Act (CWA) requires that the TMDLs ensure that water quality supports existing **and** potential uses. The appropriateness of any water quality standard (including beneficial uses and water quality objectives) must be addressed as a Basin Planning issue, not a TMDL issue. The Triennial Review process is the most appropriate forum for raising this Basin Planning issue.

Please see section 4.4 of this appendix, which explains why beaches and creeks were evaluated simultaneously and where WQOs are applicable.

Comment 143

Page 14, last paragraph, Why are SHELL WQOs being applied to areas that are not designated as such in the San Diego Basin plan? Page 15, Table 1-2, Using SHELL bacteria limits for watersheds that do not have shellfish harvesting listed for them in the San Diego Basin Plan is an incorrect use of the designation.

Page 37, Section 4, 4th paragraph, The draft bacteria TMDL states, "In other words, although SHELL is not a designated use in freshwater creeks and rivers, the total coliform density in these water where they discharge to the Pacific Ocean must be protective of the SHELL use at the shorelines."

Response: Please see section 4.4 of this appendix for additional explanation about where WQOs are applicable.

Comment 144

Page 37, Section 4, 4th paragraph. Chollas Creek is designated a REC-2 beneficial use not a REC-1 and the bacteria TMDL should be set accordingly. Page 44, Table 4-5, “Interim and Final Numeric Dry Weather Targets for Beaches and Creeks”; In the San Diego Basin Plan, Table 2-2 titled “Beneficial Uses of Inland Surface Waters”, lists Chollas Creek as a REC-2 (Non-Contact) beneficial use and a potential REC-1 use. However, REC-1 limitations are being applied to the in the draft bacteria TMDL Technical Report. Bacteria TMDL targets should match San Diego Basin Plan beneficial uses. REC-2 bacteria limitations should be applied to Chollas Creek. If in the future the Basin Plan beneficial use for Chollas is changed to REC-1, then those bacteria limitations should be applied.

Response: The Clean Water Act (CWA) requires that the TMDLs ensure that water quality supports existing **and** potential uses, not just existing uses. Thus, using WQOs for REC-1 uses as numeric targets for Chollas Creek TMDLs are appropriate.

Comment 145

Section 4.0 of the Draft TMDL, in establishing numeric bacteria targets, states that: “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 numerical target for the TMDLs for creeks and rivers even though they do not support SHELL use.” The City of Laguna Beach does not agree with the establishment of SHELL water quality standards in waters where SHELL is not a beneficial use. The final TMDL should establish bacteria standards in the regulated water bodies based on the beneficial uses designated for those water bodies.

Response: Please see section 4.4 of this appendix for additional explanation about where WQOs are applicable.

Comment 146

Use Attainability Language Is Inappropriate And Should Be Removed From The TMDL

Page 14 of the Draft Technical Report March 9, 2007 seems to contemplate a Use Attainability Analysis for the SHELL standard. This discussion has no place in the TMDL. If staff is proposing that the SHELL designation, or current shellfish harvesting should be a criterion for determining priority waterbodies, this should be more clearly explained. We agree with staff's determination (Draft Technical Report March 9, 2007, page 2) that the total coliform density in beach and creek waterbodies where they discharge to the Pacific Ocean must be protective of the SHELL use at the shorelines. Nothing in the compliance schedule should impact that designation or change the requirements of the UAA should a municipality choose to implement one.

Response: We assume that this comment, which refers to the March 9, 2007 version of the Technical Report, equates the requirement to document the non-existence of shellfish harvesting with the need for a UAA. We are not suggesting that the use be removed; however if shellfish is not occurring, there should be no increased risk to public health by giving dischargers additional time to meet the TMDLs for SHELL uses.

This comment is moot, however, since the referenced language was deleted in the June 22, 2007 version of the report. We expanded the compliance schedule to 20 years for meeting final wet and dry total coliform TMDLs for SHELL because of how stringent these TMDLs are. We intend to revise these TMDLs, and the 20-year compliance schedule after adoption of the reference system/natural sources exclusion approach Basin Plan amendment. This process is described in the response to Comment 2.

5.5 Implementation Plan/Compliance Assessment

Comment 147

Expressing the waste load allocations as number of bacteria of colonies per year (billion MPN/yr) is not a useful metric to measure for compliance with the TMDL. We understand the need to define a load allocation in a concentration per time unit; however, the current allocations set a target that we will never be certain we are meeting. Additionally, deferring the determination of the measurement metric until the revision of the NPDES permits is inappropriate and leaves much uncertainty for the regulated entities. The waste load allocations in the TMDL should be expressed in a metric that is clearly measurable and reportable.

Response: We are not proposing that bacteria loads be used for measuring compliance. However, this metric is usable for expressing WLAs because quantification of loads allows urban runoff program managers to know the magnitude by which WQOs are exceeded. Strategies for reducing bacteria loads will be dependent upon the magnitude of the bacteria loads. For example, a watershed having very frequent exceedances consisting of lower magnitude loads will require different BMPs from watersheds having infrequent exceedances consisting of higher magnitude loads. A metric expressed in a term different from a load, such as exceedance days, does not allow program managers to decipher a percentage by which loads must be reduced, nor help with selection of BMPs. Expressing WLAs as a load per time is consistent with the intent of the TMDL program.

The TMDLs for beaches and creeks are not the first TMDLs where the allocations are expressed as loads. 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. Additionally, the bacteria TMDL for Canyon Lake (San Jacinto watershed), which is under development by the Santa Ana Water Board, also expresses the allocations in terms of loads.

We further disagree that number of bacteria colonies per year is not measurable or reportable. Loads can be calculated by multiplying measured flows (volume/time) by measured bacteria densities (number of bacteria/sample volume). Flow and density measurements can be made at selected monitoring locations at a set frequency, which would be used to estimate an annual average flow and density from which an average annual load estimation could be calculated.

TMDL compliance will not necessarily be measured against the metric used to express WLAs. As described in section 10.2 of the Technical Report, WLAs are the maximum amounts of pollutant that can be contributed to a waterbody by point source discharges of the pollutant in order to attain WQOs. NPDES requirements must include conditions (WQBELs) that are consistent with the assumptions and requirements of the WLAs. *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 WLA requiring a mass load reduction. The metric for which WQBELs will be expressed and included in NPDES requirements for urban runoff, (also known as municipal "permits") for the purpose of implementing WLAs, has not been determined at this time. Examples for suitable metrics could include measurements of bacteria loads, bacteria densities, the number of days that WQOs are exceeded, or evidence of an iterative BMP program.

WQBELs will be incorporated into NPDES requirements for urban runoff upon re-issuance or revision of these requirements. WQBELs and other requirements implementing the TMDLs could be incorporated into these NPDES requirements upon the normal renewal cycle or sooner, if appropriate. Reissuence of NPDES requirements is a public process, and the public will have ample opportunity to propose a metric or comment on the proposed metric to be used to measure compliance and details concerning monitoring and reporting requirements.

We agree that, at this time, there is uncertainty for the regulated entities regarding which metric will be used to express WQBELs and measure compliance. However, the public process associated with reissuence of NPDES requirements is the proper forum for establishing this metric.

Comment 148

The text needs to define what will constitute "maintaining" Water Quality Objectives (WQOs). For how long will WQOs need to be met before the water body is considered "maintaining" the objective? Additionally, the text should state that the monitoring plans will likely need to be revised once WQOs are attained. Verification of WQO compliance will most likely be accomplished through a reduced level of monitoring than that necessary to monitor the gradual attainment of WQOs through the implementation of BMPs.

Response: We have modified the text in the Technical Report to clarify the term "maintaining WQOs." WQOs are considered "attained" when the waterbody under consideration 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 necessitating re-listing on the List of Water Quality Limited Segments. Attaining and maintaining WQOs will be accomplished by achieving wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources.

We agree that the monitoring plans can likely be revised once WQOs are attained, and that verification of WQO compliance can most likely be accomplished through a reduced level of monitoring. We modified the text of the Technical Report to reflect these changes.

Comment 149

The text needs to clarify the entities which will provide the monitoring results to be used to identify if small MS4s and discharges from nonpoint sources (owners or operators of agriculture, nursery or animal feeding operations) that may contribute to the impairments at the beaches and creeks. The text should include a commitment from the Regional Board to either conduct or require monitoring by third parties to assess the quality discharges from these entities in the vicinity of the impaired waterbodies to identify potential sources of bacteria. Data that confirms bacterial water quality impairments should be used to enroll other participants in the TMDL.

Response: At this point, we are not requiring monitoring results to identify if discharges from small MS4s and controllable nonpoint sources are contributing to impairments at the beaches and creeks. Instead, we are relying first on regulation to eliminate any threats to water quality. Owners and operators of small MS4s in the watersheds subject to this TMDL shall be required to submit Notices of Intent to comply with the requirements of Order No. 2003-0005-DWQ. Order No. 2003-0005-DWQ was issued by the SWRCB and describes General NPDES requirements for the discharge of stormwater from small MS4s. This Order 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 MEP.

For controllable nonpoint source discharges, we will enforce existing WDRs and enforce the waivers. Specifically, we will enforce facility specific WDRs and waivers with respect to discharges from animal feeding operations, manure composting and soil amendment operations, and agricultural and nursery irrigation return flow in the San Juan, San Luis Rey, San Marcos Creek, and San Dieguito watersheds where loading from these sources is significant. If, upon enforcement of the waivers, nuisance conditions or exceedances of WQOs occur despite the stated conditions, then WDRs will be issued for these discharges.

As a result of these steps, monitoring by third parties to identify potential sources of bacteria may not be necessary. These steps provide a means of curtailing discharges of bacteria, either by implementing stormwater programs or enforcing existing regulatory programs. However, if, after the measures described above are implemented, and sources are still unknown, then we can require monitoring from suspected dischargers in the vicinity of an impaired waterbody. Since it is unknown whether or not such monitoring is necessary, this amount of detail in the Technical Report is not appropriate.

Comment 150

The discussion of special studies needs to address the weaknesses in the model used to develop the TMDL (lack of water quality data, lack of representation of actual bacteria life-cycle processes (die-off, regrowth), lack of flow data, etc.) and outline a series of studies to collect the necessary data to strengthen and verify the model. The Implementation Plan should include a re-evaluation of the TMDL in conjunction with the NDPES permit renewal. The plan should commit to a recalibration and validation of the model using new data collected during program monitoring and special studies and any new information regarding bacteria fate and transport, indicator/pathogen correlations and epidemiological studies. The re-evaluation should include the TMDL targets, load and wasteload allocations. Achieving the WQOs for bacteria will be an expensive and long-term project for the named dischargers. Accurate targets based on specific data from each watershed are essential for the achievement of the TMDL in a timely and cost-effective manner.

Response: We agree that adding language in the discussion of special studies to address the weaknesses in the model used to develop the TMDL is appropriate and that more data in these areas will result in better computer modeling results. The text of the Technical Report has been modified to reflect these additions.

The models and all associated data used for TMDL development are available for public use. Dischargers are free to utilize the models to determine what kinds of special studies are needed to improve model performance, recognizing that each watershed could be unique in terms of special studies required for model improvement. Dischargers should outline a series of studies for this purpose. One appropriate place to document this information is the Bacteria Load Reduction Plans submitted by Lead Jurisdictions. We will partner with dischargers in this effort to the extent that resources are available.

In terms of reevaluating TMDLs, please see the response to Comment 58.

Comment 151

Determining Compliance with Waste Load Allocations (WLA): As suggested by the SAG, it is not clear how compliance with the WLA will be tracked and measured. The method being proposed is not practical or easily understood. It appears a complicated and costly computer generated modeling and statistical analysis may be needed on a routine basis. We recommend the WLA be simplified and expressed as “allowable exceedance days” that will achieve the required water quality objectives and waste load reductions. This approach was used in both the Malibu Creek and Santa Monica Bay Beaches TMDL Basin Plan amendments.

Response: Costly computer generated modeling and statistical analysis likely won’t be needed on a routine basis (to track and measure compliance with the WLAs). We have not proposed a method for determining compliance with TMDLs. Please see the response to Comment 147.

Comment 152

Responsible Jurisdictions: As indicated by SAG, the TMDL document should be reviewed and modified as needed to ensure that dischargers under the Project I TMDL are not responsible for other dischargers water quality violations that lead to exceedances of WQO or WLAs in cases where dischargers are either; 1) under a separate NPDES permit, or 2) outside the dischargers jurisdiction.

Response: The WLAs for municipal dischargers specifically were not subdivided among jurisdictions in order to allow the dischargers some flexibility on how the bacterial loads will be reduced and to allow pollutant load trading between dischargers. We have not modified the Technical Report in response to this comment because it addresses an enforcement issue that is appropriately addressed if or when there is a violation of an implementing order.

During implementation of the TMDLs, we will review the Bacteria Load Reduction Plans and the results generated in subsequent reports prepared by the dischargers. Subsequent reports should indicate if one municipal discharger in a watershed is not implementing BMPs to address the bacteria problem. For the discharger(s) not contributing appropriately to bacteria load reductions, we can take enforcement actions to bring them into compliance with their requirements.

Comment 153

The Executive Summary discussed “third party agreements” where the Regional Board could conditionally waive regulation of bacteria sources based on the existence of an adequate pollution control program that adequately addresses the sources. The Technical Report does not provide the criteria to be used to determine when such waivers are appropriate. When municipalities are being asked to achieve 100% compliance, and other sources have the ability to opt out of the program, this process should be outlined for all stakeholders to review. We recommend that these sources be required to perform both dry and wet weather monitoring and meet the same Ocean Plan or Basin Plan bacteria standards as the municipalities.

Response: The commenter incorrectly states that nonpoint source dischargers of bacteria can “opt out” of meeting required reductions and instead pursue third party agreements with the San Diego Water Board. Nonpoint source dischargers cannot “opt out” of meeting LAs and required load reductions. For nonpoint sources, regulation will take place primarily by enforcing facility specific WDRs and the Waivers with respect to waivers for dischargers of waste from agricultural and orchard irrigation return flow, animal feeding operations, and manure composting and soil amendment operations in the San Juan Creek, San Luis Rey River, San Marcos Creek, and San Dieguito River watersheds, where controllable nonpoint sources contribute more than 5 percent of the total wet weather bacteria load. Under the Waivers, discharges from controllable nonpoint sources are not allowed to cause nuisance conditions to receiving waters or violations of applicable WQOs. If, upon enforcement of the Waivers, nuisance conditions or exceedances of WQOs occur despite the stated conditions, then facility specific or general WDRs or waivers can be issued to violators.

We will pursue a Third-Party regulatory-based approach only for discharges not otherwise regulated by WDRs or waivers, or where issuing facility specific or general WDRs or waivers are appropriate. Upon enforcement of WDRs, waivers, or third party agreements, we may require dischargers to conduct water quality monitoring.

Comment 154

Table 11-2 - Responsible Municipalities and Lead Jurisdictions –As stated in our June 20, 2006 letter, we suggest that Table 11-2 lead agencies be organized the same as the current MS4 NPDES permits watershed lead agencies. This will be beneficial since watershed plans needed for MS4 NPDES compliance have already been developed and stakeholder group established.

Response: We agree that Lead Jurisdictions identified in the Technical Report should be consistent with Lead Agencies identified in MS4 requirements. Table 11-2 has been modified accordingly. The text of section 11.3.3 has been modified to allow municipal dischargers to elect a Lead Jurisdiction different from the ones indicated in Table 11-2. Lead Jurisdictions identified in Table 11-2 are default designations in the event that dischargers do not elect one.

Comment 155

Section 11.5 discussed Water Quality Based Effluent Limitations (WQBELs). The first paragraph of this section states *"WQBELs for municipal storm water 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 only used in rare instances. WQBELs can be incorporated into NPDES requirements for MS4 dischargers by reissuing or revising these requirements."* The Technical Report does not explain why the Bacteria 1 TMDL needs to be the exception, i.e,. a numeric limit. This appears to be more stringent than the MEP requirement of the federal Clean Water Act.

Response: Whether or not the WLAs are expressed in NPDES requirements as numeric limitations, or a program of BMPs, will be decided when the NPDES requirements are revised. Considering the variability inherent in bacteria sampling results, expressing the WLAs as a program of BMPs seems prudent. The NPDES requirements require that standards be met in receiving waters. The TMDLs provide a time schedule for achieving that result.

Comment 156

Section 11.5.4 – The City of San Diego is requesting a time line regarding when the Regional Board will contact the Phase II MS4 permittees for inclusion into this TMDL Program. Currently, University of California, San Diego has not been included in this progress. UCSD is located adjacent to the Scripps Areas of Special Biological Significance and should be notified of their requirement to participate, along with other Phase II MS4s that contribute bacteria into these impaired waterbody segments.

Response: We have contacted by phone the small MS4s listed in Appendix Q to make them aware of these TMDLs. Steps to regulate small MS4s will begin after we have initiated steps to regulate Phase I municipal dischargers in accordance with the discussion in section 11.5.3 of the Technical Report.

Comment 157

P. 96, Section 10.3.2: The Regional Board should commit to requiring small MS4 facilities located in impaired watersheds to enroll in the Municipal Phase II MS4 Statewide Order.

Response: We have committed to this action. Section 11.5.4 of the Technical Report states that 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 to comply with the requirements of Order No. 2003-0005-DWQ, the General NPDES requirements for the discharge of stormwater from small MS4s.

Comment 158

P. 98, Section 10.4: The Regional Board should commit to verifying through discharge sampling that conditional waivers for runoff from agricultural facilities, orchards, animal feeding operations and soil amendment and composting facilities are not violating waiver conditions.

Response: We have committed to enforcing waiver conditions as a result of these TMDLs, in the San Juan Creek, San Luis Rey, San Marcos Creek, and San Dieguito River watersheds where agricultural and livestock sources are significant. In these watersheds, bacteria loading from controllable nonpoint sources accounts for more than 5 percent of the total wet weather load. Upon enforcement of waivers, we may require nonpoint source dischargers to perform water quality monitoring to verify whether or not waiver conditions are being met. Whether or not such actions will be necessary is not known at this time. Additionally, we are in the process of revising the waivers for agricultural and animal facility operations to make identification of these facilities easier for the San Diego Water Board. Identification of facilities is the first step in enforcing the waivers.

Should water quality data be needed to identify a suspected discharger, we have discretion at any point in time to request this information pursuant to Water Code section 13267.

Comment 159

Table 11-2- Responsible Municipalities and Lead Jurisdictions – The County of San Diego does not have land use jurisdiction in the lower 1 mile of Forrester Creek that is impaired. The County requests that the lead jurisdiction is assigned to a jurisdiction with land use authority in the impaired segment. The County of San Diego is committed to do its fair share in improving the water quality in Forrester Creek and will work cooperatively with the other stakeholders.

Response: Table 11-2 has been modified to identify the City of El Cajon as the lead jurisdiction for the San Diego River hydrologic unit (907.00). This change was made for consistency with the San Diego Water Board Order No. R9-2007-0001, *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, the San Diego Unified Port District, and the San Diego County Regional Airport Authority.

Comment 160

Section 11.5.1, Process and Schedule for issuing NPDES Requirements. This section should more fully describe this process for several reasons:

- The compliance schedule to achieve the final wasteload reductions is 12 years but NPDES permits are renewed every five years. How will the NPDES permits be managed during this transition period?
- There are differences between the interim and final wet weather WLAs. Will the Board issue interim NPDES permits?
- The municipal discharges in each watershed collectively are required to determine how to divide the allocations of the one WLA for the watershed but that the Board issues the NPDES permits for each point source discharger within the each watershed. This raises a potential conflict issue between the allocations made by the discharges and the WQBELs in each NPDES permit.
- Requirements for new point sources and reallocations of WLAs and WQBELs for existing NPDES permits

Response: The new NPDES requirements for San Diego County and the draft requirements for Orange County municipal dischargers do not include interim WQBELs to implement the bacteria TMDLs. Whether interim and final WQBELs will be added to the requirements mid-cycle, or added during the next renewal, is unknown at this time. Please see the revisions to section 11.5.1 for further clarification.

Comment 161

Expressing the waste load allocations as billions MPN/year is not a useful metric to measure for compliance with the TMDL. The waste load allocations in the TMDL should be expressed in a metric that is clearly measurable and reportable. Despite the SAG consensus, no fundamental change to the wasteload allocation metric was made in the Revised Draft. A change was made to the dry-weather loads to present them monthly rather than annually. Some tinkering with the presentation of wet-weather load reduction percentages occurred, but no basic change of metric approach was incorporated. We fully acknowledge that the wet-weather TMDL calculations represent an impressively complex achievement on the part of your technical consultants as a snapshot of how far we need to go and could be a tool in BMP implementation planning. But from a practical standpoint of measuring progress in the receiving waters, it should be recognized that it is virtually impossible to collect the data needed to track progress in this way. The physical dangers of collecting samples under storm conditions are prohibitive. Given the inherent variability of bacteria measurements (commonly 6 or 7 orders of magnitude) and the huge variation in wet-weather storm flow rates, attempting to extrapolate single-sample daily wet-weather concentration measurements into billions of annual MPN would be sheer mathematical guesswork and would not serve anyone's interest (with the possible exception of consulting statisticians).

We recognize that the RWQCB is obligated to make TMDL calculations and that considering changes to the fundamental approach at this point in the process would be unacceptably time-consuming. We recommend that **language should be added to the Technical Report clarifying that alternative metrics to determine compliance with the TMDLs may be developed in conjunction with the Compliance Monitoring Plan,** which will be carried out in cooperation with the RWQCB's NPDES permit staff after the TMDL is formally approved.

Response: The Technical Report has been modified to explain that metrics other than "loads" to determine compliance with the TMDLs may be developed in conjunction with the monitoring plan for these TMDLs. Please see the response to Comment 147.

Comment 162

Some acknowledgement should be made in the report regarding just how costly, challenging (and probably infeasible) it will be to achieve actual target or TMDL compliance in some situations. An illustrative case: among the many bacteria-reduction efforts already implemented in the San Juan Hydrologic Unit are three constructed-treatment wetlands built in Laguna Niguel in 2001-2003 in the Aliso Creek watershed to treat dry weather flows from a 0.9-square-mile existing residential subdrainage area. One of the three wetlands (the "West Wetland") was engineered/optimized in acreage size for fecal coliform removal and functioned under a 3-day hydraulic residence time (HRT). The "East Wetland" was oversized relative to the optimum and functioned with a 17-day HRT; while the "North Wetland" was "supersized" with a functioning HRT of about 36 days. All three wetlands actually achieved 95%+ removal of Fecal Coliform, which was sufficient to produce water cleaner than the REC-1 fecal coliform objectives. However, the size-optimized West Wetland was only able to achieve an 80% reduction of Enterococcus, reducing to a geomean concentration of 635 Ent/100 ml; the oversized East Wetland achieved 98% reduction to a geomean of 82 Ent/100 ml; and the "supersized" North Wetland achieved 99.6% reduction to a geomean of 68 Ent/100 ml. But the freshwater geomean WQO for Enterococcus is 33 Ent/100 ml. So despite using up to twelve times as much land as needed to effectively remove fecal coliform and even though (at the "supersized" level) achieving the 99.1% reduction required by the dry-weather TMDL, the wetlands' discharge still doesn't meet the freshwater Ent WQO in dry weather. Why, since EPA's Fecal Coliform and Enterococcus WQOs theoretically represent "equivalent" health risks, is it considered necessary to meet both the FC *and* Ent targets and not just one or the other of them?

Probably the only way to reliably comply with *all* the bacteria WQOs in this drainage is through full technological treatment, such as is occurring at the Salt Creek Ozone Plant. The Salt Creek facility cost $6.7 million to build and runs an annual O&M cost of $230,000 (including $7,300 *per month* just for electricity) - and it only treats dry-weather flows. It is mind-boggling even to contemplate how much land it would take to treat *wet* weather flows through a treatment wetland, or how huge and expensive a technological-treatment plant would have to be in this already-fully-developed drainage where storm flows can run 10,000 times higher than dry-weather flow rates. Even adjusted to "only" the 27.6% Enterococcus MS4 load reduction required for Aliso Creek in wet weather, what, realistically, would constitute a "feasible means of compliance" to treat a 2,760-fold higher flow rate?

Response: We recognize that dischargers will have a difficult time achieving bacteria WQOs because of the sizeable load reductions needed to do so. For this reason, the compliance schedule is relatively long (20 years, as opposed to most TMDLs which are 10 years) to allow dischargers time to develop effective strategies for reducing anthropogenically-derived bacteria. We realize that natural sources of bacteria can pose an especially difficult challenge, and for this reason, we are developing a reference system approach Basin Plan amendment, as described in the response to Comment 2.

In terms of the fecal coliform/*E. Coli* issue, we are required to develop TMDLs for both because both are indicated in the Basin Plan (we did not develop TMDLs for *E. Coli* due to lack of data). The SWRCB is reviewing WQOs for bacteria for freshwater, which, if different from the current objectives, would replace the objectives in the Basin Plan. The public is encouraged to comment on WQOs development. The CEQA scoping meeting is scheduled for fall, 2007.

Comment 163

Table 11-2. Responsible Municipalities and Lead Jurisdictions; the City of El Cajon does not have land use jurisdiction in the lower 6 miles of San Diego River Lower and at the San Diego River Mouth (a.k.a. Dog Beach) that is impaired. The City requests that the lead jurisdiction be assigned to a jurisdiction with land use authority in the impaired segment. The City of El Cajon is committed to do its fair share in improving the water quality in the San Diego River and will work cooperatively with the other stakeholders.

Response: Although the City of El Cajon does not have land use jurisdiction in either the lower reaches of the San Diego River or Forrester Creek, the City of El Cajon is responsible for reducing bacteria loads to both waterbodies. We are leaving the City of El Cajon as the Lead Jurisdiction for the San Diego Hydrologic Unit (containing both the San Diego River and Forrester Creek) to be consistent with San Diego Water Board Order Number 2007-0001.

The Technical Report clearly states that the role of Lead Jurisdiction is negotiable and that dischargers within the watersheds are free to elect a more suitable Lead without the oversight of the San Diego Water Board. The City of El Cajon should consult with the other municipal dischargers in the watershed to see if a different municipality would be willing to assume the Lead Jurisdiction role.

Comment 164

Table 11-2. Responsible Municipalities and Lead Jurisdictions; the City of El Cajon does not have land use jurisdiction in the lower 1 mile of Forrester Creek that is impaired. The

City requests that the lead jurisdiction be assigned to a jurisdiction with land use authority in the impaired segment. The City of El Cajon is committed to do its fair share in improving the water quality in Forrester Creek within its jurisdiction and will work cooperatively with the other stakeholders.

Response: Please see the response to Comment 163.

Comment 165

The Owner/operators of small MS4s listed in Appendix Q should be named individually in Table 11.2.

Response: To list the numerous owners and operators in Table 11.2 is not necessary, as they are clearly described in Appendix Q. The entities noted in Appendix Q may or may not be exhaustive of all the owners and operators of small MS4s in the San Diego Region. As we become aware of more owners and operators of small MS4s in the Region, they can be added to Appendix Q appropriately.

Comment 166

The City of San Diego is concerned about language in the TMDL which addresses "attaining" and "maintaining" 303(d) list status. Section 1.6 clearly defines what attainment is; however, it states that "WQOs are considered "maintained" when, upon subsequent listing cycles, the waterbody is not returned to an impaired condition via re-listing on the 303(d) list. This requirement does not clearly state the number of 3-year listing cycles it takes to meet the monitoring requirements of the subsequent listing cycles. This ruling is arbitrary and needs to be clearly defined. Additionally, this section uses 40 CFR Section 131.38 as justification for this requirement. This section is titled "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" and is for "*toxic*" pollutants. The three indicator bacteria are not included in any of the tables or lists in Section 131.38. In fact, this new requirement also appears to be in conflict with the State Water Resources Control Board (State Board) Resolution 2005-0050, Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options. This State Board policy indicates that when listed waters which attain standards are to be delisted. There are no additional actions required. The City of San Diego is requesting the removal of the first paragraph in Section 1.6 based upon the review of both the cited 40 CFR section and the State Board policy. The Regional Board should prepare a new, separate TMDL if a water body is de-listed and then subsequently returned to impaired status.

Response: The language to which the commenter refers is not a requirement or ruling. The Technical Report clearly states that attaining and maintaining WQOs are *goals* of the Implementation Plan. We did not cite the CFR because we did not consult the CFR when writing this language. As attaining WQOs are fundamental goals of the TMDLs and Implementation Plan, this language does not trump the State Board's policy indicating when waterbodies have reached appropriate status for removal from the List of Water Quality Limited Segments.

Comment 167

Section 11.5.6 requires the named entities to investigate landfills as potential bacteria sources. The section states that 47of these landfills are currently regulated by the Regional Board by WDRs or by the General Industrial Storm Water Permit. This requirement is duplicative and is not required by the Clean Water Act or the MS4 permit requirements. The City of San Diego strongly recommends that this section require Regional Board oversight of landfills.

Response: Municipalities are responsible for runoff and associated bacteria discharged from landfills on multiple levels. As the owners and/or operators of landfills, they are responsible for their landfill discharges. Landfills also discharge to the municipalities' municipal separate storm sewer systems (MS4s), at which point the municipalities accept responsibility for the landfill discharges. In addition, Order No. 2007-0001 and Tentative Order 2007-0002 require that source identification, best management practice (BMP) designation and implementation, and inspections be applied to municipal and private landfills. Moreover, landfills are subject to municipalities' local ordinances.

The fact that landfills are regulated by the San Diego Water Board does not negate municipalities' responsibility for runoff from landfills. Responsibility for discharges remains with the discharger, whether the discharger is a landfill owner or an MS4 owner receiving and discharging landfill runoff. Since municipalities are responsible for runoff discharges from landfills, it is appropriate that they be aware of whether or not each landfill is a source of bacteria. As such, municipalities must investigate landfills as potential bacteria sources. However, it is worth noting that municipalities have discretion regarding the scope of investigations to be conducted.

Comment 168

The City of San Diego requests the inclusion of a Re-Evaluation clause with dates. This will provide an opportunity to analyze new land use data, new monitoring data and new scientific technologies under development by EPA and SCCWRP. The inclusion of dates will provide named entities motivation to participate in special studies so they can be included in the re-evaluation process.

Response: Please see the response to Comment 58.

Comment 169

The City of San Diego requests that the Regional Board assess compliance with their existing agricultural waivers and take actions as required. This action requires the review and evaluation of existing data submitted to the Regional Board, assessing the data, finding data gaps, inspect facilities as necessary, and initiate enforcement actions when required.

Response: The San Diego Water Board is in the process of revising the Agricultural/ Nursery/Animal Facility waivers to make it easier to identify these dischargers, and assess and enforce compliance with these waivers. Mo Lahsaiezadeh of the SAG is on the Advisory Committee for these waivers representing municipal dischargers. Draft waivers will be available for review in July, 2007.

Comment 170

The TMDL should be drafted as a Phased TMDL with a set date for re-evaluation of the numeric model utilizing additional data collected since 2002, further developments in the understanding of bacteria fate and transport and the human health risks from non-human sewage contaminated urban runoff. The reasons for this are as follows:

a) The August 2, 2006 EPA Memorandum regarding "Clarification Regarding "Phased" Total Maximum Daily Loads" states, "the (TMDL) Guidance recommends the phased approach for situations where available data only allow for "estimates" of necessary load reductions for "non-traditional problems" where predictive tools may not be adequate to characterize the problem with a sufficient level of certainty.[19]" This approach clearly applies to this TMDL for the following reasons:

   i) The TMDL is based on limited data. An examination of Appendix G Data Sources illustrates the limited data sets used in the modeling. In many watersheds only a few data points were used and no actual measured flow data was incorporated. Flow data, a key component in the calculation of bacteria loading, is limited at all sites and model-generated values need to be verified with actual field measurements. The modeling for Aliso Creek utilized the largest data set, yet was based on less than 2 years of bacteria concentration data, while at the time of the original modeling analysis, approximately 4 years of data had been reported to the Regional Board under the Aliso Creek CWC §13225 Directive. Data collection in many watersheds has continued through the development of the TMDL document and has not been incorporated into the modeling analysis.

   ii) Bacteria are a non-conservative pollutant with natural sources which are currently indistinguishable from human sources. Additionally, bacteria can reproduce in the environment, while the pathogens that bacteria serve as the indicator for cannot reproduce outside of a host. This leads to a situation where bacteria measurements, in areas not impacted by human sources of bacteria and pathogens, will not truly reflect the health risk from human pathogens. This situation is not currently reflected in the TMDL.

   iii) Recent studies indicate that the major assumption underlying the model used to develop the TMDL (i.e. the assumption that loadings of bacteria from specific land uses are predictive) is flawed. Researchers from University of California at Irvine have found "…distributed

[19] USEPA, 1991. Guidance for Water Quality-based Decisions: The TMDL Process, EPA440-4-91-001 http://www.epa.gov/OWOW/tmdl/decisions/ (page 22)

watershed models of pollutant transport in surface water can be used to define relationships between land use, water quality and stormwater runoff. However, application of distributed models to fecal indicator bacteria and fecal indicator viruses is complicated by the fact that once microbial indicators enter the environment, their fate and transport are likely to be affected by poorly characterized ecological processes, such as the proliferation of environmentally adapted strains of fecal indicator bacteria. Consequently, fecal indicator bacteria and viruses are unlikely to accumulate and wash off in at reproducible and land-use specific rates - an assumption inherent in most distributed watershed models.[20]" Additionally, most assumptions utilized in the model have not been verified nor analyzed for sensitivity to data changes (see Technical Issues comment #1, February 2, 2006 Letter).

Similarly, during the February, 2006 Board Meeting, Regional Board Member Johnson directed staff to address the comments submitted by the Sierra Club and County of Orange regarding modeling and modeling assumptions. (February 8, 2006 Regional Board Meeting Transcript, 154)

iv) The relationship between bacteria levels in waters not impacted by human sewage inputs and human health risk is currently unknown. Recent studies in Mission Bay indicated no link between the illnesses and bacteria levels. A similar study will begin this summer at Doheny Beach in Dana Point. The combined results of both of these studies should be evaluated and incorporated into the TMDL.

b) A re-evaluation of the model is necessary for accurate and verifiable TMDL targets, which are essential to ensuring the most timely and cost-effective implementation of Best Management Practices (BMPs) to address bacteria loads. As illustrated by Section 13 of the TMDL, bacteria control BMPs are extremely expensive to construct and maintain. Additionally, for many of the suggested structural controls (vegetated buffer strips, bioretention, sand filters and infiltration trenches), opportunities for implementation are limited due to the amount of current development in the impacted watersheds and the limited land area for retrofit projects. As such, of the recommended options, diversion and treatment of Municipal Separate Storm Sewer System (MS4) is the most applicable to the affected areas. However, this treatment option is limited not only by the high cost of diversion structure construction, but by limited treatment capacity of area wastewater treatment facilities and by restrictions on salt levels with respect to reclaimed water production. In order to utilize this treatment option, separate or additional treatment plant processes may have to be constructed, the cost of which has not been

[20] Surbeck et al, "Flow Fingerprinting Fecal Pollution and Suspended Solids in Stormwater Runoff from an Urban Coastal Watershed". Environ. Sci. and Technol. **2006** *40* 4435-4441

included in the Economic Analysis in Section 13. TMDL targets should be re-evaluated after the collection of necessary baseline data and epidemiological studies to ensure that appropriate and cost-effective BMP measures are employed.

c) A set date for TMDL re-evaluation is necessary to ensure it occurs and will also serve to coordinate research activities among all watersheds. Setting a re-evaluation date will provide the necessary schedule coordination for activities conducted within each watershed, allowing for the entire TMDL to be re-evaluated at one time. Without a set date, requests for re-evaluation of new data and information will come forward on a watershed-by-watershed basis requiring more Regional Board staff time and effort. Additionally, the re-evaluation date could be set to coincide with the re-calculation of exceedence frequencies and load allocations for San Diego Region reference systems already proposed by Regional Board staff in relation to the proposed Reference Watershed Approach for Implementing Bacteria Water Quality Objectives Basin Plan amendment.

d) The commitment by the Regional Board to a timely re-evaluation of the TMDL will provide assurances to the regulated community of the Regional Board's dedication to accurate and up-to-date regulatory requirements. Just as the named discharges are being asked to budget staff time and resources to address this issue in a timely and structured manner, we are asking the Regional Board to do the same in committing to a re-evaluation schedule.

Regional Board Member Wright expressed support at the February 8, 2006 Board Meeting for a set re-evaluation timeline for the TMDL model. He stated, "…I'd feel a lot more comfortable if we had built into this whole process some kind of steps along the way where we would review the models. Models have a way of just becoming accepted and becoming engrained in the way we operate." (February 8, 2006 Regional Board Meeting Transcript, 138-139)

Response: Several stakeholders have expressed opinion that there is a need to reevaluate TMDLs at a set date in the future to ensure that the most up-to-date, accurate information is used for model output, and ultimately, TMDL calculation. The commenter cites numerous arguments in support of this position, such as the fact that the model is based on little data; bacteria are a non-conservative pollutant and are often naturally-occurring; bacteria loading cannot always be correlated to land uses with good results; and the relationship between bacteria levels and the human health risk is less understood in waters where no sewage contamination is present. The commenter also states that re-evaluation of the models used for TMDL calculation is necessary for accurate analysis and that a set date for TMDL re-evaluation is necessary to ensure it will occur, and that in doing so, dischargers can coordinate research activities needed for model enhancement.

We agree that the models produce the most accurate results when the latest and best information is utilized, that the commenter raises valid points concerning shortcomings of the models and in the TMDL process. However, attempts to restore water quality and meeting the TMDLs as calculated must not be delayed for acquisition of new information. Even as new information is being sought, attempts to decrease existing bacteria levels must take place, since bacteria contamination is indicative of a public health risk. Available information indicates that high bacteria densities have persisted in the beaches and creeks included in this project, further, we have no information showing that sewage, human wastes, and domesticated animal wastes have been removed from nuisance flows and storm water runoff in any of the watersheds. Even if new data and information are obtained that result in more accurate model and TMDL results, chances are that significant load reductions would still have to take place. As the waterbodies included in this project have been on the List of Water Quality Limited Segments for years, there is no reason why dischargers cannot begin or continue with attaining load reductions immediately.

Please see the response to Comment 58 for further discussion of this issue.

Comment 171

Section 11 Implementation Plan: It should be clarified in the TMDL that the compliance schedule applies to Phase II MS4 dischargers and persons responsible for controllable non-point source (NPS) discharges. As such, the Regional Board should commit to a time schedule for pursuing regulatory controls for all sources of bacteria identified in the TMDL: Phase II MS4 systems, individual landowners with controllable NPS discharges such as nurseries, dairies, horse ranches, septic systems and manure composting operations.

Response: The Technical Report clearly states in Table 11-2 that owners and operators of small MS4s (Phase II) are considered responsible municipalities. Section 11.2, Implementation Plan Objectives, outlines specific actions we will pursue in executing these TMDLs. We will reissue or revise the various existing statewide and regional NPDES requirements that regulate urban runoff and other point source discharges to beaches and creeks addressed in this project, including small MS4s. We will also enforce the Waiver Policy, which will address nonpoint, but controllable sources. We have not committed to a specific timeframe to accomplish these tasks as they must be prioritized with other Board projects.

Comment 172

Section 11 Implementation Plan: Clarification of the requirements of the monitoring in Bacteria Load Reduction Plans is necessary for the following items:

a) Provide information showing whether or not wasteload reductions are being met. As previously discussed (see SAG consensus point #1) the mechanism for computing compliance with wasteload reductions expressed as million billion MPN/year is unknown. As shown by Graph 1, bacteria water quality data is extremely variable. For example, two samples taken side-by-side at the same time can result in widely varying results. Similarly, flow rates within many urban creeks vary significantly on an hourly and sub-hourly basis. Accurately computing the bacteria load and any wasteload reduction is much more complicated than simply multiplying a single concentration value by an instantaneous flow rate. Further, utilizing the TMDL model for such characterization would be beyond the capabilities of most municipal dischargers, requiring expert support from consultants knowledgeable in model configuration and with the computer capabilities to manage the process.

Chairman Minan requested staff provide "…the support for why that approach (expressing wasteload reductions as million billion MPN/year) is better than the approach taken with respect to Santa Monica Bay. And this is a point that the SAG group raised. So I think you are going to need to do some additional work in that area." (February 8, 2006 Regional Board Meeting Transcript, 52)

b) Locate anthropogenic hot spots and identify and characterize anthropogenic bacteria sources. Reliable scientific methods for differentiating between human and non-human sources of bacteria do not currently exist. It is unclear how dischargers will be able to determine whether bacteria originate from anthropogenic or natural sources.

Response (a): We do not agree that the specificity discussed in this comment is necessary to incorporate into the Technical Report. First, although TMDLs are expressed as "loads" in Tables 9-1 through 9-12, this does not imply that compliance will necessarily be measured in this metric. Second, the manner in which WQBELs are expressed (which must be consistent with WLAs), will be determined upon revision or reissuance of the NPDES requirements for urban runoff. The public process associated with reissuance of the NPDES requirements is the proper place to propose alternative metrics to measure compliance. Please see the response to Comment 147 for further discussion.

Response (b): In order to comply with the stated condition, dischargers do not necessarily have to differentiate between human and non-human sources of bacteria (we assume that the comment implies the use of DNA or other molecular-based approach). More appropriately, dischargers should differentiate between anthropogenic and non-anthropogenic sources of bacteria. For example, dischargers can check suspect bacteria hotspots for upstream cross-connections between sewer and storm drain lines. Additionally, evidence of pet waste, lawn over-fertilization, or trash, are sources of bacteria that we consider anthropogenically-derived, and therefore controllable.

We cannot clarify how compliance will take into account natural sources of pollutants, because these details are not necessary at this stage, and are more appropriately discussed upon re-issuance of NPDES requirements. Dischargers should propose both compliance methods and assessment locations in their Bacteria Load Reduction Plans, which will be unique to each watershed.

Comment 173

In our previous comment letters we have expressed concerns about 1) the technical underpinning that has been used for the development of the Project I Bacteria TMDL, and 2) various policy-level implications associated with the TMDL as proposed. Former Board Chairman Minan clearly appreciated these concerns, as he requested staff to provide "the support for why that approach (expressing wasteload reductions as million MPN/year) is better than the approach taken with respect to Santa Monica Bay" (February 8, 2006 Regional Board meeting).

Response: Please see the response to Comment 147.

Comment 174

The City of Del Mar should not be listed as a responsible municipality in Table 11-2 Responsible Municipalities and Lead Jurisdictions

Miramar Reservoir

The City of Del Mar has drainage from only 150 acres or four tenths of one percent of the Miramar Reservoir Hydrologic SubArea as shown in Figure 1 (Attachment A). The Draft Technical Report names the bacteria-impaired water quality limited segments (Table 3-1) in this watershed as the Pacific Ocean Shoreline for the Miramar Reservoir HA (part of Los Peñasquitos).

Del Mar acknowledges it will have a role in the continued monitoring and assessment of the Anderson Canyon storm drain outfall and will collaborate with watershed dischargers, including the North County Transit District, as part of the bacteria TMDL process. Del Mar anticipates a level of effort comparable to the limited geographical contribution to the watershed and does not believe it is appropriate to be named as the "responsible municipality" in charge of reporting and submittals on behalf of the Miramar Reservoir HA dischargers which includes much larger jurisdictions with more at stake in the program. Del Mar requests that an alternative "default" Responsible Municipality be named in the Draft Technical Report in Table 11-2 – Responsible Municipalities and Lead Jurisdictions; either Poway or the City of San Diego would be equally appropriate.

A similar request has been granted on comparable grounds in the past and Del Mar is no longer listed as the Lead Copermittee for the Los Peñasquitos Watershed in the Municipal Separate Storm Sewer System NPDES Permit or Tentative Order No. R9-2006-0011 (see Table 4 in the order).

Response: We agree that the default Lead Jurisdictions described in Table 11-2 should be consistent with the Lead Copermittees described in Order No. 2007-0001, *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, and the San Diego County Regional Airport Authority.*. Therefore the Lead Copermittee for the Miramar Reservoir hydrologic area will be changed to the City of Poway in the Technical Report.

Comment 175

Del Mar requests that Torrey Pines State Beach at Del Mar (Anderson Canyon) be removed from the Bacteria TMDL Project I

The water quality impaired or 303(d) listing from 1998 is the basis for the beach segments included in this Bacterial TMDL. The listing was last approved by EPA in July 2003 but was not updated to reflect new data and information. The most recent coastal water quality data collected by Del Mar and other stormwater program copermittees to comply with the Coastal Outfall Monitoring Program in Order No. 2001-01 has not been taken into account. The data has been reported annually as part of the reporting and monitoring program requirements, most recently in the *San Diego County Municipal Copermittees 2004-05 Urban Runoff Monitoring Final Report (December 2005).* The coastal outfall monitoring program includes hundreds of samples of the receiving water tested for total coliform, fecal coliform and enterococci **that clearly demonstrate that water quality for various segments of the Pacific Ocean shoreline are not bacteria-impaired**. It is Del Mar's opinion that the listings in San Diego County, including the Torrey Pines State Beach at Del Mar (Anderson Canyon), should be reassessed using data collected and reported from April 1, 2003 through August 15, 2006. The data includes 165 samples tested for all three bacterial indicators and shows attainment of water quality during this time period (see Attachment B). We request that the Regional Board initiate delisting of Anderson Canyon by applying the guidance in State Water Resources Control Board Resolution No. 2005-0050 as described in Section I.A:

> **"If the water body is neither impaired nor threatened, the appropriate regulatory response is to delist the water body.**
>
> The first step in addressing a listing is to identify the scope of the problem. In some cases, this analysis will lead to a conclusion that standards are in fact being attained and the water is not threatened, either because the assumptions underlying the listing were incorrect, or because the impairment has been corrected. In such circumstances, it is appropriate to delist the water body in accordance with the "Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List."

If the implementation of the Bacteria TMDL Project I continues as described in the Draft Technical Report and the existing data is not fully considered, valuable municipal and state resources will be spent on a project that will not provide a benefit to water quality comparable to the expenditures.

Response: Even though recent measurements show that the Del Mar beach at Anderson Canyon meets WQOs (at least during dry weather), this and other improved sites will remain included in this project. Whether or not these beach segments meet WQOs during storm events is unclear, since the data submitted for de-listing purposes consisted strictly of dry weather samples. In a letter to the SWRCB dated January 31, 2006, the San Diego Water Board recommended that all waterbodies, regardless of quality during dry weather, remain listed if no wet weather data is available to demonstrate support of beneficial uses. Furthermore, whether or not the SHELL use is supported is also unclear, since the data used for de-listing was not evaluated using the total coliform SHELL WQO.

Although dry weather bacteria load reduction plans would not be required for the watersheds draining to these beaches and any beaches meeting WQOs, BMPs implemented in these watersheds to reduce bacteria loading should be maintained, and monitoring, even if on an infrequent basis to assess the effectiveness of the BMPs, should continue. Wet weather bacteria load reduction plans are still needed, unless dischargers can demonstrate attainment of uses in wet weather. Dischargers can discuss the possibility of a reduced level of monitoring and reporting at sites such as Anderson Canyon with San Diego Water Board staff who oversee the TMDL implementation. TMDL implementation will take place primarily by incorporation of WQBELs into WDRs for urban runoff (such as Order No. 2007-0001). The process is described in section 11.5.3 in the Technical Report.

Comment 176

The Report should clearly establish a commitment to re-evaluate and recalculate the TMDLs on a five-year schedule. This is supported by the following:

i. Limited data from 2002 were used to calibrate the model and substantially more data will be available

ii. Land use data from 2000 was used to calibrate the model and needs to be updated to fairly develop the wet weather allocations to dischargers

iii. Southern California Coastal Water Research project and others are conducting research studies that will further our understanding of background loads and the linkage between indicator bacteria and human pathogens. The results of these studies expected in two to three years should be used to further improve the TMDL analysis.

iv. Based on the results of the year five re-evaluation, the mandatory compliance benchmarks contained in Table 1-2 also will need to modified accordingly.

Response: Please see response to Comment 58.

Comment 177

One reason why it is important to consider more appropriate pollutant loads at this point in time is that anti-backsliding provisions in the Clean Water Act will not allow the Regional Board to increase the Waste Load Allocations (WLAs) associated with these TMDLs once the TMDLs are incorporated into the San Diego Municipal Storm Water permit. Even if the standards can be relaxed after they are incorporated into the Storm Water permit, the City will have already taken expensive activities to comply with the TMDLs as proposed prior to relaxation of the standards.

Response: The San Diego Water Board can increase the WLA after the TMDLs are incorporated into the San Diego Municipal stormwater requirements as a result of new site specific objectives, a change to beneficial uses, or a refinement of the TMDLs based on new data. NPDES regulations [40 CFR section 122.44(l)(1)] prevent backsliding unless the circumstance upon which the previous permit was based have materially and substantially changed since the time the permit was issued. New site specific objectives, a change to beneficial uses, or a refinement of the TMDL based on new information would qualify as a material and substantial change of circumstance.

Comment 178

The San Diego Municipal Storm Water permit prohibits using Waters of the State to convey or treat storm water. The Bacti-1 TMDL indicates that WLAs must be met prior to discharge of storm water into receiving waters. Given San Diego's topography and existing storm water conveyance system design, Waters of the State/receiving waters generally occur immediately below (downstream of) storm drain outfalls. Therefore, treatment facilities must be located above (upstream of) storm drain outfalls. Moreover, given the propensity for bacteria to breed in the storm drain conveyance system, treatment facilities must be located as close to storm drain outfalls as possible, as the bacteria that regrows in storm drains is considered to be anthropogenic and subject to the zero WLA. Most land above storm drain outfalls is developed with private land uses and these land uses would be displaced by the construction of treatment facilities.

The environmental analysis for both TMDLs states that the construction of treatment BMPs has the potential to displace crops, native biota, and existing land uses but suggests that these impacts can be avoided or minimized by locating treatment BMPs where these things are not present. However, all evidence presented dictates that compliance via treatment requires treatment facilities to be located close to and upstream of storm drain outfalls. Even if treatment facilities are built underground, structures cannot be re-built on top of them. Instead of indicating where treatment BMPs should not be located, the City suggests that the environmental analyses focus on where treatment BMPs may reasonably be located and evaluate the impacts of building treatment BMPs at those locations.

Response: The CEQA requires the San Diego Water Board to consider a reasonable range of specific sites in its analysis, but does not require us to speculate on the specific locations where the dischargers may or may not choose to build BMPs. However, in evaluating potential impacts of BMPs, we considered what those impacts might be in all land use types present in the watershed. We disagree that structures cannot be built on top of underground detention basins. Please see the response to Comment 233.

Comment 179

Please clarify where compliance would be measured for both TMDLs. How would an evaluation of compliance take into account pollutants such as feral animal excrement and aerially-deposited metals that are allowed into receiving waters downstream of storm drain outlets?

Response: We cannot clarify where TMDL compliance will be measured, or how compliance will take into account natural sources of pollutants, because these details are not necessary at this stage, and are more appropriately discussed upon re-issuance of NPDES requirements. Dischargers should propose both compliance methods and assessment locations in their Bacteria Load Reduction Plans, which will be unique to each watershed.

Comment 180

Is it possible to increase the WLAs for either TMDL (i.e., as a result of new Site Specific Objectives, change to beneficial uses, results of implementing a tiered approach, completion of the bacteria reference study) after the TMDL is incorporated into the San Diego Municipal permit?

Response: Yes it is possible to increase WLAs after the WQBELs have been incorporated into the NPDES requirements.

Comment 181

When is it anticipated that the TMDLs will be incorporated into the San Diego Municipal permit?

Response: The TMDLs must undergo a series of approvals before they can be incorporated into Order No. R9-2007-0001. The TMDLs must be adopted by the San Diego Water Board, followed by the State Water Resources Control Board, Office of Administrative Law, and USEPA. The approvals following the adoption by the San Diego Water Board typically take 6 to 12 months. Incorporation of TMDLs into the NPDES requirements will take place upon the normal 5-year renewal cycle, or sooner, if appropriate.

Comment 182

The City requests that both TMDLs include a re-evaluation provision so that the need for the final WLAs can be formally re-evaluated after non-structural and less-intensive BMPs are evaluated for their maximum effectiveness.

Response: Please see the response to Comment 58.

Comment 183

The City is requesting that San Diego State University and any other universities and colleges be notified to participate in these TMDLs and the Phase II Municipal Storm Water Permit program.

Response: Please see the response to Comments 156 and 157.

Comment 184

For the bacterial TMDL, please clarify whether the final Waste Load Allocation for all anthropogenic indicator bacteria is zero.

Response: Yes, the final wet weather WLAs for anthropogenic sources of bacteria are zero. The WLAs will be revised when the final TMDLs are revised pursuant to either the reference system or natural sources exclusion approach.

Comment 185

For the bacterial TMDL, please clarify whether bacteria from feral dogs and cats, potable water (up to 2 MPN/100 ml) that could be used to maintain wetland vegetation after diverting dry weather flows, and re-growth in storm drains would be considered anthropogenic sources.

Response: Feral dogs and cats could be considered anthropogenic sources. Because domestic or feral animals are, or can be in contact with humans, they are capable of spreading pathogens to humans, and feral dog and cat populations can be controlled. Therefore loads from these sources should be reduced. Potable water used to maintain wetlands is not considered a source of bacteria. If human pathogens do not regrow in storm drains, then this regrowth could be considered non-anthropogenic. Information on whether or not human pathogens regrow in storm drains is not conclusive.

Comment 186

If future monitoring were to find that that bacteria concentrations are in excess of the TMDL limits, please clarify how it would be determined whether the exceedence is or is not due to anthropogenic bacteria. Would the City be required to conduct DNA testing to prove that anthropogenic bacteria are not the cause of the exceedence? We are not aware of many laboratory facilities that can conduct this type of testing.

Response: Please see the response to Comment 172 b).

Comment 187

On page 10, the Bacteria TMDL lists the municipalities and Caltrans that are in the Chollas Creek Watershed. The City requests that the US Navy be included in this TMDL.

Response: The US Navy is a small MS4, therefore they are responsible for meeting TMDL requirements where its facilities are located in impaired watersheds.

Comment 188

The City is concerned why we have to investigate bacteria loads from Regional Board regulated landfills when these facilities already have WDRs. The City is requesting that draft report removed those landfills with existing WDRs from this TMDL because those facilities are regulated directly by the Regional Board.

Response: Please see the response to Comment 167.

Comment 189

The SAG consensus points in Prior Comments both remain unanswered and valid, as does the recommendation: The Technical Report should clearly establish a commitment to re-evaluate and re-calculate the TMDLs on a five-year schedule.

Response: Please see the response to Comment 58.

Comment 190

The last paragraph of Section 11.5.3 indicates that dischargers to certain beach segments that were being de-listed in 2006 would not be required to prepare Bacteria Load Reduction Plans. There are a significant number of other beaches that were proposed for de-listing in 2006 but were not considered for it due to technicalities not related to actual water quality; these beaches (and perhaps some additional ones) are expected to be re-nominated and successfully de-listed in 2008. The Bacteria Load Reduction Plans are not scheduled to be completed until 2009. The second sentence in this paragraph should be modified as follows:

> *For those beach segments de-listed in 2006, or other beach or creek segments removed from the 303(d) list prior to the scheduled completion date for its respective Bacteria Load Reduction Plan, municipal dischargers and Caltrans need not prepare Bacteria Load Reduction Plans for their discharges in these watersheds.*

Response: We have revised the indicated language in the Technical Report, but we did not use the suggested language in this comment. Because the beaches that were de-listed in 2006 were not evaluated against the SHELL total coliform WQO, whether or not the SHELL beneficial use is supported is unknown. Furthermore, the data used for de-listing purposes was confined to dry weather conditions. This indicates that several municipalities have been effective at implementing dry weather BMPs. Therefore, Bacteria Load Reduction Plans are still needed in all watersheds for wet weather, unless dischargers demonstrate that uses are attained in wet weather.

Comment 191

Section 11.5.6 indicates that active Municipal Solid Waste Landfills should be investigated to determine if they are potential sources of bacteria, but the Section does not explain who is supposed to be performing these investigations. Since these facilities are separately permitted, this would seem to be an appropriate task for the RWQCB.

Response: Please see the response to Comment 167.

Comment 192

Del Mar requests that Torrey Pines State Beach at Del Mar (Anderson Canyon) be removed from the Bacteria TMDL Project I

The most recent water quality impaired list or 303(d) listing, dated October 25, 2006, should be the basis for including the beach segments in this Bacterial TMDL project. The listing was last approved by the State Water Resources Control Board to reflect new data and information in accordance with the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (Listing Policy). The fact sheet for the Pacific Ocean Shoreline at Miramar Reservoir HA (Attachment A) recommended the delisting of the segment using the weight of evidence and in compliance with the Listing Policy. Del Mar asserts that the Bacteria TMDL Project I Draft Technical Report must be amended to show this segment has been removed and no longer requires a TMDL. This action is necessary in order to provide consistency and clear priorities, for both the RWQCB and dischargers, in the development and implementation of TMDLs.

Response: Please see the response to Comment 175.

Comment 193

Del Mar requests that Table 1-1. Bacteria-Impaired Water Quality Limited Segments Addressed in this Analysis be modified.

Table 1-1 Bacteria-Impaired Water Quality Limited Segments Addressed in this Analysis should be modified and the segment for Miramar Reservoir HA removed to reflect the delisting of this area as of October 25, 2006 and to make it consistent with the Listing Policy.

Response: Please see the response to Comment 175.

Comment 194

Del Mar requests removal from the obligation to prepare a Bacteria Load Reduction Plan and comply with reporting requirements.

Removing the Miramar Reservoir at Anderson Canyon segment from the Bacteria TMDL Project I effectively eliminates the requirement to develop and implement the Bacteria Load Reduction Plan required per Section 1.6 of the Technical Report. Del Mar believes that the language in Section 1.6 is too vague and may require unnecessary plans and reports for a water segment that has been delisted by the SWRCB and approved by EPA. Removing the segment from the TMDL project effectively eliminates the City's (and other parties) obligation to comply with these requirements. Limiting this project to the 303(d) listings complies with the State's policies and allows the City to focus resources on high priority water impairments and future TMDLs, rather than on a segment that has effectively shown attainment with water quality objectives.

Response: TMDLs for beaches that have been de-listed in the section 303(d) process ensures that dischargers continue to implement BMPs to meet WQOs. We agree that dischargers should focus their resources on problematic areas, therefore areas meeting WQOs can be considered low priority and a reduced level of monitoring can suffice. Bacteria Load Reduction Plans for wet weather are still needed as described in the response to Comment 175.

Comment 195

Del Mar requests changes to Table 11-2 Responsible Municipalities and Lead Jurisdictions.

Del Mar urges that the Miramar Reservoir HA (906.10) Torrey Pines State Beach at Del Mar (Anderson Canyon) segment be removed from Table 11-2 for the same reasons noted previously.

Responses: Please see the response to Comment 175.

Comment 196

Del Mar requests changes to Table 11-3 Prioritized List of Impaired Waters for TMDL Implementation.

Del Mar urges that Miramar Reservoir HA (906.10) watershed be removed from Table 11-3 for the same reasons noted previously.

If the revisions requested by Del Mar are not incorporated, the end result for this and future TMDLs will be unpredictable and unjustifiable expenditures of limited resources. Del Mar seeks consistency throughout the region and the State so that an "even playing field" is set as originally intended by the SWRCB and the Delisting Policy. If the implementation of the Bacteria TMDL Project I continues as described in the Draft Technical Report, the Regional Board will be deviating from the SWRCB Listing Policy and defying its purpose. Del Mar believes the revisions to the delisting shown in the 303(d) List for 2006 should occur prior to approval of the Bacterial TMDL Project I.

We believe that our position is consistent with what we have heard you say on numerous occasions…..that agencies need to be strategic in what they attempt to do in order to leverage limited resources in the most cost-effective ways.

Response: We disagree that this and future TMDLs will cause unpredictable and unjustifiable expenditures of limited resources. The goal of the implementation plan is to attain and maintain WQOs throughout all seasons and hydrologic conditions. If dischargers have met this burden, then their only expenditures would be to report that WQOs are attained, and reporting would occur at an appropriate frequency as specified in the discharger's monitoring and reporting programs.

Comment 197

The last paragraph of Section 11.5.3 indicates that dischargers to certain beach segments that were being de-listed in 2006 would not be required to prepare Bacteria Load Reduction Plans. There are a significant number of other beaches that were proposed for de-listing in 2006 but were not delisted; these beaches are expected to be resubmitted and successfully de-listed in 2008. In addition, other beaches have since been evaluated and have met delisting criteria (all the water segments in Dana Point HSA 901.14, for example), and are anticipated to be delisted from the 2008 303(d) List. The Bacteria Load Reduction Plans are not scheduled to be completed until 2009. The second sentence in this paragraph should be modified as follows:

> *For those beach segments de-listed in 2006 or 2008, or other beach or creek segments removed from the 303(d) list prior to the scheduled completion date for its respective Bacteria Load Reduction Plan, municipal dischargers and Caltrans need not prepare Bacteria Load Reduction Plans for their discharges in these watersheds.*

Response: Please see the response to Comment 190.

Comment 198

Page 7, Section 1.4 This section discusses modeling used to estimate existing bacteria loads and discusses using estimates for model flow and bacteria loading. Later on page 160 the report discusses collection of useful data for model improvement. There should be some language added that gives flexibility written in to the implementation plan for the new data and results.

Response: Please see the response to Comment 58.

Comment 199

Page 60, Section 7.1.1.d explains the complexity inherent in bacterial modeling. Any kind of watershed loading or waterbody dispersion model must be developed, calibrated and validated with rigorous data sets. The report indicates this did not occur with Chollas Creek. Therefore, it is recommended that a monitoring program be established to gather the data necessary to tailor the model for this watershed.

Response: Dischargers are free to propose the execution of special studies for the purpose of gathering data for model improvement as part of their Bacteria Load Reduction Plans.

Comment 200

The City of Poway is requesting to be removed from its responsibility for the listed areas of the San Diego River Watershed: Mission San Diego, HSA (907.11) and Santee HSA (907.12). The justification for this request is that in California Regional Water Quality Control Board, San Diego Region, Order No. R9-2007-0001, the City of Poway has been removed from responsibility for the entire San Diego River Watershed.

As you know, the City only occupies 120 acres of this watershed, all of which is protected habitat. This area is located on top of Iron Mountain, as shown on the enclosed map. Because this land is zoned as Open Space—Resource Management, it can never be developed. This small area will remain in a natural state and does not have the potential to discharge pollutants to the watershed.

Response: We agree with this comment. The City of Poway has been removed from the list of responsible municipalities in hydrologic sub-areas 907.11 and 907.12.

Comment 201

Section 11.5.3 specifies that dischargers to certain beach segments that were being removed from the 303(d) list in 2006 would not be required to prepare Bacteria Load Reduction Plans. This section makes no reference to segments eligible for removal from the 2008 list. While the suitable segments in Laguna Beach were eligible for removal in 2006, they must now wait for the 2008 cycle for final delisting. The final TMDL should have provisions for exemption from the requirements of creating a Bacteria Load Reduction Plan for segments delisted in the 2008 cycle.

Response: Please see the response to Comment 190.

Comment 202

The City of Laguna Beach is also concerned with the seemingly "open ended" commitment implied by the draft TMDL. The final TMDL should provide provisions for dischargers who meet the goals of the program to be exempted from the requirements of the program.

Response: The provisions for dischargers who have implemented bacteria load reduction strategies, which have resulted in subsequent de-listings, are described in the response to Comment 175.

Comment 203

The City of Laguna Beach has invested a great deal of effort and funding into bacteria reduction and the protection of beneficial uses along our shoreline. The results of these efforts are clear- the Pacific Ocean shoreline along much of the Laguna Beach coastline meets the bacteria standards established in the 303(d) delisting guidelines. The City feels that future efforts and funding commitment should be made in areas where bacteria is a significant problem rather than areas where goals have been met.

Response: We agree with this comment and therefore the language in the Technical Report acknowledges the reduced level of effort needed from dischargers in areas meeting de-listing guidelines. Please see the response to Comment 175.

Comment 204

Lastly, the City continues to support the Aliso Creek SUPER project to meet the TMDL standards in the Aliso Hydrologic Sub-Area. The City urges the Regional Bard to adopt a balanced approach to achieving water quality objectives which includes source control, public outreach and Best Management Practices as proposed by the SUPER project; bio-filtration, erosion prevention, structural diversions and in-stream treatment.

Response: We agree that a balanced approach to achieving WQOs should include source control, public outreach, and the various BMPs suggested in this comment. Dischargers should include such measures in their Bacteria Load Reduction Plans. Also, dischargers should not wait for TMDL adoption and approval to begin reducing loads from other pollutants.

Comment 205

The issue of uncertainty about the linkage between indicator bacteria and human pathogens is worsened by the fact that farmers may choose to use composted manures and greenwaste mulches to reduce the use of manufactured nutrients and control runoff. Studies have shown substantial increases in the presence of indicator bacteria, but no human pathogens, when composted manures and greenwaste are used. If farmers administer those practices in an effort to come into compliance with stormwater regulations they may find they are running afoul of the TMDL because of the production of indicator bacteria.

Response: We agree that properly composted manure should not contain pathogens, and therefore bacteria from farming sites using properly composted manure do not pose a public health threat. Composted manures and greenwaste mulches can be effective at minimizing runoff; therefore, we anticipate its use will help, and not worsen, bacteria loads leaving sites.

Comment 206

Should this TMDL move forward as written it is our suggestion that farm sites identified as sources of indicator bacteria be further tested by the Regional Board to make the positive identification that human pathogens are present. While we have no reason to question that farm sites could be sources of indicator bacteria, it is imperative that positive linkages be established to avoid punitive measures that will do nothing to improve water quality on our beaches and in our creeks.

Response: We agree that testing for human pathogens may be a definitive way to rule out farm sites as sources of pathogens. However, this is not needed as a first step in ensuring that discharges from farms contain pathogens (or even bacteria). We are assuming that farms are not discharging bacteria and pathogens because they are prohibited from doing so under waivers of WDRs. We may have to enforce the waivers in order to confirm this assumption. If, when doing so, we find that farmers are abiding by the conditions set forth in their waivers, yet there are still bacteria loads coming from agricultural land use areas, we could require the owners and operators of the agricultural to perform testing for pathogens.

Comment 207

Concerns About Waste Load Allocation (WLA) Metrics Should be Addressed Through WQBELS

One of our earliest consensus points with all members of the SAG was that expressing the waste load allocations as number of bacteria colonies per year (billion MPN/yr) was not a useful metric for measuring compliance with the TMDL. Many of the concerns over the last four years of public participation and at the April 25th public hearing centered on this measurement of TMDL compliance.

An often-voiced complaint is that using an annual load metric in the TMDL will make it impossible to assure compliance in the beaches and creeks. We certainly agree that importing the WLAs wholesale into permits would be confusing and detrimental to achieving cost-effective reductions. However, such metrics can and should be changed when the water quality based effluent limits (WQBELs) are developed in response to the WLAs. Indeed, the draft Technical Report specifically allows for this possibility. "WQBELs may be expressed as numeric effluent limitations using a different metric, or, more likely, as BMP development, implementation, and revision requirements." Draft Technical Report at 150.

As staff explained at the April 25th hearing, such matters are appropriately resolved after the adoption of the TMDL. Indeed, a WQBEL is based on the WLAs in the adopted

TMDL. We agree that the number of days that exceed beach water quality standards may be a more easily implementable metric than total number of bacteria in the water for implementation of the TMDL. However, we cannot agree that using the annual or monthly load metric in the TMDL itself is incorrect. WQBELs need only be consistent with the requirements of the WLAs in a TMDL, the two need not be identical. As staff has explained, the stakeholder group will be engaged by staff to choose a useful and appropriate metric for implementation.

Response: We agree with this comment. An appropriate metric for measuring compliance with TMDLs will be selected with public input upon re-issuance of the pertinent NPDES requirements.

Comment 208

A Reference-Based approach is appropriate for setting waste load allocations and load allocations.

Heal the Bay strongly favors the Los Angeles Water Quality Control Board's approach in setting the TMDL targets for the Santa Monica Bay Beaches Bacteria TMDLs. This approach is based on exceedances of fecal indicator bacteria standards for both interim and final TMDL targets. The most important beneficial use that is impaired by high fecal indicator bacteria densities is recreational water contact. A TMDL based on the total number of fecal bacteria in the water, rather than the numbers of days that exceed beach water quality standards, will not lead to beneficial use attainment and is an insurmountable compliance assurance problem. How will anyone be able to determine compliance with a monthly waste load allocation in terms of billion MPN/month? Further, how will this approach verify that the receiving waterbody is no longer impaired?

Every time a beach water quality standard is exceeded, a beach gets closed or warning signs are posted, and this is an impaired beneficial use. An exceedance based approach is more consistent with current risk management procedures, AB 411 requirements, and public health protection.

Response: We agree that measuring TMDL compliance with exceedance days may be a suitable metric for beaches. Therefore, we encourage the commenter to stay involved with the public process associated with the re-issuance of the municipal NPDES requirements, which is the appropriate forum for determining the compliance metric(s) for these TMDLs. Please see the response to Comment 147 for further discussion. Unlike the Santa Monica Bay TMDLs, this project is inclusive of inland creeks, and therefore compliance methods must be suitable for determining attainment of standards in creeks in addition to beaches.

We further agree that a compliance metric based on exceedance days is consistent with current risk management procedures. However, in terms of formulating strategies for BMP implementation, the exceedance days approach does nothing to help dischargers quantify the magnitude of existing loads. A loading approach provides the ability to calculate percent reductions needed in each unique watershed. For example, in the San Luis Rey watershed, a 3 percent reduction is needed in fecal coliform loading, compared to a 53 percent reduction needed in the San Diego watershed. Further, the load contributions by land use are discussed in Appendix I. This information is useful in determining which watersheds require the most effort, and what types of BMPs may be effective, and where they might be placed. An exceedance day-based analysis does not provide such useful information.

5.6 Compliance Schedule

Comment 209

Compliance Schedule and Proposed Reductions: We are concerned that the time schedules and percent reductions proposed are too aggressive and do not fully recognize; 1) the bacteria source identification technical advances and special studies (natural loading etc.) that are necessary to achieve the bacteria reduction levels, and 2) the time necessary for public agencies to execute the watershed agency agreements, work contracts and budget the necessary funds to execute the implementation plan. We recommend the time schedule be reevaluated to allow adequate time to address the necessary steps for successful compliance.

Response: We disagree that the proposed compliance schedule is too aggressive and does not recognize the need for special studies or the time needed for dischargers to execute the implementation plan. The bacteria TMDLs can be recalculated if justified by technical advances or the results of special studies. However, these advances or studies are unlikely to justify no bacteria load reductions, thus moving forward with implementation of the TMDLs is justified. In establishing the compliance schedule for achieving the TMDLs, we must balance the need of the dischargers for a reasonable amount of time to implement an effective BMP program against the broad-based public interest in having water quality standards attained in beaches and creeks 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 light of these considerations, the San Diego Water Board believes the compliance schedule in the Technical Report is reasonable.

Some of the beaches and creeks included in the Technical Report were placed on the List of Water Quality Limited Segments in 1996. Others were placed on the List in 1998 or 2002. If the dischargers were not aware of the List of Water Quality Limited Segments during any of these listing cycles, the problem was brought to their attention in March 2003 when the San Diego Water Board held its first public workshop and CEQA scoping meeting regarding these TMDLs.

In 1999, WDRs for Caltrans' MS4 discharges were issued by the SWRCB. Receiving Water Limitation No. C-1-3.a of these WDRs (SWRCB Order No. 99-06-DWQ) prohibits the discharge of stormwater from a facility or activity that causes or contributes to the violation of WQSs or WQOs. Similarly, dischargers regulated under San Diego Water Board Order Nos. 2007-0001 and Tentative Order 2007-0002 (San Diego County and Orange County MS4 NPDES requirements for discharges of urban runoff) are subject to a similar prohibition (Receiving Water Limitation No. A.3.a.1).

The Caltrans, San Diego County, and Orange County MS4 NPDES requirements place an additional obligation on the dischargers to 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 WQSs (Receiving Water Limitations No. A.3.a.1 respectively). The WDRs require implementation of the BMPs described in the report. This obligation is triggered when either ***the dischargers*** or the San Diego Water Board determine that MS4 discharges are causing or contributing to an exceedance of an applicable standard, in this case, indicator bacteria and their associated beneficial uses. To date, neither Caltrans nor the municipal dischargers have formally made this determination or notified the San Diego Water Board as required by conditions of their WDRs.

Considering that initiation of the TMDLs took place upon the first public workshop in 2003, and the existing obligation under the Receiving Water Limitations, the compliance schedule has not been modified. Dischargers should not be rewarded for their lack of action to restore WQOs in beaches and creeks during wet weather flows. Dischargers should have initiated BMP planning and monitoring to address the impairments following adoption of WDRs in 1999 (Caltrans), 2001 (San Diego County MS4s), and 2002 (Orange County MS4s), respectively. We recognize that dischargers will face difficulty reaching final TMDLs, therefore we are developing a reference system/natural sources exclusion Basin Plan amendment, as discussed in the response to Comment 2. We will recalculate final wet weather TMDLs and modify the compliance schedule upon adoption of this Basin Plan amendment.

Comment 210

Table 1-2- Compliance Schedule – The timeframe of 5 to 7 years for a 50% waste load reduction is not realistic. The control of wet weather flows is a substantial undertaking. This allows inadequate time to fine-tune the modeling and use the results to cite the location of BMPs, identify sources, develop plans, develop memorandum of understanding with stakeholders, secure funding, acquire land, conduct permitting, bid out contracts and install BMPs.

Response: Please see the response to Comment 209.

Comment 211

The compliance schedule should separate the timeframes for dry weather versus wet weather compliance. The timeframe of 5 to 7 years for a 50% wasteload reduction, or of 10 years to 100% compliance, may be feasible for dry weather due to relatively small water volumes; and suitable because that's when most REC-1 use occurs. It is not realistic for storm flows, which account for around 98% of the annual load, because of the time required to fine-tune the modeling, locate large-volume BMPs, identify sources, develop plans, develop memoranda of understanding with stakeholders, secure funding, acquire land, conduct permitting, bid out contracts, and complete the installations. Since wet weather flows affect only a tiny percentage of REC-1 users, the separation of dry and wet weather schedules would also clarify that first priority should be given to dry weather programs, which would be most cost-effective. Furthermore, certain waterbodies were originally only 303(d) listed as impaired for wet-weather exceedances, so applying dry-weather TMDLs and schedules to them is inappropriate. We recommend that a wet-weather compliance schedule for Priority 1 sites should be 10 years for 50%, 15 years for 75% and 20 years for 100%.

Response: We have changed the compliance schedule (Table 11-4) to differentiate between dry weather and wet weather wasteload reductions. Attainment of dry weather TMDLs for REC-1 (enterococcus and fecal coliform) are required soonest. More time is allotted for attainment of wet weather and total coliform SHELL TMDLs.

Comment 212

The compliance schedule in Table 1-2 appears to combine both wet and dry weather TMDLs. In the City of San Diego approximately 296 days of the year are dry weather days, and most recreational activities occur in dry weather. It will be counterproductive to combine the relatively small, but important, dry weather loads with the large, but infrequently occurring and difficult to control, wet weather loads. Other regions (e.g., Santa Monica) have separate bacteria TMDLs for dry and a wet weather, and have applied different compliance schedules, as the control of wet weather loads is a considerable technical challenge that will take additional time and resources to achieve. As stated in our June 20, 2006 letter, we recommend a phasing of the wet- weather compliance schedule such that for Priority 1 locations the reduction target is 25% in year 5, 50% in year 10, and 75% in year 15 and 100% final TMDL compliance in year 20. The Priority 2 and 3 schedules should be adjusted accordingly.

Response: Please see the response to Comment 211.

Comment 213

TMDL implementation is recognized as likely to be very costly. We anticipate that the Bacteria Load Reduction Plans for each impaired water body will consequently be encouraged to give priority to conditions where real potential risks for public health are highest, especially during the interim prior to the 5-year re-evaluation date. In recognition of the costs and substantive technical issues, permittees should not, however, be forced to prematurely chase moving targets. **The overall Compliance Schedule should not set a 50% compliance date sooner than the recommended 5-year re-evaluation provision** so that TMDLs can be re-calculated, where appropriate, adequately in advance of mandatory compliance progress benchmarks. The overall Compliance Schedule should also reflect the daunting realities of procedural, fiscal, and inter-party coordination and staffing required to plan, design, fund, acquire land and construct multiple structural BMP projects to treat wet-weather flows over large percentages of the watersheds' urban drainage areas – very likely concurrently with implementing TMDLs for other constituents.

Please be assured that MS4 permittees have not deferred serious compliance efforts pending approval of the TMDL document or its associated schedule. It should be noted that as a result of permittees' efforts to date, the vast majority of the Orange County beach segments addressed in the Draft Report already meet de-listing criteria and are expected to be de-listed within the current 303(d) listing cycle. Despite permittee requests, RWQCB staff declined to delete these de-listable segments from the TMDL Report, helping perpetuate the (erroneous) perception that MS4 permittees haven't been taking any corrective action. Consequently, the perception also persists that setting an overall Compliance Schedule adequate for permittees to address the more difficult conditions would allow them too much leeway to delay taking action in the short term. To address these concern, **the Load Reduction Plan to be prepared for each impaired waterbody in Year 1 should be required to include a <u>Site-Specific Compliance Schedule with expedited timeframes</u> wherever more rapid compliance is feasible.** These site-specific schedules, which would be expected in some cases to achieve compliance prior to the 5-year re-evaluation, should be incorporated into the NPDES permits along with any revised targets or allocations at the time of the 5-year TMDL re-evaluations.

The compliance schedule in the TMDL Report should reflect not only the priority that should be given to ocean beaches due to their high dry-weather REC-1 usage rates, but the practical reality that achieving compliance is going to be substantially more difficult and costly during wet weather in all already-developed watersheds. **As an outside maximum, we recommend the following <u>overall</u> deadlines for compliance:**

Year after OAL approval	
Year 1	**TMDL formally approved; Bacteria Load Reduction Planning and Data Gap Infill studies proceed**
Year 5	**5-year re-evaluation and re-calculation of models, targets and allocations based on new information**
Year 7	**50% compliance for Dry Weather at Beaches**
Year 12	**100% compliance for Dry Weather at Beaches; 50% compliance for Dry Weather at Creeks**
Year 17	**100% compliance for Dry Weather at Creeks; 50% compliance for Wet Weather at Beaches**
Year 22	**100% compliance for Wet Weather at Creeks and Beaches**

Response: The compliance schedule is not too aggressive for the reasons outlined in the response to Comment 209.

In terms of the waterbodies that have recently been delisted, please see the response to Comment 190.

Comment 214

Table 9-5: Final Wet Weather TMDLs for Total Coliform Expressed as an Annual Load's percentage of reduction does not allow for any bacteria in all storm events. It is unrealistic to expect that the City can achieve this goal in 10 years. Table 9-9: Final Wet Weather TMDLs for Enterococcus Expressed as an Annual Load's percentage of reduction does not allow for any bacteria in storm events. It is unrealistic to expect that the City can achieve this goal in 10 years.

Response: We realize achieving the necessary load reductions will be challenging. Therefore we have initiated a reference system approach Basin Plan amendment to account for natural sources of bacteria. Please see the response to Comment 2.

Comment 215

The TMDL states that the interim reductions must be required 10 years after OAL approval. It is the City of San Diego understands that TMDLs become officially once the EPA approval is given. We recommend that this statement be modified to reflect the complete process required by 40 CFR.

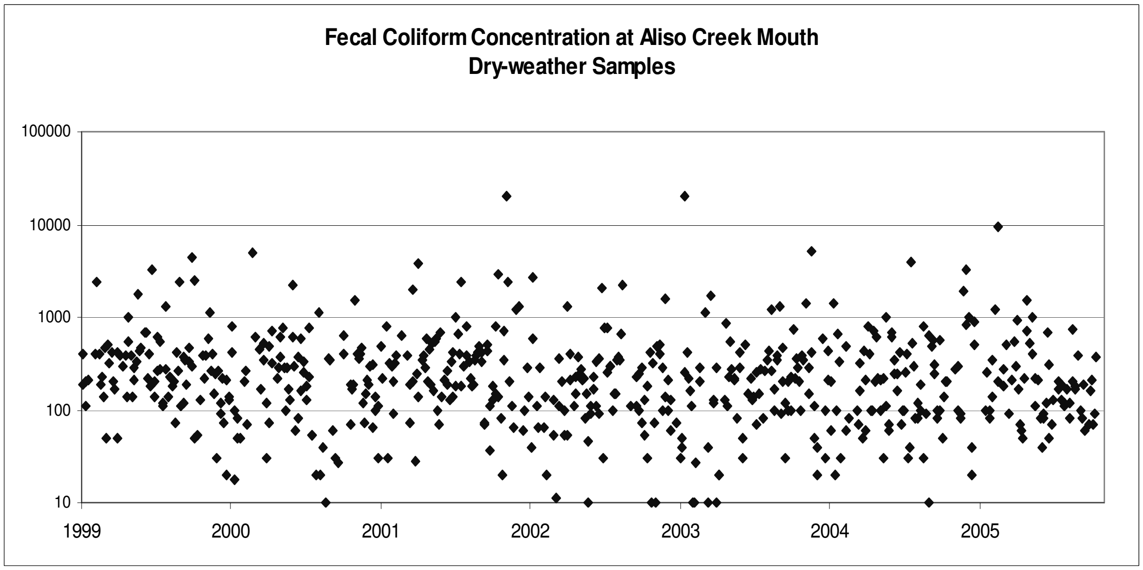
Response: Once OAL approves a rule or regulation, it goes into effect as state law and is therefore implementable. The rule or regulation remains in effect until modified. If, in its review process, USEPA requires changes to be made to the TMDLs, we would modify them appropriately.

Comment 216

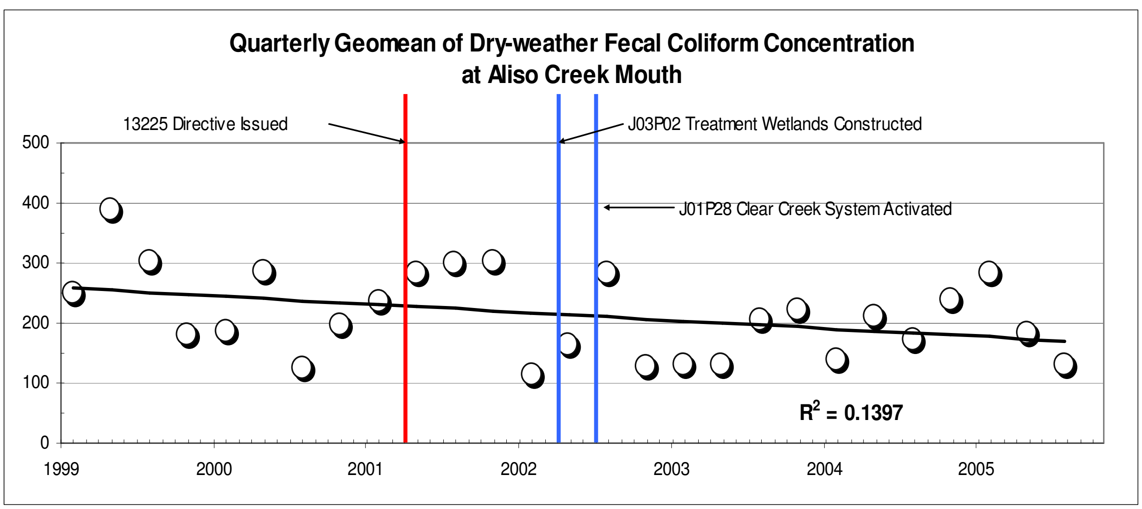
Section 9 Total Maximum Daily Loads and Allocations and Section 11 Implementation Plan: The current load reduction targets and compliance timeframes for MS4 discharges are unrealistic and unachievable and should be modified for the following reasons:

a) The load reductions and timeframes do not consider the lessons learned from the 5 year implementation of the Aliso Creek CWC §13225 Directive for bacterial impairment. To illustrate the challenges of addressing bacterial contamination the following two graphs have been developed. The first graph below shows all dry-weather fecal coliform concentrations (mpn/100 ml) at the mouth of Aliso Creek from 1999-2005. In the second graph, this data has been transformed to a quarterly geo-mean value in an effort to show trends in the data. The red vertical line indicates when the 13225 Directive was issued and intensive monitoring and BMP implementation began in the watershed. The two blue vertical lines indicate when major treatment BMPs were activated.

Graph 1



Graph 2



b) Over the past 7 years, the municipalities in the watershed have invested an estimated $10,075,400 in bacteria control BMPs, including $2,500,000 in coastal area diversions. Additionally, from April 2001 through October 2005, $2,858,251 has been spent on monitoring and data analysis. Despite these intensive BMPs efforts, a simple regression analysis of the data seems to indicate only a very weak downward in the data. The current TMDL implementation schedule requires a 50% reduction in bacteria loads in 5 to 7 years depending on watershed priority. Based on our experience in Aliso Creek, this timeframe is far too short to achieve such reductions even with intensive BMP implementation.

c) In Section 1.5 Legal Authority for TMDL Implementation Plan, the following statement is made: "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 waters of the State and that may be reasonably controlled." (emphasis added) This assumption erroneously implies that all sources of bacteria discharged via the MS4 system are controllable and has lead to the supposition that 100% reduction of dry weather bacteria loading is possible. As discussed previously, the sources of bacteria are myriad and complex. Regrowth of bacteria within the MS4 system, wildlife inputs from birds, bats and mammals living within the storm drains, and bacteria from organic matter such as leaves, soil and grass clippings are just a few common sources of fecal indicator bacteria in the MS4 system which do not contribute human pathogens, and are not controllable. Additionally, experience in the Aliso Creek watershed has shown that natural sources of bacteria can eliminate the reductions achieved through BMPs. At the J01P28 Clear Creek System, clean, treated water is discharged from an ultra-violet light disinfection system into an earthen channel with no additional inputs. After traveling 30 feet in an earthen channel before discharge into the creek, bacteria levels in the treated discharge can rebound to above water quality standards.

d) Meeting the shellfish water quality objectives should not be addressed until shellfish populations in the affected areas are documented to be sufficient for recreational harvesting. Regional Board staff has stated in meetings with the SAG that the Department of Fish and Game indicate that shellfish resources in the San Diego Region have been overfished and are not currently present at harvestable levels, if at all. As such, bacterial water quality is not the limiting factor for this issue and improvement in bacteria water quality will not result in increases in shellfish populations. Compliance efforts and timeframes should be focused on meeting REC-1 standards in a realistic manner.

e) The implementation plan should be revised to focus efforts on the reduction of sources of human pathogens rather than bacteria in the following manner:

   i) Municipalities will confirm and clearly document that there are no sources of human sewage (and therefore human pathogens) discharging into the MS4 system;

   ii) Targeted monitoring programs will be developed to identify "hot spot" storm drain discharges that are having a negative impact on bacteria levels in the receiving water, and source tracking efforts will be employed to determine whether the source is able to be identified as anthropogenic;

iii) BMPs will focus on urban-runoff reduction and public education regarding human-controlled sources of bacteria, such as pet waste and other activities.

f) Chairman Minan expressed support for an adaptive and flexible TMDL during the February 8, 2006 Board meeting:

i) Chairman Minan stated,"…I understand you are saying that it's adaptive, but when you look at the reality of the situation, I'm concerned that it may not be as adaptive as you are representing. I would be interested in your analysis." (February 8, 2006 Regional Board Meeting Transcript, 117)

ii) Chairman Minan reiterated this concern later in the hearing, "…I'm going to be very interested when the staff come back to tell us exactly how adaptive and flexible this proposal is, because I'm not convinced at the current time that it is very adaptive and flexible….I need to see the evidence to support the position with the staff on that." (February 8, 2006 Regional Board Meeting Transcript, 143)

Response (a): We disagree that load reductions and timeframes do not consider lessons learned. The compliance schedule is greater than 10 years—which is exceptionally long for TMDLs. Dischargers should focus their efforts on controllable sources of bacteria that may be associated with pathogens, as suggested in your comment e). Please see the response to comment e) below.

Response (b): We are aware of the regrowth phenomenon in conveyance pipes and hydromodified channels. This information supports the need for the natural sources exclusion approach described in the response to Comment 2, and to return hydromodified channels to more naturally functioning channels.

Response (c): Please see the response to comment e) below.

Response (d): We agree that requirements to meet the SHELL WQOs should be extended, since shellfishing is not known to occur in all areas of the region. Although it is true that shellfish populations are small in some areas, we are unsure if this is because of overfishing, poor environmental conditions, or both.

Response (e): The implementation plan will not be revised to specify that efforts to reduce bacteria should be accomplished in a certain manner, since we cannot dictate a means or methods of compliance with meeting TMDLs. The level of detail specified by the commenter is more appropriately placed in the Bacteria Load Reduction Plans, submitted by the dischargers, rather than the TMDL Implementation Plan. The implementation plan, by design, leaves dischargers with the flexibility to achieve bacteria reductions in a manner that is preferable to the discharger.

Although we cannot include the suggested language in the Technical Report, we believe the ideas specified in this comment represent a reasonable approach for achieving the load reductions. Since bacteria from natural sources may or may not contain harmful pathogens, we believe it is reasonable to prioritize efforts first on curbing anthropogenic sources of bacteria, as the commenter suggests. This approach could also build a body of data and information with which to apply the natural sources exclusion approach to a refinement of the TMDLs. See the response to Comment 2 for a discussion of the natural sources exclusion approach.

Response (f): Please see section 4.3 of this appendix for the response to this comment.

Comment 217

The City of San Diego would like to take this opportunity to express our appreciation to the Regional Board for reviewing our compliance schedule concerns and modifying the compliance schedule. On page 72, the modified compliance schedule is for all pollutants listed in the watershed. The City of San Diego is concerned that new pollutants listed in at the end of the proposed compliance schedule will be required to achieve compliance is a condensed time schedule.

Response: We suggest the City of San Diego address all known problematic pollutants in their Pollutant Load Reduction Plans in order to avoid having to achieve compliance in a condensed time schedule. Dischargers should not wait for TMDL initiation to begin strategies for reducing pollutants.

Comment 218

Table 11-5 of the Draft Technical Report presents a 'tailored' Compliance Schedule unique to Chollas Creek that extends for 20 years, with the justification that Chollas Creek dischargers will be comprehensively addressing BMP planning and load reductions for copper, lead, zinc, diazinon and trash in addition to bacteria. Considering the many acknowledged uncertainties surrounding the correlation of bacteria and actual human health risk, and the potentially enormous cost of pursuing bacteria control programs that may ultimately be recognized as not entirely justified, comprehensive multi-parameter planning and tailored compliance schedules should be actively encouraged in the TMDL for any waterbody listed as impaired or otherwise impacted by more than one constituent of concern. We suggest that the text following Table 11-5 be amended to add the following:

> *Dischargers in other bacteria-impaired watersheds will also be addressing impairments and/or load reduction programs for other pollutant constituents (i.e. metals, pesticides, trash, nutrients, sediment etc.) concurrently with the bacteria load reduction requirements in this TMDL. In these cases, the dischargers will have the option to submit a Comprehensive Load Reduction Plan for all constituents of concern in lieu of the Bacteria Load Reduction Plan for the impaired waterbody, and to propose an appropriately tailored comprehensive compliance schedule. Comprehensive compliance schedules tailored under this provision may not extend bacteria compliance milestones beyond the interim milestones set forth in Table 11-5.*

Response: We have revised the language following Table 11-5 to incorporate the concepts discussed in this comment (some revisions were made to the suggested wording; please see Technical Report for new text). One important advantage of addressing multiple pollutants concurrently, instead of consecutively, is that fewer structural BMPs will be needed. This is considered environmentally superior because we anticipate that possible adverse environmental impacts would most likely be associated with the construction and installation of structural BMPs.

Extension of the compliance schedule described in Table 11-4 is not automatic upon completion of a Comprehensive Pollutant Load Reduction Plan. Consideration for schedule extensions will take place on a case-by-case basis.

Comment 219

The overall Compliance Schedule [Table 11-4 in the current draft] should not set a 50% compliance date sooner than the recommended 5-year re-evaluation provision. *The second and third recommendation, regarding Site-Specific Compliance schedules, was addressed in my April 12, 2007 letter urging that tailored Comprehensive Load Reduction Plans and Comprehensive Compliance Schedules be available as an option for other watersheds instead of just for Chollas Creek.*

Response: Please see the responses to Comments 23 and 218.

Comment 220

In addition, several dischargers in bacteria-impaired watersheds will also be addressing impairments and/or load reduction programs for other pollutant constituents (i.e. metals, pesticides, trash, nutrients, sediment etc.) concurrently with the bacteria load reduction requirements in the bacteria TMDL. In these cases, the dischargers should have the option to submit a Comprehensive Load Reduction Plan for all constituents of concern in lieu of the Bacteria Load Reduction Plan for the impaired waterbody, and to propose an appropriately tailored comprehensive compliance schedule similar to that provided for Chollas Creek in the current version of the Project I Bacteria TMDL.

Response: Please see the response to Comment 218.

Comment 221

Compliance Schedule Is More Than Adequate To Address Bacteria Reductions

Coastkeeper supports the five to seven year schedule to meet 50% of interim reductions and the 10 year compliance schedule to meet 100% of interim targets. While we would like to see more immediate reductions, we appreciate the priority criteria outlined in the TMDL. We will work with the municipalities and EPA representatives to ensure that adequate progress is made to reach the TMDL milestones.

We do note that the Santa Monica Bay TMDL for fecal bacteria included a three year compliance schedule. That more aggressive timeline applied only to dry weather flows, and has proved very effective in reducing beach closures related to bacteria exceedances. The San Diego approach does not separate out dry and wet weather compliance schedules. However, the San Diego schedule has 50% reductions in the first 5-7 years depending on waterbody priority. As dry weather exceedances are less difficult to address than wet weather, we anticipate that municipalities will attempt to address these first. Given the success of the Santa Monica TMDL in an even shorter initial timeframe, we feel the five year milestone and ten year 100% interim reductions are certainly reasonable.

We understand the distinction made for Chollas Creek, which will be operating under a TMDL for dissolved metals as well as for bacteria. If the need for additional time is demonstrable in this instance, where best management practices will address multiple pollutants, staff should include such demonstrations in their findings. The Regional Board should not assume that waterbodies impaired by more than one pollutant will require additional time.

We cannot support the approach suggested by Laguna Niguel, that dischargers propose a compliance schedule specific to their waters after the adoption of the TMDL. This approach would undermine the certainty and transparency of the public TMDL process. Discharger plans would not be publicly noticed, and changes could be accepted by staff without the knowledge of the Board. We also note that the author's suggested language limits proposed schedules to the interim milestones (100% of reductions within 10 years). While we appreciate that compliance schedules would not be extended, as a practical matter, this would only give dischargers less time to clean up waterbodies impaired by multiple pollutants.

Response: Although we think it is preferable to address multiple pollutants, extension of the compliance schedule is not automatic. Extension of the compliance schedule will take place on a case-by-case basis. Stakeholders will have opportunity to review and comment on proposed changes to compliance schedules upon reissuance of the NPDES requirements that will be used to implement the TMDLs.

Comment 222

Compliance schedules should be separated based on the time of year (wet-weather vs. dry-weather) and type of receiving water (freshwater, saltwater, and estuarine).
In the Santa Monica Bay Beaches Bacteria TMDLs, compliance schedules vary based on the time of year. For instance:

- Targets were set for the AB 411 time period (3 years to comply), winter dry weather (November through March)(six years to comply), and wet weather (defined as a 0.1 inch storm plus 72 hours after the storm)(10 years to comply).
- The AB 411 targets was zero exceedance days, the winter dry weather target was 3 days, and the wet weather target was based on the 90th percentile storm year at a beach at the terminus of a reference watershed (approximately 22% exceedances which equals 17 days).

The system is appropriate for the San Diego Draft TMDL as well because dry-weather compliance should take less time, and this timeframe poses the greatest risk to human health.

Response: We agree that compliance with dry weather TMDLs will take less time and that this timeframe poses the greatest risk to public health. The compliance schedule does not preclude dischargers from taking this approach. In many cases, dischargers named in this project have succeeded in attaining dry weather TMDLs, as several beach locations have been de-listed since this project began.

5.7 Environmental Analysis

Comment 223

It is not at all clear that "reasonably foreseeable methods of compliance" exist for the capture and treatment of all storm flows on existing developments, that are not cost-prohibitive, may be ineffective in terms of remedying actual risk to public health, and/or are not contradictory to other environmental policy goals, such as conserving energy or avoiding wide-spread eminent domain actions to secure land for the treatment. As such, a design storm criterion should be designated to limit the maximum potential flow- or volume-based treatment obligation of permittees. This limit should be clearly identified as a ceiling rather than a floor, to allow permittees flexibility in pursuing preventative rather than treatment-based solutions.

Response: Designating design storm criteria is consistent with technology based effluent limitations in NPDES requirements. For example, NPDES requirements for concentrated animal feeding operations (CAFOs) designate that waste lagoons capture a 25-year, 24-hour storm. The industrial and municipal discharger NPDES requirements also contain "design storm" criteria. Designating design storm criteria for structural BMPs in the NPDES requirements to implement these TMDLs is reasonable. However, a design storm need not be designated as part of our environmental review of reasonably foreseeable method of compliance and economic considerations. The design storm for BMP sizing should be proposed by the dischargers based on site specific hydrology, water quality, and other characteristics that affect BMP construction at the project level phase of TMDL implementation. Section 12.4 of the Technical Report describes reasonably foreseeable methods of compliance for wet and dry weather loads, and these methods are divided into non-structural controls and structural controls. The examples described in this chapter are meant to be illustrative, not prescriptive.

Comment 224

The text should indicate the design storm size criteria for wet weather BMP development. It will be physically impossible to design and implement a BMP to capture and treat all storm flows. As such a design storm criterion, such as the 85th percentile storm for example, should be designated.

Response: Although a design storm is important for sizing structural BMPs, this level of detail is beyond the scope of the requirements that we must meet in order to comply with CEQA. Under CEQA, we must identify potential impacts from reasonably foreseeable methods of compliance—such as the implementation of BMPs. Calculating design storm size criteria is a site-specific consideration, and is more appropriately addressed by the project level CEQA analysis, not the planning level CEQA analysis (the Technical Report).

Comment 225

The Regional Board should notify all potential dischargers if the "Tributary Rule" is going to be applied to the installation of structural BMPs because additional land acquisition costs will need to be included in the economic analysis.

Response: The City of San Diego concluded that the construction of extensive detention and diversion/infiltration facilities, requiring the acquisition and demolition of hundreds of acres of developed land uses, would be an inevitable consequence of the TMDLs based in part on a belief that we would strictly interpret and apply the "tributary rule"[21] to prohibit the construction of BMPs within urban creeks. While all waters tributary to urban creeks should be of a quality consistent with the attainment in the creeks of the WQOs necessary to support the beneficial uses designated for the creeks, this policy does not, necessarily, preclude the installation of pollutant reduction BMPs in urban creeks or their tributaries. Source control is the preferred means of compliance with the TMDLS. However, in-stream structural BMPs may be reasonable, depending on the location and type of BMP, provided that they are consistent with the beneficial uses of the creek, and the natural aquatic ecosystem characteristics of the creek. This level of detail should be evaluated by municipal dischargers in coordination with the San Diego Water Board when the dischargers propose specific projects for structural BMPs to achieve the load reductions allocated to them for the implementation of the TMDLs. Please also see the response to Comment 233.

Comment 226

The City notes that the relationship between the State Board and the Regional Board with respect to the finality of environmental determinations is not well-defined. Water Code section 13245 states that Basin Plan amendments (such as TMDLs) do not have the force and effect of law until the State Board approves the amendment. Under CEQA and the State Board/Regional Board's CEQA regulations, a notice of decision regarding the environmental determination is to be filed with the Secretary of Resources. CEQA Guidelines § 15252(b); 23 CCR § 3720. At what point is such a document to be filed with the Secretary of Resources regarding the Bacteria TMDL?

Response: We will file the Notice of Decision within 30 days of USEPA approval of the Basin Plan amendment.

Comment 227

An Inadequate Project Description and Examination of Compliance Alternatives Set the Stage For Failure.

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[21] The "tributary rule" reflects early interpretations of the scope and extent of "navigable water" subject to federal jurisdiction under the Clean Water Act. [*United States v. Ashland Oil and Transp. Co.,* 504 F.2d 1317, 1329 (6th Cir.1974); *Headwaters, Inc. v. Talent Irrigation Dist.,* 243 F.3d 526, 533-34, (9th Cir.2001),] Accordingly, water quality in tributaries must be consistent with the water quality objectives needed to support designated beneficial uses in downstream navigable waters. However, the City interprets the "tributary rule" to require strict attainment of the most stringent downstream water quality objectives throughout Chollas Creek and its tributaries.

A critical component of an EIR is the environmental setting. In San Diego County watersheds, many of the tributaries: (1) are surrounded by developed areas within which storm water is conveyed by storm drains to outfalls at canyon rims; (2) lie within canyons and contain "waters" which originate at the end of the storm drains; and (3) are ephemeral and dominated by urban runoff during all but infrequent precipitation. However, the Initial Study (page R-1 of the draft Technical Report) describes the environmental setting of much of the affected areas in one paragraph and is incorrect by characterizing the Miramar, Scripps, and Chollas Creek watersheds as having "inland areas [that] primarily consist of open space with some agricultural/livestock uses".

Response: Regarding the comment on land uses within the Miramar, Scripps, and Chollas Creek watersheds, Appendix R was revised to remove the reference to agricultural/livestock uses.

Comment 228

"CEQA Alternatives": Given that the above-noted significant effects appear to be unmitigable, CEQA requires the evaluation of alternatives that would lessen the impacts. One such alternative should be provided to set the TMDL to a higher level. Such an alternative may still result in Basin Plan compliance; however, the reduced need for BMP acreage would preserve more existing land uses, effectively mitigating (partially) the significant impacts to existing land uses. Alternatively, the environmental analysis should describe why such an alternative will not achieve the basic purposes of the project.

Response: We disagree that the potentially significant impacts of the reasonably foreseeable methods of compliance appear to be unmitigable. Nonetheless, an alternative that sets the TMDLs to a higher level may fail to meet applicable WQOs that support beneficial uses. Such an alternative could not be considered because it would not attain the basic objective of the proposed activity (the TMDLs).

Comment 229

The determination that works are prohibited in "receiving waters" may also have one other consequence. Representatives of the environmental community in San Diego are concerned that the outfalls of existing storm drains at the top of canyon walls has led to erosion on canyon walls and at the base of the canyon walls. To address these concerns, in some situations the City may wish, in conjunction with constructing storm drain improvements including detention basins, to extend the storm drains to the canyon floors in order to minimize this erosion. While it could be expected that, in general, erosion on these canyon walls would decrease because of to-be-constructed upstream detention works, a prohibition on works in waters of the US/State would preclude the City from addressing this community concern.

Response: The San Diego County stormwater NPDES requirements do not preclude dischargers from moving outfalls in Chollas Creek to address erosion problems.

Comment 230

Given the fact that this TMDL requires 100% compliance in all wet weather flows, we do not believe that this analysis evaluated all reasonably foreseeable methods. To achieve 100% compliance in wet weather flows, wet weather diversion or advanced treatment methods, beyond that of the Point Loma POTW, will be necessary to achieve storm flows that have NO bacteria. Treatment will be required to maintain existing creek hydrology at approximately 2/3 of the existing storm drain outfalls which currently flow in dry weather. Because of the Regional Board's interpretation of the tributary rule (page 13 of the Technical Report), and because bacteria are known to grow in storm drains, the Regional Board must consider the impacts of building advanced treatment works immediately upstream of the approximately 3,100 of the 4,660 outfalls which currently contribute to creek hydrology.

Response: We anticipate revised TMDLs to go into effect well before the final WLAs need to be met. In fact, we will recalculate TMDLs immediately after adoption of the reference system approach/natural sources exclusion Basin Plan amendment, as discussed in the response to Comment 2.

Comment 231

CEQA Compliance - The Analysis Impermissibly Applies Inconsistent Standards

The environmental analysis begins with a discussion of the standards that apply to the Basin Plan amendment. The document states that the Regional Board has specific obligations under the Public Resources Code because the TMDL establishes performance standards or treatment requirements, and sets out an abbreviated list of those specific requirements. *See* Basin Plan Amendment at 158 – 159. The document goes on, however, to state that the Regional Board "method of analysis" is similar to "tiering" and "limited its analysis in this document to the broad environmental issues at the Basin Plan amendment "performance standard" adoption stage." The documents then goes on to opine that "the Regional 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 standards." *Id.* at 159. The document contains no citation to legal authority for these propositions. This is because these contentions are incorrect statements of the law.

Response: Appendix R, as revised in the March 9, 2007 version, does not equate the substitute environmental documents with a Tier I EIR. The appendix states that the San Diego Water Board has considered the pertinent requirements of state law,[22] and intends the analysis to serve as a tier 1 environmental review. The substitute environmental documents are not intended for others to tier off of, however, municipal entities can utilize all information included in the substitute environmental document when developing their own environmental documents.

[22] Public Resources Code section 21159 and 14 CCR section 15187

Comment 232

a. The Regional Board Does Not Fully Comply With Public Resources Code Section 21159

Here, the Regional Board concedes that the provisions of Public Resources Code section 21159 apply. Having made that concession, the Regional Board does not have the option to ignore the other specific requirements of that section. Nevertheless, the Basin Plan Amendment, completely ignores the requirements of subdivision (c) of section 21159, which states:

> The environmental analysis ***shall*** take into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and ***specific sites***.

PUBLIC RESOURCES CODE § 21159(c)(emphasis added)

Looking at each category of analysis specified in Public Resources Code section 21159, subdivision (c), the Regional Board's analysis is deficient because the TMDL applies to various watersheds, including the Scripps, Chollas Creek, San Dieguito and San Diego River watersheds. Both the entirety of the Scripps and Chollas Creek watersheds are heavily urbanized, while the upper portions of the San Dieguito and San Diego watersheds are substantially open space. Thus:

- There will be distinctly different technical challenges to implementing even the most basic structural controls in Scripps and Chollas Creek watersheds compared to the upper portions of the San Diego River and San Dieguito River watersheds because most infrastructure installed in Scripps and Chollas will disturb existing structures, while there is open space available in the upper San Diego River and San Dieguito River watersheds;
- There will be distinctly different environmental challenges for these same reasons; particularly the potential for infrastructure within the upper watersheds to disturb sensitive habitat.
- If it is necessary for the City to acquire land to implement any structural controls, the economics of implementing these measures will be different in developed watersheds when compared to undeveloped watersheds because of the relative land values;
- Not one specific site is examined despite the unambiguous statutory requirement to do so.

Thus, the record clearly reflects that the analysis does not satisfy all of the statutory requirements of an environmental analysis under Public Resources Code section 21159.

Response: We expanded our discussion of specific sites in the March 9, 2007 revisions to Appendix R. This discussion looks at existing structural and nonstructural BMPs in all major land use categories in the watersheds of this TMDL project.

Comment 233

The Regional Board has made two different contentions regarding the adequacy of the environmental analysis: (1) that treatment controls are not a reasonably foreseeable method of compliance; and (2) that the Regional Board is not required to do a site specific analysis. The first contention is not factually supported; the second is legally incorrect.

As respects treatment controls, the Regional Board ignores three critical facts in that regard:

- There is no evidence that compliance in all watersheds can be achieved in practice during both wet weather and dry weather conditions by using only non-structural controls.
- Public entities subject to this TMDL have already deployed treatment systems to combat this problem;
- At least one lead agency – the City of San Diego – has stated that it intends to implement treatment controls because it perceives treatment controls as the only means of attaining the treatment standard.

Thus, the only facts that are available undercuts the Regional Board's contention that treatment controls are a reasonably foreseeable method of compliance, which under Public Resources Code section 21159(a), must have its impacts analyzed.

As respects site specific analyses, Public Resources Code section 21159(c) unambiguously states that an analysis shall take into account a reasonable range of specific sites. A contention to the contrary is simply an incorrect statement of the law.

Even if the Regional Board does not believe that it has the responsibility to implement PRC Section 21159(c) as interpreted above, the City believes that the Regional Board has defined the TMDL with enough specificity, particularly with respect to required load reductions (which dictate the types of BMPs required), the tributary rule, and prohibitions on in-stream diversions (which dictate the possible locations of the BMPs), and failure to develop a design storm (which leaves open the acreage requirements of the BMPs), to conduct a "programmatic" level of analysis of the reasonably foreseeable means of compliance. In accordance with Section 15187of the State CEQA Guidelines this analysis could utilize numeric ranges and averages when specific data is not available. Section 15146 of the CEQ Guidelines addresses the level of specificity that is required for projects such as the TMDL. For CEQA purposes, adoption of the TMDLs by the Regional Board is comparable to adoption of a General Plan or Community Plan by a jurisdiction's legislative body with land use powers. What is required is the production of information sufficient to understand the environmental impacts of the proposed project. The current analysis does not fulfill this requirement.

Response: We disagree that the level of specificity in the substitute environmental documents is not adequate. Appendix R contains adequate information and analysis for the public to understand the potential adverse environmental impacts of the project. In response to repeated comments pertaining to inclusion of discussions of treatment systems and specific sites, we have modified Appendix R appropriately. Please see responses below for discussions pertaining to the tributary rule and where the BMPs can be located, and the design storm issue.

Design Storm - The CEQA provisions allow the San Diego Water Board to limit analysis in these substitute environmental documents to broad environmental issues which are ripe for decision at the TMDL adoption stage. At this stage, the San Diego Water Board is not required to evaluate environmental issues associated with specific projects undertaken to comply with the TMDLs. 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.

The San Diego Water Board does not need to designate the storm size for the design and construction of the BMPs to meet CEQA requirements for the TMDLs. The CEQA requires that the San Diego Water Board provide substitute environmental documents that contain sufficient information and analysis for the public to understand the potential adverse environmental impacts of the project, and to provide the San Diego Water Board with meaningful discussion and comment on these impacts. Our substitute environmental documents do that by describing a range of potential structural and non-structural controls the dischargers could construct or implement to meet the wasteload allocations (WLAs). The documents also discuss the potential adverse environmental impacts associated with those controls. Because the CEQA does not require the San Diego Water Board to speculate on the location or size of specific structural controls that the dischargers might choose to implement, we did not specify any sizing criteria such as a design storm.

The San Diego Water Board appreciates the City's efforts in moving forward with BMP planning, and is willing to discuss potential BMP siting and design issues, and different compliance monitoring approaches that could be used. However, we do not have the authority to delegate which methods or BMPs must be used to comply with the bacteria TMDLs. Additionally, it is not the purpose of the TMDLs to provide complete guidance for compliance. The San Diego Water Board has flexibility in making waste discharge requirements consistent with WLAs and establishing monitoring programs to gage compliance.

Tributary Rule - TMDLs allocate wasteloads to MS4 discharges, as opposed to receiving waters. For this reason, discharges from MS4s are required to meet WLAs. The WLAs are designed to restore water quality in receiving waters as defined by applicable WQOs. Since the San Diego County and Orange County municipal storm water requirements (Order No. R9-2007-0001 and Tentative Order No. R9-2007-0002, or their successors) will be used to implement the TMDLs at issue, the term "receiving waters" in this case refers to waters of the United States.

The conditions under which MS4s discharge to receiving waters are exceptionally diverse. This makes it difficult to define a precise "bright line" of demarcation for determining when MS4s end and receiving waters begin that will be applicable in every case. In fact, such determinations are often made on a case-by-case basis (such as with the 401 Water Quality Certification Program). While case-by-case determinations will continue to be necessary in many instances, generally speaking, where an outfall exists, receiving waters extend upstream to the outfall location.

The issues of where WLAs must be met and where receiving waters begin are important for determining where to locate BMPs. The San Diego Water Board's typical practice has been to discourage implementation of BMPs in receiving waters. For example, Order No. R9-2007-0001 states that "urban runoff treatment and/or mitigation must occur prior to the discharge of urban runoff into a receiving water" (Finding D.10). However, the issue of BMP location ultimately depends upon site specific circumstances and how compliance with WLAs is to be assessed.

There are many different monitoring approaches that the San Diego Water Board can use to determine compliance with WLAs. For example, the Chollas Creek diazinon TMDL, Order No. R9-2004-0227 requires monitoring two stations in Chollas Creek for compliance with the diazinon WLA. This relatively simple compliance monitoring was justified because the principal control, namely banning the pesticide, had been accomplished, and water quality in Chollas Creek was meeting the interim TMDL milestone at the time the new MS4 requirements were adopted. In the extreme, the San Diego Water Board could require monitoring at every storm drain outfall, and at numerous locations in Chollas Creek and its tributaries. The compliance monitoring the San Diego Water Board likely will require will be something between these two approaches, and may depend on the level of dischargers' efforts to reduce pollutant sources and loading before the San Diego Water Board issues implementing orders.

Another compliance assessment issue to be considered is how monitoring data are analyzed. Again, a wide range of approaches are available to the San Diego Water Board to determine compliance. For example, a regression approach to analysis of monitoring data can be used, where the monitoring data must exhibit a certain regression slope over time to show compliance with WLA. Other approaches, such as averaging of data, can also be used if appropriate. For example, in making water quality assessments for listing and delisting purposes, the *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* states that "samples collected within 200 meters of each other should be considered samples from the same location."

These different monitoring and compliance assessment methods may provide MS4 dischargers with the opportunity to implement a wide range of strategies for complying with TMDL requirements, including strategies that rely on restoration of receiving waters. The methods to be used to determine compliance will be developed following adoption of TMDLs, as municipalities develop urban runoff management plans that will implement MS4 requirements and TMDLs.

Finally, we assumed that structural BMPs could be built anywhere in the watershed, and did not exclude any land type from our analysis of potential impacts.

Comment 234

The TMDL and Environmental Analysis Do Not Satisfy the Criteria For Tiering

When applying statutes, specific statutes control over general. *See Cavalier Acres, Inc. v. San Simeon Acres Community Services District*, 151 Cal. App. 3d 798 (1984) (Where there is a specific provision requiring community services district to increase rates via ordinance, that specific statute controls over general provision allowing public entities to increase rates via resolution).

Here, the general provisions relate to tiered CEQA documents. *See* PUBLIC RESOURCES CODE § 21093 and 21094. The environmental analysis attempts to justify giving short-shrift to the topics required by Public Resources Code section 21159(c) under the guise of tiering; this violates the rule that specific provisions control over the general. Moreover, there are other problems with the Regional Board's reliance on the tiering provisions.

First, both Public Resources Code section 21093 and 21094 refer to the preparation of an environmental impact report as the first tier document. As the Regional Board readily notes, the environmental analysis for the basin plan amendment is **not** an EIR. *See* Remy, et al, *Guide to the California Environmental Quality Act*, 10th ed., at 495 (The definition of tiering "suggests that tiering must commence with the preparation of an EIR.") Thus, there is no authority for the proposition that the Regional Board may use a substitute document as a first tier CEQA document.

Further complicating this aspect of the Regional Board's environmental analysis are the specific provisions of CEQA Guidelines section 15253, which governs the use of an EIR substitute by a responsible agency. Specifically, subdivision (a) states a substitute document shall be used by another agency "granting an approval ***for the same project*** where the conditions in subdivision (b) have been met." Subdivision (c) of that same Guidelines section amplifies this limitation, stating:

> Where a certified agency does not meet the criteria in subdivision (b), any other agencies granting approvals for the project shall comply with CEQA in the normal manner.

Hence, the CEQA Guidelines make clear that the only permissible uses of a substitute document are with respect to that project, and not with subsequent related projects. Accordingly, it is inappropriate to treat the Basin Plan Amendment environmental analysis as a "first tier" document because no second tier document can legally flow from a "first tier substitute document."

It is also important to note that under CEQA Guidelines section 15253 subdivision (b), it is a responsible agency that may use the substitute document for subsequent approval of the project. Responsible agencies are "public agencies other than the lead agency which have discretionary approval power over the project." CEQA Guidelines section 15381. The only other California agency that has discretionary approval power over the Basin Plan amendment is the State Water Resources Control Board. Neither the Regional Board nor the State Board will issue subsequent approvals related to this project that will require CEQA compliance. Hence, the authorization in CEQA Guidelines section15253 does not apply to any subsequent activity that will involve site-specific impacts or any of the other analyses the Regional Board contends may be deferred until the second tier projects are implemented. Accordingly, the notion that the TMDL environmental analysis will serve as a first-tier analysis is inappropriate.

Second, Public Resources Code § 21093 states that the purpose of tiering is to expedite the construction of housing and other development projects by eliminating repetitive environmental review. Here, the project is not a development project; it is the imposition of performance or treatment standards. Thus, this activity does not fall within the type of projects the Legislature sought to expedite through tiering, and accordingly, there is no legal basis for the Regional Board to rely upon these principles in analyzing the impacts of the TMDL.

Response: Please see the response to Comment 231.

Comment 235

The project description is also a critical component of an adequate environmental document. *See Santiago County Water District v. County of Orange*, 118 Cal.App.3d 818 (1981) (EIR inadequate because of failure to discuss construction of water delivery facilities in project description). The project description in this case is influenced by Public Resources Code section 21159, which provides the ***minimum*** requirements for an environmental analysis of a rule or regulation that requires the installation of pollution controls.[23] That statute requires certain state agencies to analyze the following:

> (1) An analysis of the reasonably foreseeable environmental impacts of the methods of compliance.
>
> (2) An analysis of reasonably foreseeable feasible mitigation measures.
>
> (3) An analysis of reasonably foreseeable alternative means of compliance with the rule or regulation.

PUBLIC RESOURCES CODE § 21159(a)

Response: Appendix R was reorganized to make clear where the items mentioned in this comment are located.

Comment 236

Thus, the methods of compliance are part of the project description because the impacts, mitigation measures, and alternatives to the methods of compliance must be analyzed.

With that in mind, it is easy to see that the project description in this case contained only a cursory discussion of the methods of compliance. The Technical Report for the TMDL states that the required reduction in pollutants may be achieved by education, street sweeping, storm drain cleaning, BMP inspection and maintenance, manure fertilizer management plans, buffer strips and vegetated swales, bioretention, infiltration trenches, sand filters, diversion systems, animal exclusion, and waste treatment lagoons (for manure storage). The TMDL document is devoid of evidence that suggests that the pollutant reductions required to achieve full compliance with the TMDL can be achieved

[23] The statute clearly states that these topics are the minimum requirements for an adequate environmental analysis; other impacts must be identified if the impacts are a direct result or a reasonably foreseeable indirect result of the project.

by anything other than: (1) diversion or (2) treatment. Treatment is required in hundreds of locations to maintain dry flows in order to maintain creek hydrology. Again, MS4 operators the City of Laguna Niguel and Orange County installed a treatment system in Aliso Creek that reduced bacteria levels by 99%. The Caltrans Retrofit Pilot Study (2004) found removal efficiencies of no greater than 79% when the influent contained moderate levels of fecal coliform (Attachment 3) Thus, it is reasonably foreseeable that operators will install treatment controls (UV, chlorine/dechlorination or ozone), necessitating an analysis of the environmental impacts. In accordance with the Regional Board's interpretation of the tributary rule, these treatment controls would need to be installed upstream of the storm drain outfalls. Because bacteria re-grows in storm drains, the controls would need to be located as close to the outfall as possible.

Response: We revised Appendix R to include analysis of environmental impacts from UV and ozone technologies. We did not discuss chlorination/de-chlorination because this process is primarily used for drinking water treatment. We do not think that this process would be used to treat urban and stormwater runoff because of difficulties associated with chlorine transport, storage, and corrosiveness.

The CEQA does not require the level of detail requested in the comment for a planning level analysis. The dischargers are responsible for determining the specific BMPs that will be implemented at specific locations, and for evaluating the potential site specific environmental impacts of those BMPs. Dischargers should consult available literature for determining BMP efficiencies.

Comment 237

Having identified the types of facilities that could be constructed to achieve compliance (diversion and detention/infiltration), Public Resources Code section 21159, subdivision (c) kicks in to specify the details of the analysis that is required in terms of environmental, technical, and specific sites. Thus, issues that must be included to properly address these considerations in the scope of this TMDL include:

a. The "tributary rule," which subjects all receiving waters within the affected watersheds to the TMDL. The application of this rule in complying with this TMDL creates an interesting overlay in that the TMDL does not define "receiving waters, yet the San Diego County Municipal Storm Water NPDES permit states that in some instances receiving waters and the MS4 are the same;

b. Topography, which prevents BMP works from being built on canyon walls below storm drain outfalls but above receiving waters that are subject to the WQO in the TMDL;

c. The structural BMPs need to capture and treat a very high percentage of storm water due to the large level of loading reduction required by the TMDL; i.e., it is not reasonable to expect that works located far from the storm drain outfalls would, by themselves, meet the TMDL because significant amounts of storm water run into the conveyance system immediately above the outfalls.

d. Locating works some distance from the receiving waters would be infeasible because it would be necessary to construct a new, separate conveyance system to prevent the treated water from mixing with untreated water.

e. The number of control devices that may be required to achieve compliance is a technical consideration in complying with the TMDL. Because the TMDL defines the maximum loads of bacteria that may flow into receiving waters without regard to the size of a rain event, loading must be controlled in all storm events. Accordingly, certain assumptions must be made with respect to the size of the storm in order to design structural BMPs that will provide adequate contaminant reduction. Lacking a "design storm," or information on soil infiltration rates, the Regional Board's CEQA analysis must include assumptions regarding a design storm size and the acreage of detention/infiltration facilities that would be needed (including any manufactured slopes). Information is available from the City of San Diego, the California Department of Conservation, and the United States Soil Conservation Service on soil infiltration rates that would be necessary in this analysis. For purposes of revising the CEQA analysis, the Regional Board could use the following estimates of the number of storm drain outfalls within the areas affected by the TMDL:

   - the Chollas Creek watershed has approximately 816 storm drain outfalls within the City of San Diego,
   - there are approximately 1,315 outfalls within the City of San Diego within the San Diego River watershed, and
   - there are approximately 61 outfalls within 300 feet of the beaches identified in the TMDL.

The project description in the CEQA analysis is devoid of any discussion or analysis of these issues, and thus is inadequate because the failure to include this information prevented a meaningful analysis of the impacts of compliance.

As indicated in our letter on the Chollas Creek Metals TMDL, it is reasonably foreseeable that the TMDL implementation could require the City to build a large number of relatively smaller sized works in areas immediately behind a geologically-safe setback above all existing storm drain outfalls which have receiving waters immediately below them. In the Chollas Creek watershed, these works could occupy 1,387 acres – almost 10 percent of the 16,273 total acres in the watershed.

Response: The CEQA does not require the San Diego Water Board to designate a design storm or speculate on the number of control devices that the dischargers might construct. The CEQA does not require the San Diego Water Board to speculate on the specific locations where the dischargers might construct BMPs. Where BMPs can be constructed with regard to receiving waters, and the design storm issue, is discussed in the response to Comment 233.

Comment 238

CEQA Compliance – The Environmental Analysis Does Not Analyze the All Impacts Associated With Construction of Structural BMPs

Only when a meaningful discussion of the environmental setting is set forth and a thorough project description has been prepared can an adequate analysis of impacts and mitigation measures be prepared. *County of Inyo v. City of Los Angeles*, 71 Cal.App.3d 185 (1977). Here, the Regional Board has put itself in an "Catch-22." While the Regional Board contends that it is not reasonably foreseeable that treatment controls will be used as a compliance method, it nevertheless analyzed the impacts – albeit poorly – of diversion structures. Having analyzed some of the impacts to diversion structures, the Regional Board must ensure that the analysis is complete, and supported by substantial evidence. CEQA determinations related to quasi-legislative decisions must be supported by substantial evidence. *See* PUBLIC RESOURCES CODE § 21167.5; *Western States Petroleum Association v. Air Resources Board*, 9 Cal.4th 559 (1995).

Substantial evidence is defined in CEQA as:

> For the purposes of this section and this division, substantial evidence includes fact, a reasonable assumption predicated upon fact, or expert opinion supported by fact.
>
> Substantial evidence is not argument, speculation, unsubstantiated opinion or narrative, evidence that is clearly inaccurate or erroneous, or evidence of social or economic impacts that do not contribute to, or are not caused by, physical impacts on the environment.

PUBLIC RESOURCES CODE § 21080(e)

Response: New analysis, including mitigation of the construction of treatment controls, was added to the March 9, 2007 version of Appendix R. The expanded analysis addressed the concerns raised in the comment.

Comment 239

The following analyses in Chapter 12 and Appendix R are deficient because the conclusions are not supported by substantial evidence:

a. Aesthetics –

Appendix R states that the creation of structural BMPs can create adverse aesthetic impacts. The Regional Board's analysis of this impact states:

> Depending on the controls chosen, the project may result in the installation of urban runoff storage, diversion, or treatment facilities and other structural controls that could be aesthetically offensive if not properly designed, sited, and maintained. Many structural controls can be designed to provide habitat, recreational areas, and green spaces in addition to improving urban runoff water quality. In-creek diversions should not be used as controls, therefore, there should be no adverse impacts on aesthetics resulting from construction of concrete-lined basins or treatment facilities within creeks.

This analysis is legally inadequate because it does not state what constitutes a significant aesthetic impact and how designing the treatment works to serve as habitat, recreational areas, or green spaces mitigates any adverse aesthetic impact, much less mitigating any significant, adverse impact below the level of significance. It addition, the analysis ignores the reasonably foreseeable size and location of the BMPs described above, the works would be too small and subject to too many edge effects to create sustainable habitat. Moreover, regular maintenance would require periodic removal of plant growth and sediments. Topographically, it is reasonable to assume that basins associated with the works will need to be excavated and that significant portions of the basins would consist of manufactured slopes, limiting recreational opportunities. Deeper infiltration basins could be built to reduce acreage requirements; however, maintenance needs would preclude the construction or re-construction above these vaults and pumps would be needed in areas of impermeable soil to convey overflows to treatment controls. Moreover, deeper equalization basins would not be able to take advantage of evaporation or evapotranspiration. Thus, the "analysis" is merely "speculation, unsubstantiated opinion or narrative" that does not support the conclusion that the listed impact will be reduced below the level of significance, and is not, therefore, supported by substantial evidence, as required by law.

Response: The levels of significance for aesthetic impacts were set at no long term impacts including among other considerations, no long term obstruction of any scenic vistas. New analysis of aesthetics was added to the March 9, 2007 version of Appendix R that expanded the previous discussion and addressed the City of San Diego's concern.

Comment 240

b. Air Quality –

Appendix R makes the following statement regarding Air Quality:

> The construction of structural controls might adversely affect air quality because construction might require the use of diesel fuel engines to operate equipment. Potential impacts are likely to be limited and mostly short-term in nature. Impacts may be mitigated through measures such as limiting hours and amount of construction, eliminating excessive idling when vehicles are not in use, limiting construction during periods of poor air quality, and/or using alternative fuel vehicles rather than diesel fuel vehicles. Any impacts to air quality, both short-term and long-term, would be subject regulation by the appropriate air pollution control agencies under a separate process.

This analysis is deficient because the analysis does not state what the threshold of significance for impacts to air quality from toxic air pollutants, nor does it have any basis for concluding that the programs implemented by air pollution control agencies will, in fact, reduce any impacts below the unstated threshold of significance. Thus, the "analysis" is merely "speculation, unsubstantiated opinion or narrative" that does not support the conclusion that the listed impact will be reduced below the level of significance, and is not, therefore, supported by substantial evidence, as required by law.

Response: The levels of significance for air quality impacts were set at no long term impacts including, among other considerations, no long term degradation of ambient air quality or long term ongoing problems with odor which can not be remedied. New analysis was added to the March 9, 2007 version of Appendix R that expanded the previous discussion and addressed the City of San Diego's concern. Additionally, an analysis which includes the air quality impacts of street sweepers was added to the Checklist where the impact was determined to be less than significant with mitigation.

Comment 241

c. Biological Resources –

Appendix R states that there are potential impacts to riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or US Fish and Wildlife Service, but that those impacts would be reduced below the level of significance through mitigation.

The analysis does not state what sensitive species are located within the project area. It does not mention the San Diego County Multiple Species Conservation Plan – a regional plan that addresses impacts to sensitive species. The analysis that is done seems to assume that the only manner in which habitat or species can be impacted is through urban runoff flow diversion; even though the construction of treatment works could displace non-riparian species. Given the experience in Aliso Creek noted above, it is reasonable to assume that upland impacts may occur as a result of the need to intercept sheet flow runoff from canyon walls (immediately below developed areas) for treatment before these flows enter receiving waters. These interceptors would logically be located near and above the receiving waters - in areas where many canyons support native, upland vegetation and sensitive species. Impacts would result not only from construction of the diversions, but also from construction of treatment works and the associated pumps that would be necessary to put the treated water back into the receiving waters at a location near its diversion point.

Once again, the analysis does not contain facts, reasonable assumptions predicated on facts, or expert opinion based on facts; it is merely "speculation, unsubstantiated opinion or narrative" that does not rise to the level of substantial evidence.

Response: Although the analysis does not list the sensitive species in the watershed, this information can be obtained from a search of the California Natural Diversity database or through surveys of the specific location chosen for BMP construction. Thank you for bringing the San Diego County Multiple Species Conservation Plan to our attention. Dischargers should consult this plan if sensitive species are present at BMP construction sites.

That sheet flow from the urban areas flowing over canyon walls will need to be treated is not reasonably foreseeable. The volume of this flow will be small compared to flow from storm drain outfalls.

Comment 242

d. Cultural Resources –

Appendix R completely fails to address potential impacts to cultural resources. There is ample evidence available from local land use agencies about the location of cultural resources in San Diego County.

The affected watersheds are located in parts of San Diego that are designated as "Urbanized" or "Urbanizing" by the City's Progress Guide and General Plan because they are fully developed or in the process of being developed. Many structures within the watersheds were built prior to 1960, making them at least 45 years old and thus potentially significant historic resources under the criteria in 14 C.C.R. section 15064.5(a)(3)(C). Thus, with regard to checklist item V(a), the loss of an undetermined number of significant historic structures (located above storm drain outfalls/tributaries) should be considered a potentially significant effect.

With regard to checklist item V(b), it is generally accepted by land use agencies that because many older structures were built prior to or without the benefit of heavy earth-moving equipment, the soils underneath older structures have the potential to contain potentially significant archaeological resources. Therefore, the excavation of soils under potentially significant historic resources should be considered to have a potentially significant effect on archaeological resources.

Response: New analysis on potential impacts to cultural resources was added to the March 9, 2007 version of Appendix R to address the concerns in the comment.

Comment 243

e. Hydrology and Water Quality

Appendix R states that the diversion of storm flows and dry weather urban runoff would cause impacts to existing drainage patterns, but concludes that any such impact would be less than significant because "diversion of the entire stormflow of a creek is not required to meet wasteload allocations."

This statement is not supported by facts, reasonable assumptions predicated on facts, or expert opinion based on facts. There is no technical way for an MS4 operator to ascertain what percentage of a storm flow must be diverted for a particular storm to ensure that the pollutant loads do not exceed the wasteload allocations. If treatment is necessary, all storm flow must be detained and treated to ensure that the standards are met. Thus, the conclusion that this impact will be less than significant is ; "speculation, or unsubstantiated opinion" that does not rise to the level of substantial evidence.

Response: New analyses on potential impacts to hydrology and water quality were added to the March 9, 2007 version of Appendix R, which addresses the concerns in the comment.

Comment 244

f. Geology and Soils –

Appendix R concludes that there will be no impacts to Geology and Soils. This conclusion is no supported by substantial evidence.

Excavating infiltration works in the vicinity of canyon rims has the potential to make canyon walls unstable (only basins serving an equalization purpose could be lined). Increasing infiltration increases instability even if the slope in question is already engineered. For slopes that aren't engineered (and this is the case in older neighborhoods – see above), this instability can lead to failure. Increasing the integrity of slopes downhill of detention works could also result in increased impacts to biological resources or, if retaining walls are used, aesthetic impacts. Therefore, as a result of the project change, checklist item V(c) should indicate that the geology impact from the project is potentially significant.

For purposes of revising the CEQA analysis, we suggest that the Board consider that works which involve any level of infiltration be setback from a canyon rim such that a 45 degree line drawn from the bottom of the basin nearest the canyon rim does not intersect the canyon wall.

Infiltration or treatment of runoff will remove all sediment loading from the creeks. What is the impact of this on the creeks and downstream beaches?

In accordance with Section 15126.2, the Regional Board must consider the impacts of the environment on a project as well as the impacts of a project on the environment. Therefore, in concluding that infiltration can play a major role in implementing the TMDL, the Regional Board should, programmatically and on a site-specific basis, evaluate the permeability of soils within the areas affected by the TMDL.

Similarly, many formational materials within the watersheds are fossiliferous (Kennedy, 1977). Therefore, given that excavation of detention works could penetrate through surficial soils and into ungraded formational materials, the response to checklist item V(c) should indicate that this impact is potentially significant.[24] Because the environmental analysis does not discuss impacts to these resources or propose mitigation measures, the environmental analysis is inadequate.

Response: New analyses on potential impacts to geology and soils were added to the March 9, 2007 version of Appendix R, which addresses the concerns in the comment.

Thank you for the comment concerning potential fossil finds. Additional discussion on impacts and mitigation has been added to explanation of the answer to question 20 (Archeological/Historical).

Comment 245

g. Land Use and Planning –

[24] The "Kennedy Maps" are maps of geologic formations that may contain specific paleontological resources, and are specifically used by planning and land use agencies to identify the potential for significant paleontolgical resources. Such resources occur within the City of San Diego, and therefore could occur within the Chollas Creek watershed. *See* Geology of the La Jolla, Del Mar, La Mesa, Poway, Point Loma, and Southwest Quarter of the Escondido Quadrangles, San Diego County, California, by Michael P. Kennedy, 1975; and Geology of National City, Imperial Beach, and Otay Mesa Quadrangles, Southern San Diego Metropolitan Area, California, by Michael P. Kennedy and Siang S. Tan, 1977.

Checklist Item IX(b) indicates that the project would not conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the project adopted for purposes of avoiding or mitigating and environmental effect." This conclusion is not supported by substantial evidence; substantial evidence supports the opposite conclusion. The following examples are taken from the Chollas Creek watershed; a similar analysis should be made of all watersheds.

First, while the Regional Board's environmental analysis foresees the need to construct works, because no analysis was done on the required number or location of treatment works, the analysis does not discuss the need for the City to acquire and demolish hundreds of acres of developed land uses in order to construct the works. This is inconsistent with the only listed impact in the draft environmental analysis, where Regional Board staff discusses the impacts from operating a works that detains water – the works has to be constructed before it can be operated. Because the Regional Board did not properly analyze this impact, the Regional Board's analysis incorrectly concludes that the impacts will be less than significant or that they can be mitigated to below the level of significance. This conclusion is incorrect because it does not consider the following:

Housing

The Housing Element of the City's adopted General Plan and the position taken by the City Council when declaring a "Housing State of Emergency" both have as a basic objective an increase in the housing supply. According to Appendix E of the Technical Report, low and high density residential uses account for almost 64% of the land uses within the Chollas Creek Watershed. On average, this means that 64% of the 480-1400 acres if land that would be occupied by treatment works (307 to 896 acres) is currently developed with homes. Assuming an average of 10 dwelling units per acre (4,000 square foot lots are common in the watershed), this equates to the loss of 3,070 to 8,960 units. Removal of this number existing dwelling units would decrease the housing supply and is thus in conflict with adopted City policy.

Industrial Land

The Industrial Element of the City's adopted General Plan states that there is a serious shortage of large parcels suitable for industrial development exists in the City. Related goals and recommendations include:

"Insure that industrial land needs as required for a balanced economy and balanced land use are met consistent with environmental considerations" (p.286)

""Protect a reserve of manufacturing lands from encroachment by non-manufacturing uses." (p. 286)

"As mentioned earlier, in allocating additional land for industrial use it is imperative that sufficient acreage be designated to meet projected needs so that the existing market can operate effectively." (p.287)

The general theme of the existing Industrial element is precisely this shortage of industrial land, high industrial and prices, etc. and how the economy is negatively affected by the non-industrial use of industrial land. The supply increased only slightly since 1979 and has not increased since. In fact it is now at crisis level proportions.

According to Appendix E of Region 9's Technical Report, low and high density residential uses account for 3.12% of the land uses within the Chollas Creek Watershed. On average, this means that 3.12% of the 480-1400 acres of land that would be occupied by treatment works (15 to 43.7 acres) is currently developed with industrial uses.

The removal of housing and industrial acreage from the City's stock in order to build storm water treatment works required to comply with the TMDL would conflict with the City's General Plan and its declared Housing State of Emergency. Therefore, as a result of the project change, checklist item IX(b) should indicate that the Land Use and Planning impact from the project is potentially significant with respect to the loss of residential and industrial lands. The environmental analysis in inadequate because it failed to analyze this impact.

Given that none of the City's land use plans identify storm water treatment works and the nature of detention/infiltration works, the City believes that land use impacts would be significant and suggests that the Regional Board evaluate the City's plans to determine where and the extent to which inconsistencies would result.

h. Population and Housing –

Checklist item XII(c) indicates that there would be no displacement of substantial numbers of people, necessitating the construction of replacement housing elsewhere. Within the Chollas Creek watershed alone, the number of dwellings that would be lost as a result of the project change (3,070 to 8,960) should be considered substantial. According to U.S. Census Data, the average dwelling unit in San Diego houses 2.6 people. The loss of 3,070 to 8,960 dwelling units would therefore result in the displacement of 7,982 to 23,296 people. This number of dwellings that would be lost as a result of the project change should be considered substantial. Therefore, as a result of the project change, checklist items XII (b) and XII (c) should indicate that the Population and Housing impact from the project is potentially significant.

The City believes that this is in and of itself a significant impact and suggests that the Regional Board conduct a similar impact evaluation in all of the watersheds that would be subject to the TMDL.

Response: The City based the sizing of the BMP equalization basins on a 3 foot depth, neglecting to analyze deeper equalization basins in order to avoid securing a dam permit (Weston, 2006).[25] Based on the decision not to secure dam permits, the City then concluded that private property must be condemned and demolished to make room for the large, shallow equalization basins. If equalization basin are required, the City could secure dam permits and design the basins deep enough to avoid condemnation and demolition of private property.

[25] Weston Solutions, Inc. Chollas Creek TMDL Source Loading, Best Management Practices, And Monitoring Strategy Assessment, Final Report, September 2006.

Comment 246

i. Utilities and Service Systems –

Checklist item XVI (c) indicates that the project will not require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects. This is directly contradicted by the Technical Report, and given that the project change causes the additional significant impacts cited above, there is even more reason why this item should indicate that the Utilities and Service Systems impact from the project is potentially significant.

Response: New analysis on potential impacts to utilities and service systems was added to the March 9, 2007 version of Appendix R in response to this comment.

Comment 247

Given that the project change will result in previously undisclosed significant effects, CEQA compliance to date has deprived interested parties the opportunity to provide meaningful comment. In particular, we suggest that opportunity to comment be provided to historic preservationists, housing advocates, industrial developers, and those interested in public policy as it pertains to preservation of San Diego's shrinking supply of industrial lands.

Response: Although we disagree that TMDL implementation will result in significant environmental impacts from the loss of housing, industrial lands, or cultural resources, two additional comment periods were provided since the City offered the above comment. All interested persons have had ample time to respond to the changes and new analysis in the Technical Report and supporting documents.

Comment 248

Regional Board staff has, in the past, stated that it need not conduct a detailed analysis because it contends that the TMDL environmental analysis functions as a "first tier document," or would be speculative These statements are inaccurate because:

- Tiering does not excuse the lead agency from adequately analyzing the reasonably foreseeable significant environmental effects of the project and does not justify deferring such analysis to a later tier EIR or negative declaration." 14 C.C.R. Section 15152(b).
- Lead agencies cannot hide behind an inadequate analysis and leave it to the public to produce the necessary substantial evidence regarding adverse impacts. *Gentry v. City of Murietta*, 36 Cal.App.4th 1359, 1379 (1995). While foreseeing the unforeeable is not possible, the agency must find out and disclose all that it reasonably can. 14 C.C.R. § 15144.
- To claim that an impact is speculative and terminate a discussion requires analysis – it does not excuse a failure to investigate and analyze. *See Marin Municipal Water District v. KG Land California Corporation*, 235 Cal.App.3d 1652 (1991)

and 14 C.C.R. Section 15145. The record does not support a finding that the Regional Board has conducted this investigation

Response: Please see the response to Comment 231.

Comment 249

CEQA Compliance – The Regional Board Has Not Analyzed the Cumulative Impacts of All Proposed TMDLs.

CEQA requires that cumulative impacts be assessed as part of determining whether a project may have a significant effect on the environment (CEQA Guidelines Section 15064(h)(1). A Lead Agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan (CEQA Guidelines Section 15064(h)(3). However, Section 15064(h)(3) also requires preparation of an EIR (meaning a finding that the cumulative impact is significant) if there is substantial evidence that the possible effects of a particular project are still cumulatively considerable, notwithstanding that he project complies with the specified plan. Cumulatively considerable means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects."

The initial study checklist indicates that cumulative impacts from the project will not occur, but no rationale is provided for that conclusion. CEQA Guidelines Section 15130(b) describes alternative lists of projects and projections that an agency is required to consider when evaluating significant impacts. Given that the Regional Board has a mandate to adopt TMDLs for receiving waters on the 303(d) list, the checklist should, at a minimum, consider the impacts of this project in the context of impacts that would result from reasonably foreseeable means of compliance with other TMDLs, such as the recently adopted TMDL for metals in Chollas Creek (see the attached letter from Deputy City Attorney Tim Miller to the State Water Resources Control Board regarding the Chollas Creek Metals TMDL for the impacts expected to occur from that project). Moreover, the analysis should include the impacts from TMDLs that are in various stages of consideration, adoption, or implementation throughout all the affected watersheds, including the Chollas Creek Dissolved metals TMDL, and – to the extent this TMDL affects the Scripps watershed – State Board activities related to discharges into Areas of Special Biological Significance.

Response: The discussion of cumulative impacts was revised in the March 9, 2007 version of Appendix R.

Comment 250

CEQA Compliance – Chapter 12 and Appendix R Are Inconsistent:

Appendix R concludes that all listed impacts are either insignificant, or can be mitigated below the level of significance. Nevertheless, Chapter 12 contains a statement that some impacts may not be mitigated below the level of significance, but that the goals of the

Clean Water Act override these impacts. As noted previously, all findings must be supported by substantial evidence. To the extent that Appendix R and Chapter 12 conflict, one of the two conclusions is not supported by substantial evidence.

Unless mitigation to reduce potentially significant impacts to a level below significance is "guaranteed", the analysis must conclude that the impacts are significant (CEQA Guidelines, Section 15152(f)(3). In that case, "Findings" and a "Statement of Overriding Considerations" must be adopted.

Response: Although the San Diego Water Board found that all potentially significant impacts could be reduced to less than significant with mitigation, we nonetheless incorporated a finding and statement of overriding consideration in the Technical Report and Resolution. It was incorporated because the San Diego Water Board may not have approval authority over specific implementation projects and therefore, cannot ensure that mitigation will be incorporated when the projects are built.

Comment 251

Here the only alternatives analyzed are the "no action" alternative, and the "reference system approach." This is an inadequate range of alternatives. *See Citizens of Goleta Valley v. Board of Supervisors*, 52 Cal.3d 553 (1990)[Requiring a reasonable range of feasible alternatives.

Here, the Regional Board has failed to explain why setting the TMDL to a higher level is not a feasible alternative. Such an alternative may still result in Basin Plan compliance; however, the reduced need for BMP acreage would preserve more existing land uses, effectively mitigating (partially) the significant impacts to existing land uses. Alternatively, the environmental analysis should describe why such an alternative will not achieve the basic purposes of the project.

Another alternative that has not been addressed is, to the extent that the implementation plan is part of the project, whether a longer compliance schedule will result in pilot project technology becoming mainstream technology that can be deployed and reduce certain impacts.

Response: As stated in several places in the Technical Report, TMDLs must be based on WQOs established in the Basin Plan and Ocean Plan. Therefore the TMDLs cannot be arbitrarily raised to a higher level. However, we anticipate adoption of the reference system/natural sources exclusion approach Basin Plan amendment well before dischargers must meet final TMDLs. This Basin Plan amendment will result in higher TMDLs. The water quality standards alternative was added to the March 9, 2007 version of Appendix R. Whether or not pilot technology will become mainstream within a longer compliance schedule is too speculative to be a plausible alternative.

Comment 252

Appendix R, Environmental Checklist page R-14. Item 10 Risk Upset. We recommend that structural controls such as bioretention BMPs or waste treatment lagoons could have the potential for major failures that result in release of wastes into surface waters. These should be listed as less than significant with mitigation or significant impact depending on the volume of the wastes that are released during the upset. Upsets could be caused by unusually high rainfall causing a breach of the containment structure or poor design and/or construction.

Response: Item 10-Risk Upset in the checklist specifically refers to hazardous wastes, which does not include wastes from treatment lagoons. In regards to impacts from upsets due to episodic rainfall events, we considered them to be less than significant because overflow would not occur in a properly designed pond unless the rain event exceeded the 25-year, 24-hour storm. Since a storm exceeding this size is extremely rare, we considered this impact to be less than significant.

Comment 253

The Regional Board is required to prepare environmental analyses for the TMDLs to assess the impacts of implementing a reasonable range of alternative means of compliance. By understating magnitude of structural treatment facilities needed to comply with the TMDLs, the City believes that the existing environmental analysis does not fulfill the Regional Board's obligation under CEQA.

Response: Please see the response to Comment 238.

Comment 254

In summary, construction of hundreds of acres of structural treatment facilities, in conjunction with maximizing infiltration opportunities, will be necessary to comply with the required bacteria and metals load reductions. No evidence has been presented by anyone to suggest that solutions other than infiltration/diversion or treatment of entire rain events can result in compliance. The TMDLs allow no exceedences of load reductions regardless of storm size or duration; therefore, regardless of the treatment mechanism selected (grass swales, retention, biofiltration, sand filters, etc.), treatment facilities will need to incorporate acreage-intensive detention/equalization facilities because storm water cannot be treated as fast as rain falls from the sky – certain contact times are required. The significant impacts to existing development from construction of these treatment and equalization facilities has been previously documented and was calculated based allowing one exceedence every three years. The City suggests that the TMDLs include an exceedence frequency and that the Regional Board's environmental analysis include an analysis of the acreage required for treatment based on the exceedence standard. What storm size or exceedence frequency was used by Regional Board staff to calculate the costs of implementing the TMDLs?

Response: The evidence, in the form of the Weston report, submitted by the City outlines some of the challenges which will be faced in complying with the metals TMDLs in Chollas Creek. However, the Weston report presented very few options as solutions to the challenges. Securing dam permits (to increase basin depth and decrease basin size) may be more reasonable than private property demolition to make room for large equalization basins.

No storm size or exceedance frequency was used to estimate the cost of implementing the TMDLs. Estimates in the substitute environmental documents were generated utilizing observed annual stormwater volumes in the watersheds. Base on the average volume, a cost to treat the entire annual volume was determined. This annual cost was divided by ten as a broad and convenient tool to aid dischargers in estimating the total required cost based on the 10^{th} portion of the urbanized watershed needing treatment. For example, if the discharger determines that 36 percent of the urbanized watershed will require treatment, then the cost based on the 10^{th} portion can be multiplied by 3.6 to obtain as reasonable cost estimate. Please see section 7 (Economic Factors) of Appendix R, of the Technical Report, for additional details.

Comment 255

The environmental analyses for both TMDLs identifies as a reasonably foreseeable means of compliance the diversion of dry weather flows to infiltration or sanitary sewer facilities. The current environmental analyses analyze the effects of this compliance mechanism on native, downstream wetland vegetation which is dependent upon these flows; however, the conclusion regarding the significance of this impact is not clear. Overall, the conclusion seems to be that the loss of wetland vegetation which would occur after dry weather flows are diverted is less than significant because remaining and replacement vegetation would be more similar to that which persisted prior to development (i.e., native, upland vegetation). This conclusion that the loss of wetland vegetation is not significant is inconsistent with State policy and the Regional Board's own 401 certification requirements. Have trustee agencies such as the California Department of Fish and Game were consulted on this conclusion? The City suggests that this issue be clarified in revised environmental analyses.

Response: Wetland vegetation dependant on nuisance flows in the watersheds is likely not "native." The San Diego Water Board 401 requirements derive from the Army Corp of Engineer's 404 certification requirements. The San Diego Water Board, as a certifying agency for the 404 program, has broad leeway in certification and mitigation requirements. Ensuring nuisance flow dependant non-native pest species plant propagation is not consistent with the San Diego Water Board 401 requirements.

The decrease in stream flow may result in a change in the plant communities found in and near each stream. A decrease in plant diversity or abundance may occur by reducing the number of species that require a more constant water supply. However, many of these plant species may be non-natives to Southern California, and most likely would not provide habitat or a food source for native wildlife. Native plant species that previously thrived in the stream corridor may naturally repopulate the areas that are currently occupied by invasive species. Increased diversity or area of native plant cover also could be accomplished through restoration/ mitigation projects within the stream corridor. Regardless of the method, the opportunity for restoration/ enhancement of the stream corridor to pre-development conditions is realistic.

Scientists from the U.S. Fish and Wildlife Service (USFWS)[26], and the California Department of Fish and Game (DFG)[27] were contacted regarding this subject. The DFG stated that the action could be a possible concern to the DFG, depending upon each case. They would become involved in the process in cases where a streambed alteration agreement was needed or during the comment period for CEQA. The USFWS stated that reduction of contaminant loading to the streams would be beneficial; however, reduced stream flow could result in the loss of aquatic and riparian habitat (depending upon the amount of flow reduced). They would consider project impacts on a case by case basis.

Comment 256

Page R-5/page 4 of the environmental analysis for the Bacti-1 TMDL/Chollas Dissolved Metals TMDL indicate that the environmental analyses do not require an examination of every site but a reasonably representative sample of them. Please describe the sample set of sites that were examined in the analyses.

Response: The substitute environmental documents evaluated specific sites where BMPs could be located, in each of the major land use types in the watersheds, including residential, industrial, commercial, roadways and open space land uses. Please see section 6 (Reasonably Foreseeable Methods of Compliance at Specific Sites) of Appendix R.

Comment 257

While both environmental analyses note where treatment BMPs should not be built (on Prime Farmland, in special status species habitat, in areas developed with privately-owned land uses), neither analyses identifies where treatment BMPs could reasonably be built. This listing of suitable locations is critical to a determination of whether construction of treatment facilities would result in significant impacts.

Response: Avoidance is a standard mitigation measure, thus the analysis discusses where treatment BMPs should not be built. The San Diego Water Board is not required to speculate on where the discharger may or may not choose to construct BMPs. However, in discussing potential impacts, we considered constructing BMPs in all land use types.

Comment 258

Page R-19/page 15 of the environmental analyses for the Bacti-1/Chollas Dissolved Metals TMDLs indicate that short term construction impacts are not considered to be potentially significant. Why are these impacts considered less than significant on these pages and answered "less than significant" in the discussion section when mitigation measures, in the form of mufflers and lighting plans are recommended?

Response: Thank you for the comment. The designation "less than significant" has been changed to "less than significant with mitigation" in Appendix R.

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[26] Katie Zeeman, USFWS, personal communication, March 8, 2007.
[27] Kelly Fisher, DFG, personal communication, March 7, 2007.

Comment 259

Please clarify the significance determination for changes in native flora and fauna that would result from diverting dry weather flows from storm drain outfalls where the flora and fauna are dependent upon dry weather flows.

a. How would the loss of dry weather flows and the concurrent loss of wetland vegetation affect the habitat-related beneficial uses in the receiving waters?

b. How would the loss of native and vegetation due to diversion of dry weather flows affect temperature in the receiving water?

Response: The significance thresholds used to assess potential impacts to plants and animals are as follows: 1) No net reduction in native or beneficial (high value) plant species. 2) No net loss of number of plant species or area of natural pre-development habitat. 3) No barriers to native or high value plant communities and no introduction of non native species. 4) No net loss of native or beneficial animal species. 5) No deterioration of high value beneficial animal habitat compared to current conditions.

A reduction or loss of dry weather flows may affect the present habitats found in the watersheds. Wildlife use of the creeks as a drinking water source may be impacted with flow reduction; however, improvements in the water quality of the remaining water in the streams should be beneficial to wildlife.

A decrease in the flow volume and flow duration during dry weather conditions most likely would return the stream ecosystem to a more natural, pre-development condition, which may include a reduction in total plant biomass, a change in the plant diversity (increase or decrease), or a decrease in certain non-native or invasive plant species.

The changes in plant species could positively or negatively impact wildlife. Loss of invasive or non-native plant species will allow space for native plant species to grow. The native wildlife species are adapted to the native plant communities which comprise wildlife habitat. They use the plant community for food and shelter for themselves and indirectly as food and shelter for their prey. In addition, the opportunity for restoration/enhancement of native plant species could be developed to benefit wildlife. If native plant communities naturally do not overtake the areas where biomass was lost, then restoration efforts should be considered.

A detailed explanation of how plant and animal species may respond to changes in stream flow during dry weather can be found in Appendix R, in the explanations to questions 4a and 4d.

Summertime dry weather flow in the watersheds that existed before extensive urban development in the watershed likely was supported by groundwater seepage into the channel. Since there is no groundwater development in the watersheds to lower the water table, dry weather base flow from groundwater seepage is likely to be at or higher than under pre-development conditions, due to a rise in the groundwater table from irrigation water recharge. Eliminating nuisance flows should not alter the dry weather flow in the watersheds due to groundwater seepage. Thus, stream reaches with perennial stream flow and riparian or wetland habitats should not diminish below pre-development levels.

Assuming that some flow remains in the streams, loss of vegetation may affect the stream temperature in two ways: by reducing canopy cover (if the vegetation lost is tall enough to shade the stream), or by reduction in flow from evapotranspiration. Vegetation that provides canopy cover will shade the water thereby preventing an increase in water temperature due to direct sunlight. Similarly, the shading will reduce the amount of evaporation in the stream, thereby maintaining a lower water temperature. Conversely, vegetation in and near a stream will absorb water from the stream or water table, which would then reduce the amount of water in a stream and increase water temperatures.

These temperature effects from reduced flows will be less than significant for the creeks because pre-development conditions would not provide aquatic habitat during the dry season, and therefore, instream habitat would naturally be minimal or nonexistent during the dry season. Presently, species native to San Diego and Orange County may occur in the creeks, but would not occur without anthropogenic sources. Net loss of native habitats or loss of species diversity will not be tolerated, as defined by the significance thresholds in the first paragraph of this response. Mitigation is expected for any losses that may occur due to this project.

Comment 260

Mitigation measures in the environmental analyses for both TMDLs specify maintaining dry weather flows for purposes of maintaining certain animal populations. What is the reasonably foreseeable means for maintaining these flows given that the flows must also comply with the WLAs?

Response: In the March 9, 2007 version of Appendix R, we did not identify maintaining dry weather flows as a mitigation measure. We did not find impacts associated with elimination of dry weather flows.

Comment 261

Both TMDLs provide cost estimates for compliance using a variety of structural and non-structural BMPs based on data from EPA and CASQA. What is the design storm or exceedence frequency assumed in the cost estimates listed? In one example, page 70 of the environmental analysis for the Chollas Creek Dissolved Metals TMDL refers to treating 29,072,731 cubic feet of storm water, referring to this quantity as an annual "average". However, the TMDLs do not limit compliance to an average year. How does the lack of a design storm/allowable exceedence frequency affect the cost calculation?

a. Both environmental analyses reference the costs and effectiveness of Caltrans' BMPs. What was the storm size that the Caltrans BMPs were designed to and are they effective in wet weather. If they are effective in wet weather, please extrapolate the acreage required for the BMP and its equalization facilities to give a fair representation of the acreage required in the watersheds affected by the TMDL.

Response: The cost estimates were based on average annual measured flow volumes for the watersheds. Until a design storm is selected, the average and design storm cannot be compared.

The Caltrans BMPs referred to above were not extrapolated into BMP acreage requirement because of the potential variability in BMP design. However, all construction related adverse environmental impacts and mitigation has been provided. Please also see the response to Comment 254.

Comment 262

Given known data regarding water quality in the affected watersheds, what approximately is the percentage of a typical storm event that would need to be treated in order to comply with the TMDL? In other words, would "first-flush" treatment likely achieve loading requirements throughout a typical storm?

Response: CEQA does not require this level of detail. For a discussion on design storm please see the response to Comment 233.

Comment 263

In discussing impacts to population and housing, the environmental analyses for both TMDLs recommends evaluating and implementing more reasonable alternatives such as nonstructural BMPs and low impact and/or small scale structural BMPs before considering an alternative that would create considerable hardship for the community in the area. This is what the City proposed in its September, 2006 correspondence; however, the City concluded that such efforts would most likely not result in compliance. Please expand on how the Regional Board envisions that this means of compliance would roll out given the interim compliance goals.

Response: If the dischargers choose this BMP approach, how it would roll out depends on how quickly the dischargers conduct feasibility studies, select sites for implementation, and secure financing for construction. If this approach does not result in compliance, the City of San Diego would have to combine this approach with other BMP alternatives.

Comment 264

Page R-61/page 57 of environmental analyses for the Bacti-1/Chollas Dissolved Metals TMDLs indicates that the analyses do not analyze all possible means of compliance because alternative means of compliance consist of the different combinations of BMPs that dischargers might use and there are innumerable ways to combine BMPs. The preceding is correct in that the analyses not include combinations of BMPs that are not expected to result in compliance with the WLAs in the TMDLs. However, the analyses unfortunately do not list any single BMP or combinations of BMPs that 1) are documented to result in the required load reductions and 2) will not have significant impacts by displacing existing development. Please list a single combination of non-structural and less-intensive BMPs that will result in compliance with the Bacti-1 TMDL and, for the Chollas Creek watershed, both TMDLs.

Response: The substitute environmental documents contain sufficient information and analysis for the public to understand the potential adverse environmental impacts of the project, including the impacts from any possible combination of BMPs, and to provide the San Diego Water Board with meaningful discussion and comment on these impacts. The CEQA does not require the level of detail requested in the comment for a planning level analysis. The dischargers are responsible for determining the specific BMPs that will be implemented at specific locations, and for evaluating the potential site specific environmental impacts of those BMPs.

Comment 265

Why is there such a large discrepancy between the cost estimates in the Chollas Creek watershed to comply with the two TMDLs (Tables R-3 and I.2)? As suggested previously, the environmental analyses for the TMDLs should address the cumulative effects of both TMDLs (in terms of cost insofar as such an analysis is required, but certainly in terms of environmental impacts).

Response: Cost discrepancy between Tables R-3 and I.2 come from utilizing different sources for cost reference. Cost estimates can differ significantly. For example, a sand filter built by Caltrans is much more robust in design and construction (therefore more costly), compared to a small sand filter retrofit for a city street. Where the same sources were utilized in the two tables (i.e., diversion structures), the cost indicated for Chollas watershed are identical.

Comment 266

Page R-6 of the environmental analysis for the Bacti-1 TMDL states that the adoption of a TMDL is not discretionary; rather, it is compelled by section 303(d) of the federal Clean Water Act.

a. If adoption of the TMDL is not discretionary, why is the Regional Board preparing CEQA documentation for the action? CEQA compliance is only required if an agency proposes a discretionary action.
b. Why is the Bacti-1 TMDL being proposed for beaches that are not currently on the 303(d) list? On March 13, 2007, the US Environmental Protection Agency (EPA) partially approved the 2004-2006 303(d) List of Impaired Waterbody Segments. This list included the removal of 12 Scripps HA (906.30) ocean beaches. These beaches have not been removed from the TMDL for Indictor Bacteria Project 1. The City is requesting that these beaches be removed from this TMDL. The Clean Water Act, 40 CFR Section 131.38 has provisions for toxic pollutants to remain on the list for subsequent listing cycles; however, bacteria is not a toxic pollutant and has not met this criterion.

Response (a): The CEQA requires an environmental analysis of reasonably foreseeable environmental impacts of the methods of compliance with the proposed activity, which is the Basin Plan amendment. Since the TMDLs are adopted as part of a Basin Plan amendment, a CEQA analysis is required.

Response (b): Please see the response to Comment 190. Additionally, the CFR was not referenced in this project.

Comment 267

Why does the Bacti-1 environmental analysis not recognize that storm water treatment via ozonation, ultraviolet radiation, reverse osmosis, or chlorination/de-chlorination are reasonably foreseeable means of compliance? The City is aware of no evidence to suggest that compliance with the zero WLA for bacteria can be achieved by any other treatment method.

a. Please provide references for any BMP that indicates that any BMP will achieve compliance with the TMDL – that they are 100% effective under all storm conditions or the prescribe storm conditions.
b. Please provide references for the BMPs that are listed in the environmental analysis that would indicate that these BMPs would result in compliance with the final WLAs.

Response: We revised Appendix R to include analysis of environmental impacts from UV and ozone technologies. We did not discuss chlorination/de-chlorination because this process is primarily used for drinking water treatment. We do not think it is reasonably foreseeable that this process would be used to treat urban and stormwater runoff because of difficulties associated with chlorine transport, storage, and corrosiveness. We did not include an analysis of reverse osmosis because this technology is not effective for removing bacteria. Please see the response to Comment 236 for the discussion of the requested references.

Comment 268

Please identify the Lead and, if they exist, the Responsible and Trustee Agencies (all as defined by the California Environmental Quality Act) associated with this project.

Response: The San Diego Water Board is the Lead Agency. There are no Responsible Agencies. The Trustee Agencies are:

(a) The Department of Fish and Game with regard to the fish and wildlife of the state;

(b) The State Lands Commission with regard to state owned "sovereign" lands such as the beds of navigable waters and state school lands;

(c) The State Department of Parks and Recreation with regard to units of the State Park System; and

(d) The University of California with regard to sites within the Natural Land and Water Reserves System.

Comment 269

The City continues to request that the Regional Board explicitly recognize in its CEQA documentation that treatment and/or diversion (e.g., via infiltration) of storm water will be required to comply with the proposed load reductions given the ubiquitous, legal, and uncontrollable sources of the pollutants. While Board staff has taken a step closer to doing this by listing these strategies as reasonably foreseeable, the impact analysis of this construction is inadequate.

Response: Our level of analysis, in the substitute environmental documents, is sufficient to disclose the level of impacts of the project and provide a forum for meaningful public discussion and comment on those impacts, including the impacts from any possible combination of BMPs. CEQA does not require the level of detail requested in the comment for a planning level analysis. The dischargers are responsible for determining the specific BMPs that will be implemented at specific locations, and for evaluating the potential site specific environmental impacts of those BMPs.

Comment 270

The City continues to request that the Regional Board provide specificity on how compliance will be evaluated in terms of the number of Notices of Violation and/or fines that dischargers would be subject to if compliance is not obtained (e.g., one fine per outfall per day, one fine per tributary, one fine per gallon). I am pleased that the compliance issue with regard to where compliance would be measured (e.g., at storm water outfalls and/or locations downstream) as described in number 5 below.

Response: The specificity requested in this comment is not necessary for adoption of TMDLs, and is better addressed upon re-issuance of the implementing order, as described in the response to Comment 147.

Comment 271

The City continues to request that the Regional Board dictate a design storm or allowable number of exceedences in the Bacteria-1 TMDL. Such an allowance is now recognized as at least a planning goal in the Chollas Creek Dissolved Metals TMDL as one exceedence every three years since this frequency is allowed by the California Toxics Rule; however, the Bacteria-1 TMDL provides no such guidance from the state or federal government. Without this direction, the City is unable to design with certainty towards compliance its treatment and infiltration facilities and the Regional Board is unable to evaluate the environmental impacts of building the facilities. Moreover, since the Technical Report for the Chollas Creek Dissolved Metals TMDL indicates that 99.7% of the metals loading occurs during wet weather (page 35) and since the bacteria TMDL allows for zero anthropogenic-related bacteria, it is clear that treatment and/or infiltration of wet weather flows will be essential to compliance.

Response: Please see response to Comment 233.

Comment 272

The City has prepared a reasonable 'Tiered" approach to implement the TMDLs. The approach entails implementing, as experiments, various combinations of non-structural BMPs, and structural BMPs on public property and voluntary incentive programs for private property owners. The goal of this part of the approach is to 1) determine whether, contrary to existing data, widespread treatment and/or infiltration of storm water is not required to comply with the TMDLs and 2) determine the maximum effectiveness of these Tier I and II in order to minimize the impacts of constructing Tier III (infiltration and treatment) BMPs on developed and privately owned land. The City requests that the Regional Board commit to a formal re-evaluation provision in the TMDL to that final load reductions and compliance strategies can be re-assessed after collecting data from Tier I and Tier II efforts.

Response: The San Diego Water Board cannot commit to a formal re-evaluation of the TMDLs for the reasons discussed in the response to Comment 58. However, bacteria TMDLs will be recalculated immediately after the adoption of the reference system/natural sources exclusion approach Basin Plan amendment. The implementation plan and compliance schedule were revised to commit the San Diego Water Board to considering the reference system/natural sources exclusion approach within 1 year of the effective date of the TMDL Basin Plan amendment.

Comment 273

Regional Board staff has made a number of statements (referenced in previous comments) which provide a de facto prohibition on building treatment or infiltration works below storm drain outfalls for purposes of complying with the TMDLs. The City asks that the Regional Board formally state its position on where BMPs can be located to comply with these TMDLs.

Response: Please see the responses to Comment 233.

Comment 274

"Potential structural BMPs include the installation of storm drain filter sacks, which require routine maintenance". Please clarify what a "storm drain filter sack" is and provide documentation of its effectiveness in treating bacteria. The City is intrigued by this product, as we have been aggressive pursuing effective methods of reducing bacteria in the creeks and beaches within our City and have found that effective solutions to treat bacteria are difficult to find, difficult to demonstrate effectiveness, and costly to implement. To date, the City has only been able to show bacteria reduction success (in field) with nuisance water diversion and ozone treatment technology.

Response: The San Diego Water Board appreciates the earnest efforts undertaken by the City in its BMP researches. All the BMPs listed in the Technical Report should be considered, among others, as potential BMPs either used separately or as part of a treatment train of BMPs. Filter sacks are effective in removing large debris (diapers, etc…) from storm water and may provide some benefit in bacteria reduction. However, the actual BMPs to be implemented will be determined by the discharger.

5.8 Economics

Comment 275

Economics: The TMDL document as written provides available best management practice cost considerations, but falls short in providing estimated costs for overall compliance programs based on the tasks necessary to carry out the TMDL implementation plan (A Process for Addressing Impaired Waters in California, Section 7.5, draft SWRCB document March 2005). This information is essential for developing the public policy and funding mechanisms necessary to prepare and comply with the requirements.

Response: We are required to consider the costs of reasonably foreseeable methods of compliance with the proposed TMDL. Because the Implementation Plan includes an agricultural water quality control program, an estimate of the total cost of that program must be disclosed and potential sources of funding identified as required by Water Code section 13141. The Technical Report has been revised to include this information on the agricultural component. We have considered this information in implementation planning – specifically in determining the length of the compliance period. The dischargers may need to expand on this analysis to develop policy and funding mechanisms for site specific projects.

Comment 276

The presentation of the "Total Cost Estimates for Structural Controls for Urbanized Areas" in Table 13-3 is inadequate and misleading. Despite the title of the table, the treatment cost range presented is for only 10% of an urbanized area, not 100%; and in the case of "diversion", the cost for a single diversion is listed without estimating the number/total cost of diversions that might be called for over the urbanized acreage. There is also no mention in the text that various BMPs have different bacteria-removal effectiveness rates not necessarily capable of achieving the necessary reduction targets; that some BMPs are suitable for dry weather flows but not wet weather; or that no real analysis has been done to indicate whether spending all this money (even on the high end) would achieve compliance. It should also be noted that achieving compliance with bacteria indicators may not achieve the over-arching goal of reducing risks to public health, since the bacteria are only indicators, and not the actual pathogens of concern.

Response: Cost estimates are provided in increments of 10 percent to allow for upward scaling of costs since the amount of treatment and methods needed to achieve compliance with the proposed TMDLs may vary within a watershed and from watershed to 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. Likewise, the estimated cost of one diversion structure is provided and can be scaled upward depending on the scenario of what might be needed in any given watershed. To improve clarity, the title of Table 13-3 has been renamed and additional language has been added to section 13.2.2 to clarify the use of cost estimates based on 10 percent of urbanized area.

The commenter requests information on BMP effectiveness rates and suitability for dry weather flows versus wet weather flows, and an analysis about whether spending money on TMDL implementation would achieve compliance. Watershed and site-specific studies will be needed to plan and determine the effectiveness and feasibility of BMPs to ensure that targets are met. However, providing this information is beyond the scope of this discussion. We are required to consider the costs of reasonably foreseeable methods of compliance with the proposed TMDL. The purpose of this analysis is to provide cost information useful for implementation planning; most significantly, the length of the compliance schedule.

We disagree with the statement that "achieving compliance with bacteria indicators may not achieve the over-arching goal of reducing risks to public health, since the bacteria are only indicators, and not the actual pathogens of concern." In fact, the Mission Bay source identification study[28] and epidemiological study[29] show that there is a vastly reduced public health risk to swimmers in a water body where BMPs have virtually eliminated urban runoff to the receiving water. Therefore, in contrast to focusing on the relationship between bacteria and pathogens, we recommend that dischargers focus on abating anthropogenic sources that are the cause of illness, which are largely associated with urban runoff.

Comment 277

The economic analysis for TMDL project implementation costs is inadequate. The analysis does not take into account the urbanized nature of the majority of watersheds in the TMDL and the need to purchase land for BMP installation. Project implementation costs need to include land acquisition costs. Additionally, the analysis should include the bacteria-reduction effectiveness of the proposed BMPs. Without this information it is impossible to judge the potential effect on water quality the BMP will have for the cost listed.

Response: We disagree that the economic analysis is inadequate. We are required to consider the costs of reasonably foreseeable methods of compliance with the proposed TMDL, such as implementation of reasonably foreseeable types of BMPs for the purpose of bacteria reduction. This economic analysis includes a presentation of a variety of BMP types that includes a range of costs and potential effectiveness rates. We consider this information for implementation planning purposes – specifically in setting the length of the compliance period. Providing a cost benefit analysis based on BMP effectiveness rates is beyond the scope of this requirement. We are not required to speculate about

[28] 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.

[29] 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.

site-specific projects that persons or entities identified as dischargers might implement or which BMP will be the most appropriate based on cost and effectiveness. We disagree that the need to purchase land for BMP installation is reasonably foreseeable. In fact, due to the expense of land acquisition, dischargers are most likely to select BMPs that do not require land acquisition. Additionally, because the size of BMPs can be minimized through the types of BMPs selected, and engineering solutions exist to minimize the footprint of structural BMPs, displacement of existing development is not likely to be on a scale that will cause significant economic hardship.

Comment 278

The Executive Summary, Section 1.8 last paragraph states that there would be no additional beach water quality monitoring costs incurred by the discharges because it is required by the California Health & Safety Code. This is an incorrect statement. The County of San Diego Department of Environmental Health performs monitoring of beach water quality and is reimbursed by the State Board for those sites that meet AB411 criteria. The coastal San Diego MS4 copermittees perform monitoring at some of those beaches biweekly April through October and monthly the remaining time of the year. The proposed monitoring for the TMDL is a minimum of three times greater than the current monitoring costs.

Response: Sections 1.8 and 13.2.4 discuss cost estimates for surface water monitoring as a result of implementing these TMDLs. The statement that “the dischargers will incur no additional costs for monitoring water quality at beaches” has been deleted. The monitoring and reporting as required by Health and Safety Code section 15880 spans the summer months, only. Therefore, should monitoring for TMDL compliance take place in the winter months, dischargers will incur additional costs over those associated with the requirements of the Health and Safety Code.

The Technical Report does not specify locations or a monitoring frequency for determining compliance with the TMDLs. How the costs associated with monitoring as a result of these TMDLs will compare to existing monitoring costs is not known because specific TMDL monitoring plans have not been prepared. Therefore, the costs reported in the Technical Report are those associated with a two-person sampling team on a one-day effort. Once appropriate sampling locations and frequencies are identified in the Bacteria Load Reduction Plans, total costs associated with compliance with these TMDLs can be estimated.

Comment 279

Section 13 – The Economic Analysis for TMDL project implementation costs is inadequate. Table 13-1 uses capital costs in uninflated dollars. The analysis does not take into account the urbanized nature of the majority of watersheds in the TMDL and the need to purchase land for BMP installation. Project implementation costs need to include land acquisition costs. Table 13-3 is misleading by only calculating the potential costs for 10% of the watershed. If 100% compliance is required, 100% of the costs should be shown. Additionally, the analysis should include the bacteria-reduction effectiveness of the proposed BMPs. Without this information it is impossible to judge the potential effect on water quality the BMP will have for the cost listed. Please identify the source used for these estimates and correct, if appropriate, noted in the attached letter regarding the Chollas Creek Metals TMDL.

The diversion BMP noted in the Regional Board's economic impact vastly underestimates the cost of this BMP by estimating only a $1 million cost associated with building a diversion structure. Other costs that would be required to implement this BMP would be upsizing of sewer pipe capacity between the diversion and the Point Loma Wastewater Treatment Plant because existing pipes are not large enough to convey storm water flows (and the TMDL for San Diego specifically addresses storm water flows). Given that sewers are generally not over-sized so that they can be "self-cleaning", a parallel conveyance system would be required. At the end of this conveyance, the Point Loma plant itself would need to be expanded to handle storm water flows. Region 9's CEQA analysis includes as mitigation a requirement to reintroduce water to drainages to avoid "drying out existing wetlands. A reintroduction of treated water to the headwaters of Waters of the US/state would also require construction of a new reclaimed or potable water distribution system. If reclaimed, rather than potable water were to be used, t is unknown whether Total Dissolved Solids levels in reclaimed water would adversely affect the beneficial uses in the receiving waters.

Response: We disagree that the economic analysis is inadequate. However, as recommended in the commenter, the capital cost amounts in Table 13-1 have been adjusted for inflation to provide clarity. The sources used for these estimates are noted in the footnote to Table 13-3. The full references can be found in section 16.

As part of CEQA, we are required to consider the costs of reasonably foreseeable methods of compliance with the proposed TMDL, such as implementation of reasonably foreseeable types of BMPs for the purpose of bacteria reduction. This economic analysis includes a presentation of a variety of BMP types that includes a range of costs and potential effectiveness rates. We have considered this information for implementation planning purposes – specifically in setting the length of the compliance period. Providing a cost benefit analysis based on BMP effectiveness rates is beyond the scope of this requirement. Furthermore, we are not required to speculate about site-specific projects that persons or entities identified as sources might implement or which BMP will be the most appropriate based on cost and effectiveness. See the response to Comment 277 for a discussion of land acquisition.

While 100 percent compliance is ultimately required by the proposed TMDL, treatment of 100 percent of the land may not be required to achieve compliance. In the analysis, we do not assume that every watershed will require 100 percent of the land to be treated with all of the potential BMP options; therefore, cost estimates are provided in increments of 10 percent to allow for upward scaling of costs, since the amount of treatment and methods needed to achieve compliance with the proposed TMDL may vary from watershed to 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% cost estimate by 10, or by 5 for 50 percent, or 8 for 80 percent, etc. To clarify, the title of Table 13-3 has been renamed and additional language has been added to section 13.2.2 to clarify the use of cost estimates based on 10 percent of urbanized area.

We disagree that the estimate for a diversion BMP is underestimated. As noted in Table 13-3, the cost estimate for a diversion BMP is “greater than” $1 million, not $1 million as stated in the comment. Additionally, two examples are sited regarding diversion systems in section 13.2.1 and include a diversion and ultraviolet radiation treatment system that cost $1 million and a diversion and ozone treatment system that cost $6.7 million. Considerations, such as the “other costs” associated with building a diversion structure described by the comment, as well as the comments on potential mitigation discussed in the CEQA analysis, are project level, site-specific factors that we are not required to provide in this planning level discussion.

We removed the reference to the reintroduction of water to avoid “drying out of existing wetlands.” Costs associated with land acquisition are addressed in the response to Comment 277.

Comment 280

P. 128 TMDL Project Implementation Costs: The economic analysis for TMDL project implementation costs is inadequate. The analysis does not take into account the urbanized nature of the majority of watersheds in the TMDL and the need to purchase land for BMP installation. Project implementation costs need to include land acquisition costs. Additionally, the analysis should include the bacteria-reduction effectiveness of the proposed BMPs. Without this information it is impossible to judge the potential effect on water quality the BMP will have for the cost listed. None of the proposed BMPs result in 100% reduction of bacteria, except for diversions during dry weather flow conditions.

Response: Please see the response to Comment 279.

Comment 281

It is clear, both from cost estimates in the document and from discussion during the Board workshop on January 11, that the total cost of BMPs needed to meet the TMDL targets is very large. This raises two issues. The first is whether the cost to prevent an illness is within the range established by other public health policies. This analysis could be conducted with information readily available from the health policy literature. If the cost per illness prevented, especially when weighted for relative severity, is near the top end of this range, it is likely that the TMDL program will generate public resistance, especially if the program “crowds out” other municipal investments in public health. The second cost-related issue stems from the fact that this TMDL program will not be implemented in isolation. Other TMDL programs are being developed and implemented and each will have its own implementation requirements. The Regional Board should conduct a costing exercise to estimate what the aggregate TMDL-related investment could be, whether this is even economically feasible, and whether there are possible cost-saving approaches. For example, is it possible to design and/or site the bacteria BMPs in a way that will help meet targets for other TMDLs? The permittees do not all have the technical expertise to conduct such analyses. The current approach, in which TMDL implementation will apparently be addressed in a linear manner, will require separate BMP design and implementation cycles for each TMDL, an approach not designed for maximum efficiency.

Response: We recognize that implementing BMPs to comply with the TMDL requirements will likely be a substantial and costly undertaking by the dischargers; however, so are the costs associated with not adequately abating bacteria contamination.

In a recent study,[30] scientists investigated the economic impacts associated with contracting gastrointestinal illness from swimming at contaminated coastal waters at beaches in southern California. Authors used water quality data (specifically enterococci) from the year 2000, along with beach attendant data from 28 beaches, spanning 160 km of coastline in Los Angeles and Orange Counties, as input into two epidemiological dose-response models. The authors estimate that approximately 1 million excess gastrointestinal illnesses occur at beaches in Los Angeles and Orange Counties each year due to coastal contamination. Considering loss of time at work, doctor visits, and medicine for each occurrence, this equates to expenditures of about $36 million annually. This number is conservative because it does not include expenses associated with contracting other types of waterborne illnesses, nor does it account for lost recreational value, a swimmer's willingness to pay to avoid getting sick, or loss to coastal market economies that depend on contribution from beachgoers. Although this study focused specifically on beaches in Los Angeles and Orange Counties, we believe the results are applicable to the San Diego Region. Therefore, although we recognize the significant expenses associated with implementing BMPs, we also assert that efforts to abate bacteria contamination are necessary to avoid the likewise significant expenses associated with recreating in contaminated waters.

Recognizing the dischargers' need to develop comprehensive BMP programs, we are attempting to develop new TMDL projects that address all the impaired waterbodies in a watershed. We are cognizant of the fact that TMDLs can be substantial projects and multiple impairments in a single waterbody may complicate future TMDLs. Due to the complexity, development time, and the long implementation schedules, it would be impossible for us to predict the costs or impacts of current TMDLs on future TMDLs. Since the control measures will be selected by the dischargers when they develop their Bacteria Load Reduction Plans, whether or not the selected BMPs and MPs address solely bacteria reduction or a combination of bacteria and other pollutants of concern is at their discretion. Dischargers and stakeholders are not required to wait until a TMDL is initiated before they begin addressing water quality issues in their watersheds. However, to encourage dischargers to integrate BMP planning for all water quality problems in their watersheds, we have included a compliance schedule option to allow more time to meet the bacteria TMDLs, if integrated BMP planning and implementation is undertaken. Please see the revisions to section 11.4.2.

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[30] Given, Suzan, Linwood H. Pendleton, and Alexandria B. Boehm. 2006. Regional Public Health Cost Estimates of Contaminated Coastal Waters: A Case Study of Gastroenteritis at Southern California Beaches. *Environmental Science and Technology* (July 2006) 40 (16), 4851 -4858.

Comment 282

The Economic Analysis which begins on page B-11 is not sufficient as presented as the costs are based on data from 1999 and 2003. An economic analysis based on current and projected cost throughout the TMDL compliance schedule (i.e. account for inflation) should be provided, as well as the other items discussed in this letter, please.

Response: Providing the projected costs throughout the TMDL compliance schedule is beyond the scope of our requirements. Dischargers should run such analyses as part of their BMP planning effort.

Comment 283

On page R-66, "In order to achieve TMDL compliance, residential land use areas, like the area shown in Figure 6, may only require non-structural BMPs; however, structural BMPs could be retrofitted, if appropriate. Potential non-structural BMPs at this specific site include increased street sweeping, and development and enforcement of municipal ordinances prohibiting the discharge of bacteria and nuisance flows to stormwater and Stormwater drainage pathways. Other potential BMPs include adoption and enforcement of ordinances to pick up pet waste, and regular inspections of storm drains for cross connections with the sanitary sewers.

It should be noted that many of the underlined "potential" non-structural BMPs underlined above are already being implemented in most watersheds, if not all of them. So while the report states that "…residential land use areas,…may only require non-structural BMPs…." may not be appropriate and the costs for some structural BMPs should be accounted for in the economic analysis. Please also define "retrofit".

Response: We are unsure of whether or not structural BMPs will be necessary, therefore our language was appropriately not definitive. In some cases, structural BMPs may not be necessary to achieve the desired goal of reduced bacteria levels. In other cases, structural BMPs will be necessary. By retrofitting BMPs, we mean to install, fit, or adapt a structural BMP (such as a storm drain filter sack) into existing stormwater drainage pathways.

Appendix T

DELETED

Evidence of Water Quality Impairments for Indicator Bacteria in Hydrologic Areas Not On the *2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs*

The *Total Maximum Daily Loads for Indicator Bacteria Project I – Beaches and Creeks in the San Diego Region* project applies to the Pacific shoreline of the Miramar Reservoir and Scripps Hydrologic Areas (HA), even though these segments of shoreline are not listed as impaired by indicator bacteria on the *2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs*. These shoreline segments are included in the TMDL because indicator bacteria water quality data demonstrate that water quality objectives are not met at beaches within the HAs. Indicator bacteria data collected by the County of San Diego's Ocean and Bay Recreational Water Quality Program from 1999-2006 at beaches within the HAs were assessed to make this determination.[1] Data were typically collected on a weekly basis, though the length of time over which data collection occurred at different beaches varies.

Data were assessed to determine impairment according to the State Water Resources Control Board's *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (Listing Policy). Three approaches to data assessment were used for each beach. First, all available data were considered and the number of exceedances of single sample water quality objectives were tallied and compared to the Listing Policy's minimum number of measured exceedances needed to place a water segment on the Clean Water Act Section 303(d) List. Second, samples collected at times that correlated with storm events were identified and the number of those samples that exceeded single sample water quality objectives was identified. The frequency of exceedances that correlated with storm events was also compared to the Listing Policy's minimum number of measured exceedances needed for Clean Water Act Section 303(d) listing. Finally, data were also assessed to identify exceedances of geometric mean (geomean) water quality objectives. Monthly geomean values were calculated from the data, which were then compared to the geomean water quality objectives. Again, exceedances were tallied and compared to the Listing Policy's minimum number of measured exceedances needed for Clean Water Act Section 303(d) listing. Those beaches that exceeded Listing Policy's impairment criteria are identified in Table T-1 below.

[1] County of San Diego Ocean and Bay Recreational Water Quality Program, 2007. Assembly Bill 411 Monitoring Data, 1999-2006.

Table T-1. Beaches in the Miramar and Scripps HA with Indicator Bacteria Water Quality Impairments

Hydrologic Area	**Beach Segment**	**Total Coliform (REC-1)**	**Fecal Coliform (REC-1)**	**Enterococcus (REC-1)**	**Proposed 2008 303(d) Listing?**
Miramar Reservoir HA	Pacific Shoreline at Los Penasquitos Lagoon	16 out of 424 samples exceeded the single sample maximum water quality objective. 2 out of 81 calculated monthly geomeans exceeded the geomean water quality objective. **10 out of 25 samples collected during wet weather exceeded the single sample maximum water quality objective.**	26 out of 324 samples exceeded the single sample maximum water quality objective. None of the 65 calculated monthly geomeans exceeded the geomean water quality objective. **11 out of 21 samples collected during wet weather exceeded the single sample maximum water quality objective.**	36 out of 414 samples exceeded the single sample maximum water quality objective. 5 out of 78 calculated monthly geomeans exceeded the geomean water quality objective. **15 out of 27 samples collected during wet weather exceeded the single sample maximum water quality objective.**	Yes
	Pacific Shoreline at Anderson Canyon	0 out of 59 samples exceeded the single sample maximum water quality objective. 0 out of 16 calculated monthly geomeans exceeded the geomean water quality objective. None of the samples were collected during wet weather conditions.	0 out of 59 samples exceeded the single sample maximum water quality objective. 0 out of 16 calculated monthly geomeans exceeded the geomean water quality objective. None of the samples were collected during wet weather conditions.	1 of the 59 samples exceeded the single sample maximum water quality objective. 0 out of 16 calculated monthly geomeans exceeded the geomean water quality objective. None of the samples were collected during wet weather conditions.	No
Scripps HA	Pacific Shoreline at Avenida de la Playa	3 out of 325 samples exceeded the single sample maximum water quality objective. 1 out of 66 calculated monthly geomeans exceeded the geomean water quality objective. 2 out of 16 samples collected during wet weather exceeded the single sample maximum water quality objective.	12 out of 272 samples exceeded the single sample maximum water quality objective. 2 out of 53 calculated monthly geomeans exceeded the geomean water quality objective. 3 out of 12 samples collected during wet weather exceeded the single sample maximum water quality objective	32 out of 314 samples exceeded the single sample maximum water quality objective. 7 out of 63 calculated monthly geomeans exceeded the geomean water quality objective. **6 out of 13 samples collected during wet weather exceeded the single sample maximum water quality objective**.	Yes

Hydrologic Area	Beach Segment	Total Coliform (REC-1)	Fecal Coliform (REC-1)	Enterococcus (REC-1)	Proposed 2008 303(d) Listing?
Scripps HA	Pacific Shoreline at El Paseo Grande	1 out of 172 samples exceeded the single sample maximum water quality objective. 1 out of 46 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 6 samples collected during wet weather exceeded the single sample maximum water quality objective.	1 out of 174 samples exceeded the single sample maximum water quality objective. 1 out of 46 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 5 samples collected during wet weather exceeded the single sample maximum water quality objective.	4 out of 175 samples exceeded the single sample maximum water quality objective. 2 out of 46 calculated monthly geomeans exceeded the geomean water quality objective. 1 of the 6 samples collected during wet weather exceeded the single sample maximum water quality objective.	No
	Pacific Shoreline at Scripps Pier	0 out of 214 samples exceeded the single sample maximum water quality objective. 0 out of 51 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 4 samples collected during wet weather exceeded the single sample maximum water quality objective.	5 out of 174 samples exceeded the single sample maximum water quality objective. 1 out of 39 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 3 samples collected during wet weather exceeded the single sample maximum water quality objective.	8 out of 213 samples exceeded the single sample maximum water quality objective. 2 out of 50 calculated monthly geomeans exceeded the geomean water quality objective. 1 of the 4 samples collected during wet weather exceeded the single sample maximum water quality objective.	No
	Pacific Shoreline at Vallecitos	0 out of 33 samples exceeded the single sample maximum water quality objective. 0 out of 4 calculated monthly geomeans exceeded the geomean water quality objective. None of the samples were collected during wet weather.	2 out of 33 samples exceeded the single sample maximum water quality objective. 1 out of four calculated monthly geomeans exceeded the geomean water quality objective. None of the samples were collected during wet weather.	**6 out of 33 samples exceeded the single sample maximum water quality objective.** 1 out of two calculated monthly geomeans exceeded the geomean water quality objective. None of the samples were collected during wet weather.	Yes

Hydrologic Area	Beach Segment	Total Coliform (REC-1)	Fecal Coliform (REC-1)	Enterococcus (REC-1)	Proposed 2008 303(d) Listing?
Scripps HA	Pacific Shoreline at Grand Avenue	0 out of 241 samples exceeded the single sample maximum water quality objective. 0 out of 50 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 5 samples collected during wet weather exceeded the single sample maximum water quality objective.	2 out of 244 samples exceeded the single sample maximum water quality objective. 0 out of 53 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 5 samples collected during wet weather exceeded the single sample maximum water quality objective.	3 out of 265 samples exceeded the single sample maximum water quality objective. 0 out of 47 calculated monthly geomeans exceeded the geomean water quality objective. 1 out of 7 samples collected during wet weather exceeded the single sample maximum water quality objective.	No
	Pacific Shoreline at Pacific Beach Point	10 out of 429 samples exceeded the single sample maximum water quality objective. 4 out of 71 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 9 samples collected during wet weather exceeded the single sample maximum water quality objective.	**81 out of 452 samples exceeded the single sample maximum water quality objective.** 10 out of 78 calculated monthly geomeans exceeded the geomean water quality objective. 1 of the 10 samples collected during wet weather exceeded the single sample maximum water quality objective.	**161 out of 487 samples exceeded the single sample maximum water quality objective.** **47 out of 78 calculated monthly geomeans exceeded the geomean water quality objective.** **5 out of 10 samples collected during wet weather exceeded the single sample maximum water quality objective.**	Yes
	Pacific Shoreline at Tourmaline Surf Park	0 out of 239 samples exceeded the single sample maximum water quality objective. 0 out of 58 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 15 samples collected during wet weather exceeded the single sample maximum water quality objective.	4 out of 198 samples exceeded the single sample maximum water quality objective. 0 out of 48 calculated monthly geomeans exceeded the geomean water quality objective. 3 out of 12 samples collected during wet weather exceeded the single sample maximum water quality objective.	12 out of 236 samples exceeded the single sample maximum water quality objective. 4 out of 57 calculated monthly geomeans exceeded the geomean water quality objective. **5 out of 13 samples collected during wet weather exceeded the single sample maximum water quality objective.**	Yes

Hydrologic Area	Beach Segment	Total Coliform (REC-1)	Fecal Coliform (REC-1)	Enterococcus (REC-1)	Proposed 2008 303(d) Listing?
Scripps HA	Pacific Shoreline at Whispering Sands	1 out of 191 samples exceeded the single sample maximum water quality objective. 1 out of 46 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 5 samples collected during wet weather exceeded the single sample maximum water quality objective.	1 out of 144 samples exceeded the single sample maximum water quality objective. 0 out of 40 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 3 samples collected during wet weather exceeded the single sample maximum water quality objective.	5 out of 146 samples exceeded the single sample maximum water quality objective. 3 out of 43 calculated monthly geomeans exceeded the geomean water quality objective. 1 out of four samples collected during wet weather exceeded the single sample maximum water quality objective.	No
	Pacific Shoreline at Bonair	0 out of 142 samples exceeded the single sample maximum water quality objective. 0 out of 35 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 8 samples collected during wet weather exceeded the single sample maximum water quality objective.	4 out of 142 samples exceeded the single sample maximum water quality objective. 0 out of 33 calculated monthly geomeans exceeded the geomean water quality objective. 1 out of 7 samples collected during wet weather exceeded the single sample maximum water quality objective.	3 out of 130 samples exceeded the single sample maximum water quality objective. 0 out of 31 calculated monthly geomeans exceeded the geomean water quality objective. 1 out of 7 samples collected during wet weather exceeded the single sample maximum water quality objective.	No
	Pacific Shoreline at Playa Del Norte	0 out of 274 samples exceeded the single sample maximum water quality objective. 0 out of 64 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 3 samples collected during wet weather exceeded the single sample maximum water quality objective.	0 out of 235 samples exceeded the single sample maximum water quality objective. 0 out of 59 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 3 samples collected during wet weather exceeded the single sample maximum water quality objective.	2 out of 275 samples exceeded the single sample maximum water quality objective. 1 out of 64 calculated monthly geomeans exceeded the geomean water quality objective. 0 out of 7 samples collected during wet weather exceeded the single sample maximum water quality objective.	No

~~**Hydrologic Area**~~	~~**Beach Segment**~~	~~**Total Coliform (REC-1)**~~	~~**Fecal Coliform (REC-1)**~~	~~**Enterococcus (REC-1)**~~	~~**Proposed 2008 303(d) Listing?**~~
~~Scripps HA~~	~~Pacific Shoreline at Vista de la Playa~~	~~0 out of 55 samples exceeded the single sample maximum water quality objective.~~ ~~0 out of 12 calculated monthly geomeans exceeded the geomean water quality objective.~~ ~~None of the samples were collected during wet weather.~~	~~0 out of 55 samples exceeded the single sample maximum water quality objective.~~ ~~0 out of 12 calculated monthly geomeans exceeded the geomean water quality objective.~~ ~~None of the samples were collected during wet weather.~~	~~1 out of 55 samples exceeded the single sample maximum water quality objective.~~ ~~0 out of 11 calculated monthly geomeans exceeded the geomean water quality objective.~~ ~~None of the samples were collected during wet weather.~~	~~No~~

~~Descriptions in **BOLD** indicate evidence of water quality impairments according to the State Water Resources Control Board's *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List.*~~

Appendix U

Responses to Comments
Part II

For Bacteria TMDLs Project I
Adopted by the San Diego Water Board on
December 12, 2007

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1 List of Persons Submitting Comments

The following persons submitted comments on the June 25, 2007 version of the Technical Report for the Total Maximum Daily Loads (TMDLs) for Indicator Bacteria Project I—Beaches and Creeks in the San Diego Region. The table in section 2, below, links the commenter with the comment number, and version of the TMDL documents on which the comment was made.

- City of Dana Point
- City of Del Mar
- City of Laguna Beach
- City of Laguna Niguel
- City of Poway
- City of San Juan Capistrano
- County of Orange
- County of San Diego
- Heal The Bay
- San Diego Coastkeeper
- Sierra Club
- U.S. Environmental Protection Agency

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3 Introduction

This report provides responses to public comments received on the June 25, 2007 version of the Technical Report for the Total Maximum Daily Loads for Indicator Bacteria Project I - Beaches and Creeks in the San Diego Region. The TMDL documents were made available to the public for formal review and comment beginning June 25, 2007.

The San Diego Water Board received comments in letters and emails from interested persons on the June 25, 2007 version of the TMDL documents. The letters were not reproduced in this document. Individual comments were excerpted from the letters and email, and organized by subject. The comments were numbered sequentially in this report and the comment numbers were continued from Appendix S, *Response to Comments,* dated June 25, 2007. Individual commenters are identified in the "List of Persons Submitting Comments" on page U-1 of this appendix.

4 Comments and Responses

Comments and responses are grouped according to subject matter in the following subsections.

4.1 Reference System Approach Basin Plan Amendment

Comment 284

We support the interim TMDLs which account for natural sources of indicator bacteria during wet weather. We recommend that steps be taken to amend the Basin Plan to incorporate the reference system approach. There is a sense of urgency to move forward with this amendment as the final TMDLs are significantly higher and therefore, more costly to attain absent the allowance for natural bacteria sources.

Response: The San Diego Water Board is currently working on an amendment to the Basin Plan authorizing the use of a reference system and antidegradation approach or natural sources exclusion approach during implementation of indictor bacteria water quality objectives within the context of a TMDL. Drafts of the technical report and amendment language have been reviewed by the Reference System Stakeholder Advisory Group. The drafts are currently undergoing external scientific peer review. Once the peer review process is completed, the drafts will be released for public review. Release of the drafts for public review is expected to occur in the winter of 2007-2008.

Comment 285

The City is pleased to see that both the State Water Resources Control Board (SWRCB) and the San Diego Regional Water Quality Control Board (RWQCB) have acknowledged the need to address natural sources of pollutants. RWQCB staff has included language that is more definitive in regards to developing a reference system/natural sources exclusion approach Basin Plan amendment under a separate effort from this TMDL project, with a deadline of one-year after the effective date of the TMDL. RWQCB staff had indicated that the project is currently in process, and a Stakeholder Advisory Group (SAG) has been established to participate in this process.

The State Water Resources Control Board is proposing to amend the Ocean Plan to acknowledge non-human sources of bacteria. As we slowly, but diligently, learn more, it appears that addressing non-human sources of bacteria will be a significant piece of the puzzle in terms of planning and implementation. The City has commented appropriately on the Ocean Plan Scoping Document. The City encourages the RWQCB staff to ensure that the TMDL development coincides with the State's proposed efforts.

Response: The San Diego Water Board is an active participant in the State Water Board's public process to amend the Ocean Plan and intends to implement the TMDL consistently with the State Water Board's Ocean Plan efforts.

Comment 286

Page S-21 states that in order to use the natural sources exclusion approach, dischargers must control all anthropogenic sources of indicator bacteria, including the prevention or infiltration from the sanitary sewer and control of sanitary sewer over flows, etc. It should be noted that the sanitary sewer is owned and operated by an independent water/sewer district in Dana Point, as well as in other cities in south Orange County, over which we have no control. We ask that this fact be acknowledged in the TMDL document.

Response: In order to address this situation, the TMDL has been modified to include as responsible dischargers wastewater agencies that control the sanitary sewer systems. As such, the wastewater agencies will be primarily responsible for sewer leaks or overflows that may enter MS4s and be discharged into receiving waters. This action does not increase the responsibilities of the wastewater agencies as they are already required to prevent discharges from the sanitary sewer to the storm sewers pursuant to their waste discharge requirements prescribed in State Water Board Order No. 2006-0003-DWQ. However, municipalities will also continue to remain secondarily responsible for sewage that is collected, transported, and discharged by their MS4s. This is consistent with the requirements of the Clean Water Act, which requires that municipalities effectively prohibit non-storm water discharges, such as sewage, into their MS4s.[1]

Comment 287

Page S-20 states that the natural sources exclusion approach will essentially recognize natural exceedances of WQOs as long as all anthropogenic sources of indicator bacteria arc controlled. Under the natural sources exclusion approach, after all anthropogenic sources of indicator bacteria have been controlled, a certain frequency of exceedance of the WQOs can be authorized based on applying a natural exceedance frequency to the specific water body.

The City is concerned that this document and process has not considered the detailed method of compliance. For example, the document has made reference of "anthropogenic" sources of indicator bacteria as human and domestic animal waste.

In the following hypothetical scenario, from the eyes of a regulator, do the actions below "demonstrate" that all anthropogenic bacteria are controlled?

- Sewer agency implements its Sanitary Sewer Overflow Prevention Program
- Areas of repeated homeless activity arc regular inspected and homeless are forced to move per current protocol.
- Pet owner ordinance requiring pet owners to pick up pet waste.
- City provides poop pick up bags and trash receptacle in hot spot areas.
- Ongoing education regarding impacts of pet waste to water quality is conducted.

The City feels it is crucial to think about how this TMDL document is going to be implemented in the real world as we are still in the planning/development stage. We understand that details will come later; however we ask that, at the very minimum, please conceptualize how the connection between regulatory requirements and implementation and compliance assessment will work or acknowledge that what was provided above would meet current expectations.

[1] Clean Water Act section 402(p)(B)(3)(ii).

Response: Under the natural sources exclusion approach, control of anthropogenic sources is expected to be demonstrated by using the weight of evidence gathered from several different efforts. The general framework for such an approach would include: (1) demonstration of compliance with all permit BMP requirements related to indicator bacteria sources; (2) implementation of BMPs to control indicator bacteria discharges, such as those BMPs mentioned in the comment, as well as others; (3) performance of a sanitary survey that identifies no ongoing anthropogenic sources; (4) monitoring of indicator bacteria in the target water body to show indicator bacteria levels consistent with natural sources; (5) performance of an epidemiological study demonstrating that swimmers are not subject to elevated health risks; and (6) microbial source tracking indicating that controllable anthropogenic sources are not contributing indicator bacteria to the target water body.

Comment 288

Comment 8. The response in Appendix S indicates that *"Dry weather beach data from near the outlets of San Mateo and San Onofre Creeks (relatively undeveloped watersheds) were used in this project to show that single sample maximum WQOs are rarely exceeded during dry flow conditions. In contrast, SCCWRP showed that single sample maximum WQOs are frequently exceeded at beaches near the outlets of undeveloped (reference) watersheds during wet weather, or storm flow conditions. Thus, a TMDL that allows some exceedance of single sample WQOs is appropriate for storm flow conditions, but not for dry flow conditions. In addition, a reference system approach is not applicable to dry weather TMDL calculations because numeric targets are based on the geometric mean WQOs."*

During dry flow conditions, San Mateo and San Onofre Creeks do not discharge to the ocean. The mouths of the creeks are closed by sand berms during much of the dry season, therefore it is questionable whether this data set is appropriate for determining whether creek inputs can cause single sample maximum WQO exceedances at the beach. This response also appears in conflict with the response to Comment 9 which states *"We recognize that there is essentially no data at this point to quantify bacteria loading from a reference watershed during dry weather."* Additionally, inspection of the dry weather monitoring during 2004-2005 (not evaluated by the Regional Board in the TMDL) within the undeveloped San Onofre Creek watershed also exhibits frequent exceedances of single sample maximum water quality objectives for indicator bacteria. Inspection of data available to the Regional Board clearly indicates that frequent exceedances were observed upstream in San Onofre Creek and the San Onofre lagoon for E. coli and enterococcus, while frequent exceedances at the beach were observed for total coliform. Given the undeveloped nature of this watershed, reexamination and careful consideration of the reference system approach for dry weather seems appropriate.

Response: The San Diego Water Board is currently working on an amendment to the Basin Plan that will authorize the use of a reference system and antidegradation approach or natural source exclusion approach during implementation of indictor bacteria water quality objectives within the context of TMDLs. The amendment is anticipated to authorize use of a reference system and antidegradation approach for dry weather

TMDLs. As such, there will be an opportunity to recalculate the dry weather TMDLs for inland streams using a reference system and antidegradation approach in the future once data are sufficient to use a statistical approach rather than a modeling approach for dry weather TMDL calculations.

Comment 289

Comment 9. *"the data collected at the shoreline of San Onofre and San Mateo Creeks was not used to establish an acceptable exceedance frequency for dry weather. The data was used merely to demonstrate that local beach sources, such as birds, marine mammals, and re-growth in the wrack line, are not sufficient to cause exceedances of single sample maximum WQOs during dry weather conditions. We recognize that there is essentially no data at this point to quantify bacteria loading from a reference watershed during dry weather. However, a reference system approach will not be used to calculate dry weather TMDLs for the reasons described in the response to Comment 8."*

The data from 2004-2005 indicate very different results than those described in the response above. Given that there are exceedances of WQO in undeveloped watersheds during the dry season, the reexamination and careful consideration of the reference system approach for dry weather seems appropriate (as recommended above in #8).

The critical point was chosen as a conservative measure to protect the downstream beach, where the majority of REC-1 use occurs.

It is noted that the perspective of focusing on areas where the majority of the use occurs is one that we condone and encourage the Board to emphasize. In fact, not only are the locations where the majority of the use occurs important, so are the times of the year when the majority of the use occurs.

Response: The 2004-2005 dry weather data from San Onofre Beach support the San Diego Water Board's previous response. Of twelve samples collected and tested for total coliform, E. coli, and enterococci during dry weather at San Onofre Beach, only one sample exceeded water quality objectives, and only for one parameter (enterococci). However, water quality objectives were more frequently exceeded at inland locations on San Onofre Creek during dry weather. These data indicate that a reference system and antidegradation approach may be useful for dry weather TMDLs for creeks. As such, the San Diego Water Board is developing a Basin Plan amendment that will authorize the use of a reference system and antidegradation approach during implementation of indictor bacteria water quality objectives within the context of dry weather TMDLs. Please see the response to Comment 284 above for further discussion of this amendment.

Regarding the comment of focusing where and when the majority of the use occurs, the San Diego Water Board will do so when such an approach conservatively protects beneficial uses.

Comment 290

Comment 17. *In developing the reference system approach, there will be variation in exceedance frequencies from reference watershed to reference watershed. There will* *also be variation in exceedance frequencies based on the method used to determine an acceptable exceedance frequency (e.g., minimum, mean, maximum).*

The commenter notes that local reference stations show exceedances of up to 50 percent. However, the commenter fails to note that there are data from reference watersheds that have exceedances as low as 0 percent.

We used a conservative approach when developing the TMDLs. Until evidence is provided that demonstrates a less conservative approach is warranted, the TMDLs that are developed must be protective of the beneficial uses of the receiving waters. At this time, we determined that an allowable exceedance frequency of 22 percent, based on data from the Los Angeles Water Board to be acceptable by the San Diego Water Board for purposes of developing interim TMDLs. When the reference system/natural sources exclusion approach Basin Plan amendment is adopted, region-wide, bacteria-specific, and/or watershed-specific allowable exceedance frequencies will be developed.

The response does not address the comment that was made. The salient points, which remain unanswered are: 1) the methodology of combining the reference system approach developed by the Los Angeles Regional Board to allow a specific exceedance frequency with the wet weather loading approach to estimate required load reductions during wet weather, is without precedent or technical basis, 2) we are very concerned with the lack of sensitivity analysis associated with the current reference system approach. Local reference stations, based on limited data show exceedances of up to 50%, yet the allowable frequencies specified in the TMDL, based on data from the Los Angeles Regional Board, are 22%, 3) We believe that the potential impacts associated with characterizing the sensitivity of reference watersheds to variability justify rigorous and prioritized investigation, and 4) the reference system approach should also be applied to winter dry weather as is the case in TMDLs conducted by the Los Angeles Regional Board (and may be supported by the data discussed in #8 above)

Response: Our response is organized according to the numbered issues found in the comment:

(1) The methodology of using the reference system and antidegradation approach to calculate an allowable exceedance load using exceedance days is technically sound. The methodology has undergone external scientific peer review and has been thoroughly described in the technical report (see Appendix I).

(2 & 3) The allowable exceedance frequency of 22 percent is used for interim TMDLs. As described in our previous response, the 22 percent frequency was chosen as a conservative measure using the best available data (data from more local reference systems was not sufficient for TMDL calculation). However, as new data from better matched reference systems becomes available, the final wet weather TMDLs will be recalculated. Likewise, continuing to characterize and understand variability among different reference systems is important. New information from these efforts can also be used to better quantify exceedance frequencies and recalculate the final TMDLs. The San Diego Water Board will continue to support the ongoing research being conducted on this issue by SCCWRP.

(4) The San Diego Water Board is currently working on an amendment to the Basin Plan that will authorize the use of a reference system and antidegradation approach during implementation of indictor bacteria water quality objectives within the context of TMDLs. The amendment is anticipated to authorize use of a reference system and antidegradation approach for dry weather TMDLs.

4.2 Technical Analysis

Comment 291

We must take exception to the Existing Beneficial Uses statement on page S-44, last paragraph regarding SHELL beneficial use. "Collection of shellfish for consumption along California's coasts and bays is well documented for both commercial and sport purposes," The "well documented" appears unsubstantiated, specifically for the south Orange County area in the northern portion of the San Diego RWQCB region. The City requests a copy of any documentation substantiating this statement for the coast in southern Orange County. RWQCB staff has provided, to date, only an internal memo (attached), dated November 3, 2006 from Christina Arias to Julie Chan regarding a meeting with Department of Fish & Game (DFG) which indicates that DFG wardens have observed shellfishing and/or habitat in San Diego County, and Huntington Beach. From the information provided in the memo, it appears that there are data gaps in south Orange County (areas north of Oceanside in the San Diego Region). Absent any additional "well documented" evidence of shellfishing and/or habitat along the south Orange County coastline, acknowledgement that no documentation exists for south Orange County is requested, please.

Further, the blanket approval for all beaches to meet a higher standard than for human recreation is simply unattainable within the TMDL time frame required and it is also potentially financially infeasible. We would submit that sections of beaches adjacent to major creeks and outfalls from an urban environment, with large bird populations, will seldom meet bacteria total coliform numbers of 70/ l00ml and should be excluded from shellfish harvesting. Let's be smart about this! Since there appears to be no evidence or proof of collection and consumption of shellfish along south Orange County beaches, let's carefully choose certain sections of beaches where shellfishing can be reinstated and have a reasonable chance of regularly meeting this difficult to obtain standard. The RWQCB has repeatedly indicated that this TMDL is not the appropriate venue to address the beneficial uses, as identified in the Basin/Ocean Plan; however wouldn't it make sense to revisit this issue as part of the TMDL implementation plan before dischargers are forced to spend millions and potentially billions of dollars trying to restore a beneficial use that may not be appropriate for all beaches?

Response: All the coastal waters in the San Diego Region are designated as having existing SHELL beneficial use. If a water body is designated with a beneficial use in the Basin Plan, this means that the beneficial use must be supported and the mission of the San Diego Water Board is to ensure that the water quality supports the beneficial use to be in compliance with the Basin Plan. The TMDL is developed to restore and protect water quality to support the beneficial uses in the Basin Plan. The TMDL may identify beneficial uses that are difficult to support, but a TMDL does not determine whether a beneficial use is appropriate or not.

We consulted the DFG to evaluate the possibility that the SHELL beneficial use does not exist anywhere along the coastal waters of the San Diego Region. However, after consulting with the DFG, we concluded that the habitat along the coast, especially the beaches in this TMDL, is suitable for several harvestable types of shellfish. If the City believes that the SHELL beneficial use does not exist along any coastal segments in Orange County, sufficient evidence must be provided to support the removal of the beneficial use from the Basin Plan. Until then, the all coastal waters will remain designated with the SHELL beneficial use.

The natural sources exclusion approach presented a method for calculating SHELL TMDLs that would not result in meeting WQOs at all times. However, consultation with the USEPA led us to discover that the National Shellfish Sanitation Program Model Ordinance, on which our WQOs for SHELL are based, does not allow consideration of non-anthropogenic sources in its implementation. Because the data from reference beaches show that non-anthropogenic bacteria sources frequently cause exceedances of SHELL WQOs, we decided to remove the SHELL TMDLs from this project.

SHELL will be addressed in a separate SHELL TMDL and/or standards action pending the outcome of the work of the statewide task force involving the Ocean Planning Unit of the State Water Board, the California Department of Public Health, the USEPA, and the coastal Regional Water Boards.

Comment 292

The response to Comment 38 indicates numerous times that "Dischargers are not required to reduce loads caused by background sources, even though these loads are eventually transmitted to receiving waters via MS4s". The City has concern as to how this is going to be quantified and implemented. It also does not account for regrowth/proliferation of background bacteria. For example, even if we could quantify an amount of background bacteria that enters an MS4, that "background" bacteria could multiply in the MS4 and the amount of background bacteria exiting the MS4 could be more that what entered. These issues will need to be taken into account when determining how the natural background exclusion, implementation and assessment methods are developed. Please discuss.

Response: For a TMDL developed using the reference system approach, the load from background sources for an urban watershed is estimated based on the loading in a reference watershed. The “allowable exceedance load” is ascribed to the natural sources and the dischargers do not need to quantify natural loads in the urban watershed. For a TMDL developed using the natural sources exclusion approach, a suggested methodology for estimating non-anthropogenic loads is outlined in the response to Comment 287. How to account for bacteria re-growth in storm drains is an issue that needs further study. Although pathogenic viruses cannot reproduce outside of a host, pathogenic bacteria might be capable of reproducing in the biofilms that line storm drains. The risk posed to human health by “re-growth” bacteria is not well understood at this time.

Comment 293

The response to Comment 41 acknowledges that the there was "limited" validation of the modeling assumptions specific to land use, which is the basis for the entire TMDL. We have any concerns about pursuing an intense regulatory document that will require extremely large amounts of public funds to implement on a program based on a model that may not be appropriately or carefully validated. The stated lack of time and resources of the RWQCB would seem to be the same difficulty with which dischargers are struggling with.

Response: As stated in the response to Comment 41, validation of modeling assumptions specific to land uses was limited by the lack of land-use-specific water quality data collected in the San Diego Region. Land-use-specific water quality data collected by SCCWRP in the Los Angeles Region were used to determine ranges of bacteria build up rates on specific land uses.

We used bacteria build up rates on different land uses based on the water quality data collected in the Los Angeles Region because there are no land-use-specific water quality data for the San Diego Region. During the calibration of the LSPC model the bacteria build up rates were selected from the bacteria build up rate ranges determined by SCCWRP for the Los Angeles Region. The bacteria build up rates that were selected were then validated to San Diego Region water quality data. Please see Appendix J, section J.2.5 for a more detailed discussion.

The commenter may be concerned that the build up rates selected are not based on San Diego Region water quality data. However, the alternative is to make assumptions that are not based on any water quality data, but based on literature or other sources that would likewise not be based on data specific to the San Diego Region. We believe that the bacteria build up rates selected are appropriate based on the results of the model validation using the model calibrated with the bacteria build up rates selected.

However, a special study could be performed as part of the TMDL implementation to obtain bacteria build up rates for different land uses specific to the San Diego Region. The model can be re-calibrated and re-validated with the new bacteria build up rates based on the San Diego Region land-use-specific water quality data.

Comment 294

Per Comment 59, the City requests that the concurrence that MPN is an equivalent metric to CFU be written into the TMDL document.

Response: We concur that MPN is an equivalent metric to CFU. However, we have not revised the TMDL documents. The units that will be used to measure bacteria densities in the water samples collected should be discussed during the stakeholder process prior to submission of the Pollutant Load Reduction Plans.

Comment 295

The response to Comment 82, "Whether or nor the use of infiltration is feasible in terms of complying with TMDL requirements is the responsibility of the dischargers to investigate. We cannot speculate on the manner of compliance with the TMDLs."

One has to question how realistic the financial analysis is, in terms of Implementation, as well as assessment of compliance, with the RWQCB response noted above. Suffice to say that we believe the financial analysis provided to date is vastly underestimated.

Response: We have provided an economic analysis that is based on the reasonably foreseeable means of compliance. We have provided a range of potential costs for several types of BMPs for 10 percent of urbanized areas. The costs may be scaled up or down depending on the planned percentage of urbanized areas where structural controls will be implemented. The methods to comply with the TMDLs will be selected by the dischargers. What methods are selected will determine the cost of implementation. The estimated cost ranges are based on the sources cited in the economic analysis, which are accepted industry costs. We do not believe the economic analysis is underestimated.

Comment 296

Based on our detailed review of this most recent version of the TMDL document including Appendix S, it is clear that 1) other interested organizations and agencies shared many of the same concerns we expressed, 2) many of our comments were not addressed in a substantive manner, and 3) on many of the issues that we perceive to be most critical, we have reached a scientific and/or technical impasse with Board staff.

For example, we have been and continue to be particularly concerned that the selected technical approach for the TMDL may not lead to enhancements in beneficial use protection that are commensurate with the expenditure of potentially significant public funds that will be required to achieve the required bacteria loading reduction in the various watersheds. Heal the Bay expressed a similar concern in their comments (P. S-89) indicating that the TMDL would not lead to attainment of the water quality standards. Board staff continue to support the position that this approach is the most suitable for the impaired waters addressed in this TMDL, although the approach employed for this TMDL appears not to have been used previously (the TMDL document indicates that two previous TMDLs have used a similar method of expressing the allocations, however the technical approach used for TMDL LA and WLA development employed in this TMDL is substantially different than those cited), and is apparently intentionally ambiguous in terms of measuring compliance. During the February 2006 Regional Board meeting, former Board Chairman Minan requested staff to provide “the support for why that approach (expressing wasteload reductions as million MPN/year) is better than the approach taken with respect to Santa Monica Bay”. In our opinion, the explanation provided by Board staff (p. S-119)[2] is inaccurate and not sufficient to overcome the serious shortcomings noted above.

Response: The WLAs and LAs and existing loads calculated in the watershed models provide a basic understanding of where bacteria loads may be reduced to meet the TMDLs. While expressing the TMDLs in terms of “exceedance days” may give the dischargers the impression that it will be allowable for WLAs to be exceeded, it is not a metric that can be used by watershed managers to identify where bacteria loads can be reduced. The primary goal of the TMDLs is to restore the water quality of the impaired water bodies to support the designated beneficial uses.

2 . “A metric expressed in a term different from a load, such as exceedance days (as has been approved by the LA RWQCB and SWRCB) does not allow program managers to decipher a percentage by which loads must be reduced, nor help with selection of BMPs

Million MPN/year may or may not be used as a metric for compliance, but is used in this TMDL as a metric for identifying controllable bacteria sources that require load reductions. The TMDLs are calculated using numeric targets based on water quality objectives in the Ocean Plan and Basin Plan for indicator bacteria. If the water quality objectives are met, the water quality supports the designated beneficial uses. This essentially means that compliance with the water quality objectives in the Ocean Plan and/or Basin Plan will restore the water quality that will support the designated beneficial uses and, thus, will result in compliance with the TMDLs.

Reducing the bacteria loads in the receiving waters will likely require a reduction of bacteria sources as well as end of pipe treatment. The costs associated with end of pipe treatment can be prohibitively expensive if the bacteria sources are not adequately controlled. If the dischargers believe end of pipe treatment methods are the only means that may be implemented to comply with the TMDLs, then we can understand a statement such as "*the TMDL may not lead to enhancements in beneficial use protection that are commensurate with the expenditure of potentially significant public funds that will be required to achieve the required bacteria loading reduction in the various watersheds*" can be made. However, source control methods (i.e., public education, and developing and enforcing ordinances) can significantly reduce pollutant loads with comparatively low expenses. We encourage the dischargers to explore the effectiveness of source control before concluding that bacteria pollutant loads cannot be reduced to meet the TMDLs.

Comment 297

The draft report indicates the wet weather numeric targets were set equal to the single sample maximum WQS (p.35), where the basis for the WQS are as follows:

"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." (P. 34).

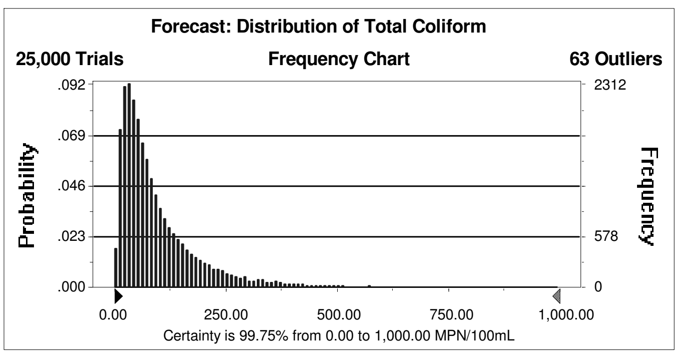
This comment applies specifically to the single sample maximum values for the total coliform objective for the SHELL use and the fecal coliform objective for the REC-1 use for inland surface waters (that is, creek and steams). Based on the information presented in Appendix F, the relevant WQS are as follows:

Fecal coliform WQS for REC-1 for inland waters: Based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 per 100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400 per 100 ml.

Total coliform WQS for SHELL: At all areas where shellfish may be harvested for human consumption, as determined by the Regional Board, the following bacteria objectives *shall be maintained throughout the water column: The median total coliform density shall not exceed 70 per 100 ml, and not more than 10 percent of the samples shall exceed 230 per 100 ml.*

Table 4-2 indicates that the interim and final wet weather target for fecal coliform is 400MPN/100mL and the final wet weather target for total coliform is 230MPN/100mL (p.40). Further, the allowable loads were computed as the daily flows multiplied by the representative numeric targets to create a numeric target line across the load duration curve (pp64-65).

Based on this information, it appears that the allowable loads neglect the fact that in both cases the WQS are 90th percentile values, not values which are never to be exceeded. The potential implications in terms of allowable loads is significant, as illustrated below. Assuming that the distribution of bacterial indicators is lognormal with a 50th percentile (median) of 70MPN/100mL total coliform and 90th percentile of 230 MPN/100ml (as would be the case for the SHELL WQS), the expected distribution of TC for a waterbody meeting the WQS is as follows (obtained via simulation of 25,000 iterations, exact solution would vary slightly):



Summary statistics for this distribution are as follows:

%ile of Distribution	MPN/100 mL
0%	3
10%	21
20%	31
30%	42
40%	54
50%	68
60%	88
70%	112
80%	152
90%	229
91%	240
92%	252
93%	270
94%	288
95%	317
96%	348
97%	390
98%	460
99%	580
99.5%	730
99.7%	895
99.9%	1495

Inspection of these data clearly indicates that a 90th percentile drastically underestimates the maximum coliform densities that could be expected when a waterbody is in compliance with the WQS. For example, the data shown indicate that 1% of the time, total coliform densities above 580 MPN/100mL should be expected in a waterbody just meeting the applicable WQS, and 0.5% of the time total coliform densities above 730 MPN/100mL should be expected. When this information is considered in the context of the loading based approach employed for TMDL allocations, the potential impacts on the TMDL are substantial. For example, the bacterial loadings that would be associated with an observed total coliform concentration of 580 MPN/100mL (which would be expected 1% of the time in a waterbody meeting the WQS) could be up to 150% higher than the allowed load based on the methodology described in the Draft TMDL document.

A similar analysis can be developed of the fecal coliform WQS that apply to the REC-1 wet weather TMDLs for inland waters. Such an analysis (not shown) indicates that 1% of the time, fecal coliform densities above 690 MPN/100mL should be expected in a waterbody just meeting the applicable WQS, and 0.5% of the time fecal coliform densities above 800 MPN/100mL should be expected in such a waterbody. For comparative purposes, the allowable loads in the draft TMDL document are based on a maximum concentration of 200 MPN/100ml.

Thus, the allowed loads, as computed in the TMDL may substantially underestimate the loads that should be allowed under the methodology described in the draft document, based on the stringency of the WQS in the Basin Plan. Further, the differences noted above could be substantially greater than the usual 10% that is included as an explicit margin of safety.

If it was the intention of the Regional Board to set the stringency of the TMDL equal to that of the applicable WQS (with a reasonable and appropriate margin of safety), it appears that the loading (and all subsequent) calculations corresponding to the single sample maximum values for the total coliform objective for the SHELL use and the fecal coliform objective for the REC-1 use for inland surface waters may need revision.

Response: While the commenter's statistical analysis is technically correct, there are several points that should be acknowledged.

First, there may be water samples collected with bacteria densities that exceed the single sample maximum numeric targets selected for the TMDLs that could still statistically be in compliance with the water quality objectives found in the Basin Plan. However, in our experience, seldom do the dischargers collect enough samples in a month to statistically demonstrate that a high bacteria density result is either an anomaly or within a statistically acceptable range. Additionally, if we were to take the statistical example provided by the commenter to the extreme, technically the "maximum" result could be infinity, given the asymptotic result of the simulation, which is obviously not acceptable under any circumstances.

Second, the water quality objectives of the Ocean Plan, included in the discussion of applicable water quality objectives in Appendix F of the Technical Report, are also a factor in selecting the numeric target. The Ocean Plan states that the single sample maximum fecal coliform density shall not exceed 400 MPN/100 ml. Because all the water bodies in this TMDL are within the ocean, or ultimately discharge into the ocean, the water quality must be consistent with the water quality objectives in the Ocean Plan.

The numeric targets for the TMDLs were selected to be protective of water quality under "critical" conditions and protective of beneficial uses designated in the Basin Plan and Ocean Plan. The commenter has not provided any evidence to show that the numeric targets could be increased and still be protective of beneficial uses under "critical" conditions.

Comment 298

Comment 33a. *In a letter to the SWRCB dated January 31, 2006, the San Diego Water Board recommended that all waterbodies, regardless of quality during dry weather, remain listed if no wet weather data is available to demonstrate support of beneficial uses. Even if the waterbodies in question are de-listed in the 2008 list evaluation, they will be included in this TMDL project. Please see the response to Comment 190 for further discussion.*

The response does not address the comment. The comment was that draft SWRCB policy and guidance for the development of TMDLs has not been followed. According to the SWRCB policy, the original listing of the water body should be re-evaluated based on current existing data. According to the State Regulatory Structure and Options Policy, "If the water body is neither impaired nor threatened, the appropriate regulatory response is to delist the water body." The SDRWQCB recommendation regarding listing waterbodies does not conform with the SWRCB Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List.

Response: The existing data were evaluated in the early stages of TMDL development, and during the 2006 303(d) process. Although beaches in the Scripps and Miramar

Reservoir Hydrologic Subareas were delisted by the State Water Board in 2006, the Technical Report has been revised to provide an explanation for why we are proposing TMDLs for these beaches. Please see Appendix T.

Comment 299

Comment 33b. *The San Diego Water Board has no basis to reject the Ocean Plan WQOs and use different ones.*

The response does not address the comment. It is not suggested that the WQOs be rejected. Rather our comment was to indicate that the appropriateness of the uses be evaluated for some of the listed sites. In fact, changes have been made to this version of the TMDL document that are consistent with this comment. For example, refer to page 39 and Table 4-2. Our original concerns remain, and we believe that the Regional Board has much more leeway and authority in interpreting the Basin Plan than has been exercised to date.

Response: The beneficial uses are designated in the Basin Plan and Ocean Plan. Any de-designation of a beneficial use for a water body could only occur after a Use Attainability Analysis and Basin Plan amendment, which would require significant evidence as well as public input. This type of analysis is beyond the scope of these TMDLs. Further, the dischargers have not yet provided convincing evidence that the San Diego Water Board should pursue a standards action rather than a TMDL to address the bacteria listings. If this information is developed, it can be brought to the San Diego Water Board for consideration at any time.

Comment 300

Comment 34. *The analysis of hydrologic model error based on volumetric comparisons provided sufficient evaluation of model error for purposes of this study.*

As one example illustrating our concerns with the TMDL modeling and performance, please consider the following text from Appendix K. *"The methodology for estimating fecal coliform concentrations was not as successful for prediction of total coliform and enterococci. Similar regression analyses were performed to determine whether there are relationships between total coliform and enterococci and land use and subwatershed size, but no acceptable correlations were found. As a result, a separate approach was used for estimating total coliform and enterococci concentrations in dry weather runoff for each subwatershed….. The following are the resulting equations obtained (units of fecal coliform and total coliform/enterococci are consistent): total coliform = 5.0324 × fecal coliform and enterococci = 0.8466 ×fecal coliform."*

Given the available scientific information regarding the ubiquitous and substantial variability of indicator data in ambient waters, we question the robustness of the stated relationships with respect to temporal and spatial variability. Further, without any sensitivity analysis it is impossible to know how these point estimates for characterizing indicator densities impact the resultant TMDL loadings. Thus, it is difficult to understand what the basis was for accepting that the potential model error is sufficient for the purposes of this study.

Response: There were two models and approaches calibrated separately for TMDL development: a dynamic model for wet periods and a steady-state model for dry periods. The referenced text, *the analysis of hydrologic model error based on volumetric comparisons provided sufficient evaluation of model error for purposes of this study,* from the response to Comment 34 was used to describe the hydrologic calibration which the original comment stated *Calibration and validation of model performance are presented only as figures for a visual inspection. Some error analysis was conducted for the wet-weather hydrology, but not discussed*. The reference text was meant to address this comment. However, the response above refers to the dry weather model, and references discussions that are not relevant to the wet-weather hydrologic calibration discussion. Furthermore, the response uses as examples text from Appendix K that describes assumptions developed for the dry modeling approach, not calibration results or results meant to illustrate model accuracy. Separate calibration results were presented for illustration of the sufficiency of these assumptions to represent typical dry-weather bacterial densities.

Comment 301

Comment 35. *Evaluation of the sensitivity of modeling parameters was a key consideration during the model calibration process to provide modelers insight regarding parameters requiring adjustment…. To provide information recommended by the commenter on model uncertainty based on sensitivity analysis, many model input parameters would require adjustment based on high and low confidence interval values. However, such confidence intervals are not available for each parameter, which would result in an arbitrary selection of a confidence range (e.g., +/- 50% of the parameter value). As a result, sensitivity analyses would be informative regarding sensitivity of each input parameter, but ranges of predictive values are not directly transferable for determination of model uncertainty and a numeric MOS with confidence. Moreover, additional non-modeling assumptions were considered in the implicit MOS of the TMDL, and quantitative measures of each of these assumptions relative to modeling assumptions will also require further study.*

The uncertainty in the modeling is acceptable for the regulatory decisions required in this TMDL which is based on the best available data and method of analysis. We acknowledge that the development of the bacteria TMDLs is characterized by data gaps and uncertainties. Scientific uncertainty is a reality within all water quality programs, including the TMDL program, and it cannot be entirely eliminated. The TMDL program must move forward in the face of these uncertainties if progress in establishing TMDLs and attaining WQOs in impaired waters is to be made.

Based on the responses in the first paragraph above, it appears that the Board staff appreciate the technical importance of this comment. However, science policy decisions, as described in the subsequent paragraph are flawed. For example, no information is presented to suggest that the uncertainty is acceptable. While we agree that improvements to water quality are necessary, the appropriate balancing of resources with benefits is conditional on the best possible inferences from the available science which therefore requires a high level of transparency and rigor, to the degree feasible. Thus, as suggested in the original comment, sensitivity and uncertainty analyses should be conducted and used to evaluate and/or verify the potential impacts on the loading required by the TMDL.

Response: As stated in the original response to this comment, *To provide information recommended by the commenter on model uncertainty based on sensitivity analysis, many model input parameters would require adjustment based on high and low confidence interval values. However, such confidence intervals are not available for each parameter, which would result in an arbitrary selection of a confidence range (e.g., plus or minus 50 percent of the parameter value). As a result, sensitivity analyses would be informative regarding sensitivity of each input parameter, but ranges of predictive values are not directly transferable for determination of model uncertainty and a numeric MOS with confidence.* The commenter should be aware that each parameter can have different impacts on results, and arbitrary selection of a range for that parameter, such as the parameter values plus and minus 20 percent or 50 percent, does not have meaningful translation when evaluating impacts of model results on TMDL load estimates.

The model calibration results were sufficient to use the models for science policy decisions such as this TMDL. These results represent the present state of the science in modeling indicator bacteria loads in the region for both wet and dry conditions. Further technical peer review verified this opinion as the reviewers were specifically asked whether modeling assumptions or results were sufficient. None of these independent, unbiased, peer reviewers suggested that these models or their applications were insufficient for the TMDL.

As more water quality and flow data are collected in the waterbodies addressed in this TMDL, the models can be further tested and additional uncertainty analyses can be performed in the future. We encourage stakeholders to collect such data and further test model uncertainty under an expanded range of hydrologic and pollutant loading conditions. These results will prove useful in working with the San Diego Water Board to evaluate the implementation of the TMDL and ensure that future resources and benefits are balanced with the latest and most up-to-date state of the science.

Comment 302

Comment 36. *An explicit MOS is not required for calculation of TMDLs.*

Our comment was that the report should explicitly list each of the conservative assumptions used to form the MOS and (at least) discuss the potential relative magnitude of the assumption’s importance on the estimated loading capacity. The response does not address the comment.

Response: The report explicitly *lists* the modeling and non-modeling assumptions in Appendix L and section 8.1.7. Quantitatively describing the impact of each individual assumption is equal to describing an explicit assumption, which was the basis of the original response to the comment. Implicit conservative assumptions are acceptable for TMDL development, and do not require quantification or translation into explicit assumptions with defined quantitative impacts on TMDL results.

Comment 303

Comment 37. *The average flows calculated for the dry-weather model were based on dry weather monitoring data collected from Aliso Creek, Rose Creek, and Tecolote Creek. These average flows were relatively small, ranging from 0.007 to 0.23 cfs. The differences between calculated median and average (mean) flows are less than 0.05 cfs, which are negligible. Moreover, the monitoring data are unlikely to be accurate within this range. Thus, average flows are acceptable for estimation of dry-weather flows in this study.*

Our comment was that median flow values should be used (to compute loadings) since mean flow values will greatly increase the loading due to higher assumed flow. Based on the response it appears that monitoring data may not be sufficiently accurate to compute loadings, which brings into question the reductions required by the TMDL. While we understand that modeling is necessary in cases where sufficient data do not exist to make decisions, it is important that technical underpinnings are as correct as possible. The response above does not help to understand if/how the reductions required by the TMDL are accurate.

Response: As stated in the original response, *The differences between calculated median and average (mean) flows are less than 0.05 cubic feet per second (cfs), which are negligible. Moreover, the monitoring data are unlikely to be accurate within this range*. The difference of 0.05 cfs does not *greatly increase* the loading as stated in the response above. Also, the accuracy mentioned in the original response describes the ability to measure a difference of 0.05 cfs in the field, and in no way illustrates that *data may not be sufficiently accurate to compute loadings, which brings into question the reductions required by the TMDL*, as stated in the response above.

Comment 304

Comment 38. *The reference system approach, which will be incorporated into the Basin Plan permanently, accounts for discharges of bacteria from background sources.*

We encourage the Regional Board to adopt the TMDL and the Basin Plan amendment simultaneously so that there is no ambiguity on this point.

Dischargers are not required to reduce loads caused by background sources, even though these loads are eventually transmitted to receiving waters via MS4s.

Please clarify whether this statement is true throughout the year including the winter dry weather season.

Response: The statement is taken out of context with regard to the complete response to Comment 38, in which we discussed how the reference system approach accounts for background loads. Please see the response to Comment 292 where we clarify the statement about loads from background sources.

Comment 305

Comment 40. *The modeling analysis does not assume that there is a consistent relationship between flow and bacteria loads. Bacteria loads are assumed to be a* *function of land use types comprising each watershed, as discussed in the source analysis.*

The response does not help to clarify the issue addressed in the comment. Section 5.3 of the TMDL indicates that fecal coliform levels varied throughout the year and were not related to flow. The text then indicates that "This indicates the need to assess bacteria separately during both wet weather events and dry weather conditions." We do not understand the logic used to arrive at such a conclusion based on the observation presented. Please clarify this point.

Response: In Section 5.3, high bacteria densities were shown to occur during both dry and wet conditions. The statement, *this indicates the need to assess bacteria separately during both wet weather events and dry weather conditions*, simply means that since both conditions result in high bacteria densities, both conditions should be addressed in modeling analyses.

Comment 306

Comment 41. *Validation of modeling assumptions specific to land uses was limited by the lack of land use-specific water quality data collected in the San Diego Region.*

Thank you for the clarification. Our point was that "these data are so key to the model results" that the implications of the uncertainties need to be discussed.

Response: Lack of land-use-specific water quality data collected in the San Diego Region can lead to model uncertainty. However, this uncertainty cannot be evaluated or quantified until land-use-specific monitoring data are collected and available in the San Diego Region for comparison with model predictions.

Comment 307

Comment 42. *The steady-state approach for defining dry-weather flows and bacteria loads is acceptable and adequate for loading assessment and TMDL calculation. A steady-state approach for prediction of dry-weather flows is typical for source assessments used in TMDLs. Similar modeling approaches have been used for calculation of TMDLs in the Los Angeles Region where dry-weather runoff is also common, including TMDLs for Ballona Creek and Los Angles River, and models currently under development by USEPA for estimation of dry-weather loads to San Gabriel River and Los Angeles and Long Beach Harbors.*

We indicated that the fundamental decision about which type of modeling to employ was based on the assumption that the Region is "*dominated by nonpoint sources that are generally constant on an hourly time step and deposit directly to drains*". We further noted that there is no documentation given for the basis of this assumption about the behavior of nonpoint sources, nor is there any reference to more detail in an Appendix. The response to our comment does not substantively explain the technical decision that was made.

Response: As stated in the original response to this comment, *the assumption in the comment that the Region is "dominated by nonpoint sources that are generally constant* *on an hourly time step and deposit directly to drains" refers to wet weather, for which a LSPC model was developed that provides hourly predictions of flow and bacteria concentrations assumed constant during each hourly time step. This does not refer to an assumption used in selecting a dry-weather modeling approach, as stated by the comment. The text has been clarified to this effect.* In other words, the stated assumption regarding the *dominated by nonpoint sources that are generally constant on an hourly time step and deposit directly to drains* is meant to refer to wet weather. This refers to the adequacy of the wet-weather model to simulate flows and bacteria densities at an hourly time-step. It is unclear given the statement quoted above from the response to the comment, in addition to the new response provided above, what the new response is referring to regarding the technical decision made. We are confident that an hourly timestep is sufficient to model and characterize wet-weather flows and bacteria densities, and does not require more-detailed discussion, justification, or documentation in the report. Since the rainfall data is typically provided at an hourly time-step, and the models are based on rainfall for model input, the model cannot be expected to provide simulation at a time-step less than an hour.

Comment 308

Comment 43. *The TMDL must provide protection of receiving waters during all periods when the designated use is applicable, including periods most impacted by watershed flows, the wettest year was used as the critical period for TMDL calculation. Reduction in bacteria loads calculated based on the critical wet year provides assurance that load reductions will be sufficient during all periods.*

We indicted that it would be useful to see model runs that show the sensitivity of the TMDL targets to different rainfall years, and that the choice of this particular year seems arbitrary. We continue to believe that without some sensitivity analysis, the implications of the selected year are unknown.

Response: As stated in the original response, *The critical wet year was the wettest year of the model simulation period based on rainfall data used to develop the wet-weather model. The model simulation period was from 1990 through 2002. Year 1993 was characterized with the most rainfall, and produced more flows and resulting loading of bacteria to receiving waters than any other year during the simulation period. Since the TMDL must provide protection of receiving waters during all periods when the designated use is applicable, including periods most impacted by watershed flows, the wettest year was used as the critical period for TMDL calculation. Reduction in bacteria loads calculated based on the critical wet year provides assurance that load reductions will be sufficient during all periods. The same critical wet year was used in calculation of TMDLs for Santa Monica Bay Beaches in the Los Angeles Region. Therefore, selection of this critical period was not arbitrary.* Sensitivity analysis is irrelevant when considering that the criterion for selection of the critical period was the wettest from 1990 through 2002 modeled (and is also the wettest through 2006). Any sensitivity analysis will still show that 1993 was the wettest year for this period.

Comment 309

Comment 44. *Bacteria loading was modeled as a function of land use, and all land uses have both natural sources (wildlife) and anthropogenic sources of bacteria. Once pollutants are washed into an MS4, municipalities are responsible for these pollutants in the waste stream discharged from the MS4s.*

This comment seems to be in conflict with the response to comment #38, which indicates: "*Dischargers are not required to reduce loads caused by background sources, even though these loads are eventually transmitted to receiving waters via MS4s.*" Please clarify.

Response: The dischargers are responsible for any bacteria loads that are discharged from the MS4s. However, if the dischargers can demonstrate that the bacteria loads from the MS4s are not from anthropogenic sources, then those loads may be considered background or natural loads for the purpose of calculating a TMDL under the natural sources exclusion approach. With the reference system approach, an allowable exceedance load is calculated based on the exceedance frequency in a reference system. The allowable exceedance load represents the non-anthropogenic loading in the urban watershed that causes allowable exceedance of WQOs.

Comment 310

Comment 45. *The bacteria TMDLs must ensure that WQOs are met in all conditions and at all times. The REC-1 beneficial use is a component of a water quality standard and is not intended to be used as a risk management index that calculates a level of risk. The bacteria TMDLs will not address issues dealing with the appropriateness of existing REC-1 beneficial uses or the bacteria water quality standards in the Ocean Plan. These types of issues are more appropriately addressed by amending the WQOs in the Ocean Plan through the formal amendment process.*

This response did not address the comment. The important issue is whether or not REC-1 is appropriately designated for creeks and streams during storm events. While it is agreed that this TMDL may not be the appropriate venue for resolving the question, the question is germane in that the TMDL requires municipal agencies to reduce bacterial loadings during storm events based on the assumption that the designations are appropriate during storm events. The Santa Ana RWQCB has recognized this as an important issue also and is considering how to rectify the issue in their jurisdiction. The SD RWQCB should consider this issue in the near future and the TMDL should be subsequently amended.

The commenter should also keep in mind that the wet weather TMDLs address not just the period of the storm, but the 72 hours after cessation of rainfall when bacteria levels remain high at beaches. Weather can improve significantly within 1 to 3 days of a storm, so the assumption that inclement weather keeps swimmers out of the water during storm flow conditions is not entirely correct.

Please clarify whether the loading (flow times concentration) that occurs during the 72 hours following a storm is considered to be part of the wet or dry weather TMDL allocation.

Response: For the response to the first part of this comment, please see the response to Comment 299.

The peak of the flow from a watershed after a storm may not occur until after the storm ends. The loading that occurs during the storm flow is considered to be part of the wet weather TMDL allocation. For TMDL calculations, we included the 3 days (72 hours) after a storm in the wet weather load calculations.

Comment 311

Comment 47. *Bacteria loading from urban creeks should be reduced even though open space loading exceeds the capacity of the creeks and beaches because pet waste and human sewage are more likely to occur in urban runoff. We recognize that it will be difficult for dischargers to meet final allocations and WQOs during wet weather. Therefore, we are developing a Basin Plan amendment to permanently incorporate a reference system/natural sources exclusion approach for implementing bacteria WQOs.*

This response highlights the importance of adopting the Basin Plan Amendment at the same time as the TMDL to ensure that the TMDL is implementable.

Response: The Basin Plan amendment is a high priority for the San Diego Water Board. In the Implementation Plan, the San Diego Water Board has committed to consider the Basin Plan amendment and revise the wet weather TMDLs within one year of OAL approval of these TMDLs. Further, the dischargers will not be required to submit Bacteria Load Reduction Plans for the final wet weather TMDLs until after the San Diego Water Board takes that action.

Comment 312

Comment 90. *The methodology used to develop allocations … was designed to produce proportional load reductions among the two main discharger categories. In formulating this methodology, we attempted to use a fair approach to developing load allocations and reductions. Setting allocations proportional to existing loading was the way we chose to accomplish this. We agree that agricultural and livestock practices lend themselves to the opportunity for water quality control. Agricultural and livestock dischargers may be able to meet their allocations easier or faster than MS4 dischargers, or achieve that load reductions in excess of 13 percent. This could create an opportunity for trading pollution credit. Municipal dischargers could meet their reductions by paying for BMPs to achieve higher load reductions from agricultural and livestock facilities.*

While this comment provides insight towards understanding how the decision was made, it seems inequitable, unreasonable, and arbitrary. We encourage the Board to reconsider this policy decision and formulate a policy that emphasizes reductions of loadings based on ease (and cost) of implementation in conjunction with the likely benefits associated with such reductions (i.e. those that are easy and inexpensive should be required first).

Response: The decision was made based on the model results showing that the MS4s are the largest controllable sources of bacteria. Reduction of bacteria loads from the largest controllable sources of bacteria should be the first focus of the efforts to meet the TMDLs. Load reductions from the largest controllable sources of bacteria will further highlight and help identify the sources of loading that is occurring from smaller controllable sources of bacteria.

Methods of implementation are more appropriately discussed in a stakeholder process prior to submission of the Pollutant Load Reduction Plans. The MS4 dischargers should propose both compliance methods and assessment locations in their Pollutant Load Reduction Plans, which will be unique to each watershed. The compliance methods and assessment locations will help the dischargers determine where and what types of BMPs should be implemented. The dischargers must decide which methods, in terms of ease and expense, will be implemented first.

Comment 313

Comment 96. *Dry-weather loads were not predicted based on the arithmetic average bacteria densities, but were based on the regression analyses of the geometric mean of bacteria densities observed in multiple streams throughout the San Diego Region, as discussed on page K-7 of Appendix K.*

The response does not address the comment. The point of the comment is that the loading based approach using the geometric mean WQO times the average flow as the basis for the allowable loading, unintentionally imposes WQS more stringent than those in the basin plan. For example, assume for the sake of simplicity that the flow in a hypothetical stream covered by the TMDL is constant for a whole month and that daily (30) fecal coliform observations are available for the stream. The allowable loading based on the stated approach (p.68) would be the geometric WQO (200 MPN/100mL) times a constant times 30 days. The actual loading (based on observed data) would be the sum of each of the observations times the same constant. Thus to meet the allowable load, the sum of the 30 observations would need to be less than the geometric mean standard times 30 (or equivalently the arithmetic average of the observed data must be no greater than the geometric mean WQO). The response to comment 140 confirms this: *Conceptually, the sum of the bacteria loads from the creek or river at the shoreline from every day in a given month must be less than or equal to the dry weather TMDL.* The point is that this method inadvertently requires the average value (sum/#observations) to equal the geometric mean standard. Because bacterial indicator data are typically lognormally distributed (right skewed), this effectively puts in place a standard that is more stringent than in the Basin Plan.

Response: The method for implementing, monitoring, and reporting compliance with the dry weather wasteload allocation has not been specified in this TMDL, and will not be determined until wasteload allocations are ultimately incorporated into the revised MS4 permits. As an example of an alternative to the approach mentioned by the commenter, the 30-day geometric mean of observed daily (or weekly, which has also yet to be determined for specification in the revised MS4 permit) bacteria densities can first be calculated, and this value can then be multiplied by the sum of the daily flows. This will not result in comparison of an arithmetic average verses a geometric mean. There are other options for implementing the TMDL, which will be fully described in the revised MS4 permit.

Comment 314

I'm curious please explain what is a "waste metabolozing bacteria" is. The reference to this is found on page 144 in the landfills section.

Response: "Waste metabolizing bacteria" breakdown volatile organic compounds (VOCs) in a landfill (e.g. petroleum hydrocarbons, chlorinated solvents). The bacteria are naturally occurring, but can be increased in the landfill by adding food sources, or additional cultures to speed up the breakdown of VOCs if necessary. Naturally occurring bacteria break down almost anything organic in the landfill.

Comment 315

With regard to achieving the zero Wasteload Allocation in any size storm, is there data to suggest that the facilities shown in R-67 or R-70 would lead to compliance with this TMDL?

Response: The facilities shown are examples of BMPs that may be implemented by the dischargers. At this time we have not determined how compliance with the TMDLs will be measured because these details are not necessary at this stage. Methods for determining compliance are more appropriately discussed in a stakeholder process prior to submission of the Pollutant Load Reduction Plans. The dischargers should propose compliance methods, assessment locations, and compliance metrics in their Pollutant Load Reduction Plans, which may be unique to each watershed.

Comment 316

Please describe how a bacteria loading at the "critical point" (modeled as being above the tidal prism, approximately one mile from the nearest beach in the San Diego River) is related to achieving receiving water standards at the beaches at the base of the river. This assumption is the foundation of the TMDL, the proposed Waste Load Allocations, and BMP requirements.

Response: The critical point is a node in the model representing the culmination point at the bottom of the watershed, before intertidal mixing and dilution takes place. Conceptually, this critical point is the place where freshwater and saltwater meet. The actual location in the watershed where freshwater and saltwater meet will depend on the time of day and year, but may be well inland during extreme high tides, and at the beaches of the coast during extreme low tides. During extreme low tides, when the freshwater conceptually may be discharging directly to the beach, the water quality objectives of the freshwater must comply with the water quality objectives of the beach waters. Thus, the critical point must meet the water quality objectives of both inland surface waters and surface waters at the beaches. Also, by calculating the TMDLs at the "critical point," we incorporated an implicit margin of safety into the TMDLs by not considering any dilution of creek water in the wave wash of the beach.

4.3 Water Quality Objectives/Indicator Bacteria

Comment 317

Comment 106. Our comment was: The best available science clearly indicates that 2 of the 3 indicator organisms employed in the TMDL (total and fecal coliform) are uncorrelated with risk to human health and thus, to the protection of the beneficial use. We believe that the Regional Board should consider the policy implications of this assumption relative to current and future listings, as well as the implications of this assumption as it constrains the ability of the staff to evaluate impairment based on the best available scientific information. Staff efforts should be focused on the indicator(s) that has (have) the strongest link to public health protection (enterococci) and that will result in true protection of beneficial uses. Limited resources should not be spent on controlling indicators that do not correlate with protecting public health.

The response was: *Since the Basin Plan and Ocean Plan include WQOs for total and fecal coliform, we are required to develop TMDLs for waterbodies not meeting these WQOs. We agree that efforts by all parties should be focused on the indicators that have the strongest link to public health issues and will result in true protection of beneficial uses; therefore we encourage dischargers to focus their efforts on abating anthropogenic sources of bacteria.*

We believe that the Regional Board has more authority than alluded to in this comment. There is not credible epidemiological evidence linking either total coliform or fecal coliform with health effects in humans via recreational activities. The large base of scientific information strongly indicates that the indicators recommended by USEPA, at the current time are the best available (*E. coli* and/or enterococci). Our comment was not to revise the objectives, but rather to "consider the policy implications of this assumption relative to current and future listings, as well as the implications of this assumption as it constrains the ability of the staff to evaluate impairment based on the best available scientific information". Further, we feel very strongly that efforts and resources should be focused on the indicators that have the strongest link to public health protection (*E. coli* and enterococcus). Such an effort would be most likely to result in true protection of beneficial uses.

Response: We do not have the authority to develop TMDLs for some bacteria WQOs and not others. We are required to adopt TMDLs for all bacteria WQOs in the Ocean Plan and Basin Plan for the affected waterbodies, or else undertake a standards action to either de-designate the beneficial use or revise the WQO. The bacteria objectives in the Ocean Plan were revised by the State Water Board in 2005 to include a WQO for enterococci. However, the State Water Board retained WQOs for total and fecal coliform in the Ocean Plan at that time. Thus, we are required to develop and adopt TMDLs for those WQOs.

Further, we disagree that total coliform and fecal coliform levels are not positively correlated to adverse health outcomes, and that the TMDLs should focus on the enterococci WQO. An independent technical group, the Microbiological Advisory

Committee (MAC) was formed in 1992 to advise the State Water Board on the indicator organism issue. As a starting point, the MAC recommended a statistical analysis of two data sets which included concurrent measurement of all three indicators. A contract was initiated with the University of California, Berkeley (UC Berkeley) in 1993, stipulating the following:

a. at each monitoring station, for each month and for each individual indicator organism, the number of times the measured level exceeded the allowable value contained in the California Ocean Plan was determined; and,

b. for each monitoring station, the density of indicator organisms were compared against each other and to physical parameters measured at the same time (water temperature, salinity, dissolved oxygen, etc.).

The contract also required that recent epidemiological studies be reviewed, summarized, and related (if possible) to the discharger data analyses. Based on review of both discharger monitoring data and results of recent epidemiological studies, UC Berkeley was to make recommendations for possible revision of the California Ocean Plan water-contact bacterial standards.

Because there was interest in the environmental fate of indicator organisms based on monitoring data taken over a time course of several years and under diverse environmental conditions, data from the City of San Diego and the City and County of San Francisco were analyzed. The study[3] concluded that:

- when fecal contamination is present, all three indicators respond similarly;
- during less polluted periods, this relationship breaks down and the three indicator organisms vary independently;
- from a risk management perspective, the measurement of enterococci levels seems to add little to the information provided by total and fecal coliform data;
- where there is increased likelihood of fecal contamination, enterococci levels are well predicted by the fecal coliform measurement; and
- based on these findings, the California Ocean Plan could revert to the pre-1990 bacterial monitoring requirements calling for total and fecal coliform only.

As part of the UC Berkeley contract, five epidemiological studies were reviewed.[4] In general, these five studies consistently show that bathing at beaches where the water is contaminated by urban runoff, domestic wastewater discharges, or other swimmers can lead to an increased risk of gastrointestinal and respiratory disorders, as well as ear, eye, and skin infections in some circumstances. However, there is no consistent relationship between any one indicator and health endpoints. In a 1996 report, Fleisher, *et al.* concluded that even within a single study, different indicators predict different health endpoints and that “these findings argue against the use of a single illness or indicator organism in the establishment of marine standards for recreational water quality.” A complete explanation for retaining the total coliform and fecal coliform WQOs in the Ocean Plan is discussed in the State Water Board document titled “Final Functional

[3] Spear et al, 1998.
[4] Cheung et al, 1990; Fleisher et al, 1993; Corbett et al, 1993; Kay et al, 1994; and Haile et al, 1996.

Equivalent Document, Amendment to the Water Quality Control Plan for Ocean Waters of California" dated December 2004 which can be accessed at http://www.waterboards.ca.gov/plnspols/docs/oplans/bactffed.pdf.

Comment 318

Comment 107. *We disagree that traditional indicator bacteria provide "unreliable" estimates of potential public health impacts; however, we recognize that the accuracy of the correlation of bacteria densities to health risks is the subject of recent discussions.* Please refer to the citations below. In particular, see page 6 and Table 2 in the 1986 US EPA document which indicates: "The freshwater studies confirmed the findings of the marine studies with respect to enterococci and fecal coliforms in that the densities of the former in bathing water showed strong correlation with swimming associated gastroenteritis rates and densities of the latter showed no correlation at all."

Pruss A. 1998. Review of Epidemiological Studies on Health Effects from Exposure to Recreational Water. Int. J. Epidemiol. 27: 1-9.
Wade TJ, Pai N, Eisenberg J, Colford JM. 2003. Do US EPA water quality guidelines for recreational waters prevent gastrointestinal illness? A systematic review and meta-analysis. Environ. Heal. Perspec. 111: 1102-1109.
U.S. EPA. 1986, Ambient water quality criteria for bacteria, Office of Water, EPA440/5-84-002,Washington, DC,

TMDL calculations must be based on existing WQOs. Reevaluation of water quality criteria that are the basis for WQOs cited in the Basin Plan takes place at the USEPA level. Should USEPA promulgate new water criteria, then the WQOs in the Basin Plan will be updated accordingly and TMDLs recalculated.

Please refer to comment #106. We find the second portion of the comment hard to understand, as we are encouraging the Regional Board to focus on the information that has been available from and recommended by EPA since 1986.

We further disagree with the commenter that achieving the TMDL targets might not result in the desired outcome, i.e. lowering public health risk. If the numeric targets are overly conservative in terms of lowering risk to public health, then the desired policy outcome (sufficiently high receiving water quality) has been achieved if WQOs have been attained.

If there is no scientifically defensible relation between the indicators in question (total coliform and fecal coliform) and health risk (EPA, 1986), then reductions of those indicators would not correlate with a reduced risk to human health.

Response: Please see the response to Comment 317 which summarizes the scientific basis for retaining the total coliform and fecal coliform WQOs in the Ocean Plan. Based on the information considered by the State Water Board in its 2005 amendments to the Ocean Plan, we disagree that there is no scientifically defensible relation between total coliform and fecal coliform, and health risk.

Comment 319

Comment 112. *We are obligated to proceed with utilizing WQOs consisting of total coliform, fecal coliform, and enterococci bacteria to calculate TMDLs because they are the established indicators of risk to public health. Under Clean Water Act (CWA) section 303(d), the San Diego Water Board is obligated to develop TMDLs for waters not meeting water quality standards (WQOs and the beneficial uses they are designated to protect). TMDL calculations must be based on existing WQOs.*

It is agreed that the TMDL must include all of these indicators. The Regional Board does have the authority to focus the TMDL on the indicators that have the strongest link to human health risk. It seems hard to believe that EPA would not approve a TMDL that employed as its basis the indicators that are recommended in their 1986 ambient water quality criteria document.

Response: Please see the response to Comment 317 which summarizes the scientific basis for retaining the total coliform and fecal coliform WQOs in the Ocean Plan. Based on the information considered by the State Water Board in its 2005 amendments to the Ocean Plan, we cannot recommend focusing the bacteria TMDLs on the enterococci WQO.

Comment 320

Comment 113. *…we do not agree that it (the 1986 EPA ambient water quality criteria document) indicates that the single sample maximum was not intended to apply during wet weather events in general.*

In southern California and the San Diego Region, the beaches are open year-round, even during wet weather conditions. There are many members of the public that may recreate in the water during wet weather (e.g., surfers). Therefore, protection must be adequate year-round and during wet weather conditions.

The 1986 US EPA document is not explicit on this topic. It states the following: “In general, samples should be collected during dry weather periods to establish so-called "steady state" conditions. Special studies may be necessary to evaluate the effects of wet weather conditions on waters of interest especially if sanitary surveys indicate the area may be subject to storm water effects.” We discussed this point in detail with individuals who were involved in the development of the document in question at US EPA. Those conversations confirmed that in fact there is little to no reason to believe that the relationships are valid under stormwater dominated conditions. Further evidence on this point may be found in a newly released research report from the Water Environment Research Foundation (WERF Report 03-SW-2, 2007).

We agree that the REC-1 use occurs and is appropriate at beaches during wet weather. It is questioned however, whether or not the REC-1 use is appropriate for creeks and streams during wet weather (greater than some specified flow), and how the assumption that it is appropriate impacts the magnitude of the bacterial reductions that are required and the subsequent societal and economic impacts under this TMDL.

Response: We fully vetted these TMDLs via our USEPA liaison, and the TMDLs were peer reviewed. Thus, we maintain that the single sample maximum is appropriate to use as a numeric target for wet weather TMDL calculations. Whether REC-1 use exists during wet weather is a Basin Planning issue which can be evaluated if information is forthcoming and if the action is warranted.

Comment 321

Please describe the empirical basis for the statement on page R-67 of the Environmental Analysis which describes how structural controls may not be required for residential areas (i.e., is there an example of how a discharger has achieved a zero Wasteload Allocation for indicator bacteria in dry and wet weather with non-structural controls?)

How would the Regional Board staff expect dischargers to show compliance with zero Wasteload Allocation given that the detection limit of standard laboratory analytical procedures are greater than zero?

Response: Dry weather wasteload allocations can be met by completely eliminating dry weather nuisance flows via city ordinances and enforcement. Empirically, where there are zero flows, the WLA is automatically met.

For the interim wet weather TMDLs, the question is moot because zero WLA are not required. However, in order for municipal dischargers to meet the current interim wet weather targets (which are near or at what the final TMDLs will be after the reference watershed approach has been incorporated), they must reduce their current bacteria contribution by certain percentages for all three indicators (e.g. fecal coliform, enterococci, and total coliform), depending on the watershed. For all the watersheds, these percent reductions fall within the following ranges:

Fecal Coliform - 1.6 to 53.3 percent
Enterococci - 1.9 to 51.4 percent
Total Coliform - 1.6 to 47.0 percent

The amount of required reduction depends on the watershed, with some watersheds requiring less than 2 percent reduction, thereby allowing more than 98 percent of the current municipal load to continue. On the other hand the largest required reduction will be less than 54 percent, thereby allowing more than 46 percent of the current municipal load to continue. The San Diego Water Board believes that the municipalities are capable of achieving 2 to 54 percent reductions via a combination of aggressive non-structural and structural BMPs.

Concerning laboratory detection limits, the San Diego Water Board would consider a laboratory result showing bacteria below the detection limit as meeting the WLA, assuming one-half the detection limit is less than the bacteria WQO. This is consistent with the typical methods used in handling non-detect results in human health and ecological risk assessments.

Comment 322

EPA supports the Regional Board's use of the natural sources exclusion approach (NSEA) to develop numeric targets and allocations to protect recreational uses in waters of San Diego. EPA has approved such use in other bacteria TMDLs (e.g., Santa Monica Bay Bacteria TMDL, Los Angeles River Bacteria TMDLs). We support Regional Board's use of the NSEA approach to address recreational beneficial uses in the identified beaches and creeks of San Diego.

In addition, we have been in discussion with you to determine if sufficient data exists to support development of a TMDL and whether the NSEA approach can appropriately address the need to protect the shellfish harvesting use. At this point, we support deferring the establishment of TMDLs to address the shellfish harvesting use; this deferral would allow more time for monitoring, impairment assessment, and numeric targets development that are appropriate to address the impaired shellfish harvesting use. Although NSEA provides a mechanism to address non-human sources of bacteria, it was originally intended to address recreational uses in coastal waters (see 2004 final rule for *Water Quality Standards for Coastal and Great Lakes Recreation Waters*).

The existing standards for shellfish designated areas, currently incorporated in the Basin Plan, originated from the National Shellfish Sanitation Program (NSSP). These standards are used by the California Department of Health Services (DHS) to approve shellfish beds for commercial use. More extensive monitoring, sanitary surveys and an epidemiological study would assist in the establishment of TMDLs to protect the shellfish harvesting use. We hope to see some of this work included in the implementation plan for the bacteria TMDL to address recreational uses in San Diego beaches and creeks; this will assist with the development of a TMDL to address the shellfish harvesting beneficial use.

Response: Thank you for the comment. The SHELL TMDLs have been removed from these bacteria TMDLs, and the SHELL impairments are being addressed in separate TMDLs and/or standards action. At this time we have not required work related to the SHELL standard in the Implementation Plan. However, the San Diego Water Board will use its investigative authority, if needed, to require dischargers to submit technical reports with the information we need to refine the SHELL TMDLs and/or develop a SHELL standards action to address the SHELL listings.

4.4 Beneficial Uses

Comment 323

Page S - 126 stales "We agree that, at this time, there is uncertainty for the regulated entities regarding which metric will be used to express WQBELs and measure compliance. However, the public process associated with reissuance of NPDES requirements is the proper forum for establishing this metric."

The NPDES reissuance public process for south Orange County is occurring now and TMDL compliance has yet to be addressed. The RWQCB has indicated that this could occur at the scheduled Permit issuance date or before, if appropriate. When does the RWQCB foresee the TMDL being incorporated into the NDPES Permit, specifically for south Orange County?

Response: If warranted, the San Diego Water Board may choose to incorporate the TMDL requirements into NPDES Stormwater WDRs at any time. All persons are allowed to petition the San Diego Water Board to open and amend existing NPDES WDRs, if a strong case can be made. However, the most likely time for inclusion of these TMDL requirements is during the five year NPDES WDR reissuance cycle. Actual inclusion into the Orange County NPDES permit will depend on when these TMDLs are adopted in relation to the Orange County 5-year NPDES WDR reissuance cycle.

Comment 324

Comment 126. *We agree that rainfall events correspond to times of the year when the REC-1 beneficial use is at its minimum. However, beneficial uses apply at all times, and therefore must be protected at all times, regardless of season or hydrological conditions. Despite poor water quality, or even dangerous oceanographic conditions, REC-1 use is still occurring during wet weather events and the following 72 hours. The technical approach does assume that to protect the use, bacterial loading must be reduced during these storm events.*

We agree that reduction strategies should be prioritized according to when the use is highest, namely the summer dry season. However, this does not obviate the need to eventually address wet weather loads. The compliance schedule does not preclude dischargers from addressing dry weather loads before addressing wet weather loads.

Several important issues are raised in the above response. First, as indicated above (comment 113), it is disputed that the REC-1 use is appropriate or that *REC-1 use is still occurring* in creeks and streams under storm event conditions. Second, the use of the loading based approach in the TMDL necessarily focuses bacterial reductions on these storm events even though these *events correspond to times of the year when the REC-1 beneficial use is at its minimum*. This is true because the loadings that are associated with storm events are so much greater than dry weather (when higher levels of REC-1 use occurs), that the implementation strategies will be forced to focus on these events if there is hope of meeting the TMDL requirements.

Response: The San Diego Water Board maintains that reduction strategies should be prioritized according to when the use is highest, namely the summer dry season. However, this does not obviate the need to eventually address wet weather loads. The compliance schedule does not preclude dischargers from addressing dry weather loads before addressing wet weather loads.

A high-flow REC-1 use suspension Basin Plan amendment could be developed if warranted. However, REC-1 use at beaches likely occurs even during storm events and certainly in the 72-hours after storms.

Comment 325

Comment 132. The comment was that the Shellfishing beneficial use (SHELL) only applies to coastal marine waters. Freshwater creeks do not support shellfishing habitat or species and are not assigned the SHELL beneficial use nor water quality objectives to support shellfishing activities.

In response it was indicated in section 4.4 of Appendix S that *If WQOs are met at the mouth of the watershed, then WQOs likely also are met at the beach because dilution with the wavewash has taken place. This approach is justified because (1) the beach ocean shorelines are the ultimate receiving waterbodies. All creeks included in this project discharge to the ocean or San Diego Bay which are designated with REC-1 and SHELL uses, (2) the beaches have more recreational users than creeks, and (3) the beaches are designated with the most sensitive beneficial use, shellfish harvesting, whereas creeks are not.*

Dischargers will not be held accountable for achieving SHELL WQOs in the freshwater creeks. The dischargers will be held accountable for reducing total coliform loads at the mouths of the creeks to levels that do not cause the SHELL total coliform WQO to be exceeded at the beaches.

It is agreed that the point articulated above in the second paragraph is appropriate. However, it is not clear that this perspective is accounted for in calculating loadings in the TMDL document. Clarification on this point is requested. In addition, it is further requested that the perspectives discussed in Comment 140 be considered in the response here.

Response: The SHELL TMDLs were removed from these Bacteria TMDLs, therefore, at this time, the comment is moot. We will consider the SHELL TMDL comments at the time when we revise the draft SHELL TMDLs.

Comment 326

Comment 140. *The commenter is correct that the SHELL beneficial use is designated for the shoreline, not the creeks and rivers.*

If the discharger can provide compelling evidence that the TMDL should include a dilution factor, the TMDLs can be revised to do so. However, until that evidence is provided, the assumptions that are included in the TMDL calculations will result in water quality that supports all beneficial uses designated for the creeks and beaches.

This information seems to be in conflict with the response to Board member Kraus, as identified above under comment 132 (from section 4.4 of Appendix S). The comment was that given the low dry weather volume of water discharging from the creeks and rivers (relative to the Pacific Ocean), a prioritized investigation is needed to determine the relative impact of the creeks on the SHELL use on the Shoreline (i.e. if dilution of greater than ~15:1 occurs, the effective WQOs in creeks for the REC-1 use and on the shoreline for the SHELL use would be similar for total coliform). Based on the data that were used to develop the TMDL, it seems likely that a simple paper exercise would indicate whether or not, on average a 15:1 dilution is likely to occur at areas that feasibly could support the SHELL use (i.e. not the mouths of the creeks as the creeks do not support the SHELL use, but at a point on the shoreline that could support the use). If so, the REC-1 standard at the mouth of the creeks and streams would be protective of the SHELL use at the point at which it occurs.

Response: The SHELL TMDLs were removed from these Bacteria TMDLs, therefore, at this time, the comment is moot. We will consider the SHELL TMDL comments at the time when we revise the draft SHELL TMDLs.

Comment 327

Comment 170. *Several stakeholders have expressed opinion that there is a need to reevaluate TMDLs at a set date in the future to ensure that the most up-to-date, accurate information is used for model output, and ultimately, TMDL calculation. The commenter cites numerous arguments in support of this position… However, attempts to restore water quality and meeting the TMDLs as calculated must not be delayed for acquisition of new information.*

As indicated in the main body of our letter, we agree that actions to institute water quality improvements should begin as soon as possible. However, development of the TMDL began in 2004, but only data collected through 2002 was utilized in the modeling. Throughout the development of the TMDL SAG members have been requesting that all available information, particularly data submitted to the Regional Board through other programs, be included in the modeling process. SAG members and others have continued to collect new data during the development and multiple revisions of this TMDL. Some of those data could be used to fill data gaps and otherwise inform the TMDL. However, the Regional Board has not taken full advantage of these data to date. The comment was not proposing that the process be stopped to collect more data, rather that currently available data be fully utilized in the TMDL calculations.

Response: Incorporating updated land use data and new flow and water quality data into the watershed models and recalculating the TMDLs is an expensive and time consuming process and one we will not undertake at this time. Since the final TMDLs will be revised in the near future, an opportunity exists to explore the benefits and cost of updating the models. San Diego Water Board staff and stakeholders should investigate the possibilities.

Comment 328

Comment 172. *Although TMDLs are expressed as "loads" in Tables 9-1 through 9-12, this does not imply that compliance will necessarily be measured in this metric. Second, the manner in which WQBELs are expressed (which must be consistent with WLAs), will be determined upon revision or reissuance of the NPDES requirements for urban runoff.*

The issue of compliance is of great concern in this TMDL. The Board's justification for selecting the loading based approach over other methods that have been used successfully in bacterial TMDLs was that "A metric expressed in a term different from a load, such as exceedance days (as has been approved by the LA RWQCB and SWRCB) does not allow program managers to decipher a percentage by which loads must be reduced, nor help with selection of BMPs" (from response to comment 147). Given all of the uncertainties and technical difficulties discussed herein, we believe that this justification is not sufficient to overcome the serious shortcomings of the technical method employed.

Response: The technical basis of these TMDLs is sound, and has been peer reviewed. Whether or not to express WLAs as exceedance days or loads in the implementing orders will be decided when the orders are written.

Comment 329

The draft technical report states that the Enterococcus for the creeks is designed to protect the downstream beach. This scenario is commendable; however, it does not address the fact that Chollas Creek has no downstream beach. Usage at the mouth of Chollas Creek is restricted by the Department of Defense and entry into the area is not allowed due to national security reasons. Therefore, the City recommends that the Regional Board establish a different goal/requirement for the Chollas Creek watershed.

Response: Although not a "beach," San Diego Bay at the mouth of Chollas Creek is designated with REC-1 beneficial uses. Before we could consider revising the beneficial use designation as an alternative to the TMDL, an investigation of the issue must first be conducted. Then if warranted, a Basin Plan amendment revising the REC-1 use and the Bacteria TMDL could be developed. Until the issue is better investigated, revising the enterococci TMDL is premature.

4.5 Implementation Plan/Compliance Assessment

Comment 330

Can you explain how the waiver system will be implemented in regards to municipal discharger compliance assessment, BMP sizing, etc.? We are particularly concerned about how the impacts of bacteria loads from waivers are going to be addressed at the bottom of the watersheds (i.e. beaches). Schools, sewer agencies and waiver recipients must be held to the same standards as the dischargers identified in the TMDL or an allowance make in the authorized exceedence levels, similar to backgrounds sources for authorized waivers. It appears that waivers would allow a zero bacteria discharge, but how can we be sure of this?

Response: The San Diego Water Board will enforce waiver conditions to ensure that waiver discharges meet wasteload allocations. The San Diego Water Board has recently adopted new waiver conditions that better enable direct regulation of waiver dischargers by requiring enrollment and monitoring. Waiver compliance is expected to be assessed by more localized and upper watershed monitoring, rather than at the bottom of the watersheds. This monitoring may be a combination of monitoring conducted under the waiver program and municipal storm water programs.

Comment 331

In regards to the response to Comment 149. First, we are happy to see a commitment to enforce the Phase II requirements. However, as the City looks forward in an attempt to try and conceptualize how this program is going to be implemented, we have concerns. The response indicates. "If, upon enforcement of the waivers, nuisance conditions or exceedences of WQOs occur despite the stated conditions, then WDRs will be issued for these discharges." The City's concern is how the enforcing agency is going to 1) know if exceedences of WQOs occur and, 2) if an exceedence does occur, how will you know who the responsible party is – especially when you indicate that you arc not requiring monitoring from Phase II communities? Obviously the dischargers are concerned over being held responsible should Phase II communities not succeed in compliance.

Response: Exceedances of water quality objectives by Phase II municipalities and non-point sources will be determined by typical compliance assessment measures such as inspections, surveillance, complaint response, reporting, and monitoring. These measures are also expected to be sufficient to identify responsible dischargers if exceedances are noted. While the TMDLs do not expressly require monitoring by these dischargers, Phase II municipalities are required to conduct monitoring under Order No. 2003-0005-DWQ. Likewise, agricultural dischargers will be required to conduct monitoring under waiver conditions. These monitoring efforts are expected to provide useful information in determining whether or not water quality objectives are met. Moreover, any discharger can be required to conduct monitoring if there is a suspected water quality problem, under the San Diego Water Board's investigation authority (Water Code section 13267).

Comment 332

Your response to Comment 170 indicates that "we have no information showing that sewage, human wastes, and domesticated animal wastes have been removed from nuisance flows and Stormwater runoff in any of the watersheds." The City disagrees with this statement. For one, bacteria reductions have been documented at a number of beaches where data has indicated that the beach water quality meets de-listing criteria. Each year the City submits an annual report, including a San Juan Creek Watershed Action Plan (WAP), which highlights all the watershed-wide actions that have been implemented to address bacteria. In addition, the City has provided reports directly to TMDL staff outlining the actions we have taken to reduce human sources of bacteria in San Juan Creek in the Dana Point jurisdiction. And, the South Coast Water District also submits regular reports to the RWQCB indicating their aggressive sewer spill prevention plan, including their operations and maintenance, videoing and grease control ordinance via their regular reporting requirements. Considering this, it is requested that this comment be revised accordingly.

Response: Your comment clarifies the record concerning information on bacteria load reductions in the watersheds of concern to you. While many measures have been implemented that have achieved indicator bacteria reductions, much more needs to be done. Indicator bacteria levels in receiving waters frequently exceed standards, especially during wet weather. For example, 195 of 217 (90 percent) wet weather samples collected from Agua Hedionda Creek, Escondido Creek, Los Penasquitos Creek, San Diego River, San Dieguito River, San Luis Rey River, Santa Margarita River, and Sweetwater River in San Diego County from 1998-2006 exceeded indicator bacteria water quality objectives.[5] Although various entities have undertaken efforts to control sources of indicator bacteria especially during dry weather, the continuing high levels of indicator bacteria warrant further action especially during wet weather.

Comment 333

This comment letter is organized showing our original and remaining requests for changes in the Draft Technical Report (Items 1 through 4) followed by the Regional Board's comments in *italics* as provided in Appendix S of the Draft Technical Report, and lastly the City's additional supporting arguments for each of the four issues.

Del Mar requests that Torrey Pines State Beach at Del Mar (Anderson Canyon) be removed from the Bacteria TMDL Project I

The most recently adopted water quality impaired list or 303(d) listing, dated October 25, 2006, should be the basis for the beach segments included in this Bacterial TMDL. The listing was last approved by the State Water Resources Control Board to reflect new data and information in accordance with the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (Listing Policy). The fact sheet for the Pacific Ocean Shoreline at Miramar Reservoir HA recommended the delisting of the segment using the weight of evidence and in compliance with the Listing Policy. It is Del

[5] San Diego County Municipal Copermittees, 2007. 2005-2006 Urban Runoff Monitoring. Volume 1 – Final Report.

Mar's request that the Bacteria TMDL Project I Draft Technical Report be amended to show this segment has been removed and no longer requires a TMDL. This action is necessary in order to provide consistency and clear priorities, for both the RWQCB and dischargers, in the development and implementation of TMDLs.

Regional Board Response (No. 192 and 175 Draft Technical Report Appendix S).

The Regional Board Response to this comment states: "Even though recent measurements show that the Del Mar beach at Anderson Canyon meets WQOs (at least during dry weather), this and other improved sites will remain included in this project. Whether or not these beach segments meet WQOs during storm events is unclear, since the data submitted for de-listing purposes consisted strictly of dry weather samples. In a letter to the SWRCB dated January 31, 2006, the San Diego Water Board recommended that all waterbodies, regardless of quality during dry weather, remain listed if no wet weather data is available to demonstrate support of beneficial uses. Furthermore, whether or not the SHELL use is supported is also unclear, since the data used for de-listing was not evaluated using the total coliform SHELL WQO. Although dry weather bacteria load reduction plans would not be required for the watersheds draining to these beaches and any beaches meeting WQOs, BMPs implemented in these watersheds to reduce bacteria loading should be maintained, and monitoring, even if on an infrequent basis to assess the effectiveness of the BMPs, should continue. Wet weather bacteria load reduction plans are still needed, unless dischargers can demonstrate attainment of uses in wet weather. Dischargers can discuss the possibility of a reduced level of monitoring and reporting at sites such as Anderson Canyon with San Diego Water Board staff who oversee the TMDL implementation. TMDL implementation will take place primarily by incorporation of WQBELs into WDRs for urban runoff (such as Order No. 2007-0001). The process is described in section 11.5.3 in the Technical Report."

Del Mar's Response Comment No.1: Regional Board Does Not Present Any Basis for TMDL for Waterbody in Attainment of Water Quality Objectives.

In this above response the Regional Board, without giving a citation to policy or regulation, has expanded its authority to include as part of the Bacteria 1 TMDL a waterbody that has attained water quality as defined in the Listing Policy. Del Mar does not find the Regional Board's explanation is supported by the Listing Policy, Clean Water Act or California Water Code. We base our position on the following statements found in the Listing Policy:

"The Water Quality Control Policy for Developing California's CWA Section 303(d) List" (Policy) is intended to provide SWRCB and RWQCB staff with recommended procedures for evaluating information solicited in support of listing or delisting candidate water bodies for the section 303(d) list. The Policy does not develop new or revise existing water quality standards (i.e., beneficial uses, water quality objectives, or the State's Non-degradation Policy). The Policy does address scheduling of listed water bodies for eventual development and implementation of TMDLs.

Section 13191.3(a) of the California Water Code (CWC) requires the State Water Resources Control Board (SWRCB), on or before July 1, 2003, to prepare guidelines to be used by the SWRCB and the RWQCBs (Regional Water Quality Control Boards) in listing, delisting, developing, and implementing TMDLs pursuant to section 303(d) of the federal CWA (33 United States Code [USC] section 1313(d)). In addition, the 2001 Budget Act Supplemental Report required the use of a "weight of evidence" approach in developing the Policy for listing and delisting waters and to include criteria that ensure the data and information used are accurate and verifiable."

Del Mar believes that the State has clearly outlined the priorities for the TMDL program and that they should apply only to impaired water segments as defined in the 303(d) List which has used a weight of evidence approach to provide statewide consistency in its application.

Del Mar respectfully requests that the Regional Board provide references to its authority to impose more stringent TMDL requirements on dischargers than outlined in the State's Listing Policy.

Response: Section 303(d)(3) of the Clean Water Act supports the San Diego Water Board's inclusion of the Miramar Reservoir Hydrologic Area (HA) in the TMDL. This section requires that "each State shall identify all waters within its boundaries which it has not identified under paragraph (I)(A) and (I)(B) of this subsection and estimate for such waters the total maximum daily load […]" As such, the Clean Water Act directs the San Diego Water Board to develop TMDLs for all water bodies, not just those water bodies found on the 303(d) list. This requirement is recognized in *Pronsolino v. Nastri,* (9th Cir. 2002) 291 F.3d 1123, 1128. Moreover, the San Diego Water Board's proceeding with a TMDL for the Miramar Reservoir HA does not contravene the State Water Board's *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (Listing Policy). While the Listing Policy requires that impaired water bodies be prioritized, it contains no language stating that a Regional Water Board must follow the designated prioritization when developing TMDLs. Likewise, the Clean Water Act, section 303(d), does not require that the Regional Water Board follow a designated prioritization for TMDL development. The San Diego Water Board generally follows the priorities found in the 303(d) list when developing TMDLs, but also exercises its discretion when it is prudent to do so. The Clean Water Act, section 303(d), does not prohibit state action as long as the state is not attempting to adopt more lenient pollution control standards already in place under the Clean Water Act. See *City of Arcadia v. State Water Resources Control Board* (135 Cal.App.4th 1392, 1419) (citing *City of Arcadia v. EPA* (9th Cir. 2005) 411 F.3d 1103, 1107.)

The Miramar Reservoir HA is a location where the San Diego Water Board finds that it is appropriate to develop a TMDL for a water body that is not on the 303(d) list. The Miramar Reservoir HA was previously on the 303(d) list for indicator bacteria impairment, but was removed in 2006 based on dry weather data only. The lack of wet weather data used in the analysis makes the determination that the HA is not impaired by indicator bacteria inconclusive. For example, the County of San Diego Department of Environmental Health issues a general advisory during wet weather, advising people to avoid contact with ocean water for 72 hours following a storm event. This advisory applies to the Miramar Reservoir HA shoreline. In addition, TMDL modeling results indicate that beaches addressed by the TMDL are impaired by indicator bacteria during wet weather, including the beaches in the Miramar Reservoir HA. Moreover, data from the Miramar Reservoir HA were only assessed for one location in the HA (the beach at Anderson Canyon) in 2006. Data collected from another location within the HA (the beach at the mouth of Los Penasquitos Lagoon) demonstrates that the HA is impaired by indicator bacteria. This information, combined with modeling results and the lack of wet weather indicator bacteria data at the beach at Anderson Canyon, demonstrates that it is appropriate for the Miramar Reservoir HA to be addressed by the TMDL.

The Technical Report has been revised at Appendix T to exhibit that the Miramar Reservoir HA is impaired by indicator bacteria.

Comment 334

Del Mar's Response Comment No. 2: Regional Board's Argument to Use SHELL WQO Unfounded

The Regional Board is arguing that the SHELL Beneficial Use should be protected in this segment that has not been listed to be impaired in the most recent 303(d) listing dated October 25, 2006. As mentioned above, Del Mar does not believe the Regional Board has supported, in policy or regulation, requiring a TMDL for a waterbody that has attained water quality.

Del Mar respectfully requests that the Regional Board provide references to its authority to impose more stringent TMDL requirements on dischargers than outlined in the State's Listing Policy.

Response: As previously discussed, Clean Water Act Section 303(d)(3) requires the San Diego Water Board to develop TMDLs for all water bodies. The San Diego Water Board has evaluated indicator bacteria data from the Miramar Reservoir HA and found that the Miramar Reservoir HA does not meet indicator bacteria water quality objectives. This finding applies to water quality objectives that support the SHELL beneficial use. Please see our response to Comment 333 for further discussion.

Comment 335

Del Mar's Response Comment No. 3: Regional Board Requires Bacterial Load Reduction Plans for De-Listed Waterbodies

The Regional Board plans to require Bacterial Load Reduction Plans for wet weather discharges for a de-listed waterbody and has not provided the basis to impose this requirement for a waterbody segment that has attained water quality objectives.

Del Mar respectfully requests that the Regional Board provide references to its authority to require a Load Reduction Plan or Implementation Plan for a segment that has attained water quality objectives based on the State's Listing Policy.

Response: As previously discussed, Clean Water Act Section 303(d)(3) requires the San Diego Water Board to develop TMDLs for all water bodies. The San Diego Water Board has evaluated indicator bacteria data from the Miramar Reservoir HA and found that the Miramar Reservoir HA does not meet indicator bacteria water quality objectives. As such, it is appropriate for the Miramar Reservoir HA to be subject to the TMDL and its

Bacteria Load Reduction Plan requirements. Please see our response to Comment 333 for further discussion.

Comment 336

<u>Del Mar's Response Comment No. 4: Regional Board Requires Assessment of BMP Effectiveness and Monitoring Already in Place as part of the MS4 Permit.</u>

The BMP assessment and other requirements that include "reduced level of monitoring" are not justified and should not extend beyond the existing programs currently in place to comply with the MS4 Permit (Order No. 2001-01 and 2007-0001) which is the basis for the programs being implemented by Del Mar. Attainment of water quality in this waterbody segment was accomplished by demonstrating that it was erroneously listed in 1998 using very limited water quality data and delisted only after the data collected by Del Mar from 2002-2006 was considered by the SWRCB in compliance with the Listing Policy of 2004.

Response: As previously discussed, Clean Water Act Section 303(d)(3) requires the San Diego Water Board to develop TMDLs for all water bodies. The San Diego Water Board has evaluated indicator bacteria data from the Miramar Reservoir HA and found that the Miramar Reservoir HA does not meet indicator bacteria water quality objectives. As such, it is appropriate for the Miramar Reservoir HA to be subject to the TMDL and its BMP effectiveness assessment and monitoring requirements. Please see our response to Comment 333 for further discussion.

Comment 337

Del Mar requests that Table 1-1. *Bacteria-Impaired Water Quality Limited Segments Addressed in this Analysis* be modified

Table 1-1 *Bacteria-Impaired Water Quality Limited Segments Addressed in this Analysis* should be modified and the segment for Miramar Reservoir HA removed to reflect the delisting of this area as of October 25, 2006 and to make it consistent with the Listing Policy.

Regional Board Response No. 193 and 175 (Draft Technical Report Appendix S) is the Same as Above.

<u>Del Mar's Response Comments No. 1 through No. 4 to the Regional Board's Responses are shown above.</u>

Response: As previously discussed, Clean Water Act Section 303(d)(3) requires the San Diego Water Board to develop TMDLs for all water bodies. The San Diego Water Board has evaluated indicator bacteria data from the Miramar Reservoir HA and found that the Miramar Reservoir HA does not meet indicator bacteria water quality objectives. As such, it will not be removed from Table 1-1 as a bacteria-impaired water quality limited segment. Please see our response to Comment 333 for further discussion.

Comment 338

Del Mar requests removal from the obligation to prepare a Bacteria Load Reduction Plan and comply with reporting requirements.

Removing the Miramar Reservoir at Anderson Canyon segment from the Bacteria TMDL Project I effectively eliminates the requirement to develop and implement the Bacteria Load Reduction Plan required per Section 1.6 of the Technical Report. Del Mar believes that the language in Section 1.6 is too vague and may require unnecessary plans and reports for a water segment that has been effectively delisted by the SWRCB and approved by EPA. Removing the segment from the TMDL effectively eliminates the City's (and other parties) obligation to comply with these requirements. The end result for this small City is to allow us to focus limited resources on high priority water impairments and future TMDLs and not on a segment that has effectively shown attainment with water quality objectives.

Regional Board Response No. 194 (Draft Technical Report Appendix S): *TMDLs for beaches that have been de-listed in the section 303(d) process ensures that dischargers continue to implement BMPs to meet WQOs. We agree that dischargers should focus their resources on problematic areas, therefore areas meeting WQOs can be considered low priority and a reduced level of monitoring can suffice. Bacteria Load Reduction Plans for wet weather are still needed as described in the response to Comment 175.*

Furthermore, the Regional Board added text to Section 1.6 in the revised Draft Technical Report in response to the City's previous comments regarding the Load Reduction Plan requirements (page 19, 4th paragraph):

"In some cases, waterbodies included in this project are no longer on the List of Water Quality Limited Segments (footnote: Beaches in the Miramar Reservoir and Scripps hydrologic area were removed from the List of Water Quality Limited Segments in 2006 based on assessment of dry weather data). For these areas, municipal dischargers and Caltrans need not prepare bacteria load reduction plans for their discharges in these watersheds if attainment of WQOs is demonstrated in both wet and dry weather. 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. For areas that have been de-listed strictly based on dry weather samples, wet weather bacteria load reduction plans are needed."

<u>Del Mar's Response Comment No. 5: Regional Board Requires Bacterial Load Reduction Plans for De-Listed Waterbodies</u>

The Regional Board plans to require Bacterial Load Reduction Plans for wet weather discharges for a de-listed waterbody and has not provided the basis to impose this requirement for a waterbody segment that has attained water quality objectives. The Regional Board has not provided the basis, in policy or regulation, for this requirement. Del Mar requests that the Regional Board cite its authority to expand the requirements beyond those waterbodies on the 303(d) List and subject to a TMDL prior to adoption of the Bacteria 1 TMDL.

Response: As previously discussed, Clean Water Act Section 303(d)(3) requires the San Diego Water Board to develop TMDLs for all water bodies. The San Diego Water Board has evaluated indicator bacteria data from the Miramar Reservoir HA and found that the Miramar Reservoir HA does not meet indicator bacteria water quality objectives. As such, it is appropriate for the Miramar Reservoir HA to be subject to the TMDL and its Bacteria Load Reduction Plan requirements. Please see our response to Comment 333 for further discussion.

Comment 339

Del Mar's Response Comment No. 6: Regional Board Requires Assessment of BMP Effectiveness and Monitoring Already in Place as part of the MS4 Permit.

The BMP assessment and other requirements that include "monitoring" are not justified and should not extend beyond the existing programs in place as part of compliance with the MS4 Permit (Order No. 2001-01 and 2007-0001) which is the basis for the current programs being implemented by Del Mar. Attainment of water quality in this watershed was accomplished by demonstrating that it was erroneously listed in 1998 with very limited water quality data only after the data collected by Del Mar from 2002-2006 was considered by the SWRCB in compliance with the Listing Policy of 2004. Del Mar should only be required to continue to implement its Jurisdictional Urban Runoff Management Plan (JURMP) in compliance with NPDES Order No. 2007-0001 to demonstrate sustainable water quality for this segment. The Regional Board should provide in its response to this comment letter the basis in policy or regulation to require additional monitoring or assessment of BMPs for a waterbody that has attained water quality in accordance with the Listing Policy.

Response: As previously discussed, Clean Water Act Section 303(d)(3) requires the San Diego Water Board to develop TMDLs for all water bodies. The San Diego Water Board has evaluated indicator bacteria data from the Miramar Reservoir HA and found that the Miramar Reservoir HA does not meet indicator bacteria water quality objectives. As such, it is appropriate for the Miramar Reservoir HA to be subject to the TMDL and its BMP effectiveness assessment and monitoring requirements. Please see our response to Comment 333 for further discussion.

Comment 340

Del Mar requests changes to Table 11-3 *Prioritized List of Impaired Waters for TMDL Implementation*

Del Mar requests Miramar Reservoir HA (906.10) watershed be removed from Table 11-3 for the same reasons noted previously.

If the revisions requested by Del Mar are not incorporated, the end result for this and future TMDLs will be unpredictability and unjustifiable expenditure of resources. Del Mar seeks consistency throughout the region and the State so that an "even playing field" is set as originally intended by the SWRCB and the Delisting Policy. If the implementation of the Bacteria TMDL Project I continues as described in the Draft Technical Report, the Regional Board will be deviating from the SWRCB Listing Policy and defying its purpose. Del Mar believes the revisions to the delisting shown in the 303(d) List for 2006 should be taken into consideration prior to approval of the Bacterial TMDL Project I adoption.

Regional Board Response No. 196: *We disagree that this and future TMDLs will cause unpredictable and unjustifiable expenditures of limited resources. The goal of the implementation plan is to attain and maintain WQOs throughout all seasons and hydrologic conditions. If dischargers have met this burden, then their only expenditures would be to report that WQOs are attained, and reporting would occur at an appropriate frequency as specified in the discharger's monitoring and reporting programs.*

See Del Mar's Comments to Response No. 6 above.

Response: As previously discussed, Clean Water Act Section 303(d)(3) requires the San Diego Water Board to develop TMDLs for all water bodies. The San Diego Water Board has evaluated indicator bacteria data from the Miramar Reservoir HA and found that the Miramar Reservoir HA does not meet indicator bacteria water quality objectives. For this reason, it will not be removed from Table 11-3. Please see our response to Comment 333 for further discussion.

Comment 341

The Regional Board has provided responses in Appendix S of the Draft Technical Report to our previous comments submitted on April 17, 2007 and September 15, 2006, but **has not addressed what Del Mar believes is the most significant issue and comment to date**. We provide below additional arguments supporting our position that a waterbody that is no longer on the State's 303(d) list of Water Quality Impaired Water Bodies should not be subjected to a Total Maximum Daily Load (TMDL) program because it as "attained" status with respect to water quality objectives.

The reason this is important to Del Mar is that we believe the requirements are unfounded and unreasonable when they go beyond the State's current Listing Policy and create an economic disadvantage and burden to the community for **no perceived environmental benefit**. The Regional Board has not provided the City with the basis of its authority to require TMDL implementation for a waterbody in attainment status.

Response: As previously discussed, Clean Water Act Section 303(d)(3) requires the San Diego Water Board to develop TMDLs for all water bodies. The San Diego Water Board has evaluated indicator bacteria data from the Miramar Reservoir HA and found that the Miramar Reservoir HA does not meet indicator bacteria water quality objectives. As such, it is appropriate to develop an indicator bacteria TMDL for the Miramar Reservoir HA. Please see our response to Comment 333 for further discussion.

Comment 342

Comment 173. *The TMDLs for beaches and creeks are not the first TMDLs where the allocations are expressed as loads. 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.*

The response does not adequately address the comment. Our comment was regarding the technical basis of this TMDL. Careful review of the TMDLs cited above clearly indicates that the methodology used to derive allocations in this TMDL is substantially different than those in the TMDLs referred to in the response. While, it is true that the referred to TMDLs employed loading based approaches, the technical basis for this TMDL is without precedent. We have conducted a detailed review of available information and have not found other TMDLs that have derived allocations in the same manner as has been done in this TMDL. This lack of precedent reinforces our concerns regarding the technical underpinning of the TMDL methodology. In further support of this point of view, a newly released EPA document highlighting 17 TMDLs with stormwater sources (EPA 841-R-07-002, 2007) indicates that there are innovative methods that have been used successfully to address bacteria in stormwater impacted areas, however the method employed in this TMDL is not mentioned.

TMDL compliance will not necessarily be measured against the metric used to express WLAs. …NPDES requirements must include conditions (WQBELs) that are consistent with the assumptions and requirements of the WLAs. 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 WLA requiring a mass load reduction. The metric for which WQBELs will be expressed and included in NPDES requirements for urban runoff, (also known as municipal "permits") for the purpose of implementing WLAs, has not been determined at this time.

As noted above in comment 172, this issue is of great concern and should be resolved prior to adoption of the TMDL.

Response: The commenter provides no support for the position that the approach used to calculate the TMDLs' wasteload allocations is technically inadequate. While other TMDLs may not use the same approach, that does not mean that the approach is invalid.

Although TMDLs are expressed as "loads," this does not imply that compliance will necessarily be measured in this metric. The manner in which WQBELs are expressed (which must be consistent with WLAs), will be determined upon revision or reissuance of the NPDES requirements for urban runoff. The public process associated with reissuance of the NPDES requirements is the proper place to propose alternative metrics to measure compliance.

Comment 343

Comment 208. We are in agreement with the Heal the Bay comments that indicated the following : "The most important beneficial use that is impaired by high fecal indicator bacteria densities is recreational water contact. A TMDL based on the total number of fecal bacteria in the water, rather than the numbers of days that exceed beach water quality standards, will not lead to beneficial use attainment and is an insurmountable compliance assurance problem."

Response: We agree that measuring TMDL compliance with exceedance days may be a suitable metric for beaches. Therefore, we encourage the commenter to stay involved with the public process associated with the re-issuance of the municipal NPDES requirements, which is the appropriate forum for determining the compliance metric(s) for these TMDLs. However, unlike the Santa Monica Bay TMDLs, this project is inclusive of inland creeks, and therefore compliance methods must be suitable for determining attainment of standards in creeks in addition to beaches. Moreover, in terms of formulating strategies for BMP implementation, the exceedance days approach does nothing to help dischargers quantify the magnitude of existing loads or link those loads to their sources. A loading approach provides the ability to calculate percent reductions needed in each unique watershed. For example, in the San Luis Rey watershed, a 3 percent reduction is needed in fecal coliform loading, compared to a 53 percent reduction needed in the San Diego watershed. Further, the load contributions by land use are discussed in Appendix I of the technical report. This information is useful in determining which watersheds require the most effort, and what types of BMPs may be effective, and where they might be placed. An exceedance day-based analysis does not provide such useful information.

Comment 344

The approved 2006 303(d) list removed beaches from the Miramar Reservoir and Scripps Hydrologic Areas for bacteria, with the exception of the Children's Pool; however, they are still included in this TMDL. The Water Quality Control Plan for the San Diego Region 9 does not provide the ability to list pollutants by seasonal variations. The City of San Diego requests that these beaches be removed from this TMDL and be compliant with the State Water Board's Water Quality Control Policy for Addressing Impaired Waters, or provide an interpretation of State Water Board Resolution 2005-0050 which authorizes the above referenced policy.

Response: As discussed in our response to Comment 333, the Clean Water Act supports the San Diego Water Board inclusion in these TMDLs of beaches in the Miramar Reservoir and Scripps HAs. Please refer to the response to that comment for a complete discussion of this issue.

Comment 345

Enforcement - The City continues to request that the Regional Board provide specificity on how compliance will be evaluated in terms of the number of Notices of Violation and/or fines that dischargers would be subject to if compliance is not obtained (e.g., one fine per outfall per day, one fine per tributary, a certain dollar amount per gallon). Given the difficulty that dischargers will encounter in trying to comply with the TMDL, it is only fair to offer dischargers a basis for considering cost/benefit consequences during their implementation planning.

Response: The San Diego Water Board determines appropriateness of different enforcement measures at the time of non-compliance. Numerous factors are considered, such as magnitude of impact to beneficial uses, duration of impact to beneficial uses, previous compliance record of the discharger, etc. Since this information is not currently known, the expected number of enforcement actions or their severity cannot be established at this time. Moreover, the San Diego Water Board expects dischargers to be in compliance with the waste discharge requirements that implement the TMDLs. As such, it does not accommodate planned non-compliance in the manner suggested in the comment. In addition, please note that any potential economic benefit derived from non-compliance is taken into account when administrative civil liability penalties are calculated.

Comment 346

With regard to the discussion of where Wasteload Allocations need to be met (i.e., above or below outfalls, and the discussion of using receiving waters to convey or assimilate waste,) please clarify the graphics on page R-67 and R-70 of the Environmental Analyses. These graphics show, respectively, sandbags and treatment wetlands in what appear to be Waters of the State.

Response: The graphics on pages R-67 and R-70 of the Environmental Analysis and Checklist are provided only as examples of BMP implementation. The graphics are not meant to dictate where in relation to Waters of the State BMPs can or cannot be implemented. While the images do not provide adequate information to determine if the BMPs are located in Waters of the State or not, both of the BMPs presented (sand bags and constructed wetlands) can certainly be implemented outside of Waters of the State.

4.6 Compliance Schedule

Comment 347

Coastkeeper supports adoption of this TMDL, followed by the Basin Plan Amendment (BPA) that will incorporate the reference approach for final wet weather. We recognize the compromise staff has made to balance stakeholder concerns, including extending the final compliance schedule for this TMDL to 20 years. Coastkeeper supports this TMDL only with the understanding that the Reference Approach BPA will provide for a more appropriate compliance schedule for final limits. That is, that the schedule for the revised limits should be consistent with the interim compliance schedule of this TMDL.

The Technical Report seems to recognize this concern, stating that the revised final limits of the TMDL, once the reference approach is applied, will be "similar" to the interim limits of this TMDL (see page 14). However, the report does not indicate how far the similarity will extend. Without limits clearly spelled out in the TMDL or Technical Report, we are concerned that hard-fought negotiations on the compliance schedule will be lost once the Reference Approach BPA is adopted. Coastkeeper supports limiting the new reference schedule to the interim schedule of this TMDL.

Response: In determining appropriate interim wet weather TMDLs, the San Diego Water Board chose to apply the 22 percent exceedance frequency determined for Leo Carillo Beach in Los Angeles County. At the time, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. Since then, four other reference beaches have been characterized by SCCWRP. Based on all the available reference beach data, all watersheds in this TMDL will receive a watershed specific exceedance frequency once the reference system basin plan amendment has been adopted. The 22 percent exceedance frequency was justified for the current interim targets because the exceedance frequencies of our Region's urban watersheds will likely be close to the value as the one calculated for Leo Carillo Beach. If this does indeed turn out to be the case, or if the exceedance frequency is greater than 22 percent, then the resulting final wet weather TMDLs will be the same as, or less stringent than, the interim TMDL. In this case, a 10-year compliance period would be appropriate for the revised final TMDLs.

Comment 348

Although the County supports the timely adoption of the TMDL, it should be noted that the timeframe of 5-7 years for a 50% waste load reduction as presented in Table 11-4 of the TMDL technical Report is not realistic. The control of wet weather flows is a substantial undertaking. This schedule does not allow adequate time to fine-tune the modeling and use the results to site the location of BMPs, identify sources, develop plans, develop formal agreements with stakeholders, secure funding, acquire land, conduct permitting, bid out contracts, and install BMPs. As we have previously commented, we recommend a timeframe of 7-10 years for reaching the 50% waste load reduction requirement.

Response: The San Diego Water Board believes that 5-7 years to meet the 50 percent wasteload reductions of the interim wet weather targets is reasonable for the following reasons.

In order for municipal dischargers to meet the current interim wet weather targets, they must reduce their current bacteria contribution by certain percentages for all three indicators (e.g. fecal coliform, enterococci, and total coliform), depending on the watershed. For all the watersheds, these percent reductions fall within the following ranges:

Fecal Coliform - 1.6 to 53.3 percent
Enterococci - 1.9 to 51.4 percent
Total Coliform - 1.6 to 47.0 percent

In order for municipal dischargers to meet the required 50 percent wasteload reduction of the current interim wet weather targets, they must reduce their current bacteria contributions by a percentage, depending on the watershed, within the following ranges:

Fecal Coliform - 0.8 to 26.3 percent
Enterococci - 1.0 to 25.7 percent
Total Coliform - 0.8 to 23.5 percent

The amount of required reduction depends on the watershed, with some watersheds requiring less than 1 percent reduction, thereby allowing more than 99 percent of the current municipal load to continue. On the other hand the largest required reduction will be less than 27 percent, thereby allowing more than 73 percent of the current municipal load to continue.

The San Diego Water Board believes that the municipalities are capable of achieving 1 to 27 percent reductions within 5 to 7 years via a combination of aggressive non-structural BMPs, and targeted structural BMPs in known bacterial hot spots.

Comment 349

Comment 216. Numerous specific responses were provided in the comments, nevertheless, our concern remains that the current load reduction targets and compliance timeframes for MS4 discharges are unrealistic and unachievable. The load reduction targets are impacted by many of the comments described in this attachment, and our concern regarding timing is inextricably linked to those targets.

Response: Please see response to Comment 348.

Comment 350

Compliance Schedule – The June 25, 2007 draft technical report modified the Final Dry Fecal Coliform and Enterococcus compliance schedule. This change is inconsistent with the previous Regional Board staff position which was based on an acknowledgement that, while it is feasible for dischargers to comply with final Wasteload Allocations within 17 years, it is infeasible for the dischargers to comply with these final Wasteload Allocations within 10 years. Please describe the rationale for the change, anticipated impacts to dischargers, and feasibility of compliance.

Response: The San Diego Water Board believes that 10 years is the maximum required timeline to achieve dry weather TMDLs. In fact, many beaches included in this TMDL are meeting WQOs during summer dry weather as shown by monitoring data. This is due to low flow diversion structures and other BMPs implemented by coastal municipal dischargers since 2002. We also believe that a 10-year compliance schedule for dry weather TMDLs is feasible because non-structural, less expensive source reduction BMPs are available to the dischargers.

Comment 351

The compliance schedule and interim goals/milestones should be clarified.
The Draft TMDL's compliance schedule requires 50% of "all interim and final dry ENT and FC" to be met several years before 100% interim reductions are required. The Regional Board should clarify what is meant by "50%". Is this 50% of the billion MPN/year existing load or is it a 50% reduction in exceedance days? Also does "all interim" refer to both dry and wet weather interim requirements? This is extremely confusing. For comparison, the Santa Monica Bay Beaches Bacteria TMDL sets interim compliance targets as maximum allowable exceedance days. The Regional Board should clarify this language.

Response: Thank you for the comment. The required reductions have been clarified by separating the wet and dry weather requirements into two tables. The required 50 percent reduction is a wasteload reduction.

Comment 352

The compliance point for final dry weather targets should be moved forward.
The Draft TMDL requires final dry and wet weather targets to be met 20 years after TMDL approval. The timeframe appears excessive for meeting final dry weather targets. As you know dry weather targets are much easier to meet than wet weather targets, and the dry weather period is the most critical period from a public health perspective. The Santa Monica Bay, Marina del Rey and San Pedro Bay Beaches Bacteria TMDLs require final dry weather targets to be met three years after adoption for the AB411 time period and 6 years for winter dry weather. Since this deadline has past, we have seen great improvements in beach water quality in Santa Monica Bay. Many municipalities in Los Angeles County have implemented best management practices such as dry weather diversions and treatment facilities to improve beach water quality. San Diego Regional Board staff should separate the final compliance dates for dry and wet weather, so that the dry weather targets are met within at most five years. This is necessary to protect public health as soon as feasible during the high-use beach period.

Response: To clarify, the compliance period for the dry weather TMDLs is 10 years. The San Diego Water Board developed the compliance schedule through several years of collaborative efforts with our stakeholders. Even though the TMDLs were not yet adopted, our municipal dischargers showed their commitment to meeting water quality objectives during dry weather by implementing BMPs like those mentioned in the comment. Monitoring data show that many San Diego Region beaches included in this TMDL are meeting REC-1 standards during summer dry weather. The compliance schedule, with its 10 year period to meet interim wet and final dry TMDLs, was developed to allow dischargers as much flexibility as possible to meet TMDLs. For these reasons, we are not proposing to shorten the dry weather compliance period it at this time.

4.7 Environmental Analysis

Comment 353

With regard to the impacts of diverting dry weather flows on existing wetland vegetation, please provide the basis for the statements on pages R-32 and S-185 that impacted plants would likely be non-natives.

Response: Under natural conditions, most southern California inland wetlands would generally be dry during the summer and only appear wet after storm events, after the soil becomes saturated and enough storm water runoff is available to remain on the surface. Therefore, under natural conditions, inland wetlands in southern California would only appear to be wet on the surface for short periods of time primarily during the wet season.

Species of plants native to southern California inland wetlands are adapted to long periods where the wetland surface is dry. On the other hand, inland wetlands that exist due to urban runoff would have much shorter dry periods, or no dry periods at all. This type of regime encourages the growth of plant species with higher water requirements. Non-native species of plants that require significantly more water than native species, such as *Arundo donax*, crowd out the native species as long as there is an artificial source of water sustaining their growth and reproduction.

If urban runoff, which is the primary source of dry weather flows, is significantly reduced or ceases completely, the dry periods for inland wetlands are expected to become longer and more conducive to the re-emergence of native inland wetland plant species.

Comment 354

With regard to the contention on page S-185 that the elimination of dry weather flows and enhance future restoration opportunities, it is true that the removal of non-natives can facilitate enhanced growth of natives. However, if the diversion of water results in the elimination of hydrophytic non-natives, wouldn't the same diversion also reduce the area in which the hydrophytic natives could thrive?

Response: Many of the hydrophytic non-native plant species thrive when the water table is close to the surface. Additionally, many non-native species, especially *Arundo donax*, reproduce more quickly and consume significantly more water resources than native species. Therefore, the reduction or elimination of dry weather flows would remove the source of water that sustains many of the hydrophytic non-native plant species. Removal of the non-native species would also decrease the competition for and increase the availability of water for native plant species.

With a reduction in urban runoff, the area in which hydrophytic native plant species could thrive may be reduced. However, the reduction in area would likely reflect a more natural condition.

Comment 355

The City believes that achieving zero indicator bacteria at its beaches involves much more than eliminating indicator bacteria from its storm water discharges because of regrowth in receiving water and because bacteria which is generated at the beaches by birds and "dog beaches". Please address the reasonable foreseeability that dischargers will need to eliminate the wracklines upon which birds feed and excrete waste (along with the potential impacts to sensitive bird species and grunion) as well as the potential need for dischargers to prohibit dogs on beaches (along with the potential recreation impacts).

Response: The TMDL does not require a zero load of indicator bacteria at beaches. There is an allowable load for both wet and dry weather conditions. Bacteria generated by birds on wracklines are considered natural sources that are not included in the WLA for the MS4 dischargers. If the bacteria loads from natural sources exceed the TMDL, then the WLA for the MS4 dischargers may be zero. MS4 dischargers are not responsible for reducing the bacteria load from natural sources. Eliminating the wracklines is not a requirement for the municipalities to meet their WLAs, thus this is not a reasonably foreseeable alternative that will be implemented by the municipalities.

As for bacteria in dog feces, there is no need to prohibit dogs on beaches as long as the municipalities enforce their ordinances requiring dog owners to pick up after their dogs. Municipalities can also encourage dog owners to pick up after their dogs by providing plastic bags and trash receptacles at the beaches. Enforcement of a municipality's ordinances and providing plastic bags and trash receptacles are reasonably foreseeable alternatives that will not have an adverse impact on recreation, and will likely increase recreational use of beaches.

4.8 Economics

Comment 356

In the responses to comments there are numerous references to conducting more studies, gathering more data and model refinement (since the RWQCB indicated they cannot commit to re-evaluating the watershed models used, even though numerous flaws have been acknowledged); however the costs of these studies, data collection and model refinement did not appear in the economic analysis. Studies can be extremely costly (for example, the SCCWRP Epidemiology study is $2M-$3M plus) and resource intensive and they need to be considered in the economic analysis.

Response: The economic analysis considers the costs of reasonably foreseeable methods of compliance with the proposed TMDL. Methods of compliance include the implementation of non-structural and structural controls to reduce pollutant loads to meet the TMDL and collection of data to determine compliance with the proposed TMDL. However, collection of data and conducting studies for model refinement or TMDL refinement are not part of the reasonably foreseeable methods of compliance with these TMDLs. Therefore, the economic analysis is not required to consider data collection, studies, and model refinement for this purpose.

Comment 357

Comment 281. The response to comment 281 does not address either of the salient issues in the comment. Those issues are as follows: 1) whether the cost to prevent an illness is within the range established by other public health policies, and 2) this TMDL program will not be implemented in isolation. Other TMDL programs are being developed and implemented and each will have its own implementation requirements. It was recommended that the Regional Board conduct a costing exercise to estimate what the aggregate TMDL-related investment could be, whether this is even economically feasible, and whether there are possible cost saving approaches.

It is difficult to understand how the cited study (Given et al 2006) applies to the current TMDL. A more relevant analysis would estimate the cost of an illness avoided by implementation of BMPs to achieve water quality standards. The cited study presents costs of all illnesses in the specific area of Southern California due to recreational activities based on the EPA (1986) and Kay et al. (2004) relations between enterococci densities and health risk. It is important to keep in mind that EPA has set an acceptable level of risk at ~1 illness per 100 recreation events. So even if all waters investigated in that study were to be in compliance with the EPA standards, there would be substantial costs associated with GI illness in Southern California, given the large number of recreation events that occur annually. It should also be noted that there is substantial and unresolved scientific controversy regarding the use of the Kay et al relation as employed by Given et al (2006) (See commentary by Wymer et al. in Water Research 2006).

Response: The commenter's recommendation that the San Diego Water Board conduct a costing exercise to estimate what the aggregate TMDL-related investment could be, whether this a economically feasible, and whether there are cost saving approaches is beyond the scope of the economic factors the San Diego Water Board must consider in its environmental analysis. The study cited (Given et al 2006) in the response to Comment 281 was simply an example that shows there are economic benefits for the dischargers to comply with the TMDL. The economic impact due to illnesses contracted from swimming at contaminated coastal waters can offset the costs of complying with the TMDL. However, compliance with the TMDL is a requirement, and while public health is a consideration, it is not an overriding factor that allows the dischargers to discharge in exceedance of the wasteload allocations. A TMDL is not a public health policy, it is for the restoration and/or protection of water quality.

We do recognize that this TMDL program will not be implemented in isolation. We have revised the implementation plan to allow the dischargers to submit a Comprehensive Load Reduction Plan (CLRP) for all constituents of concern in lieu of the Bacteria Load Reduction Plan. The CLRP may provide a basis for an appropriately tailored comprehensive compliance schedule (CCS), which may not extend beyond 20 years. The CCS will allow the dischargers to budget implementation of measures to comply with the TMDLs for all constituents of concern over a longer period of time, thereby reducing the annual costs required. In the CLRP and CCS, the dischargers will be able to identify the most cost effective approach and cost saving opportunities to implement their programs to comply with the TMDLs.

Comment 358

Reasonably Foreseeable Means of Compliance The City continues to request that the Regional Board explicitly acknowledge that treatment and/or diversion (e.g., infiltration) of storm water will be required in order to produce storm water discharges with zero indicator bacteria as required by the final Wasteload Allocations. Unlike Chollas Creek Dissolved Metals TMDL which acknowledged this reasonably foreseeable means of compliance, the staff response for this TMDL (page S-2001) states that in some cases structural BMPs may not be necessary. Does this response apply only to discharges which have no anthropogenic-related bacteria sources in the drainage area? Analysis of water quality samples collected in the city reveal that 79% of the samples contain detectable levels of indicator bacteria (DNA analysis is required to determine whether the source of this bacteria is anthropogenic). Detection limits vary, but it is reasonable to assume that some of the remaining 21% of samples contain indicator bacteria in excess of the zero Wasteload Allocation.

Response: The response referred to by the comment was in reference to the discussion about potential non-structural or structural controls that may be implemented in residential areas. We do not know which non-structural and/or structural controls will be implemented by the dischargers in residential areas to comply with the TMDLs. In some cases, non-structural controls (e.g., enforcement of ordinances, education) may be all that is required to meet load and wasteload allocations. In other cases, structural controls may also be required. The dischargers will have to determine what non-structural and/or structural controls will need to be implemented on a cases-by-case basis, appropriate to the environmental setting and potential sources of bacteria. Treatment and/or diversion of storm water will be necessary to meet a zero wasteload allocation for wet weather. Because we intend to revise the final wet weather TMDLs to incorporate a reference system approach, the Implementation Plan does not require the dischargers to conduct wet weather planning, or reduce wet weather loads until after the San Diego Water Board has considered adopting the revised TMDLs.

4.9 Comprehensive Load Reduction Plans

Comment 359

We appreciate the inclusion in the June 2007 Draft TMDL Report of provisions allowing watershed co-permittees to propose Comprehensive Load Reduction Plans with tailored compliance timeframes so that other interrelated watershed concerns such as hydromodification and nutrients can be addressed cost-effectively in lieu of just bacteria load reduction. While it seems likely that all impaired waters could benefit from a comprehensive approach, the South Orange County Co-Permittees consider the two impaired creeks (Aliso and San Juan) as best justified and the highest priority to be addressed in the comprehensive manner, due to multiple impairments and the existence of already-substantial bodies of watershed data, planning and BMP efforts. The County of Orange, with the full support of the Co-Permittees including the City of Laguna Niguel, has taken the lead since the release of the June 2007 Draft TMDL to develop a framework document, based on the Chollas Creek framework document previously developed by the City of San Diego, to support a comprehensive load reduction program for Aliso and San Juan Creeks. This document, called the *TMDL Strategic Assessment and Watershed Implementation Framework* (a.k.a. ASJIF, for *Aliso/San Juan Implementation Framework)* will be submitted to the RWQCB by the County of Orange by August 1, 2007. The ASJIF will establish the foundation for the development of Comprehensive Load Reduction Plans with 20-year tailored compliance schedules for Aliso and San Juan Creeks, in lieu of the respective Bacteria Load Reduction Plans. ***The Co-Permittees request that these two creeks be specifically authorized for comprehensive planning and 20-year compliance schedules, along with Chollas Creek, explicitly in the Bacteria TMDL Report prior to the scheduled RWQCB action in September 2007.*** Please note that this limited request is driven primarily by time constraints and is not intended to imply that future similar requests will not be made for the other impaired waterbodies in South Orange County, as provided for in the Revised Draft TMDL.

Response: The San Diego Water Board appreciates the timely efforts put forth in the *TMDL Strategic Assessment and Watershed Implementation Framework: Aliso Creek and San Juan Creek Watersheds*, (Orange County ASJIF) which was submitted to our office on August 2, 2007.

In response to a comment from Coastkeeper, the San Diego Water Board developed conceptual performance standards for CLRPs, and these are included in the revised Technical Report. Among the performance standards is a requirement that municipalities achieve water quality objectives in receiving waters for other impairing pollutants that are to be included along with bacteria in the CLRPs, within the proposed timeframe for the CLRPs, not to exceed 20 years. That CLRPs be designed to meet water quality objectives in receiving waters was always our intent. However, this was not explicitly made clear in the draft Technical Report. In this context, “achieving the water quality objectives in receiving waters for other impairing pollutants” means that the municipal dischargers and Caltrans meet the Receiving Water Limitations requirements of their respective NPDES

Storm Water WDRs. These Receiving Water Limitations include an iterative process of increasingly stringent BMPs that will result in achieving water quality objectives. The respective NPDES Storm Water WDRs also contain monitoring requirements which can be adapted to monitor, document, and assess BMP implementation. All CLRPs must be designed to achieve water quality objectives in receiving waters for other impairing pollutants, by meeting NPDES Receiving Water Limitations as verified through NPDES monitoring requirements, within the CLRP timeframe.

While the Orange County ASJIF contains many of the conceptual performance standards discussed in the Technical Report, and deserves to be commended, it falls short of committing to achieving water quality objectives in receiving waters for other impairing pollutants within the proposed timeframe of 20 years. Rather, it states that the ASJIF "will move the improvement schedule for the parameters dramatically forward." Because of this shortcoming, the San Diego Water Board cannot authorize a 20 year compliance schedule for the San Juan Creek and Aliso Creek Watersheds.

Comment 360

The City is pleased to see that the compliance schedule has been revised with a phased-approach. In addition, the option of a comprehensive load reduction plan framework makes a lot of sense. South Orange County Cities have worked expediently and cooperatively together to prepare a comprehensive watershed specific load reduction framework, "TMDL Strategic Assessment & Watershed Implementation Framework for the San Juan Creek and Aliso Creek Watersheds," which has been/will be submitted to the RWQCB by the County of Orange on behalf of the municipalities. The City of Dana Point has been an active participant in the development of this framework and fully supports this more comprehensive effort. The City highly encourages RWQCB staff to consider including details (revised compliance schedule, etc.) of this element in the TMDL prior to adoption (similar to Chollas Creek).

Response: Please see response to Comment 359.

Comment 361

The Cities of Laguna Beach, Laguna Woods, Mission Viejo, and San Juan Capistrano support the development and implementation of the *TMDL Strategic Assessment and Watershed Implementation Framework* for the Aliso Creek and San Juan Creek watersheds, prepared and submitted by the County of Orange. This document establishes the foundation for the development of a Comprehensive Load Reduction Plan, which will be prepared upon adoption of the Indicator Bacteria TMDL for the Project I Beaches and Creeks in the San Diego Region.

The proposed approach will address all of the 303(d) listed pollutants in the Aliso Creek and San Juan Creek watersheds as well as other local watershed concerns such as hydromodification and flooding. A 20-year implementation period is proposed to allow for a comprehensive and adaptive plan. A comprehensive watershed approach rather than a bacteria-focused approach will provide many benefits, including:

- Best use of resources through multi-objective BMPs. Comprehensive planning will necessitate that BMPs be selected that can address a range of impairments. This will result in cost savings to the public by limiting the number of BMPs that will be required.
- Best use of resources through adaptive management. The phased implementation of BMPs will allows for adaptive management through the implementation period. This will result in cost savings to the public as the plan is continually refined to incorporate data from earlier phases.
- Accelerated attention to additional 303(d) listed impairments. While the bacteria TMDL will likely be approved in 2008, additional 303(d) impairments are not scheduled for TMDL completion until 2019. Pursuing a comprehensive plan at this time will result in improving water quality related to those impairments earlier.
- Development of critical monitoring data. In order to address impairments outside of bacteria, the Permittees are committed to a robust data acquisition strategy that will develop monitoring data related to a wide range of impairments. This data will be available to the Permittees as well as the Regional Board.

Response: Please see response to Comment 359.

Comment 362

One revision in latest version of the Technical Report gives dischargers addressing other pollutant constituents concurrently with the bacteria load reduction the option to submit a Comprehensive Load Reduction Plan in lieu of the Bacteria Load Reduction Plan (see page 16). In the CLRP, a discharger may propose a comprehensive compliance schedule, different from the milestones and compliance points set forth in the TMDL.

Coastkeeper agrees with the rationale of encouraging cities to proactively address pollutants, especially in waters currently listed as impaired, but not yet covered by a TMDL restoration plan. However, without mandatory Board approval and adequate public participation, there is insufficient oversight of discharger accountability in the CLRP process. Adequate public participation includes notifying stakeholder groups of the CLRP submission, an opportunity for public comment, public hearing (and notice of the hearing), and requisite review by the Regional Board.

Without input from interested stakeholders, compliance schedules and pollution reduction practices could potentially be implemented without a uniform standard, permitting some dischargers to implement their CLRPs with less stringent requirements and compliance schedules than other dischargers. This concern may be clarified with more information about the performance standards to be used.

a. Conceptual Performance Standards Must be Developed and Clarified
At the July 9th SAG meeting, staff alluded to 'performance standards' that would be used to determine whether the actions and compliance schedules proposed by dischargers are adequate for the Comprehensive Load Reduction Plans. After talking with staff, it seems these standards have not been developed and are still under staff consideration. No performance standard or template has been shared with the SAG or posted on the website. The format of the standards will be critical to developing a transparent,

objective, and consistent system. We are particularly interested in ensuring that the CLRPs do not result in inconsistent compliance schedules.

The concept of addressing multiple pollutants was raised in the Chollas Creek Metals TMDL (Technical Report, May 30, 2007, Appendix I, Section 8.4). However, in that case, a significant study (Weston Solutions, 2006. Chollas Creek TMDL Source Loading, Best Management Practices, and Monitoring Strategy Assessment, September, 2006) was the basis for a tiered system. Specifically, the tiering was outlined in several public meetings, and stakeholders were able to comment on the length of the compliance schedule, and the particular tiered objectives. Any performance standard allowed for the Bacteria 1 TMDL should use defined targets that ensure compliance standards and schedules are respected.

Response: Conceptual performance standards for Bacteria Load Reduction Plans (BLRPs) and CLRPs were developed and are included in the draft technical report in section 11. These performance standards should result in consistent CLRPs and consistent information upon which to base tailored compliance schedules. When compliance schedules are incorporated into stormwater WDRs, the public will have ample opportunity to review and comment on the compliance schedules.

Comment 363

b. Review by Regional Board Review Must be Mandatory
The technical report states CLRPs are "subject" to review by the San Diego Water Board, but does not appear to make this review mandatory (see page 16). Without moving the CLRPs through the Board process, stakeholders will have no opportunity to comment on specific CLRPs, nor will dischargers or other interested parties have access to notice and feedback when the CLRPs are submitted.

If, as we suspect, Board approval is not mandatory, we find this to be an inappropriate delegation of authority by the Board to its executive officer. Section 13223(a) of the California Water Code provides that a regional board may delegate substantial powers to its executive officer, except for "the issuance, modification, or revocation of any water quality control plan, …" (Cal. Water Code § 13223(a) (2007)). The TMDL amends the Basin Plan, the San Diego water quality control plan. A water quality control plan must contain "a program of implementation needed for achieving water quality objectives." (Cal. Water Code §13050(j) (2007)).

Generally, load reduction plans submitted during the implementation phase of other TMDLs focus on how compliance with the TMDL will be attained. However, here the CLRP could potentially modify this TMDL by changing its substantive provisions, namely the compliance schedule and quantity of other pollutants addressed. Thus, the CLRP is a component of the water quality control plan, rather than simply the implementation method, and so requires a public hearing to be consistent with §13244 of the California Water Code.

Response: CLRPs will be submitted in compliance with an implementing order of the San Diego Water Board, and will not be added to the Basin Plan. As such, section 13244 of the Water Code does not apply, because the Basin Plan is not being amended.

Furthermore, CLRPs cannot change the bacteria TMDLs or load and wasteload allocations. Since the Implementation Plan allows tailored compliance schedules when justified in a CLRP, the compliance schedule provisions of the TMDL are not substantively changed when a longer compliance schedule is authorized pursuant to a CLRP.

A public review and comment process will occur when CLRPs are incorporated into NPDES stormwater WDRs during renewal. Any TMDL implementation provisions and any compliance schedule proposed in a CLRP, and proposed by the San Diego Water Board for incorporation into NPDES stormwater WDRs, will be subject to the public review process for renewing WDRs.

Comment 364

The Technical Report purports to limit compliance schedules in a CLRP in that they may not extend bacteria compliance milestones beyond the interim milestones set forth for Chollas Creek (See page 16). The term 'interim milestones' could refer to the 10 year, 80% reductions or the 20 year, 100% reductions in the Chollas Creek Technical Report (Table 11.2) and should be clarified. In either case, subsequent to Board action on the TMDL, the compliance schedule for bacteria could change, potentially tripling the compliance schedule approved by the Board based on the CLRPs.

Response: Thank you for the comment. The technical report has been clarified. The previous draft incorrectly referred to 'interim milestones' and was actually intended to establish the same 20-year maximum compliance schedule for CLRPs as per the Chollas Creek Metals TMDL.

4.10 Independent Advisory Panel

Comment 365

With respect to this TMDL, RDMD's goal is active and responsible stewardship of the waters within our jurisdiction. Within this context we have interest in ensuring, to the extent feasible that public resources allocated towards water quality improvements will enhance protection of the beneficial uses (that is, actual reduction of risk to levels that are acceptable), and thus, public health protection. At the same time, we understand that the Regional Board would like to move the TMDL forward and begin to see implementation of water quality improvements in the most expeditious manner possible. To resolve these potentially competing goals, we offer the suggestion of convening an Independent Advisory Panel (IAP) comprised of nationally recognized experts to assist the Regional Board in resolving the technical issues that have led to the impasse described above. We suggest this approach because the existing peer review process has not adequately addressed these issues. We envision contracting an independent third party agency to assemble the panel, manage the review process, and provide documentation of the panel's proceedings, findings, and recommendations. RDMD would be willing to participate in setting up and supporting the IAP process. Further, we would expect Regional Board staff to actively participate in this IAP process by submitting suggestions for charge questions and attending IAP meetings. Upon completion, the proceedings from the IAP would be provided to the Regional Board. It is our hope that the findings and recommendations from the IAP would be key to informing the next steps and shaping the direction of the final TMDL. We anticipate the findings from the panel could be available in a time period of 3-4 months from the point of initiation.

Logistically, the adoption of the TMDL could be delayed until the IAP process is concluded, or a specific clause for a re-opener could be included in the TMDL to address the findings of the IAP. Given that development of the TMDL has taken several years to date, and that results from the IAP could be available in a relatively short time period, it would be preferable to commence the IAP process as quickly as possible and postpone adoption of the TMDL until the process concludes. This approach has the additional appeal of allowing sufficient time so that the Basin Plan amendment addressing the reference system approach and natural sources could be adopted at the same time as the TMDL, thus resulting in a comprehensive and implementable TMDL process, as many stakeholders have recommended and requested. If the Regional Board is willing to adopt this approach, RDMD will work with Orange County stakeholders to begin to move forward with TMDL implementation in a prioritized manner in parallel to the IAP process. The initial focus would be on elements that address dry weather exceedances of bacterial water quality standards at beaches, as the highest priority, as these exceedances are of the greatest public health concern.

Response: Periodic reviews of TMDLs and consideration of new information are key to making the TMDL process adaptive. As part of the Implementation of these TMDLs, and the development of the revised final wet weather TMDLs, the stakeholders are encouraged to form an expert panel to provide input and information on refining and improving the TMDLs to the San Diego Water Board. TMDL program staff will interact with the panel to the extent that is feasible and practical. We have not included a "fixed" TMDL review schedule in the Implementation Plan because we cannot predict when information justifying TMDL revisions will be collected and available. However, when data and information are collected and available, and they indicate the TMDLs are either too conservative or too liberal, we will make revising the TMDLs a program priority.

Comment 366

Additionally, because numerous important issues (methods for calculating loadings, using the 90th percentile standards as not-to-exceed values, feasibility of load reduction targets, potential implementation costs, etc.) have yet to be resolved, and will likely not be resolved prior to initial TMDL adoption and implementation, we believe that ongoing discussion and review by an independent expert panel should be part of the TMDL implementation process. The County of San Diego supports the concurrent implementation of the TMDL and the convening of an expert panel on bacteria to aid in the refinement of the TMDL technical criteria, improvements to data evaluation and modeling, and the development of feasible and appropriate Bacteria Load Reduction Plans.

We request that the Regional Board commit, as part of the ongoing TMDL implementation process, to periodic reviews and discussion of input received through the independent expert panel or other sources, and that needed modifications be made to the TMDL as identified through that process. While we understand that your Board has the discretion to consider modifications to the TMDL in response to staff recommendations at any time, we feel it is crucial that a fixed review schedule be incorporated as part of the implementation process. As the science of bacteria evolves and additional monitoring data are collected, continued open communication and improved refinement of the modeling will further ensure that the public funds for structural or other improvements to reduce bacteria in streams and beaches are necessary and appropriate.

Response: Please see response to Comment 365.

Comment 367

The City of Laguna Niguel endorses the comment letter submitted on July 25, 2007 by the County of Orange regarding its ongoing concerns with the Total Maximum Daily Loads for Indicator Bacteria Project I – Beaches and Creeks in the San Diego Region Draft Technical Report dated June 25, 2007. While we appreciate the RWQCB staff's efforts in this latest Draft to incorporate adaptability into the process, we share the County's concerns that the TMDL's load reduction emphasis on wet-weather days when recreational use is minimal is not cost-beneficial with respect to public health risk; that WQOs and load reductions are inappropriately applied statistically and geographically; and that the issue of a useful compliance metric – brought up by the SAG on numerous occasions – has once again been pushed to a later date, leaving the municipalities, the public, and the RWQCB's NPDES permit-implementation staff all dangling without assurance of what's going to be required. In its current letter, the County proposes that an Independent Advisory Panel be convened to address these issues, preferably in advance of adoption of the TMDL by the RWQCB, so that the IAP's findings would be timely to be reflected also in the text of the proposed Reference System/Natural Sources Exclusion Basin Plan Amendment. We support this approach.

Response: Neither the federal Clean Water Act nor the state Porter-Cologne Water Quality Control Act allow us to take into account cost-benefit considerations when we implement water quality standards. Although fewer people recreate in the ocean and inland waters during winter-time storm events compared to summer months, we must ensure that water quality supports REC-1 uses year round. We disagree that the load reductions are inappropriately applied geographically and statistically and have addressed comments on this topic in our two Response to Comments Appendices. By not requiring a particular metric for compliance, we have allowed time for dialogue among the stakeholders and San Diego Water Board staff to develop a workable compliance approach to incorporate into the TMDL implementing orders. We believe this approach allows us to move forward now to adopt the TMDLs while still providing time to develop an appropriate compliance metric, even though it leaves unanswered questions at this time.

4.11 Miscellaneous

Comment 368

The apparent aggressive pursuit, with pressures from EPA and State, of finalizing the TMDL with acknowledgement of the lack of data, data that will be available in the near future and refusal to revise the model based on best available data, continues to cause tremendous concern. Repeated written responses and comments from the RWQCB staff that the TMDL cannot be delayed any longer because dischargers need to start doing something to address bacteria are not justified, particularly in South Orange County, in our opinion.

It should be noted that South Orange County dischargers have been aggressively focusing their efforts under the current Stormwater permit and their watershed actions plans for at least the past five years. The fact that beaches in every south Orange County coastal City (San Clemente. Dana Point and Laguna Beach) meet criteria for de-listing demonstrate significant achievement from the efforts that the Cities' have made to address indicator bacteria issues. Dischargers are doing plenty! The City of Dana Point aggressively pursued funding and committed $500,000 itself to initiated the Epidemiology and Microbial Source Tracking Study at Doheny State Beach, currently being conducted by the Southern California Coastal Water Research Project (SCCWRP) and University of California Berkeley - knowing that this effort is greatly needed to help effectively address this TMDL effort and beyond.

Response: We appreciate the proactive and effective actions of the South Orange County dischargers to reduce dry weather loading. However, we are not aware of any actions taken to address wet weather loads. The adoption and implementation of the TMDLs should not wait until the studies being performed on behalf of the dischargers are completed. When the studies are completed, the results of the studies and the data that are collected by the dischargers may help the dischargers identify anthropogenic sources that can be further reduced to meet the wasteload allocations, as well as provide a basis for modifying the parameters in the models used to calculate the TMDLs.

Comment 369

Although, the City has continued concerns regarding the method of implementation and method of compliance evaluation of the TMDL program, we have been told by staff that the details will he developed in the load reduction plans. We feel strongly that the natural background exclusion Basin Plan Amendment and the Epidemiology study should provide valuable information that will help develop these plans. However, the RWQCB, along with the SAG, have only briefly mentioned a few options of compliance assessment that may be considered (verbally indicating that effluent limits are not necessarily required) which has only provided a modicum of comfort. As an agency who serves the public, we must ensure that programs are developed in our constituents' best interest in a financially responsible way. We hope to continue a cooperative relationship with the RWQCB so that these items are developed and the final outcome will he reasonable, flexible and effective: however we need to note that we remain concerned that because these items are not being addressed at this time, with the potential change of staff, etc., the intent could be lost, whereby subjecting dischargers to undue methods of implementation and compliance assessment.

Response: Upon adoption of this TMDL, a Transfer Plan will be developed to lay out the expected actions that will be taken by the San Diego Water Board to implement the TMDLs. The load reduction plans and methods of compliance assessment will require a cooperative effort between the dischargers and the San Diego Water Board.

The dischargers have the primary responsibility of developing the load reduction plans. Therefore, the dischargers are given an opportunity to propose a monitoring strategy that will provide the flexibility they are looking for as long as they provide the data and information to determine compliance with the TMDL.

Comment 370

Another great concern that has just been brought to the table in the NPDES reissuance process, is the newly defined Facility that Extracts, Treats and Discharges (FETD) waters of the US or State. This language and the proposed monitoring requirements, as well as long-term intention of requiring these facilities to obtain individual NPDES discharge permits (meeting all applicable water quality standards), was recently included in the revised draft tentative order for the south Orange County MS4 Permit. It is an entirely new addition, as it was not included in the first iteration of the draft Permit. This proposed requirement is quite alarming, as it requires addition monitoring, which may or may not be based on the treatments purpose. At this time it appears that in order to meet the goals of the TMDL, treatment facilities will be necessary. This extra layer of regulatory requirements will put an extra burden on dischargers trying to do the right thing and may exclude potential solutions to the problems at hand.

The City sincerely understands the need to ensure that a treatment facility will not create additional concerns (such as toxic byproducts), and we also understand that it is prudent to address more than one concern at a time when it makes sense (hence our support and development of a comprehensive load reduction plant); however the language included requires monitoring that may not be applicable to the pollutants of concern and does not address the concern of toxic products of treatment.

Why does the RWQCB feel the necessity to pursue individual NPDES permits for FETDs? It appears that that this will block any "end of pipe" solutions that address current 303(d) list bacteria reduction efforts, when it is these ends of pipe solutions that may be the only way to get us to our goal. It seems logical to require monitoring for potential toxic byproducts for a specific time to see if they are in fact a concern, but the reasons for requiring monitoring for other parameters is not understood. It seems logical to look at specific projects on a case by case basis, under the existing NPDES Permit and TMDL Bacteria Load Reduction Plans to determine what monitoring makes sense for that particular project. Please address.

Response: As stated in revised Tentative Order No. R9-2007-0002, facilities that extract, treat, and discharge (FETDs) to waters of the U.S. may discharge effluent that does not support all designated beneficial uses without proper treatment processes. The use of the

MS4 NPDES requirements to regulate discharges from FETDs is an interim approach until individual or general NPDES requirements are developed. Until then, discharges from FETDs are expected to meet all applicable water quality standards (i.e., antidegredation policy, water quality objectives, and beneficial uses) to comply with the NPDES requirements for Southern Orange County. This does not differ from what is generally required of any discharge to a surface water body from a point source. If FETDs can meet all water quality standards, there may be no need to issue individual NPDES permits.

However, development of individual NPDES requirements for an individual FETD, or general NPDES requirements for region wide FETDs would allow for a more focused monitoring and reporting program than what is required to comply with the Southern Orange County NPDES requirements. In any case, the discharges from FETDs are considered point source discharges to surface water bodies and must comply with the water quality standards in the Basin Plan.

Comment 371

Design Storm – The City continues to request the Regional Board provide a design storm or an allowable exceedance frequency. Regional Board staff has declined to do so, indicating that providing such a number is not required by CEQA. This response misses the mark in that the issue here is not necessarily the CEQA compliance but needed guidance on how large to build treatment and diversion facilities. For example, on page R-76 of the Environmental Analysis, treatment systems in Dana Point and Encinitas are described, including their costs. Based on the capacities noted (1,000 gallons per minute and 150 gallons per minute) these facilities (assuming they operate correctly) would themselves result in compliance with the TMDL in terms of size and effectiveness on the downstream beach. If they wouldn't, please describe a facility of a size and capacity comparable to that which would be needed to comply with the proposed TMDL. Without guidance on this issue, it is impossible for dischargers to know with certainty how to comply with the TMDL. It is not reasonable to expect dischargers to be able to design or build treatment or infiltration facilities with enough capacity to comply with a final zero Wasteload Allocation during a storm of infinite size.

Page S-162 of the Regional Board's responses to comments states that "[d]esignating a design storm criteria for structural BMPs in the NPDES requirements to implement these TMDLs is reasonable". Page S-120 indicates that the storm water permit may not be amended to incorporate the TMDL until it is renewed. The last storm water permit, Order 2001-01, was effective for almost 6 years before it was renewed. Guidance on this issue is needed much sooner in order to comply with the 10-year interim milestones in the TMDL.

Response: We understand that a design storm criterion is important for sizing and designing structural BMPs. However, specifying a design storm is not within the scope of this TMDL or environmental analysis. If the dischargers and/or San Diego Water Board develop an appropriate design storm, the NPDES storm water requirements can be amended to include it. Amending the NPDES storm water requirements is a different process and not within the scope of this project.

Comment 372

Best Management Practices (BMPs) Locations - The City continues to request that the Regional Board acknowledge its own requirement that Wasteload Allocations must be achieved prior to discharge of runoff from storm drain outfalls. The issued here is not whether the Regional Board's 401 certification program can permit BMPs in receiving water but whether BMPs built in receiving waters can result in compliance with the TMDL. Regional Board staff deleted the term "prior to discharge[d]" from pages 13 and 122 of the Technical Report (note the comparable language was not deleted from page S-168 under the "Tributary Rule" discussion0; however, this change does not appear to be of any effect given the July 23, 2007 correspondence from John Robertus to Chris Zirkle which reiterates the prohibition on using the loading capacity of receiving waters to convey or assimilate waste. Coupled with Regional Board staff's admission that, "generally speaking, where an outfall exists, receiving water extend upstream to the outfall location" (page S-169), it is apparent that the treatment and infiltration facilities need to be built above storm drain outfalls. Given the propensity for indicator bacteria to re-grow even in treated storm water effluent, storm water will either have to be infiltrated (in locations where slope stability is not an issue) or treated immediately above outfalls on land that is privately owned or currently developed.

Response: At this time we have not determined where TMDL compliance will be measured because these details are not necessary at this stage, and are more appropriately discussed in a stakeholder process prior to submission of the Pollutant Load Reduction Plans. The City of San Diego should propose both compliance methods and assessment locations in their Pollutant Load Reduction Plans, which will be unique to each watershed. The compliance methods and assessment locations will help the dischargers determine where and what types of BMPs should be implemented. We encourage the City to continue its discussion with the San Diego Water Board Storm Water Program staff on site-specific BMP proposals for compliance with TMDLs.

Comment 373

Pages S-180 and S-184 of the Regional Board's Responses to Comments critique the City's 2006 "Weston Report" by estimating the acreage required for treatment facilities based on the assumption that three-foot deep detention basins would be required upstream of the treatment works. The Weston Report uses as the basis for this three-foot depth the admittedly arbitrary criteria based on the need to obtain a dam permit to build deeper detention basins which would reduce the acreage required. However, it is the Regional Board's obligation under CEQA to disclose the reasonably foreseeable alternative means of compliance and the environmental impacts thereof, not the City's.

Response: We have provided a range of reasonably foreseeable methods of compliance in our analysis. The range of compliance methods is not a complete list of possible methods by any means, but is a range of methods that is reasonable and foreseeable. Our analysis includes the reasonably foreseeable environmental impacts, and identifies the potential mitigation measures that may be implemented. Our environmental analysis fulfills our obligations under CEQA.

Comment 374

If the Regional Board finds the Weston Report to accurately represent a reasonably foreseeable means of compliance but for the three-foot detention basin depth (or with regard to the location/sizing of treatment facilities), the Regional Board should discuss an amended scenario and the environmental impacts thereof.

Response: We agree with the Weston Report's tiered and iterative implementation strategy to comply with the TMDL, but we do not endorse any specific methods or scenarios. In our analysis, we have provided a range of reasonably foreseeable methods of compliance. Our analysis includes the reasonably foreseeable environmental impacts, and identifies the potential mitigation measures that may be implemented. However, the strategy for implementation and the selection of compliance methods will be the responsibility of the dischargers, not the San Diego Water Board.

Comment 375

Dry weather targets and waste load allocations should be clarified.
The Draft TMDL provides interim and final dry weather targets based on 30-day geometric mean water quality objectives. However, there are **seven** Ocean Plan water quality standards for indicator bacteria. Specifically, there are rolling 30-day geometric mean limits for total coliform, fecal coliform and enterococcus and single sample limits for total coliform, fecal coliform, enterococcus and a fecal-to-total coliform ratio. Thus, the final dry weather targets in the Draft TMDL should include all seven bacteria indicators. Also AB411 requires immediate public notification if a single sample standard is exceeded, so the current geometric mean-based targets conflict with this requirement. Clearly, a beach has impaired waters when public health warnings are issued and signs are posted.

In addition, the Draft TMDL does not clearly state that zero exceedances of the numeric targets are allowed in the AB411 time period at the final compliance milestone. In order to meet water quality standards and fully protect public health, no exceedances should occur at any shoreline monitoring location during summer dry weather (April 1 to October 31) unless there is a rain event. A final waste load allocation of zero exceedances is further supported by the fact that the California Department of Health Services has established minimum protective bacteriological standards – the same as the Ocean Plan standards – which, when exceeded during the period April 1 to October 31, result in posting a beach with a health hazard warning (California Code of Regulations, title 17, section 7958). After partaking in conversations with your staff, a zero exceedance waste load allocation appears to be the intention for dry weather. However, this should be clearly stated in both the Basin Plan Amendment and the accompanying Technical Document.

Response: The Technical Report has been revised to clarify that all of the Ocean Plan water quality objectives for REC-1 are TMDL numeric targets. The dry weather TMDLs are calculated based on the 30-day geometric mean, but the single sample maximums and the total-to-fecal coliform ratio are still applicable. The dry weather TMDLs represent an average maximum load that a water body can assimilate without exceeding the water quality objectives over a period of time rather than at an instantaneous moment in time. There is the possibility that a single sample may exceed the single sample maximum water quality objective and still be able to meet the 30-day geometric mean water quality objective. However, any exceedance of the single sample maximums at beaches monitored pursuant to the Health and Safety Code (AB411) during dry weather would still be required to post signs to notify the public. Therefore, there is no conflict between the dry weather TMDLs and the Health and Safety Code.

Each discharger is assigned a wasteload allocation to comply with the TMDL. The compliance schedule provides the wasteload reduction required to meet the wasteload allocation. By the end of the compliance schedule, a 100 percent wasteload reduction is required to meet the wasteload allocation. If the dischargers do not reduce their wasteloads and exceed their assigned wasteload allocations after the end of the TMDL compliance schedule, they are not complying with the TMDL. Therefore, the TMDLs and compliance schedule implicitly state that there are zero allowable exceedances of wasteload allocations by the end of the TMDL compliance implementation period.

Comment 376

The numeric limits should not be based on the frequency of use.
The Draft TMDL appears to account for beach usage in determining the appropriate numeric targets. As stated in the Draft TMDL, "…the "designated beach" category may be over-protective of water quality because of the infrequent recreational use in the impaired creeks. The recreational usage frequency in these creeks may correspond to the "moderately to lightly used areas" category. If information is obtained to justify the "moderately to lightly used area" usage frequency, TMDLs using the corresponding to this numeric target will be used instead." This approach is inappropriate. This policy approach is in essence saying that it is okay if a few beach-goers get sick after recreating in polluted water. The Draft TMDL should not differentiate the numeric limits in this manner. If the Board believes that receiving waters are not used for recreational purposes, then the Regional Board should complete a Use Attainability Analysis to determine if the use is truly absent.

Response: The Basin Plan for the San Diego Region has different enterococci water quality objectives for different usages or use frequencies for both freshwater and saltwater, whereas the Ocean Plan only has enterococci water quality objectives for saltwater without differentiating usages or use frequencies. At the impaired segments located along the Pacific Ocean shoreline, the Ocean Plan enterococci water quality objectives are applicable. However, for inland freshwater creeks, the Basin Plan water quality objectives are applicable.

The Technical Report acknowledges that the four impaired creeks (San Juan Creek, Aliso Creek, San Diego River, and Chollas Creek) included in the TMDL project, which are freshwater water bodies, may not be necessarily used at "designated beach" level, but may potentially be classified as "moderately or lightly uses areas" for recreational purposes. However, the dischargers must provide evidence justifying the "moderately to lightly used area" usage frequency for the four impaired creeks before the San Diego

Water Board issues orders to implement the TMDLs. Otherwise, we will implement the more stringent enterococci TMDLs based on the "designated beach" usage frequency.

This approach is appropriate and is consistent with the Basin Plan and Ocean Plan.

Comment 377

Table 4-4 (Final Dry Weather Targets) implies that the final Total Coliform target for creeks is 70 MPN, which contradicts the associated text which describes it as 1,000 MPN. The table also does not reflect all the other differences described in the text between beaches and creeks with respect to interim targets. Also, the text in Section 4 should at least paraphrase the discussion included in Section 1.1, acknowledging that SHELL is not a designated use in freshwater creeks and rivers and that total coliform wet/dry and interim/final TMDLs are only applicable at the ocean shoreline, not upstream in the creeks.

Response: Thank you for noting the error. The error has been corrected and, in addition, the SHELL TMDLs were removed from this project and will be addressed in a separate SHELL TMDL and/or standards action. As a result, there are now only final dry weather targets, and no interim dry weather targets.

Comment 378

The descriptions in Tables 11-4 and 11-5 (the compliance schedules) have been generalized to the extent that what is meant by "All Interim" and "All Wet" is unclear and can be read as contradictory to the associated text. The most straightforward way to avoid misinterpretations would be more explicitness in the descriptions and inclusion of the Section 9 Table Numbers in each relevant line, for example for Years 5 through 7 in Table 11-4: "50% Interim Wet FC, TC, & Ent (Tables 9-1, 9-4, and 9-8); 50% Interim Dry TC (Table 9-6); and 50% Final Dry FC & Ent (Tables 9-3 and 9-10)", etc..

Response: Thank you for noting where the tables were unclear. Table 11-4 has been split into two distinct tables to more clearly distinguish between wet and dry weather milestones. In addition, the SHELL TMDLs were removed from this project and will be addressed in a separate SHELL TMDL and/or standards action. As a result, there are now only final dry weather targets, and no interim dry weather targets.

Comment 379

In reviewing the Technical Report released on June 25th, I noticed what must be an administrative oversight, that the City of Poway is still listed as responsibly municipality for the Mission San Diego and Santee HSA on page 137.

Response: Thank you for noting the oversight. The City of Poway has been removed from the list of responsible municipalities in the Mission San Diego and Santee HSA.

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Appendix V

Responses to Comments
Part III

For Revised Bacteria TMDLs Project I
Adopted by the San Diego Water Board on
Month Day, 2010

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Responses to Comments for

Revised Bacteria TMDLs Project I

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