TOTAL MAXIMUM DAILY LOADS FOR INDICATOR BACTERIA IN SANTA CLARA RIVER ESTUARY AND REACHES 3, 5, 6 AND 7

PREPARED BY

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

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ACL	Administrative Civil Liabilitie
BMP	Best Management Practice
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CDO	Cease and Desist Order
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DWR	Department of Water Resources
EPA	Environmental Protection Agency
FIB	Fecal Indicator Bacteria
FSF	Free Surface Flow
LA	Load Allocation
LADPW	County of Los Angeles Department of Public Works
LAR	Los Angeles River
LARWQCB	Los Angeles Regional Water Quality Control Board
MGD	Million Gallons per Day
ml	Milliliters
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTS	Natural Treatment System

OAL	Office of Administrative Law
QAPP	Quality Assurance Project Plan
REC-1	Water Contact Recreational Use
REC-2	Non-contact Recreational Use
SCCWRP	Southern California Coastal Water Research Project
SCR	Santa Clara River
SCVSD	Santa Clarita Valley Sanitation District
SMB	Santa Monica Bay
SSF	Sub-Surface Flow
SSO	Sanitary Sewer Overflow
TMDL	Total Maximum Daily Load
USEPA	Unites States Environmental Protection Agency
USGS	United States Geological Survey
UWCD	United Water Conservation District
VCWPD	Ventura County Watershed Protection District
WDR	Waste Discharge Requirement
WLA	Waste Load Allocation
WQA	Water Quality Assessment
WQO	Water Quality Objective
WRF	Wastewater Reclamation Facility
WRP	Water Reclamation Plant
WTP	Wastewater Treatment Plant

1 INTRODUCTION

This document covers the required elements of the Total Maximum Daily Load (TMDL) for the bacteria water quality impairments in the Santa Clara River (SCR) Estuary, and SCR Reaches 3, 5, 6 and 7, as well as providing the supporting technical analysis used in the development of the TMDL by the California Regional Water Quality Control Board, Los Angeles Region (Regional Board). The goal of this TMDL is to determine and set forth measures needed to prevent impairment of water quality due to elevated bacteria densities in the SCR Estuary and Reaches 3, 5, 6, and 7. The target bacteria indicators addressed are fecal coliform, total coliform, enterococcus, and E. coli.

This TMDL complies with 40 CFR 130.2 and 130.7, Section 303(d) of the Clean Water Act and U.S. Environmental Protection Agency (EPA) guidance for developing TMDLs in California (U.S. EPA, 2000a). It is based on information provided by other entities concerning bacteriological water quality in the SCR Estuary and Reaches 3, 5, 6, and 7.

1.1 Regulatory Background

The California Water Quality Control Plan, Los Angeles Region (Basin Plan) sets water quality standards for the Los Angeles Region, which includes beneficial uses for surface and ground water, numeric and narrative objectives necessary to support beneficial uses, and the state's antidegradation policy; and describes implementation programs to protect all waters in the region. The Basin Plan establishes water quality control plans and policies for the implementation of the Porter-Cologne Water Quality Control Act within the Los Angeles Region and serves as the State Water Quality Control Plan applicable to regulating bacteria in the SCR Estuary and Reaches 3, 5, 6 and 7 and their tributaries, as required pursuant to the federal Clean Water Act (CWA).

Section 303(d)(1)(A) of the CWA requires each state to conduct a biennial assessment of its waters, and identify those waters that are not achieving water quality standards. The resulting list is referred to as the 303(d) list. The CWA also requires states to establish a priority ranking for waters on the 303(d) list of impaired waters and to develop and implement TMDLs for these waters.

A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and allocates the pollutant loadings to point and nonpoint sources. The elements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the CWA, as well as in U.S. EPA guidance (U.S. EPA, 1991). A TMDL is defined as the "sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2) such that the capacity of the waterbody to assimilate pollutant loads (the loading capacity) is not exceeded. The Regional Board is also required to develop a TMDL taking into account seasonal variations and including a margin of safety to address uncertainty in the analysis (40 CFR 130.7(c)(1)). Finally, TMDLs must be included in the State's water quality management plan, or referenced as part of the water quality management plan if contained in separate documents (40 CFR section 130.6(c)(1)).

The U.S. EPA has oversight authority for the 303(d) program and is required to review and either approve or disapprove the state's 303(d) list and each TMDL developed by the state. If the state fails to develop a TMDL in a timely manner or if the U.S. EPA disapproves a TMDL submitted by a state, U.S. EPA is required to establish a TMDL for that waterbody (40 CFR 130.7(d)(2)).

As part of its 1996 and 1998 regional water quality assessments, the Regional Board identified over 700 waterbody-pollutant combinations in the Los Angeles Region where TMDLs would be required (LARWQCB, 1996, 1998). A 13-year schedule for development of TMDLs in the Los Angeles Region was established in a consent decree (*Heal the Bay Inc., et al. v. Browner, et al.* C 98-4825 SBA) approved on March 22, 1999.

For the purpose of scheduling TMDL development, the decree combined the over 700 waterbody-pollutant combinations into 92 TMDL analytical units. Analytical Unit 34 lists SCR Estuary and SCR Reach 6 (U.S. EPA 303(d) list Reach 8, West Pier Highway 99 to Bouquet Canyon Road Bridge) with impairments related to coliform bacteria.

SCR Reaches 5 and 7 were added to the 303(d) list in 1998 for high coliform counts. Additional data analysis conducted as part of TMDL development demonstrates an impairment for indicator bacteria in SCR Reach 3 as well. This TMDL therefore addresses indicator bacteria impairments in the SCR Estuary and Reaches 3, 5, 6, and 7.

On December 9, 2009, Regional Board staff held a kickoff meeting to receive comments on the development of a TMDL for indicator bacteria in the SCR Estuary and Reaches 3, 5, 6, and 7. At the kickoff meeting, Regional Board staff presented background on the TMDL, reviewed recent data, and solicited stakeholder involvement. About 20 stakeholders, including municipal stormwater permittees, publicly owned treatment works, farmers and farming groups, city and county representatives, and developers attended the meeting.

On February 25, 2010, Regional Board staff attended meetings of two Integrated Regional Water Management Plan groups in the lower and upper SCR watershed to present the TMDL and get stakeholder feedback. On March 2, 2010, an additional stakeholder meeting was conducted to facilitate the development of the TMDL.

On March 2, 2010, the Regional Board held a California Environmental Quality Act (CEQA) scoping meeting to solicit input from the public and interested stakeholders in determining the appropriate scope, content and implementation options of the proposed TMDL for bacteria in the SCR Estuary and Reaches 3, 5, 6 and 7. At the scoping meeting, the CEQA checklist of significant environmental issues and mitigation measures was discussed. This meeting fulfilled the requirements under CEQA (Public Resources Code, Section 21083.9).

1.2 Environmental Setting

The Santa Clara River (Figures 1-1 and 1-2) is the largest river system in Southern California that remains in a relatively natural state. The river originates on the northern slope of the San Gabriel Mountains in Los Angeles County, traverses Ventura County, and flows into the Pacific Ocean between the cities of San Buenaventura (Ventura) and Oxnard. The watershed is approximately 1600 square miles.

Municipalities within the watershed include Santa Clarita, Fillmore, Santa Paula, and Ventura. The SCR occupies a comparatively narrow, sinuous channel, and the river and its tributaries are underlain by an unconfined alluvial aquifer. The sandy channel is highly permeable over much of its length, and in places large quantities of water infiltrate through the streambed to the alluvial aquifer (Department of Water Resources (DWR), 1993).

The groundwater is discharged to the surface where the water table intersects the river bed at Highway 99 (bottom of Reach 6), Blue Cut (bottom of Reach 5), the Fish Hatchery (Reach 4), and Willard Road (bottom of Reach 3). The surface flow percolates into groundwater in the upper Piru Basin and in the upper Fillmore Basin (Reach 4). United Water Conservation District (UWCD) releases imported water from Lake Piru to maintain elevated groundwater levels, which are released to the Oxnard Plain to manage seawater intrusion.

The predominant land uses in the SCR watershed include agriculture, open space, and residential uses. Revenue from the agricultural industry within the SCR watershed is estimated at over $700 million annually. Residential use is increasing rapidly in both in the upper and lower watershed. The number of housing units in the watershed is estimated to increase by 187 percent from 1997 to 2025.

Figure 1-1: The Santa Clara River Watershed

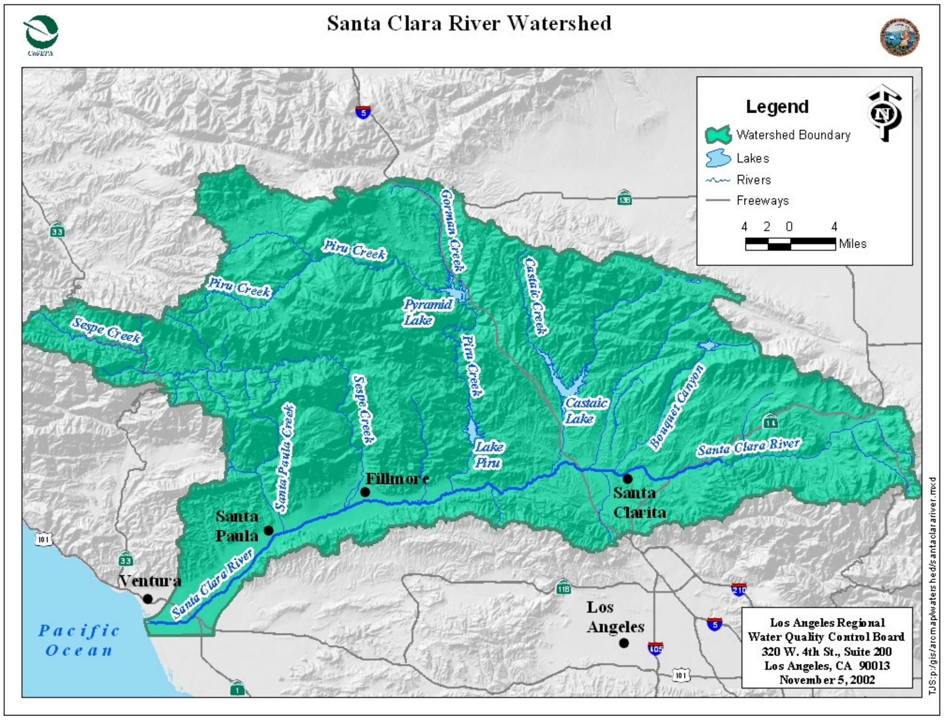
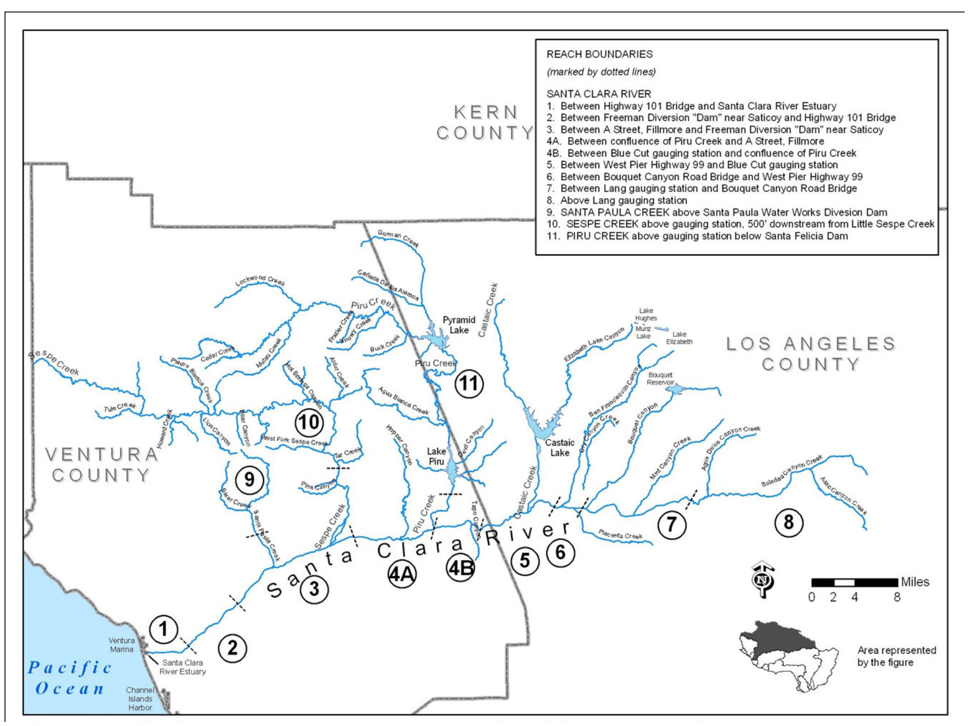


Figure 1-2: Santa Clara River Reach Boundaries



1.2.1 *Santa Clara River Estuary*

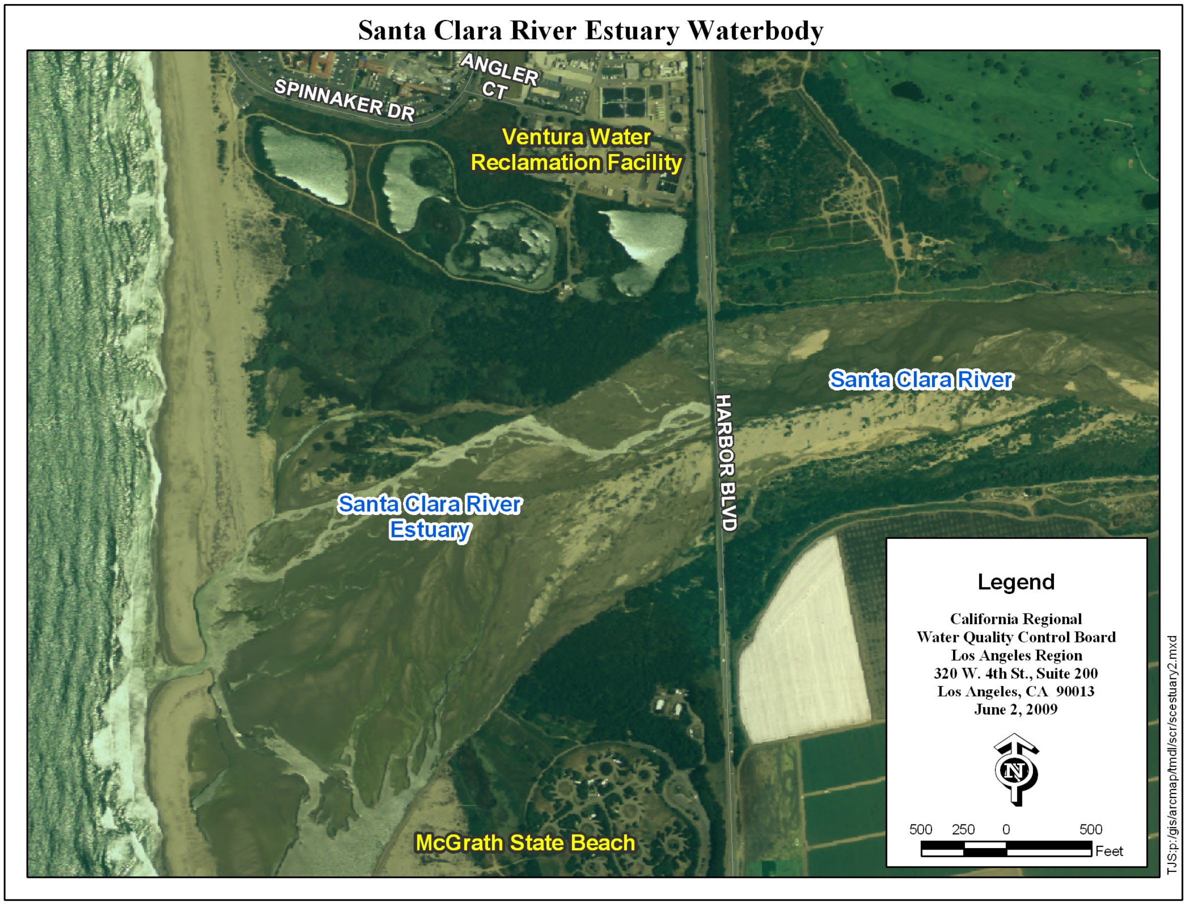
The SCR Estuary (Figure 1-3) is located in Ventura County, between the cities of Ventura and Oxnard, on McGrath State Beach in the Santa Clara River Estuary Natural Reserve. The estuary area extends from the ocean to just east of the Harbor Boulevard Bridge, which crosses the river a half mile from the mouth. The Ventura Water Reclamation Facility (WRF) is on the north side of the estuary. The Ventura Harbor is north of the Ventura WRF. A golf course lies to the east of Harbor Boulevard Bridge. To the south are agricultural fields and a state park campground. The Estuary is a designated Natural Preserve within McGrath State Beach. It is designated for conservation and resource protection in the City of Oxnard 2020 General Plan (CERES, 2009).

The estuary is closed by a berm, which forms at the mouth during periods of low flow. The berm is usually breached by storm water flows and/or wave overwashing, and closes again after varying lengths of time. In the marsh area outside the river channel the soils are course sand, sand, clay, sandy clay and loam. In the riverbed, sediment sizes range from silt to gravel (CERES, 2009).

Since 1855, the estuary has been modified by human activities. Agriculture, roads, urban development and levees have altered the estuary. By the late 1920s roads and agricultural fields had become established. The Ventura WRF, agricultural fields, Harbor Boulevard Bridge, and marina, all of which occupy the former delta, were in place by the late 1950s (CERES, 2009).

Flow upstream of the estuary is seasonal except for controlled releases and wastewater treatment discharges. The channel is braided, and the banks are reinforced with groins and levees along much of the lower river. The estuary receives approximately 8.5 million gallons per day (MGD) of treated wastewater from the Ventura WRF.

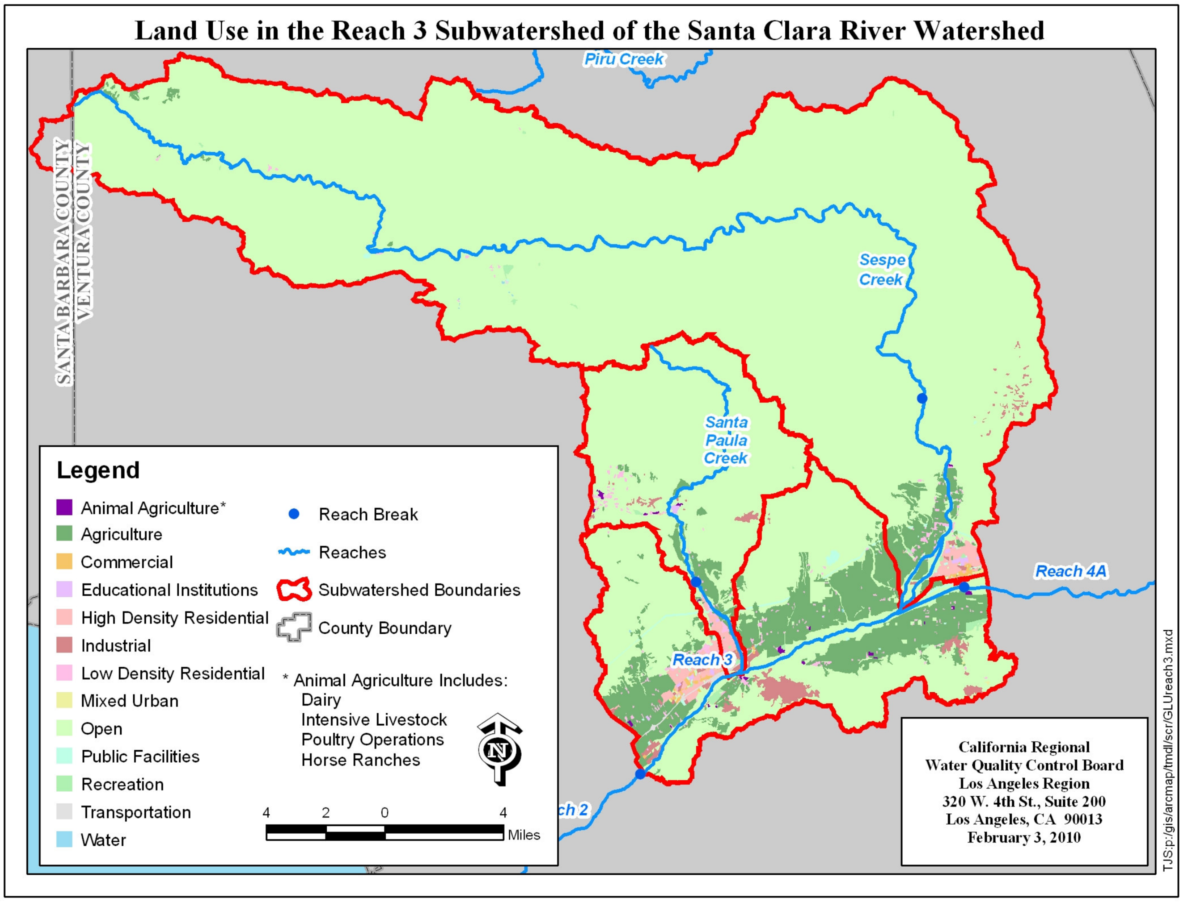
Figure 1-3: The Santa Clara River Estuary



1.2.2 *Santa Clara River Reach 3*

SCR Reach 3 (Figure 1-4) is between A Street, in Fillmore and the Freeman Diversion "Dam" near Saticoy. The Freeman Diversion is located at the dividing line for Reaches 2 and 3 of the SCR. The facility may divert a maximum of 375 cfs, and flows in excess of this amount spill over the structure and continue downstream. Diversions are typically suspended when the turbidity of the river exceeds 3000 NTU, as suspended sediment impairs the ability of spreading basins to percolate water. Natural groundwater recharge occurs in the Oxnard Forebay Basin downstream of the Freeman Diversion in the SCR, and downstream flow generally decreases between the diversion and the Highway 101 Bridge as river water percolates into the river bed. Between the 101 Bridge and the estuary a confining clay layer exists in the subsurface, and perennial flow generally exists in this reach.

Figure 1-4: The Santa Clara River Reach 3 Subwatershed



1.2.3 *Santa Clara River Reaches 5, 6 and 7*

The upper reaches of the SCR include Reaches 5, 6 and 7, which are located upstream of the Blue Cut gauging station that lies west of the Los Angeles - Ventura County line. The upper boundary extends to Lang Gaging Station, upstream of the City of Santa Clarita (Figures 1-5 to 1-7). The City of Santa Clarita lays in Reaches 5, 6, and 7.

Surface flow both infiltrates into groundwater basins underlying the Santa Clara River and is augmented, at some times and locations, by groundwater flow. At Reach 5, shallow, impermeable beds underlie the downstream end of the reach at Blue Cut. The overlying alluvial aquifers are thin and close to the surface. Groundwater is commonly discharged at this location from the underlying Santa Clara River Valley Basin and mixes with surface flow. During most of the year, all stream water percolates into the streambed before the beginning of the Dry Gap in Reach 4B. Below the Dry Gap, the SCR becomes perennial at the confluence with Piru Creek.

Upstream from Blue Cut, the Valencia Water Reclamation Plant (WRP) provides continuous discharge into Reach 5. In summer, conservation discharges from Castaic Lake also enter the river via Castaic Creek between Blue Cut and the Valencia WRP.

Reach 6 lies upstream of Reach 5, between Highway 99 and Bouquet Canyon Bridge. Groundwater is discharged from upstream basins and augmented by flows from the Saugus WRP, Bouquet Canyon and smaller flows from San Francisquito and Dry Canyons.

Reach 7 lies between Bouquet Canyon Bridge and Lang Gaging Station. Just upstream of the Bouquet Canyon Bridge the river is almost always dry. The major tributary in Reach 7 is Mint Canyon Creek.

Figure 1-5: The Santa Clara River Reach 5 Subwatershed

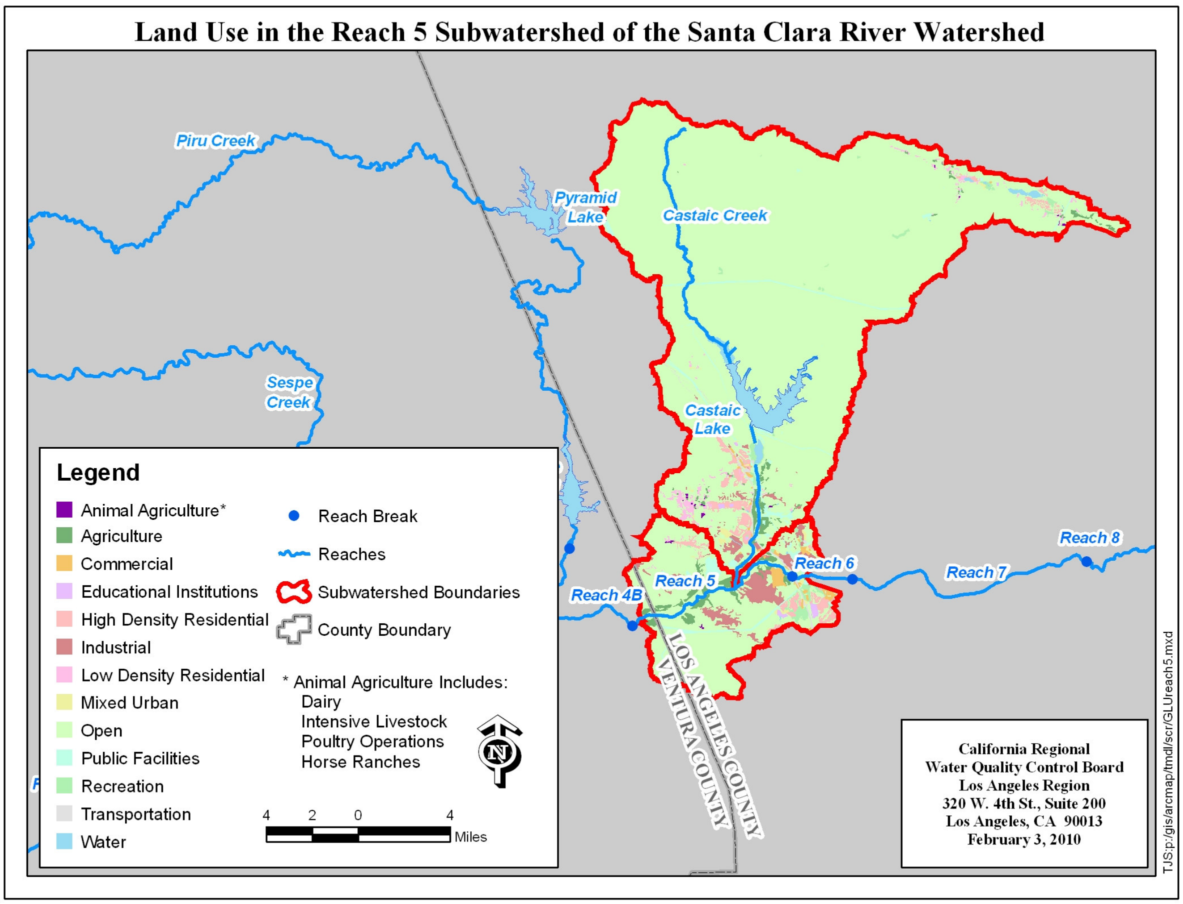


Figure 1-6: The Santa Clara River Reach 6 Subwatershed

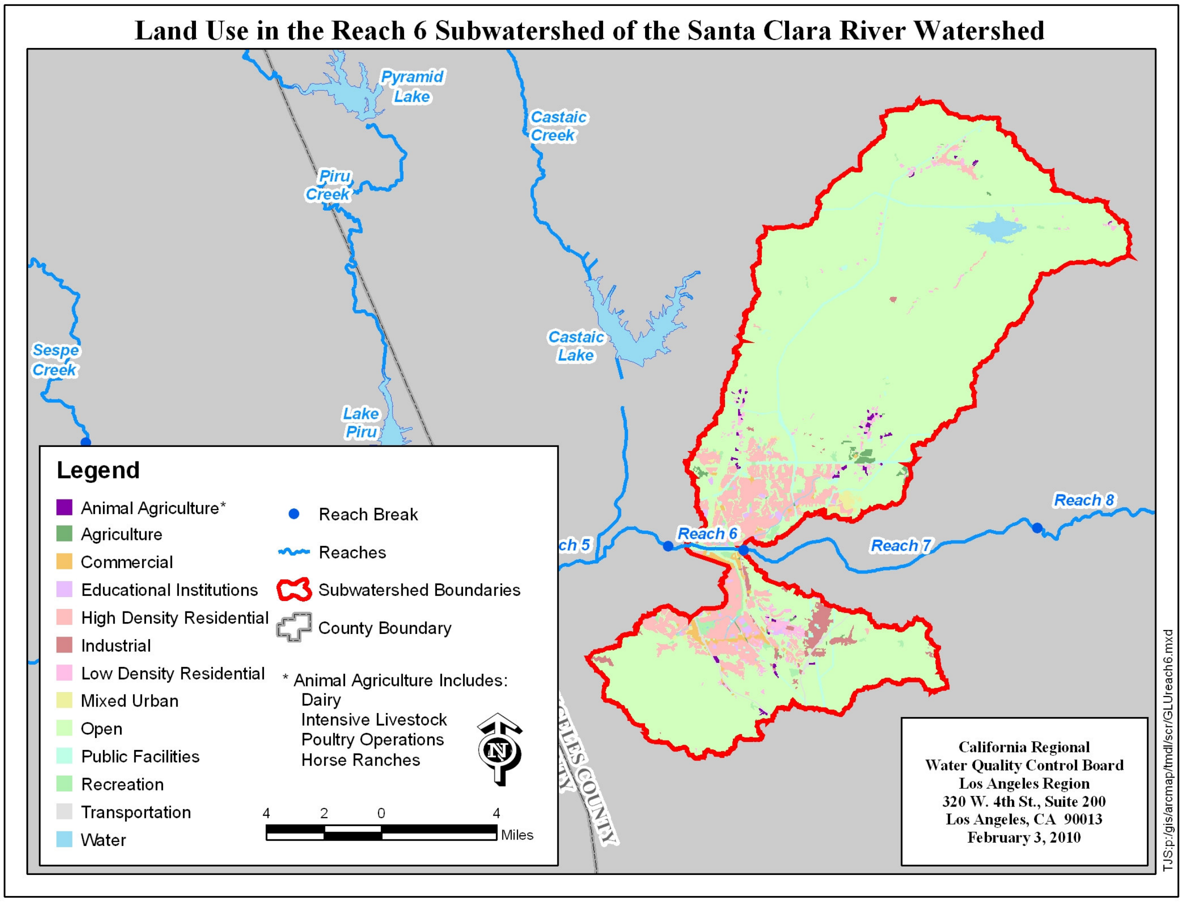
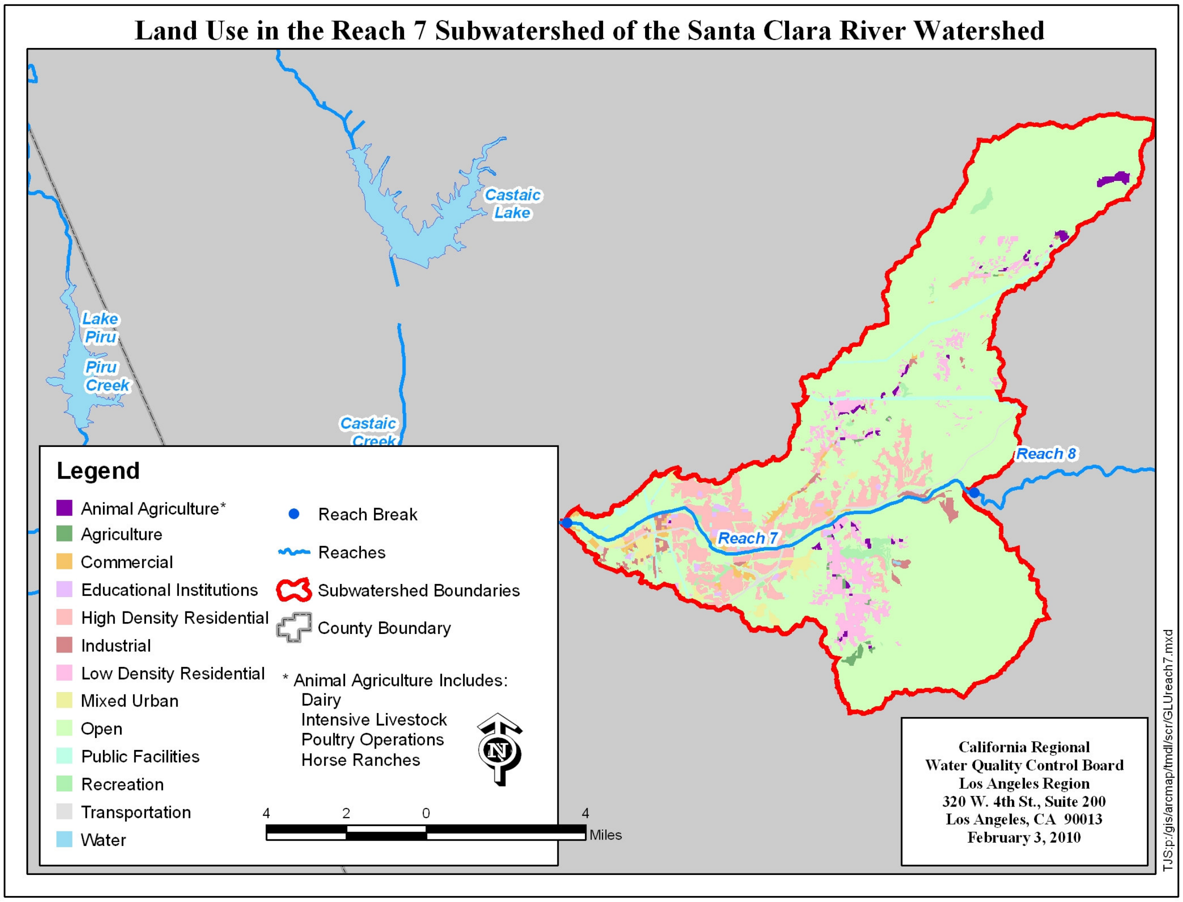


Figure 1-7: The Santa Clara River Reach 7 Subwatershed



2 PROBLEM IDENTIFICATION

This section discusses the water quality standards applicable to this TMDL, and provides some background on their development. Also a review of more recent water quality data is provided to verify the current 303(d) listings of the SCR Estuary and Reaches 5, 6 and 7 for bacteria, and document bacteria impairment in Reach 3.

2.1 Water Quality Standards

2.1.1 Beneficial Uses

The Basin Plan designates beneficial uses for water bodies in the Los Angeles Region. These are recognized as existing (E), potential (P), or intermittent (I) uses. SCR has a variety of beneficial use designations including Water Contact (REC-1) and Non-contact (REC-2) Recreation for the Estuary and Reaches 3, 5, 6 and 7 (See Table 2-1).

The REC-1 beneficial use is defined in the Basin Plan as "[U]ses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs" (Basin Plan, p. 2-2).

The REC-2 beneficial use is defined as "[U]ses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to picnicking, sunbathing, hiking, beachcombing, camping, boating, tide-pool and marine life study, hunting, sightseeing, or aesthetics enjoyment in conjunction with the above activities" (Basin Plan, p. 2-2).

Table 2-1: Beneficial Uses of Santa Clara River Estuary and Reaches 3, 5, 6 and 7

SCR Watershed	Hydro Unit #	MUN	IND	PROC	AGR	GWR	FRSH	NAV	REC1	REC2	COMM	WARM	EST	MAR	WILD	BIOL	RARE	MIGR	SPWN	SHELL	WET[a]
Estuary	403.11							E	E	E	E		E	E	E		E[b]	E[c]	E[c]		E
Reach 3	403.21 & 403.31	P*	E	E	E	E	E		E[d]	E		E	E		E		E				E
Reaches 5 6, and 7	403.51	P*	E	E	E	E	E		E	E		E	E		E		E				E

Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.
E: Existing beneficial use
P: Potential beneficial use
E and P shall be protected as required
*: Asterixed MUN designations are designated under SB 88-63 and RB 89-03. Some designations may be considered for exemptions at a later date.
a: Waterbodies designated as WET may have wetlands habitat associated with only a portion of the waterbody. Any regulatory action may require a detailed analysis of the area.
b: One or more rare species utilize all oceans, bays, estuaries, and wetlands for foraging and/or nesting.
c: Aquatic organisms utilize all bays, estuaries, lagoons, and coastal wetlands, to a certain extent, for spawning and early development. This may include migration into areas that are heavily influenced by freshwater inputs.
d. Limited public access precludes full utilization.

Exceedance of bacteria objectives in these waterbodies results in impairments of beneficial uses associated with recreational uses (REC-1 and REC-2).

2.1.2 Water Quality Objectives

The Basin Plan contains bacteria water quality objectives to protect REC-1 and REC-2 uses. In 2001, the Regional Board updated the bacteria objectives for waters designated as REC-1 to be consistent with U.S. EPA's recommended criteria, which recommends the use of *E. coli* criteria for freshwater and enterococcus criteria for marine waters (See Regional Board Resolution R01-018). The updated bacteria objectives were subsequently approved by the State Water Resources Control Board (State Board) on July 18, 2002 (State Board Resolution 2002-0142), the Office of Administrative Law (OAL) on September 19, 2002 (OAL File No. 02-0807-01-S), and the U.S. EPA on September 25, 2002. The revised objectives include geometric mean limits and single sample limits for total coliform, fecal coliform, *E. coli*, and enterococcus. They are also consistent with those contained in state law (California Code of Regulations, Title 17, Section 7958, which implements Assembly Bill 411 (1997 Stats. 765)). Applicable water quality objectives (WQOs) are summarized in Table 2-2.

Table 2-2: Water Quality Objectives for SCR Estuary and SCR Reaches 3, 5, 6 and 7

Water Quality Objectives	Estuary (Marine REC-1)	Reaches 3, 5, 6 and 7 (Freshwater REC-1)
Single Sample		
E. coli	NA	235/100 ml
Fecal coliform	400/100 ml	400/100 ml
Enterococcus	104/100 ml	NA
Total coliform*	10,000/100 ml	NA
Geometric mean		
E. coli	NA	126/100 ml
Fecal coliform	200/100 ml	200/100 ml
Enterococcus	35/100 ml	NA
Total coliform	1,000/100 ml	NA

*Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.
NA: not applicable

The REC-1 bacteria objectives also state that "[t]he geometric mean values should be calculated based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period)" (LARWQCB, 2001).

Protecting REC-1 beneficial uses will result in the protection of REC-2 beneficial uses because REC-1 bacteria objectives are more stringent than REC-2 bacteria objectives.

2.1.3 Implementation Provisions for Bacteria Objectives

Implementation provisions for the bacteria objectives set to protect REC-1 were incorporated into the Basin Plan on December 12, 2002 (Regional Board Resolution No. R02-022).

This Basin Plan Amendment states:

The single sample bacteriological objectives shall be strictly applied except when provided for in a Total Maximum Daily Load. In all circumstances, including in the context of a TMDL, the geometric mean objectives shall be strictly applied. In the context of a TMDL, the Regional Board may implement the single sample objectives in fresh and marine waters by using a 'reference system/antidegradation approach' or 'natural sources exclusion' approach subject to the antidegradation policies as discussed below. A reference system is defined as an area and associated monitoring point that is not impacted by human activities that potentially affect bacteria densities in the receiving water body.

These approaches recognize that there are natural sources of bacteria, which may cause or contribute to exceedances of the single sample objectives for bacteria indicators. They also acknowledge that it is not the intent of the Regional Board to require treatment or diversion of natural water bodies or to require treatment of natural sources of bacteria from undeveloped areas. Such requirements, if imposed by the Regional Board, could adversely affect valuable aquatic life and wildlife beneficial uses supported by natural water bodies in the Region.

Under the ‘reference system/antidegradation’ implementation procedure, a certain frequency of exceedance of the single sample objectives shall be permitted on the basis of the observed exceedance frequency in the selected reference system(s) or the targeted water body. The ‘reference system/antidegradation’ approach ensures that bacteriological water quality is at least as good as that of a reference system and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of the selected reference system(s).

Under the natural sources exclusion implementation procedure, after all anthropogenic sources of bacteria have been controlled such that they do not cause or contribute to an exceedance of the single sample objectives and natural sources have been identified and quantified, a certain frequency of exceedance of the single sample objectives shall be permitted based on the residual exceedance frequency in the specific water body. The residual exceedance frequency shall define the background level of exceedance due to natural sources. The ‘natural sources exclusion’ approach subject to the antidegradation policies may be used if an appropriate reference system cannot be identified due to unique characteristics of the target water body. These approaches are consistent with the State Antidegradation Policy (State Board Resolution No. 68-16) and with federal antidegradation requirements (40 CFR §131.12).

TMDLs and associated waste load allocations (WLAs) and load allocations (LAs) (see Section 6) are vehicles for implementing water quality standards. Therefore, the appropriateness of a reference system/antidegradation approach will be evaluated within the context of TMDL development for a specific water body. WLAs will be incorporated into National Pollution Discharge Elimination System (NPDES) permits for Municipal Separate Storm Sewer System (MS4), non-storm water general NPDES permits, general industrial storm water permits, and general and individual permits. LAs for nonpoint sources will be implemented according to the “Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program” (Nonpoint Source Implementation and Enforcement Policy) (SWRCB, 2004) within the context of the TMDL and the Conditional Waiver for Discharges from Irrigated Lands (Conditional Waiver).

The reference system/antidegradation approach is the approach proposed in this TMDL. However, Regional Board Staff recognizes the most appropriate reference system may not be identified. The proposed TMDL schedule allows the Regional Board time to re-consider this issue after the effective date of the TMDL. New information will be considered by Regional Board Staff when assessing more appropriate reference systems.

2.1.4 Antidegradation

Both the State of California and the federal government have antidegradation policies for water quality. The State policy is formally referred to as the “Statement of Policy with Respect to Maintaining High Quality Waters in California” (State Board Resolution No.

68-16). This policy restricts degradation of surface or ground waters and protects water bodies where existing quality is higher than is necessary for the protection of beneficial uses. The federal Antidegradation Policy (40 CFR §131.12) was developed under the Clean Water Act. This TMDL complies with antidegradation policies by ensuring the protection of beneficial uses and by not setting any WLAs and LAs above existing numbers of exceedance days.

2.2 Water Quality Impairments

During the 1996 Water Quality Assessment, the Regional Board evaluated total and fecal coliform monitoring data for beaches and fecal coliform data for inland surface waterbodies. As a result, SCR Estuary was listed on the basis of exceeding fecal coliform objectives in 78-93% of samples, and SCR Reach 6 (U.S. EPA 303(d) list Reach 8, West Pier Highway 99 to Bouquet Canyon Road Bridge) was listed for fecal coliform exceedances. The 1998 Water Quality Assessment kept all these listings and added Reach 5 (U.S. EPA 303(d) list Reach 7, Blue Cut to West Pier Highway 99) and 7 (U.S. EPA Reach 9, Bouquet Canyon Road Bridge to above Lang Gaging Station) to the 303(d) list for high coliform counts. SCR Estuary and Reaches 5, 6 and 7 remain on the 2002 and 2006 303(d) lists.

2.3 Data Review

Bacteria water quality data sets were reviewed during the development of this TMDL to confirm 303(d) listed impairments and identify possible impairments in other reaches that should be addressed concurrently. The 303(d) listing assessment requires a minimum of 5 samples; therefore, where there were 5 or more samples from the same reach and the same source, these data were summarized and analyzed. Monitoring data from the same reach, but from different sources were not combined because they are considered different lines of evidence during the 303(d) listing process. The calculation of the rolling 30-day geometric mean generally requires at least five equally spaced samples to be statistically significant (LARWQCB, 2001). The rolling 30-day geometric mean was calculated where possible. Sampling sites are shown in Figure 2-1.

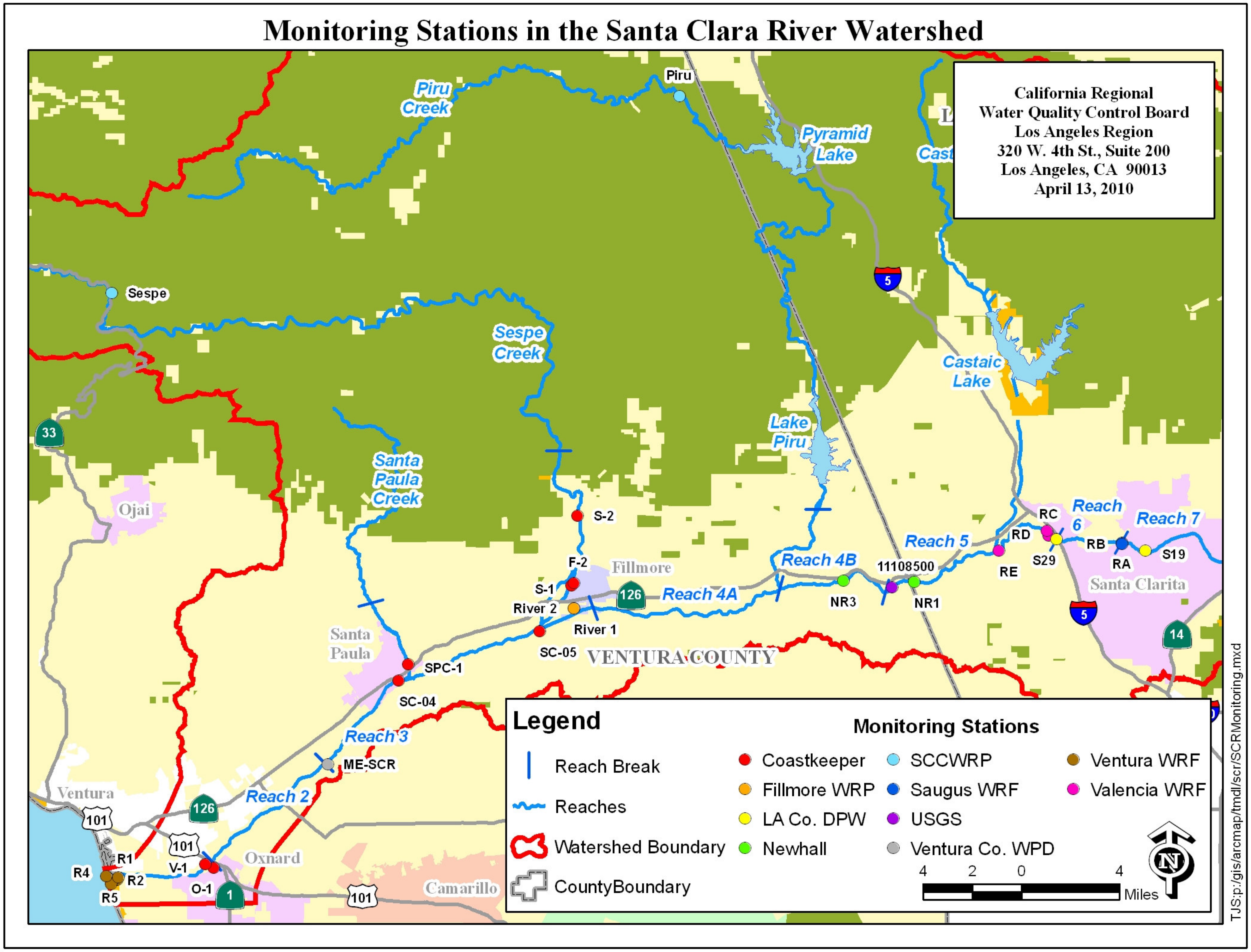
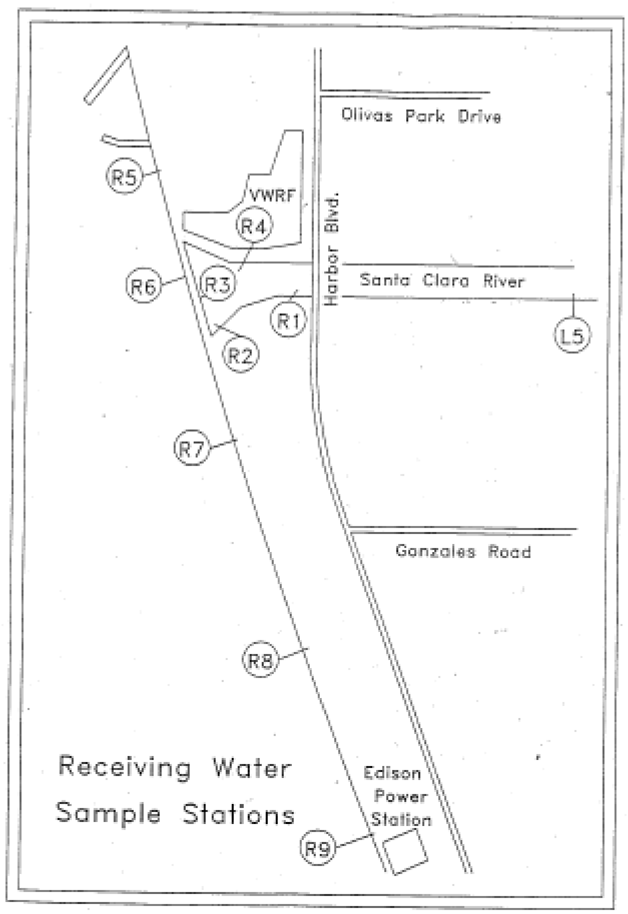


Figure 2-1. Monitoring Stations in the Santa Clara River Watershed

2.3.1 Santa Clara River Estuary

The Ventura WRF conducts weekly bacteria monitoring at 5 receiving water stations (R1, R2, R3, R4, and R5, previously named L5) in the SCR Estuary. Detailed locations of these monitoring sites are illustrated in Figure 2-2. The location of R5 (previously named L5) varies each year based on water level in the estuary. Available data for samples collected from January 1990 to April 2009 for the 5 receiving water stations are summarized in Tables 2-3 and 2-4. Data were compared against geometric mean objectives using a rolling 30-day geometric mean. Results suggest that the impairment is caused by both total coliform and fecal coliform exceedances. The number of exceedance days exceeds the minimum number of exceedances required for listing.

Figure 2-2. Ventura WRF Receiving Water Sample Stations (Santa Clara River Estuary)



* From Ventura WRF 1992 Annual Monitoring Report.

Table 2-3: Summary of single sample statistics for coliform bacteria at Ventura WRF receiving water monitoring stations in SCR Estuary

Site Name	*Total Coliform*			*Fecal Coliform*		
	No. of Samples	No. of Samples Exceeding 10000 MPN/100ml [1]	Percent Exceedance	No. of Samples	No. of Samples Exceeding 400 MPN/100ml	Percent Exceedance
R1	480	130	27%	355	93	26%
R2	560	179	32%	436	167	38%
R3	562	200	36%	437	184	42%
R4	563	208	37%	438	154	35%
L5	535	179	33%	410	125	30%
Total	2700	896	33%	2076	723	35%

[1] Or exceeding 1000 MPN/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Table 2-4: Summary of geometric mean statistics for coliform bacteria at Ventura WRF receiving water monitoring stations in SCR Estuary

Site Name	*Total Coliform*			*Fecal Coliform*		
	No. of Samples	No. of Samples Exceeding 1000 MPN/100ml	Percent Exceedance	No. of Samples	No. of Samples Exceeding 200 MPN/100ml	Percent Exceedance
R1	650	467	72%	515	146	28%
R2	965	565	59%	837	451	54%
R3	987	583	59%	848	498	59%
R4	997	775	78%	858	497	58%
L5	908	705	78%	769	360	47%
Total	4507	3095	69%	3827	1952	51%

2.3.2 Santa Clara River Reach 3

In compliance with the MS4 permit, the Ventura County Watershed Protection District (VCWPD) conducts the Stormwater Monitoring Program in Ventura County. The monitoring program in the SCR watershed includes one mass emission station at the Freeman Diversion (ME-SCR). Available monitoring data from June 2002 to February 2009 are summarized in Table 2-5. Geometric mean values were not calculated because there are less than 5 samples over a 30-day period. Results suggest that the impairment is caused by both fecal coliform and *E. coli* exceedances in Reach 3. The number of exceedance days exceeds the minimum number of exceedances required for listing.

Table 2-5: Summary of single sample statistics for coliform bacteria at VCWPD Mass Emission Station in Reach 3

Site Name	***Fecal Coliform***			***E. coli***		
	No. of Samples	No. of Samples Exceeding 400 MPN/100 ml	Percent Exceedance	No. of Samples	No. of Samples Exceeding 235 MPN/100 ml	Percent Exceedance
ME-SCR	38	19	50%	44	20	45%

The Fillmore Wastewater Treatment Plant (WTP) conducted monthly bacteria monitoring at 2 receiving water stations (River 1 and River 2) in SCR Reach 3. The Fillmore WTP is a secondary wastewater treatment plant located at "C" Street and River Street, in Fillmore. River 1 is located approximately 300 feet upstream from the discharge point, and River 2 is located approximately 300 feet downstream from the discharge point. Available data for samples collected from October 2004 to June 2008 for the 2 receiving water stations are summarized in Table 2-6. Geometric mean values were not calculated because there are less than 5 samples over a 30-day period. Results suggest that the impairment is caused by fecal coliform and *E. coli* exceedances. The number of exceedance days of the single sample objectives exceeds the minimum number of exceedances required for listing. As will be discussed in the source analysis section, Fillmore WTP will no longer discharge into the SCR. This data assessment shows the existing impairment.

Table 2-6: Summary of single sample statistics for coliform bacteria at Fillmore WTP receiving water monitoring stations (Reach 3)

Station Name	***Fecal Coliform***			***E. coli***		
	No. of Samples	No. of Samples Exceeding 400 MPN/100 ml	Percent Exceedance	No. of Samples	No. of Samples Exceeding 235 MPN/100 ml	Percent Exceedance
River 2	38	13	34%	38	18	47%
River 1	38	7	18%	38	8	21%
Total	76	20	26%	76	26	34%

Wishtoyo's Ventura Coastkeeper Watershed Monitoring Program conducted bacteria monitoring in the SCR Watershed. Available monitoring data from July 2009 to December

2009 are summarized in Table 2-7. Samples were taken from lower Santa Paula Creek and lower Sespe Creek, which, based on reach boundaries, are defined as part of Reach 3. Wishtoyo's Ventura Coastkeeper Watershed Monitoring Program collected, analyzed, and processed data in accordance with the quality assurance/quality control procedures and protocols set forth in the Wishtoyo Foundation's/Ventura Coastkeeper's quality assurance project plan (QAPP) for the Calleguas Creek Watershed, which has been certified and approved by the Regional Board. Geometric mean values were not calculated because there are less than 5 samples over a 30-day period. Data do not exceed bacteria water quality objectives.

Table 2-7. Summary of Wishtoyo's Ventura Coastkeeper Watershed Monitoring in tributaries of SCR Reach 3

Site Name	***E. coli***		
	No. of Samples	No. of Samples Exceeding 235 MPN/100ml	% Exceedances
S-1	2	0	0%
S-2	1	0	0%
SC-04	2	0	0%
SC-05	2	0	0%
SPC-1	2	0	0%
Total	9	0	0%

2.3.3 Santa Clara River Reach 4B

Newhall Ranch Company conducted bacteria monitoring from November 8, 2004 to November 12, 2004 (daily), on December 8, 2004, and on January 24, 2005. One of the two monitoring sites (NR3) is located at about 2.5 miles downstream of Blue Cut Gaging Station in Reach 4B. Available data are summarized in Tables 2-8 and 2-9. It should be noted that this is a small data set. There is one exceedance for both the fecal coliform and *E. coli* single sample objectives out of 7 samples. There are no exceedances for both the fecal coliform and *E. coli* geometric mean objectives out of 7 samples (a total of 2 samples when calculated using a 30-day rolling geometric mean). The number of exceedance days did not reach the minimum number of exceedances required for listing.

Table 2-8: Summary of single sample statistics for coliform bacteria at Newhall Ranch monitoring stations (Reach 4B and Reach 5)

Site Name	*Location*	*Fecal Coliform*			*E. coli*		
		No. of Samples	No. of Samples Exceeding 400 MPN/100 ml	Percent Exceedance	No. of Samples	No. of Samples Exceeding 235 MPN/100 ml	Percent Exceedance
NR3	Reach 4B	7	1	14%	7	1	14%
NR1	Reach 5	7	1	14%	7	1	14%

Table 2-9: Summary of geometric mean sample statistics for coliform bacteria at Newhall Ranch monitoring stations (Reach 4B and Reach 5).

Site Name	*Location*	*Fecal Coliform*			*E. coli*		
		No. of Samples	No. of Samples Exceeding 200 MPN/100 ml	Percent Exceedance	No. of Samples	No. of Samples Exceeding 126 MPN/100 ml	Percent Exceedance
NR3	Reach 4B	2	0	0%	2	0	0%
NR1	Reach 5	2	0	0%	2	0	0%

2.3.4 Santa Clara River Reach 5

SCVSD conducted weekly bacteria monitoring at 3 receiving water stations (RC, RD, RE) in Reach 5 of the SCR. Available data for samples collected from September 2004 to August 2009 for these stations are summarized in Tables 2-10 and 2-11. Results suggest that the impairment is caused by fecal coliform and *E. coli* exceedances. The numbers of exceedances days of the single sample and geometric mean objectives exceed the minimum number of exceedances required for listing. RC, which is close to and downstream of Los Angeles Department of Public Works (LADPW) stormwater monitoring mass emission station S29, has the highest bacteria exceedances among all the 3 receiving water stations. Bacteria exceedances at the station downstream of the Valencia WRP (RD) are lower than those at the station upstream of the Valencia WRP (RC), suggesting that dilution occurs due to discharge from the Valencia WRP. Station RE is further downstream of Station RD. Bacteria exceedances at Station RE are also lower than those at Station RC.

Table 2-10. Summary of single sample statistics for coliform bacteria at Valencia WRP receiving monitoring stations (Reach 5)

Site Name	***Fecal Coliform***			***E. coli***		
	No. of Samples	No. of Samples Exceeding 400 MPN/100ml	% Exceedances	No. of Samples	No. of Samples Exceeding 235 MPN/100ml	% Exceedances
RC	229	63	28%	229	64	28%
RD	231	33	14%	231	31	13%
RE	231	27	12%	231	35	15%
Total	691	123	18%	691	130	19%

Table 2-11. Summary of geometric mean statistics for coliform bacteria at Valencia WRP receiving monitoring stations (Reach 5)

Site Name	***Fecal Coliform***			***E. coli***		
	No. of Samples	No. of Samples Exceeding 200 MPN/100ml	% Exceedances	No. of Samples	No. of Samples Exceeding 126 MPN/100ml	% Exceedances
RC	323	181	56%	323	135	42%
RD	333	63	19%	333	59	18%
RE	335	99	30%	335	90	27%
Total	991	343	35%	991	284	29%

USGS conducted nationwide water quality monitoring, including one site in the SCR watershed (USGS 11108500) at the Los Angeles –Ventura county line in Reach 5. Available monthly monitoring data from March 1979 to September 1988 are summarized in Table 2-12. It should be noted that these data are few and collected more than 20 years ago. The number of exceedances of fecal coliform did not reach the minimum number of exceedances required for listing.

Table 2-12. Summary of single sample statistics for fecal coliform at USGS Station 11108500 (Reach 5)

Site Name	*Fecal Coliform*		
	No. of Samples	No. of Samples Exceeding 400 MPN/100 ml	Percent Exceedance
USGS 11108500	50	8	16%

Newhall Ranch Company conducted bacteria monitoring during November 8, 2004 and November 12, 2004 (daily), on December 8, 2004, and on January 24, 2005. One of the two monitoring sites (NR1) is located at Los Angeles –Ventura county line in Reach 5. Available data are summarized in Tables 2-8 and 2-9. It should be noted that this is a small data set. There is one exceedance out of 7 samples for coliform and *E. coli*, respectively. The number of exceedance did not reach the minimum number of exceedances required for listing.

2.3.5 Santa Clara River Reach 6

The NPDES permit for municipal storm water and urban runoff discharges within Los Angeles County was adopted on December 13, 2001 (Regional Board Order No. 01-182) and amended by Regional Board Orders R4-2006-074 on September 14, 2006, R4-2007-0042 on August 9, 2007, and R4-2009-0130 on December 10, 2009. In compliance with the permit, LADPW conducts the stormwater monitoring in Los Angeles County. The current monitoring program in the SCR watershed includes mass emission station S29. Station S29 is located in Reach 6 near Interstate 5 about 1.5 miles west of the confluence with San Francisquito Canyon. (Data from a previous monitoring location (S19), located in Reach 7, are discussed in section 2.3.6.) Available monitoring data from S29 from October 2002 to February 2009 are summarized in Table 2-13. Results suggest that high percentages of exceedances occur for fecal coliform. The number of exceedance days for fecal coliform reaches the minimum number of exceedances required for listing.

Table 2-13: Summary of single sample statistics for fecal coliform at LADPW Mass Emission Stations in Reaches 6 (S29) and 7 (S19)

Site Name	***Fecal Coliform***		
	No. of Samples	No. of Samples Exceeding 400 MPN/100 ml	Percent Exceedance
S29	40	29	73%
S19	10	9	90%

The Santa Clarita Valley Sanitation District (SCVSD) conducts weekly bacteria monitoring at 2 receiving water stations (RA, RB) in Reach 6 of the SCR (Tables 2-14 and 2-15). Grab samples were taken and analyzed on a weekly basis from March 2005 to August 2009 for these stations. There are 5 out of 30 single samples that exceeded single sample water quality objectives at RA, and 1 out of 232 single samples that exceeded single sample water quality objectives at RB. RA and RB are located upstream and downstream of the Saugus WRP, respectively. The difference in number of exceedances between RA and RB suggests that discharges from the Saugus WRP caused dilution of coliform bacteria in the receiving water. Therefore, results from RA and RB cannot be combined when analyzing impairments caused by coliform bacteria at Reach 6. Results from RA indicate that Reach 6 is still impaired by coliform bacteria. The numbers of exceedance days at RA reach the minimum number of exceedances required for listing. Detailed analysis indicates that the exceedances at RA are caused by both fecal coliform and *E. coli* (Table 2-14).

Table 2-14. Summary of single sample statistics for coliform bacteria at Saugus WRP receiving water monitoring stations (Reach 6)

Site Name	***Fecal Coliform***			***E. coli***		
	No. of Samples	No. of Samples Exceeding 400 MPN/100ml	% Exceedances	No. of Samples	No. of Samples Exceeding 235 MPN/100ml	% Exceedances
RA	30	4	13%	30	5	17%
RB	232	0	0%	232	1	0%

Table 2-15. Summary of geometric mean statistics for coliform bacteria at Saugus WRP receiving water monitoring stations (Reach 6)

Site Name	*Fecal Coliform*			*E. coli*		
	No. of Samples	No. of Samples Exceeding 200 MPN/100ml	% Exceedances	No. of Samples	No. of Samples Exceeding 126 MPN/100ml	% Exceedances
RA	14	0	0%	14	0	0%
RB	343	0	0%	343	0	0%
Total	357	0	0%	357	0	0%

2.3.6 Santa Clara River Reach 7

The LADPW stormwater monitoring program in the SCR watershed previously included a mass emission station (S19). Station S19 is located in Reach 7 at Newhall Ranch Road, in Santa Clarita. Available monitoring data from October 1995 to June 1996 are summarized in Table 2-13. Results suggest that a high percentage of exceedances occur for fecal coliform. The number of exceedance days reaches the minimum number of exceedances required for listing.

2.3.7 Santa Clara River Reaches 10 and 11

Southern California Coastal Water Research Project (SCCWRP) conducted bacteria monitoring of natural landscapes in upper Sespe Creek in Reach 10 and upper Piru Creek in Reach 11 in the SCR Watershed. Available monitoring data from December 2004 to February 2006 are summarized in Table 2-16. These data include dry weather samples and one wet-weather sample from Sespe Creek. Results of all samples did not exceed single sample bacteria water quality objectives for *E. coli*.

Table 2-16. Summary of single sample statistics for *E. coli* for SCCWRP monitoring sites in Reaches 10 and 11

Site Name	*Reach*	*E. coli*		
		No. of Samples	No. of Samples Exceeding 235 MPN/100ml	% Exceedances
Sespe Creek	10	4	0	0%
Piru Creek	11	5	0	0%

In summary, all listed reaches in SCR are still impaired by indicator bacteria. Recent data also indicate that Reach 3 is impaired by indicator bacteria; therefore, Reach 3 is included as an impaired reach that is addressed by this TMDL.

3 NUMERIC TARGETS

The TMDL will have multi-part numeric targets based on the updated bacteria objectives for marine and fresh waters designated for contact recreation (REC-1). Both single sample and geometric mean limits apply.

Regional Board staff is in the process of updating the bacteria objectives for freshwaters designated as REC-1 to remove redundancy and maintain consistency with U.S. EPA's 1986 recommended criteria. The update of bacteria objectives will remove the fecal coliform objectives and use *E. coli* objectives as the sole objective for freshwaters. To be consistent with the update of bacteria objectives, the numeric targets for SCR Reaches 3, 5, 6 and 7 will be only the adopted Basin Plan objectives for *E. coli* for REC-1 in freshwaters. The numeric targets for SCR Estuary will be the same as the adopted Basin Plan objectives for REC-1 in marine waters. All applicable numeric targets are contained in Table 3-1.

Table 3-1: Numeric Targets for SCR Estuary and SCR Reaches 3, 5, 6 and 7

Numeric Targets	Estuary (Marine REC-1)	Reaches 3, 5, 6 and 7 (Freshwater REC-1)
Single Sample		
E. coli	NA	235/100ml
Fecal coliform	400/100ml	NA
Enterococcus	104/100ml	NA
Total coliform*	10,000/100ml	NA
Geometric mean		
E. coli	NA	126/100ml
Fecal coliform	200/100ml	NA
Enterococcus	35/100ml	NA
Total coliform	1,000/100ml	NA

*Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.
NA: not applicable.

To implement the single sample bacteria objectives for waters designated REC-1, and to set allocations based on the single sample targets, an allowable number of exceedance days is set for marine and fresh waters. The numeric target in the TMDL is expressed as 'allowable exceedance days' since bacterial density and the frequency of exceedances is most relevant to public health. The US EPA allows states to select the most appropriate measure to express the TMDL; and allowable exceedance days are considered an 'appropriate measure' consistent with the definition in 40 CFR 130.2(i).

The number of allowable exceedance days is based on two criteria: (1) bacteriological water quality at any site is at least as good as at a designated reference site, and (2) there is no degradation of existing bacteriological water quality if historical water quality at a particular site is better than the designated reference site. Applying these two criteria allows the Regional Board to avoid imposing requirements to treat natural sources of bacteria from undeveloped areas. This approach, including the allowable exceedance levels during dry weather and wet weather, is consistent with that used in other bacteria TMDLs previously approved in this region. The geometric mean targets, which are based on a 30-day period, must be strictly adhered to and may not be exceeded at any time.

4 SOURCE ASSESSMENT

The TMDL requires an estimate of loadings from point sources and nonpoint sources. In the development of a TMDL, WLAs are given for point sources and LAs for nonpoint sources. Point sources typically include discharges from a discrete human-engineered point (e.g., a pipe from a wastewater treatment plant, industrial facility, or separate storm sewer system). Nonpoint source by definition includes pollutants that reach waters from diffuse sources.

Monitoring data indicate that the SCR is impaired by coliform bacteria in multiple reaches during both dry and wet weather. During wet weather, surface flow is continuous and bacteria can be transported in stormwater from any location in the watershed to the impaired reaches. Therefore, the potential source area for this TMDL is the whole SCR watershed.

Land uses in the SCR watershed are 90.5% open space, 3.2% agriculture, 1.5% high density residential, 1.2% low density residential, 1.1% public facilities, 0.7% industrial, 0.4% recreation, and 0.2% commercial. Other land uses range from 0.0003% to 0.6%, including water, mixed urban, transportation, military, and education. Table 4-1 shows the percentage of lands uses in each reach of the SCR.

Table 4-1. Land uses in the SCR Watershed

Subwatershed	High Density Residential	Low Density Residential	Commercial	Industrial	Public Facilities	Mixed Urban	Open	Recreation	Agriculture	Education	Transportation	Military	Water	Total for all classes
Reach 1	0.01%	0.05%	0.00%	0.02%	0.15%	0.03%	20.6%	0.04%	0.21%	0.01%	0.02%	0%	0.01%	21.3%
Reach 2	0.15%	0.03%	0.01%	0.03%	0.02%	0.02%	1.5%	0.01%	0.47%	0.01%	0.01%	0%	0.05%	2.3%
Reach 3	0.07%	0.04%	0.02%	0.12%	0.04%	0.003%	2.5%	0.02%	1.1%	0.01%	0.01%	0%	0.001%	3.9%
Reach 4A	0.01%	0.01%	0.0004%	0.08%	0.04%	0.001%	2.6%	0.0001%	0.33%	0.00%	0.0003%	0%	0.003%	3.1%
Reach 4B	0.00%	0.002%	0%	0.01%	0.02%	0%	0.61%	0%	0.15%	0%	0%	0%	0%	0.79%
Reach 5	0.20%	0.09%	0.06%	0.25%	0.22%	0.03%	10.7%	0.08%	0.19%	0.02%	0.05%	0%	0.25%	12.1%
Reach 6	0.62%	0.10%	0.06%	0.10%	0.18%	0.03%	6.9%	0.06%	0.06%	0.04%	0.03%	0%	0.06%	8.3%
Reach 7	0.31%	0.19%	0.04%	0.04%	0.07%	0.05%	3.2%	0.04%	0.04%	0.02%	0.03%	0.00004%	0.001%	4.0%
Reach 8	0.01%	0.58%	0.01%	0.02%	0.18%	0.01%	6.8%	0.03%	0.09%	0.01%	0.04%	0.00026%	0.001%	7.8%
Reach 9	0.04%	0.02%	0.003%	0.03%	0.003%	0.0001%	2.1%	0.01%	0.10%	0.01%	0.003%	0%	0.004%	2.3%
Reach 10	0.05%	0.03%	0.01%	0.02%	0.01%	0.003%	12.6%	0.01%	0.23%	0.01%	0.001%	0%	0.001%	12.9%
Reach 11	0.01%	0.05%	0.002%	0.02%	0.15%	0%	20.6%	0.04%	0.21%	0.0002%	0.06%	0%	0.19%	21.3%
Total	1.5%	1.2%	0.21%	0.74%	1.1%	0.18%	90.5%	0.35%	3.2%	0.12%	0.27%	0.0003%	0.57%	100%

4.1 Description of Sources and Data Review

While the data review in Section 2 is to confirm 303(d) listed impairments and identify possible impairments in other reaches, the data review in this section focuses on identifying potential sources. Monitoring data for MS4 discharges, WRP effluents, and natural landscapes are reviewed to identify potential sources. Loads from different sources are calculated (section 4.2) where possible.

4.1.1 Point Sources Data and Description

Point source discharges are regulated through an NPDES permit, typically issued in the form of Waste Discharge Requirements (WDRs) by the Regional Board. The NPDES permits in the SCR Watershed include two (2) MS4 permits, the California Department of Transportation (Caltrans) storm water permit, individual NPDES permits, general construction storm water permits, general industrial storm water permits, and general NPDES permits (Table 4-1). Urban runoff to the SCR is regulated as a point source discharge under three municipal separate storm sewer system (MS4) NPDES permits. The first is the County of Los Angeles MS4 Permit, which was most recently amended in December 2009 and is on a five-year renewal cycle. There are 85 co-permittees covered under this permit including 84 cities and the County of Los Angeles and Los Angeles County Flood Control District. The second is the County of Ventura MS4 Permit, which was most recently renewed in May 2009 and is on a five-year renewal cycle. The Ventura County Watershed Protection District is the principal permittee. There are 11 co-permittees covered under this permit including 10 cities and the County of Ventura. The third is a separate statewide storm water permit specifically for Caltrans. Runoff from construction and industrial activities is also subject to statewide general NPDES permits for storm water. There are five major NPDES permits in the watershed for the Saugus WRP, Valencia WRP, Fillmore WTP, Santa Paula WRF, and Ventura WRF. Other NPDES permits issued in the SCR watershed are for minor or general discharges, as listed in Table 4-2. Data are available from monitoring of effluents and receiving waters from wastewater treatment plants and from MS4 monitoring sites.

Table 4-2. NPDES permits in the SCR watershed

Type of NPDES Permit	Number of Permits
Municipal Separate Storm Sewer System (MS4)	2
California Department of Transportation Storm Water	1
General Construction Storm Water	416
General Industrial Storm Water	235
Individual NPDES Permits (Major)	5
Individual NPDES Permits (Minors)	5
General NPDES Permits	27
Total	**691**

MS4 permit data and description

Runoff from residential, industrial, and commercial areas can be an important source of bacteria. Most of the major residential and commercial areas are in the cities of Santa Clarita, Fillmore, Santa Paula, and Oxnard. Lower density residential areas are scattered in other small cities and unincorporated county areas of the SCR watershed. The potential sources of bacteria from these areas include fertilizer used for lawns and landscaping; organic debris from gardens, landscaping, and parks; trash such as food wastes; domestic animal waste; and human waste from areas inhabited by the homeless. Bacteria build up, particularly on impervious surfaces, and are washed into the waterways through storm drains when it rains. These loads are typically highest during the first major storms after extended dry periods, when the pollutants have accumulated (Tiefenthaler, et al., 2008). Activities such as the watering of lawns and the washing down of parking lots and driveways can contribute pollutants between storms during dry weather. SCCWRP Technical Report 510 (2007) investigated sources, patterns and mechanisms of storm water pollutant loading from watersheds and land uses of the greater Los Angeles area. Technical Report 510 found that coliform bacteria exceedances occurred consistently and uniformly at all mass emission sites. Mean bacteria concentrations and fluxes were significantly greater at mass emission sites from developed compared to undeveloped watersheds. This study also found that bacteria concentrations in rivers were strongly influenced by the length of antecedent dry condition but not with amount of rainfall.

Stormwater monitoring data are available for mass emission stations from the VCWPD (ME-SCR) and LADPW (S29) stormwater monitoring programs, for land use monitoring sites from the VCWPD stormwater monitoring program, and for MS4 discharges from Wishtoyo's Ventura Coastkeeper Watershed Monitoring Program. The data from mass emission stations, which were previously summarized in section 2.3, are presented here again to demonstrate the differences in bacteria concentrations in wet weather and dry weather.

Monitoring Data from Mass Emission Stations

The VCWPD stormwater monitoring program Station ME-SCR is located at the Freeman Diversion in Reach 3. The Los Angeles County stormwater monitoring program Station S29 is located near Interstate 5 about 1.5 miles west of the confluence with San Francisquito Canyon in Reach 6, and historical Station S19 is located at Newhall Ranch Road in Santa Clarita in Reach 7. Available monitoring data from June 2002 to February 2009 for ME-SCR, from October 2002 to February 2009 for S29, and from October 1995 to June 1996 for S19 are summarized in Table 4-3 as shown below. The numbers of samples exceeding the single sample bacteria objectives are listed for reference. The objectives for both marine water and freshwater are shown because discharges to Reaches 3, 6, and 7 can cause exceedances of freshwater objectives applicable to these reaches as well flow downstream and cause exceedances of marine water objectives applicable to the Estuary.

At ME-SCR, a high percentage of exceedances occurs for all types of coliforms during wet weather. A lower percentage of exceedances occurs during the dry season. At S29, a high percentage of exceedances occurs for both total coliform and fecal coliform during the wet season. A lower percentage of exceedances occurs for both total coliform and fecal coliform during the dry season. At S19, a high percentage of exceedances occurs for both total coliform and fecal coliform during wet and dry weather. The percentage of exceedances is lower in wet weather than in dry weather at this site.

Table 4-3. Summary statistics for coliform bacteria at mass emission stations ME-SCR, S29, and S19

Site Name	***Reach***	***Season***	***Total Coliform***			***Fecal Coliform***			***E. coli***		
			No. of Samples	No. of Samples Exceeding 10000 MPN/100ml[1]	% Exceedances	No. of Samples	No. of Samples Exceeding 400 MPN/100ml	% Exceedances	No. of Samples	No. of Samples Exceeding 235 MPN/100ml	% Exceedances
ME-SCR	3	Wet	26	24	92%	23	16	70%	24	18	75%
ME-SCR	3	Dry	19	8	42%	15	3	20%	17	1	6%
S29	6	Wet	26	26	100%	26	25	96%	NA[2]	NA	NA
S29	6	Dry	14	7	50%	14	4	29%	NA	NA	NA
S19	7	Wet	4	3	75%	4	3	75%	NA	NA	NA
S19	7	Dry	6	6	100%	6	6	100%	NA	NA	NA

[1] or exceeding 1000 MPN/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

[2] NA indicates not available.

Monitoring Data from Land Use Sites

The VCWPD stormwater monitoring program in the SCR watershed includes two downstream land use sites (I-2 at Ortega St., and R-1 at Swan St. and Macaw Ave.). Station I-2 is intended to monitor storm water flow from an industrial area, and station R-1 is intended to monitor storm water flow from a residential area. Available monitoring data for total coliform, fecal coliform, and *E. coli* from January 1993 to October 2004 are summarized in Table 4-4 as shown below. The numbers of samples exceeding the single sample bacteria objectives are listed for reference. The objectives for both marine water and freshwater are shown because discharges to Reaches 1 and 2 can cause exceedances of freshwater objectives applicable to Reaches 1 and 2 as well flow downstream and cause exceedances of marine water objectives applicable to the Estuary. The data show high concentrations of bacteria coming from industrial and residential areas.

Table 4-4. Summary statistics for coliform bacteria at land use sites I-2 and R-1

Site Name	*Reach*	*Season*	*Total Coliform*			*Fecal Coliform*			*E. coli*		
			No. of Samples	No. of Samples Exceeding 10000 MPN/100 ml[1]	% Exceedances	No. of Samples	No. of Samples Exceeding 400 MPN/100 ml	% Exceedances	No. of Samples	No. of Samples Exceeding 235 MPN/100 ml	% Exceedances
I-2	1	Wet	17	16	94%	24	23	96%	3	3	100%
R-1	2	Wet	18	18	100%	25	25	100%	3	3	100%

[1] or exceeding 1000 MPN/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Monitoring Data for MS4 Discharges from Wishtoyo's Ventura Coastkeeper Watershed Monitoring Program

Wishtoyo's Ventura Coastkeeper Watershed Monitoring Program conducted bacteria monitoring of MS4 discharges in the SCR Watershed. Three sites were monitored: (1) O-1 is El Rio Drain, a covered drain discharging to SCR Reach 1 that drains an urbanized area (95% urban) of 1374 acres; (2) V-1 is Moon Ditch, an open channel discharging to SCR Reach 1 that drains an urbanized area (92% urban) of 707 acres; and (3) F-2 is North Fillmore Drain, an open channel discharging to Sespe Creek that drains a mostly urbanized area (58% urban) of 762 acres. Available monitoring data from July 2009 to November 2009 are summarized in Table 4-5. A high percentage of exceedances occurred for both total coliform and *E. coli.*

Table 4-5. Summary of MS4 discharge monitoring by the Wishtoyo's Ventura Coastkeeper Watershed Monitoring program.

Site Name	*Reach*	*Total Coliform*			*E. coli*		
		No. of Samples	No. of Samples Exceeding 10000 MPN/100ml	% Exceedances	No. of Samples	No. of Samples Exceeding 235 MPN/100ml	% Exceedances
O-1 MS4	1	2	2	100%	2	1	50%
V-1 MS4	1	5	5	100%	5	3	60%
F-2 MS4	3	2	2	100%	2	2	100%

WRP permit data and description

Staff reviewed daily effluent monitoring data collected from 2005 to 2009 for the Ventura WRF and Saugus and Valencia WRPs and found that most of the monitoring results are non-detect. Bacteria were detected occasionally in effluents but generally well below the bacteria water quality objectives for marine and fresh waters. Therefore, staff used permit limits to calculate bacteria loads from WRPs (see Section 4.3).

While Sanitary Sewer Overflows (SSOs) and exfiltration from sewer systems has been indentified by U.S. EPA as a potential source of pathogens in surface water (U.S. EPA 2000b and 2001), because of their unpredictability, SSOs are most appropriately addressed through enforcement actions such as Administrative Civil Liabilities (ACLs) and Cease and Desist Orders (CDOs). In addition, U.S. EPA documents indicate that although exfiltration may be possible given certain conditions, "no data or narrative information in the literature demonstrate, or even suggest, that sewer exfiltration has directly contaminated surface waters"(U.S. EPA 2000b).

4.1.2 Nonpoint Sources Data and Description

Nonpoint sources in the SCR watershed include inputs from the ocean and natural landscapes, wildlife, golf courses, horses and livestock, onsite wastewater treatment systems, irrigated lands, and in-stream sources. This section provides a discussion of each source and presents data to characterize each source, where available.

Monitoring Data from the Ventura WRF for the Shoreline Adjacent to the Estuary

The Ventura WRF conducted weekly total coliform monitoring at 5 stations from January 1990 to October 2000 along the Pacific Ocean shore adjacent to the Estuary. Locations of these monitoring stations are illustrated in Figure 2-1. Of the 125 samples from each station, no exceedances were found (Table 4-6) for total coliform. During this same period, samples collected from the Estuary (see section 2.3.1), showed a total of 82 exceedances of the total coliform objective of 10000 MPN/100ml. This indicates that coliform exceedances in the Estuary are caused by watershed sources, instead of sources from the Pacific Ocean.

Table 4-6: Summary statistics for coliform bacteria at Ventura WRF shoreline monitoring stations

Location	***Total Coliform***		
	No. of Samples	No. of Samples Exceeding 10000 MPN/100ml	Percent Exceedance
R5	125	0	0%
R6	125	0	0%
R7	125	0	0%
R8	125	0	0%
R9	125	0	0%

Monitoring Data from SCCWRP Study for Natural Landscapes

SCCWRP conducted bacteria monitoring of natural landscapes in Sespe Creek and Piru Creek in the SCR Watershed. Available wet- and dry-weather monitoring data from December 2004 to February 2006 are summarized in Table 4-7. These data were presented in section 2.3.7 to determine if there were bacteria impairments in these tributaries, but they are presented here as well to determine the potential loading of natural landscapes to the SCR. Results of all samples did not exceed bacteria water quality objectives for either total coliform or *E. coli*.

Table 4-7. Summary of single sample statistics for coliform bacteria for SCCWRP natural landscapes monitoring sites

Site Name	***Reach***	***Total Coliform***			***E. coli***		
		No. of Samples	No. of Samples Exceeding 10000 MPN/100ml	% Exceedances	No. of Samples	No. of Samples Exceeding 235 MPN/100ml	% Exceedances
Sespe Creek	10	4	0	0%	4	0	0%
Piru Creek	11	5	0	0%	5	0	0%

Wildlife

Wildlife wastes can contribute to the bacterial loads from the large undeveloped portions of the watershed, and may be the only source of bacteria from these areas. Over 88 percent of the entire Santa Clara River Watershed is undeveloped wildland. The abundance of wildlife varies among the different habitat and vegetation types. Potential loads from wildlife are accounted for through the use of a reference system/antidegradation approach.

Golf Courses

Golf courses are a potential source of bacteria since, typically, fertilization and watering rates are high. Golf courses also attract large numbers of birds. The bacteria may be transported to waterways by irrigation and storm runoff. Most of the golf courses in the SCR watershed are adjacent to waterways. There are 9 golf courses in Santa Clarita, 1 in Fillmore, 2 in Santa Paula, 2 in Satcoy, and 6 in Oxnard (Google map, 2010). Based on available data, the contribution from golf courses cannot be quantified, but they are considered potential sources and are assigned LAs.

Horses and Livestock

Manure produced by horses, cattle, sheep, and goats in the SCR Watershed is a source of both nutrients and coliforms. In the SCR watershed, there are about 2.2 acres of horse ranches in Los Angeles County and 0.3 acre in Ventura County. These areas were obtained from 2005 Southern California Association of Governments land use data. There are low-density residential properties within the watershed with horses located on the properties. The horse-related activities on these residential properties are not accounted for in the estimation of horse ranch acreage in the watershed. The actual area of horse-impacted land uses may be greater than 2.2 acres. About 0.1 acre of dairy/intensive livestock is located in the SCR watershed. Bacteria loads can be introduced directly to the receiving waters in the case of livestock wading in streams, or may occur as nonpoint sources during storm runoff. Based on available data, the contribution from horses and livestock cannot be quantified, but they are considered potential sources and are assigned LAs.

Onsite Wastewater Treatment Systems

Onsite wastewater treatment system (or septic system) discharges occur in the SCR watershed. When properly sited and operated, it is assumed that onsite wastewater treatment systems remove nearly 100% of the fecal coliform bacteria. However, onsite wastewater treatment systems can be significant sources of bacteria when the systems provide inadequate treatment and discharge directly to groundwater in close proximity to surface waters or discharge directly to surface water via overland flow. Inadequate treatment may be due to insufficient vertical separation to the groundwater, insufficient horizontal separation or surface discharge from a failed disposal field.

There are an estimated 10,000 people served by septic systems in the Los Angeles County portion of the watershed, and it is assumed that they are distributed in proportion to land area outside the Santa Clarita area (LARWQCB, 2003a). There are about 1916 septic systems in the Ventura County portion of the watershed (County of Ventura Environmental Health, 2010). Based on available data, the contribution from onsite wastewater treatment systems cannot be quantified, but given the groundwater-surface water interaction in the SCR watershed, these systems are considered potential sources and are assigned LAs.

Irrigated Lands

Irrigated lands may be another source of bacteria. Sources of bacteria from irrigated lands may include irrigation with bacteria-polluted water, application of manure, and wild animals living on irrigated lands. Nonpoint source discharges from irrigated lands tend to contain higher quantities of nutrients like nitrogen and phosphorus, which promote bacterial growth. There were no requirements for monitoring discharges from agricultural lands before 2005. On November 3, 2005, the Los Angeles Regional Board adopted a Conditional Waiver for Discharges from Irrigated Lands (Order No. R4-2005-0080). Currently, there is no requirement for monitoring bacteria in the Irrigated Lands Conditional Waiver program. However, irrigated lands are considered potential sources and it is anticipated that the next term of the Conditional Waiver will include bacteria monitoring. Based on available data, the contribution from irrigated lands cannot be quantified, but they are considered potential sources and are assigned LAs.

In-channel Sources

Loads directly within the SCR and Estuary are potential non-point sources of bacteria. These loads may include loads from homeless persons living in or along the SCR, illicit/illegal discharges, wildlife and birds, regrowth and/or suspension of sediment-associated bacteria, regrowth of bacteria in the water column, and resuscitation of injured bacteria discharged with disinfected wastewater effluent, etc.

4.2 Estimation of Loading

Available monitoring data indicate that the major contributors of bacteria loading to the SCR and Estuary are dry- and wet-weather urban runoff discharges from the storm water conveyance system. Exceedances of single sample targets occur more frequently in wet weather than in dry weather. This section provides an estimation of the loadings from the

MS4 mass emission stations and other point sources in the watershed to characterize their relative contributions to bacteria in the Santa Clara River.

Ventura WRF

The Ventura WRF has the capacity to treat and discharge up to 14 MGD of tertiary-treated sewage. On average, the plant presently discharges 7.6 MGD. Effluent is transferred to a wildlife pond with a design capacity of 34 million gallons. The wildlife pond provides 4 days of detention at the current average daily outfall flow rate. There is a loss of approximately 1.0 MGD effluent from the wildlife pond each year through percolation. Approximately 1.0 MGD of reclaimed water from the wildlife pond has been used each year for irrigation of golf courses, Marina Park, and commercial landscaping. The remaining effluent in the wildlife pond is discharged to the SCR estuary.

Ventura WRF's permit requires that all the wastewater be chlorinated to a 7-day median of 2.2 organisms per 100 milliliters (ml) for total coliform, and the number of total coliform organisms does not exceed 23 per 100 ml in more than one sample within any 30-day period. The fecal coliform loads discharged to the SCR estuary from the Ventura WRF were estimated from annual average flow and the permit limit of 2.2 total coliform organisms per 100 ml. Fecal coliform loads were assumed to be equal to total coliform loads. Based on this analysis, the annual fecal coliform loading from the Ventura WRF is on the order of 190 to 294 billion counts per year (Table 4-8). It is assumed that most of the fecal coliform is *E. Coli,* and the water quality objectives are for *E. coli*. However, the loads are presented here as fecal coliform so that they may be compared with the loads estimated for the stormwater mass emission site (see Table 4-12).

Table 4-8. Annual gross loading of fecal coliform to the SCR Estuary in Ventura WRF effluent*

Year	2004	2005	2006	2007	2008
Permit Limit (MPN/100 ml)	2.2	2.2	2.2	2.2	2.2
Average Flow (cfs)	9.67	11.81	12.60	13.30	14.97
Load (billion counts/year)	190.0	232.0	247.6	261.3	294.2

* Fecal coliform loads were assumed to be equal to total coliform loads. This is a conservative assumption, and it is expected that the actual fecal coliform loads may be lower.

Santa Paula WRF

The Santa Paula WRF has the capacity to treat and discharge up to 2.55 MGD of secondary treated municipal wastewater. Treated wastewater is discharged to the lined Peck Road storm drain, then flows into a natural, unlined channel, and then enters the SCR in Reach 3. Santa Paula WRF's permit also requires that all the wastewater be chlorinated to a 7-day median of 2.2 organisms per 100 ml for total coliform, and the number of total coliform organisms does not exceed 23 per 100 ml in more than one sample within any 30-day period. The fecal coliform loads discharged to the SCR from Santa Paula WRF were estimated from annual average flow and the permit limit of 2.2 organisms per 100 ml. Fecal coliform loads were assumed to be equal to total coliform loads. Based on this analysis, the annual fecal coliform loading from the Santa Paula WRF is on the order of 68 to 75 billion counts per year (Table 4-9). It is assumed that most of the fecal coliform is *E. Coli,* and the water quality objectives are for *E. coli*. However, the loads are presented here as fecal coliform so that they may be compared with the loads estimated for the stormwater mass emission site (see Table 4-12).

Table 4-9. Annual gross loading of fecal coliform to the SCR in Santa Paula WRF effluent*

Year	2004	2005	2006	2007	2008
Permit Limit (MPN/100 ml)	2.2	2.2	2.2	2.2	2.2
Average Flow (cfs)	3.46	3.64	3.56	3.45	3.84
Load (billion counts/year)	68.0	71.5	69.9	67.8	75.4

* Fecal coliform loads were assumed to be equal to total coliform loads. This is a conservative assumption, and it is expected that the actual fecal coliform loads may be lower.

On April 27, 2005, the City of Santa Paula filed a Report of Waste Discharge and applied to the Regional Board for new WDRs for disposal and reuse of treated wastewater from a proposed new treatment plant. The new plant will eliminate the discharge to the Santa Clara River or any other surface water body. On May 3, 2007, the Regional Board adopted new WDRs (Order No. R4-2007-0028) for the proposed new plant. The City is required to complete construction of the new plant by September 15, 2010 and achieve full compliance with the WDRs by December 15, 2010. The construction of the plant is currently on schedule.

Fillmore WTP

The final treated wastewater effluent of the Fillmore WTP is discharged to the ground through five percolation/evaporation ponds and/or to a subsurface percolation field regulated under WDRs contained in Order No. 97-038, adopted by the Regional Board on April 7, 1997. When the ponds and subsurface percolation fields are unavailable to dispose of the effluent, the treated effluent is discharged into the Santa Clara River under separate requirements contained in NPDES Permit No. CA0059021, as adopted by Regional Board

Order No. R4-2003-0136. However, Fillmore WTP has eliminated the discharge to the Santa Clara River since 2007.

On December 10, 2008, the Regional Board issued Order No. R4-2009-0127 relative to termination of Order No. R4-2003-0136. On May 11, 2006, the Regional Board adopted new WDRs (Order No. R4-2006-0049) for a proposed new plant for discharges to ground. The effluent will initially be discharged into reconstructed ponds at the existing Fillmore WTP pond site and distributed to subsurface driplines. In the event of an extreme flood event, such as a 100-year flood, the Discharger may use the C Street Park to be constructed as an unlined emergency storage facility for treated wastewater only. The new plant is currently operating.

Saugus WRP

The Saugus WRP has the capacity to treat and discharge up to 6.5 MGD of tertiary treated municipal wastewater. Saugus WRP's permit requires that all the wastewater be chlorinated to a 7-day median of 2.2 per 100 ml for total coliform organisms, and the number of total coliform organisms does not exceed 23 per 100 ml in more than one sample within any 30-day period. The fecal coliform loads discharged to the SCR from Saugus WRP were estimated from annual average flow and the permit limit of 2.2 total coliform organisms per 100 ml. Fecal coliform loads were assumed to be equal to total coliform loads. Based on this analysis, the annual fecal coliform loading from the Saugus WRP is on the order of 123 to 154 billion counts per year (Table 4-10). It is assumed that most of the fecal coliform is *E. Coli* and the water quality objectives are for *E. coli*. However, the loads are presented here as fecal coliform so that they may be compared with the loads estimated for the stormwater mass emission site (see Table 4-12).

Table 4-10. Annual gross loading of fecal coliform to the SCR in Saugus WRP effluent*

Year	2004	2005	2006	2007	2008
Permit Limit (MPN/100 ml)	2.2	2.2	2.2	2.2	2.2
Average Flow (cfs)	6.26	6.49	7.52	7.66	7.86
Load (billion counts/year)	123.0	127.6	147.7	150.4	154.4

* Fecal coliform loads were assumed to be equal to total coliform loads. This is a conservative assumption, and it is expected that the actual fecal coliform loads may be lower.

Valencia WRP

The Valencia WRP has the capacity to treat and discharge up to 27.6 MGD of tertiary treated municipal wastewater. Valencia WRP's permit requires that all the wastewater be chlorinated to a 7-day median of 2.2 per 100 ml for total coliform organisms, and the number of total coliform organisms does not exceed 23 per 100 ml in more than one sample within any 30-day period. The fecal coliform loads discharged to the SCR from Saugus WRP were estimated from annual average flow and the permit limit of 2.2 total coliform organisms per 100 ml. Fecal coliform loads were assumed to be equal to total coliform loads. Based on this analysis the annual fecal coliform loading from the Valencia WRP is on the order of 449 to 516 billion counts per year (Table 4-11). It is assumed that most of the fecal coliform is *E. Coli* and the water quality objectives are for *E. coli*. However, the loads are presented here as fecal coliform so that they may be compared with the loads estimated for the stormwater mass emission site (see Table 4-12).

Table 4-11. Annual gross loading of fecal coliform to the SCR in Valencia WRP effluent*

Year	2004	2005	2006	2007	2008
Permit Limit (MPN/100 ml)	2.2	2.2	2.2	2.2	2.2
Average Flow (cfs)	22.85	26.26	24.78	24.75	24.55
Load (billion counts/year)	448.8	515.8	486.9	486.3	482.3

* Fecal coliform loads were assumed to be equal to total coliform loads. This is a conservative assumption, and it is expected that the actual fecal coliform loads may be lower.

Stormwater

Stormwater loadings at mass emission station S29 were calculated when both total runoff volume and fecal coliform concentrations for a storm event were available from the LADPW annual monitoring reports. The number of sampling events and the total loadings for these sampling events are listed in Table 4-12. Results show that wet-weather fecal coliform loading for a given year based on the sum of loadings from only 3-5 storm events sampled per year ranges from 2795 to 1,187,473 billion counts per year. The estimated stormwater loadings from just 3-5 storm events are 6 to 2646 times greater than the estimated total annual loadings from the Valencia WRP (Table 4-11) and 19 to 9654 times greater than the estimated total annual loadings from the Saugus WRP (Table 4-10). It should be noted that only loadings from storm events that have data available were calculated and the total loading from all storm events in a storm year is expected to be higher.

Table 4-12. Stormwater loadings of fecal coliform at mass emission station S29

Storm Year	No. of Sampling Events	Total Loading (Billion Counts)
2008 - 2009	4	9349
2007 - 2008	3	6980
2006 - 2007	5	2795
2003 - 2004	3	1,187,473

Stormwater loadings at mass emission station ME-SCR are not calculated because the measured flow rate at the Freeman Diversion during wet weather only represents a fraction of total flow. The Santa Clara River flows through two possible routes at the Freeman Diversion during wet-weather conditions. One route is through the river diversion gate structure where the majority of wet-weather flow passes. The other route is over the diversion dam, a situation which occurs only during high flows generated by large storm events. Presently, wet-weather flow can only be measured at the diversion dam because there is no flow meter installed at the river diversion gate (Ventura Countywide Stormwater Monitoring Program Water Quality Monitoring Report, 2009).

4.3 Summary of Source Assessment

Based on available data and estimation of loadings, surface runoff loads from urbanized areas via the MS4 are a significant source of bacteria to the SCR. MS4 mass emission data show elevated levels of bacteria in the river. Data from natural landscapes in the region indicate that open space loading is not a significant source of bacteria. Data from storm drains and channels draining urban areas show elevated levels of bacteria, indicating that urban areas are a source. Data from throughout the Los Angeles Region further demonstrate that bacteria concentrations are significantly greater in developed areas. A calculation of bacteria loadings in the SCR shows that average annual loadings from WRPs are significantly less than wet-weather loadings and that most of the annual bacteria loading to the SCR is associated with wet weather. Based on this information, staff concludes that runoff from urban areas served by the storm drain system is a significant source of bacteria. Storm drain system discharges may have elevated levels of bacteria indicators due to sanitary sewer leaks and spills, illicit connections of sanitary lines to the storm drain system, runoff from homeless encampments, pet waste, and illegal discharges from recreational vehicle holding tanks, among others. Other point and nonpoint sources were analyzed and found to be less significant or there were not enough data to quantify their contribution. Nonetheless, all potential sources of bacteria are assigned WLAs and LAs in the TMDL.

5 LINKAGE ANALYSIS

The source analysis in this report showed that dry weather urban runoff and storm water, both conveyed by storm drains, are the primary sources of elevated bacterial indicator densities to the SCR and Estuary during dry and wet weather. Other point and nonpoint sources may also potentially contribute to elevated bacterial indicator densities. Therefore, all point and nonpoint sources will be assigned WLAs and LAs. Data on natural runoff in the region demonstrate that natural background loading is not a significant source. Certain concepts of the linkage analysis for this TMDL are the same, or similar to, the other Los Angeles Region bacteria TMDLs.

1. In Southern California, in dry weather, local sources of bacteria principally drive exceedances (LARWQCB, 2002a; 2003b; 2004).

2. In Southern California, in wet weather, upstream or watershed sources principally cause the bacteria exceedances (LARWQCB, 2002b; 2003b; 2004).

3. Based on three experiments conducted by Noble et al. (1999) to mimic natural conditions in or near Santa Monica Bay (SMB), two in marine water and one in fresh water, bacteria degradation was shown to range from hours to days. Based on the results of the marine water experiments, a first-order decay rate for bacteria of 0.8 d^{-1} (or 0.45 per day) is assumed. Degradation rates were shown to be as high as 1.0 d^{-1} (Noble et al., 1999). These studies show that bacterial degradation and dilution during transport through the watershed do not significantly affect bacterial indicator densities in receiving waters.

Therefore, loading capacity for the SCR and Estuary is defined in terms of bacterial indicator densities and is equivalent to the numeric targets in Section 3. This is consistent with the approach used in other Los Angeles Region bacteria TMDLs, including the Santa Monica Bay Beaches Bacteria TMDLs.

5.1 Critical Condition

The critical condition in a TMDL defines an extreme condition for the purpose of setting allocations to meet the TMDL numeric target. While a separate element of the TMDL, it may be thought of as an additional margin of safety such that the allocations are set to meet the numeric target during an extreme (or above average) condition.

Unlike many TMDLs where the critical condition is during low-flow conditions or summer months, the critical condition for bacteria loading is during wet weather. This is because intermittent or episodic loading from sources such as urban runoff can have maximal impacts at high (i.e. storm) flows (U.S. EPA, 2001). Local and Bight-wide shoreline monitoring data show a higher percentage of daily exceedance of the single sample targets during wet weather, as well as more severe bacteriological impairments indicated by higher magnitude exceedances and exceedances of multiple indicators (Noble et al., 2000, Schiff et al., 2001). This also appears to be the case for the SCR Estuary and Reaches 3, 5, 6, and 7 based on the data review in Section 2.3.

The SMB Beaches Bacteria TMDL identified the critical condition within wet weather more specifically, in order to set the allowable number of daily exceedances of the single sample targets. The 90th percentile storm year in terms of wet days was used as the reference year. The 90th percentile year was selected for several reasons. First, selecting the 90th percentile year avoids an untenable situation where the reference system is frequently out of compliance. Second, selecting the 90th percentile year allows responsible jurisdictions and responsible agencies to plan for a 'worst-case scenario', as a critical condition is intended to do. Finally, the Regional Board expects that there will be fewer exceedance days in drier years, since structural controls will be designed for the 90th percentile year. The same approach will be used to determine the critical year for this TMDL.

The 90th percentile storm year in terms of wet days was identified by constructing a cumulative frequency distribution of annual wet weather days using historical rainfall data. This means that only 10% of years should have more wet days than the 90th percentile year. The number of wet days was selected instead of total rainfall because a retrospective evaluation of data showed that the number of sampling events during which greater than 10% of samples exceeded the fecal coliform objective on the day after a rain was nearly equivalent for rainstorms less than 0.5 inch and those greater than 0.5 inch, concluding that even small storms represent a critical condition (Noble et al., 2000). This is particularly true since the TMDL's numeric target is based on number of days of exceedance, not on the magnitude of the exceedance.

Historical rainfall data are available at multiple meteorological stations located in the SCR watershed. Staff considered four stations to calculate the 90th percentile year and the number of wet days in the critical year. The four stations are located in the Estuary area, Santa Paula Creek, Reach 5, and Reach 6 of the SCR watershed. For the station in Estuary area, staff combined data from 4 nearby stations (Ventura-Old Olivas Adobe, Station # 216, data available from 10/01/1964 to 09/30/1983; Ventura Marina – CINP, Station # 216A, data available from 09/30/1983 to 09/30/1989; Ventura Marina – Port District, Station # 216B, data available from 10/01/1989 to 09/30/2008; and Ventura Harbor, Station # 216C, data available from 10/01/2008 to 09/30/2009). The other three selected stations are Santa Paula Canyon – Ferndale Ranch in Santa Paula Creek (Stations # 173 and 173A, data available from 09/30/1956 to 09/30/2009), Piru-Newhall Ranch in Reach 5 (Station # 025, data available from 10/2/1927 to 09/30/2009) and Newhall S Fc32ce in Reach 6 (data available from 11/1/1949 to 10/31/1996). Rain data from Newhall S Fc32ce was not collected continuously; therefore, this station was not used for further calculation. The 90th percentile year was found to be 1995 for the Estuary area stations (82 wet days), 1957 for Santa Paula Canyon – Ferndale Ranch (86 wet days), and 1995 for Piru-Newhall Ranch (81 wet days). The Santa Paula Canyon – Ferndale Ranch has the highest number of wet days due to its relatively high elevation. The same storm year (1995) and similar number of wet days (82 and 81) were found at the Estuary area stations and the Piru-Newhall Ranch station. The Piru-Newhall Ranch station was chosen to calculate the number of exceedances days for this TMDL because this station has the longest record of rain data (1927-2009), this station results in a similar number of wet days to other stations, and this station is located in the middle area of the SCR watershed.

5.2 Margin of Safety

An implicit margin of safety was assumed by directly applying the numeric water quality standards and implementation procedures as WLAs. This ensures that there is little uncertainty about whether meeting the TMDLs will result in meeting the water quality standards. An implicit margin of safety is incorporated in the allocations through the use of a conservative assumption of no (0) bacterial decay in discharges from storm drains to the receiving water when determining compliance with allocations.

6 POLLUTANT ALLOCATIONS AND TMDLs

WLAs are allocations of bacteria loads to point sources and LAs are allocations of bacteria loads to nonpoint sources. WLAs and LAs are expressed as the number of daily or weekly sample days that may exceed single sample targets at appropriate monitoring sites. WLAs and LAs are expressed as allowable exceedance days because the bacteria density and frequency of single sample exceedances are the most relevant to public health protection. Allowable exceedance days are "appropriate measures" consistent with the definition in 40CFR §130.2(i).

6.1 Selection of Reference Systems

In determining an appropriate reference system for the SCR, staff considered technical reports prepared as part of the development of the Los Angeles River (LAR) Bacteria TMDL. For freshwater systems, the LAR Bacteria TMDL Technical Reports suggested using a freshwater reference system based on monitoring by SCCWRP, which has conducted three studies that included bacteria monitoring of freshwater reference sites. There are 22 freshwater sites from "Assessment of Water Quality Concentrations and Loads from Natural Landscapes" (Technical Report 500, 2007), 12 freshwater sites from "Fecal Indicator Bacteria (FIB) Levels During Dry Weather from Southern California Reference Streams" (Technical Report 542, 2008), and 4 freshwater sites from "Microbiological Water Quality at Reference Beaches in Southern California During Wet Weather" (Technical Report, 2005). Samples were collected from fall 2004 to spring 2007 in these studies. The LAR Bacteria TMDL Technical Reports combined and analyzed data from the freshwater SCCWRP sites to calculate the exceedance probabilities of the geometric mean and single sample objectives during dry weather and wet weather. The exceedance probabilities are equal to the total number of exceedances of the objective divided by the total number of samples collected from the 38 reference sites. The raw data used to calculate the exceedances probabilities are presented in Appendix A. This approach is used for SCR Reaches 3, 5, 6, and 7.

For the SCR Estuary, data from San Mateo State Beach and the San Onofre State Beach are used as the local reference system. These beaches were studied as part of the SCCWRP study entitled, "Microbiological water quality at non-human impacted reference beaches in southern California during wet weather" (Technical Report 495, 2006). They represent a larger reference system that is more appropriate for the Santa Clara River watershed than the reference system used in previous TMDLs (i.e., Leo Carillo Beach). The San Mateo Beach is located at the mouth of San Mateo Creek in San Diego County, and the San Onofre State Beach is located at the mouth of San Onofre Creek in San Diego County. These two reference beaches are open with breaking waves and have freshwater inputs (Technical Report 495, 2006).

6.2 Calculation of Allowable Exceedance Days

Allowable exceedance days in an impaired reach will equal the water quality objective exceedance probability in the reference system times the number of days during the critical year. For the SCCWRP reference system for freshwaters, allowable exceedance days are set on an annual basis as well as for two other time periods. These two periods are (1) dry-weather and (2) wet-weather (defined as days of 0.1 inch of rain or more plus three days following the rain event). For the San Mateo/San Onofre Beach reference system for the Estuary, allowable exceedance days are set on an annual basis as well as for three other time periods. These three periods are (1) winter dry weather (November 1 to March 31), (2) summer dry weather (April 1 to October 31) and (2) wet weather (defined as days of 0.1 inch of rain or more plus three days following the rain event). As discussed earlier, Regional Board staff found 1995 as the critical year and there are 81 wet days in 1995. The allowable exceedance days of the numeric targets were calculated on an annual and a dry weather and wet weather basis as listed in Table 6-1.

Table 6-1. Annual allowable exceedance days of numeric targets

Reference System	Reaches 3, 5, 6, and 7		Estuary[4]		
	Dry Weather	Wet Weather	Summer Dry Weather (April 1 to October 31)	Winter Dry Weather (November 1-March 31)	Wet Weather
% WQO Exceedance Probability	1.6%	19%	4.7%	13.4%	30%
Allowable Exceedance Days of Single Sample Objectives[1, 2, 3]	5	16	10	12	25
Allowable Exceedance Days of Geomean Objectives	0	0	0	0	0

[1] Allowable exceedance days calculated by the following equation: Allowable Exceedance Days = WQO Exceedance Probability in Reference System(s) x Number of Days during 1995.

[2] Consistent with the Santa Monica Bay Beaches TMDL, where the fractional remainder for the calculated allowable exceedance days exceeds 1/10th then the number of days are rounded up (e.g., 4.12 is rounded up to 5). In instances where the tenth decimal place for the allowable exceedance days (or weeks or months) is lower than 1/10th then the number of days are rounded down (e.g., 4.02 is rounded down to 4).

[3] The calculated number of exceedance days assumes that daily sampling is conducted. To determine the number of allowable exceedances for less frequent sampling, a ratio is used

[4] The exceedance probability for the Estuary is based on the average of the exceedance probabilities for the San Onofre and San Mateo Beaches, as presented in SCCWRP Technical Report 495.

6.3 WLAs

WLAs for the MS4 permittees will be equal to allowable exceedance days listed in Table 6-1. Furthermore, the WLAs include no allowable exceedances of the geometric mean targets. The Los Angeles County MS4 permittees in the SCR watershed include Los Angeles County, Los Angeles County Flood Control District, and the City of Santa Clarita. The Ventura County MS4 permittees in the SCR watershed include Ventura County, VCWPD, the City of Fillmore, the City of Oxnard, the City of San Buenaventura, and the City of Santa Paula.

Because the wastewater treatment plants have demonstrated the ability to comply with bacteriological receiving water limits, the WLAs for the Saugus WRP, Valencia WRP, Fillmore WTP, Santa Paula WRF, and Newhall WRP are set equal to a 7-day median of 2.2 MPN/100 mL of *E. coli* and a daily max of 235 MPN/100 mL of *E. coli* to ensure zero (0) allowable exceedance days. No exceedances of the geometric mean targets shall be permitted.

The WLAs for the Ventura WRF are set equal to a 7-day median of 2.2 MPN/100 mL of total coliform to ensure zero (0) allowable exceedance days. No exceedances of the geometric mean targets shall be permitted.

General NPDES permits, individual NPDES permits, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, the Statewide Stormwater Permit for Caltrans Activities, and WDR permittees in the SCR watershed are assigned WLAs of zero (0) days of allowable exceedances for all time periods for the single sample targets and no exceedances of the 30-day geometric mean targets because they are not expected to be significant source of indicator bacteria. Compliance with an effluent limit based on the bacteria water quality objectives will be used to demonstrate compliance with the WLA.

Permittees that discharge to Reaches 1 and 2 have WLAs based on allowable exceedance days for the Estuary. Permittees that discharge to Reach 3 or above have WLAs based on allowable exceedance days for Reaches 3, 5, 6, and 7.

6.4 LAs

LAs will be equal to allowable exceedance days listed in Table 6-1. Furthermore, LAs include no exceedances of the geometric mean targets.

LAs for irrigated agricultural lands will be implemented through requirements in the Conditional Waiver or other order that are consistent with the LAs. The Conditional Waiver is in effect for a period of five years and will be reconsidered at the end of five years in 2010. Though potential load contributions of agriculture have not been characterized, monitoring and new data may better quantify the bacteria loading potential of agriculture and be incorporated into the Conditional Waiver.

LAs for onsite wastewater treatment systems will be implemented through WDRs or waivers of WDRs. The responsible agencies are the county and city health departments and/or other local agencies that oversee installation and operation of on-site wastewater treatment systems. However, owners of on-site wastewater treatment systems are responsible for actual discharges.

LAs for other nonpoint sources will be implemented through the Nonpoint Source Implementation and Enforcement Policy.

Sources that discharge to Reaches 1 and 2 have LAs based on allowable exceedance days for the Estuary. Sources that discharge to Reach 3 or above have LAs based on allowable exceedance days for Reaches 3, 5, 6, and 7.

6.5 Interim LAs and MS4 WLAs

Interim LAs and MS4 WLAs will be equal to the allowable exceedance days listed in Table 6-2. Interim allocations are based on the historical exceedance probability of single sample bacteria objectives at existing monitoring locations to ensure no degradation of water quality. For the Estuary, the current exceedance probability is based on all five Estuary monitoring locations, where an exceedance at any one location of any objective on any day counts as an exceedance. For Reaches, 3, 5, 6, and 7, the exceedance probability is based on station ME-SCR in Reach 3 (see Table 4-3). This location was used because it has *E. coli* data collected in both dry and wet weather over a long time period.

Table 6-2. Annual allowable exceedance days for Interim LAs and MS4 WLAs.

Reference System	Reaches 3, 5, 6, and 7		Estuary		
	Dry Weather	Wet Weather	Summer Dry-Weather (April 1 - October 31)	Winter Dry-Weather (November 1 - March 31)	Wet Weather
% WQO Exceedance Probability	5.9%	75%	74.9%	58.4%	76.0%
Allowable Exceedance Days of Single Sample Objectives[1,2,3]	17	61	150	49	62

[1] Allowable exceedance days calculated by the following equation: Allowable Exceedance Days = Current WQO Exceedance Probability x Number of Days during 1995.

[2] Consistent with the Santa Monica Bay Beaches TMDL, where the fractional remainder for the calculated allowable exceedance days exceeds 1/10th then the number of days are rounded up (e.g., 4.12 is rounded up to 5). In instances where the tenth decimal place for the allowable exceedance days (or weeks or months) is lower than 1/10th then the number of days are rounded down (e.g., 4.02 is rounded down to 4).

[3] The calculated number of exceedance days assumes that daily sampling is conducted. To determine the number of allowable exceedances for less frequent sampling, a ratio is used.

7 IMPLEMENTATION PLAN

This section describes implementation procedures that could be used to provide reasonable assurances the waste load and load allocations developed for the SCR Indicator Bacteria TMDL can be met. However, the Porter-Cologne Water Quality Control Act prohibits the Regional Board from prescribing the method of achieving compliance with water quality standards, and likewise TMDLs. Below staff have identified some potential implementation strategies; however, there is no requirement to follow the particular strategies proposed herein as long as the WLAs and LAs, expressed as maximum allowable exceedance days for each time period, are not exceeded.

7.1. Responsible Jurisdictions, Agencies and Entities

The cities of Santa Clarita, Fillmore, Santa Paula, and Ventura, the Counties of Los Angeles and Ventura, and the Los Angeles County Flood Control District and Ventura County Watershed Protection District are responsible for meeting the WLAs assigned to MS4 discharges. Cities and counties with co-mingled stormwater are jointly and severally responsible for meeting WLAs assigned to MS4 discharges, unless the dischargers demonstrate that their discharges did not cause or contribute to the exceedances. The cities and the counties may jointly or individually decide how to achieve the necessary reductions in exceedance days at each compliance point by employing one or more of the implementation strategies discussed below or any other viable strategy. Staff expects that the monitoring and source characterization outlined in the monitoring plan in Section 8 will assist municipalities in focusing their implementation efforts on key land uses, critical sources and storm periods.

Responsible parties must provide an Implementation Plan to the Regional Board outlining how each intends to individually or cooperatively achieve compliance with the WLAs. The report shall include implementation methods, an implementation schedule, proposed milestones, and proposed outfall monitoring to determine compliance. Proposed milestones will be considered by the Regional Board as potential permit conditions when the MS4 is reopened or reissued. For responsible jurisdictions and agencies who will be proposing wet-weather load-based compliance at MS4 outfalls, the plan shall include an estimate of existing load and the allowable load from MS4 outfalls to attain the allowable number of exceedance days in-stream. The plan shall include a technically defensible quantitative linkage to the WLAs. The plan shall include quantitative estimates of the water quality benefits provided by the proposed implementation approach.

Other stakeholders are individually responsible for their WLAs and LAs. WLAs for point sources will be implemented through NPDES permits. LAs for irrigated agricultural lands will be implemented through requirements in the Conditional Waiver or other order that are consistent with the LAs. The LAs for onsite wastewater treatment systems will be regulated by WDRs or waivers of WDRs. LAs for other nonpoint sources such as horses/livestock, aquaculture, onsite wastewater treatment systems, and golf courses, will be implemented through the State's Nonpoint Source Implementation and Enforcement Policy. The Nonpoint Source Implementation and Enforcement Policy specifies that the regional boards have the authority to regulate nonpoint source discharges through WDRs, waivers, and prohibitions.

7.2. Implementing Strategies for Achieving Allocations

A variety of strategies exist to reduce bacteria concentration and loading to the SCR. Rather than any single strategy, a combination of strategies may be required to reduce bacteria exceedances to acceptable levels. These strategies are categorized as structural Best Management Practices (BMPs) and non-structural BMPs.

7.2.1 Structural BMPs

Structural BMPs involve the use of structural methods to treat or divert water at either the point of generation or point of discharge to either the storm system or to receiving waters. Structural BMPs may be sub-regional or regional in scope.

Sub-Regional Structural BMPs

Sub-regional structural BMPs consist of a single or a series of BMPs designed to treat flows for limited sub-regions within the watershed. Sub-regions can vary in size from small parking lots to several city blocks. These sub-regional implementation strategies typically have multiple pollutant treatment potential (MDRWRA, 2007). Listed below are sub-regional structural BMPs and a brief description of each.

Local Capture Systems

Local capture systems contribute to the control of bacteria in the watershed by reducing the volume of runoff and reducing peak flows. BMPs within this category include rain barrels, cisterns, and other containers used to hold rainwater for reuse or recharge. These systems are usually designed to capture runoff from relatively clean surfaces, such as roofs, so that the water may be reused without treatment. Tank capacities range from around 55 gallons to several thousand cubic feet and can be above or below ground. Local capture systems contribute to control of bacteria in the watershed by reducing the volume of runoff and reducing peak flows.

Vegetated Treatment Systems

Through a combination of biofiltration, retention, infiltration, and evapotranspiration, BMPs within this category can provide a significant contribution to bacteria control for small areas and can be applied across the watershed. BMPs in this category include swales, filter strips, bioretention areas, and storm water planters (McCoy et al., 2006). These can be installed as on-site features of developments or in street medians, parking lot islands, or curb extensions. Vegetated systems involve the use of soils and vegetation to filter and treat stormwater prior to discharge into surface or sub-surface water.

Infiltration, along with soil soaking and evapotranspiration, reduces the volume of storm water runoff, and therefore reduces required sizes of downstream facilities.

Biofiltration can remove some particulates and the associated bacteria loading from storm water runoff. Additional bioslopes, infiltration trenches, soil grading alterations, bioretention ponds, and the use of selective vegetation can further increase the efficiency of vegetative biofiltration systems. In areas where biofiltration is not practical, modification includes design of bioslopes and infiltration trenches, which utilize amended soil and promote subsurface flow.

Vegetated bioswales are constructed drainages used to convey stormwater runoff. Vegetation in bioswales allows for the filtering of pollutants, and infiltration of runoff into groundwater. Broad swales on flat slopes with dense vegetation are the most effective at reducing the volume of runoff and pollutant removal. Bioswales planted with native vegetation offer higher resistance to flow and provide a better environment for filtering and trapping pollutants from stormwater. Vegetated bioswales generally have a trapezoidal or parabolic shape with relatively flat side slopes. Individual vegetated bioswales generally treat small drainage areas (five acres or less).

Local Infiltration Systems

Local infiltration systems contribute to bacteria control by reducing the potentially contaminated runoff from houses, streets, parking lots, and agriculture, and mitigating peak flows. Local infiltration systems utilize methods to increase on-site infiltration including the use of alternative paving materials, retention grading and infiltration pits, but effectiveness is based primarily on soil characteristics. Specific BMPs in this category include permeable paving, pervious concrete, pervious asphalt, pervious paving blocks, grass pavers, gravel pavers, pervious crushed stone, retention grading, and infiltration pits. Local infiltration systems can be effective for management of stormwater runoff from areas ranging from an individual lot to several city blocks.

Media Filtration

Media filtration in storm water is primarily used to separate fine particulates and associated pollutants, but might also be used for enhanced treatment to remove bacteria and nutrients. To maximize bacteria removal benefits, these facilities should be strategically placed in locations with high observed or suspected bacteria loadings. In this process, stormwater is captured and either directed by gravity or pumped through media such as sand, anthracite, compost, zeolite and combinations of natural and engineered substrates. These systems do not provide volume reduction benefits, but may provide limited flow attenuation for small size storms depending on size and type of facility. Media filters could be integrated directly into existing storm drain systems, but are generally off-line facilities requiring a diversion structure.

On-Farm BMPs

On-farm BMPs would focus on individual growers implementing BMPs on individual parcels throughout the watershed. Effective BMPs to reduce pollutant loading would focus on sediment and erosion management practices. Irrigation management practices are also important to reduce and/or eliminate dry weather runoff from fields. Listed below are some practices that may be implemented by individual growers.

- ☐ Avoid bare fields by planting cover crops or leaving plant debris in field
- ☐ Minimize road erosion by grading or using gravel on roads
- ☐ Capture and reuse irrigation/storm water runoff on site
- ☐ Use sediment traps at the end of fields to capture sediment from runoff
- ☐ Mitigate runoff before it leaves property with grassed swales and filter strips
- ☐ Conduct tests of irrigation systems to ensure efficiency and uniformity
- ☐ Inspect irrigation systems for breaks and leaks
- ☐ Divert water from non-cropped areas
- ☐ Use current weather information to determine irrigation requirements
- ☐ Stop irrigation if runoff occurs

Equestrian Related BMPs

Equestrian related BMPs contribute to bacteria control by controlling bacteria at their source. Buffers and filter strips provide separation between pollution generating areas and waterbodies and provide biofiltration for runoff from these areas. Equestrian related BMPs include buffers and filter strips protecting streams and drainages, improved manure storage areas and designated horse-wash areas with connections to sanitary sewers. Presence of exclusion fences would prohibit livestock and horses from grazing adjacent to water courses, potentially reducing bacterial loadings.

Regional Structural BMPs

Regional structural BMPs contain many similarities to sub-regional structural BMPs but differ in both the scope and scale of implementation strategies. Treatment areas can range from several sub-regions to the entire watershed. Regional structural BMPs retain the multiple treatment potential of sub-regional BMPs. Listed below are regional structural BMPs and a brief description of each.

Regional Infiltration Systems

A regional infiltration facility is generally a large basin capable of detaining the entire volume of a design storm and infiltration volume over a specified period. Regional biofiltration systems, including sub-surface flow wetlands, promote hydrolysis, oxidation, and rhizodegradation from soil filtration through the aerobic and anaerobic zones of the soil matrix (Halverson, 2004). These systems can treat a variety of different pollutants and can be utilized for flood mitigation. This is primarily accomplished by impounding water and allowing it to slowly percolate in surface soil and eventually to groundwater. These facilities can be applied as a stand-alone treatment feature for bacteria control on a subwatershed scale. In the event of a large storm, some flow would bypass infiltration and discharge to the receiving water untreated. However, treatment of a large percentage of flow would still be achieved. Application of a regional facility depends on suitability of soils for infiltration and appropriately-located open space.

Regional Detention Facility

Regional detention systems help reduce flow volume and promote sedimentation (McCoy et al., 2006). This type of facility consists of a large basin equipped with outlet structures that regulate rates of release. It can be used upstream of an infiltration facility, constructed wetland or disinfection plant to equalize flows and reduce sediment loads. These basins can be shallow, lined with vegetation, and separated into multiple bays to improve their water quality functions; unlike infiltration systems they do not require favorable soils. Detention facilities can also be deep, steep-wall basins, or underground vaults when space is a limiting factor. However, they are not effective as a stand-alone treatment option for bacteria.

Regional Natural Treatment Systems

Regional Natural Treatment Systems (NTS) are vegetated treatment systems, and primarily constructed water quality treatment wetlands. Constructed wetlands imitate processes carried out by natural wetlands and waste water treatment plants. Unlike natural wetlands, regional NTS are vegetated treatment systems, which are constructed, designed and maintained primarily for water quality treatment. Constructed wetlands can be applied either as on-line or off-line facilities or can be integrated into other habitat enhancement projects. The two most common regional NTS are free surface flow (FSF) and sub-surface flow (SSF) wetlands. FSF wetlands are characterized by shallow ponded water at varying depths above the ground surface; solar irradiation is supposedly the process involved in bacterial removal in this type of wetland. For the SSF wetlands, water flows through the sub-surface soil matrix, rarely surfacing; here the presence of the anoxic zone contributes to the bacterial removal mechanism. This method requires comparatively large areas of relatively flat land to mimic natural function. Also, these facilities are not intended to provide stand-alone treatment of storm water runoff. Often, a detention facility can be integrated upstream to mitigate peak flows and provide a more steady inflow, and biofiltration facilities, media filters or sedimentation basins can be integrated to reduce sedimentation loads and to further provide longevity and better performance of the NTS.

Diversion and/or Treatment

A diversion and/or treatment BMP routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or other treatment system, where the contaminated runoff then receives treatment and filtration before being re-used or discharged. As the name suggests, the unit collects street runoff and, through a series of tanks and pumps, diverts the liquid flow into the sanitary sewer system (City of Los Angeles Storm Water Program Website, 2007). Depending on the water quality of the flow, it might have to be passed through a wastewater treatment facility that uses UV irradiation, chlorination, ozonolysis or Biocides and Peracetic acids. Chlorination is one of the most used methods of disinfection, wherein chlorine being a strong oxidant breaks the cell membranes of bacteria and kills them. UV light with a wavelength of 220 to 320 nanometers can be used to inactivate pathogens. Ozone is generated onsite and the compound is an extremely reactive oxidant that inactivates pathogens through lysis. Peracetic acids deactivate outer cell membranes and can be applied for de-activation of bacteria and viruses; further, they are a more effective oxidant than chlorine and do not have harmful by-products.

After treatment, water could be channeled to receiving waters, to a nearby pond or lake or for a secondary usage.

7.2.2 Non-structural BMPs

Non-structural BMPs include prevention practices designed to improve water quality by reducing bacteria sources. Non-structural BMPs provide for the development of bacteria control programs that include, but are not limited to prevention, education, and regulation. These programs are described below.

Administrative Controls

Administrative controls require less initial investment of time compared to structural BMPs. However, for continuous implementation, administrative actions may require greater time. These actions include better enforcement of existing pet disposal ordinances, better enforcement of existing litter ordinances, posting additional signage, continuing feral cat population control, proposing stricter penalties, and other actions of an administrative nature.

Outreach and Education

Education and outreach to residents may minimize the potential for contamination of stormwater runoff by encouraging residents to clean up after their pets, pick up litter, minimize runoff from agricultural, residential, and commercial facilities, and control excessive irrigation. The public is often unaware of the fact that excess water discharged on streets and lawns ends up in receiving waters, or of the contamination caused by the polluted runoff.

Local agencies can provide educational materials to the public via television, radio, online, and print media, distribute brochures, flyers, and community newsletters, create information hotlines to outreach to educators and schools, develop community events, and support volunteer monitoring and cleanup programs

Storm Drain Stenciling

Storm drain inlet stenciling is another means of educating the public about the direct discharge of stormwater to receiving waters and the effects of polluted runoff on receiving water quality. Stenciling can be conducted in partnership with other agencies and organizations to garner greater support for educational programs (U.S. EPA, 2005).

Street Cleaning

Street and parking lot cleaning may minimize trash and pollutant loading to urban storm drains. This management measure involves employing pavement cleaning practices such as street sweeping on a regular basis to minimize trash, sediment, debris and other pollutants that might end up in receiving waters.

Storm Drain Cleaning

Routine cleaning of the storm drain system reduces the amount of trash and other pollutants entering the river, prevents clogging, and ensures the flood control capacity of the system. A successful storm drain cleaning program includes regular inspection and cleaning of catch basins and storm drain inlets, increased inspection and cleaning in areas with high trash accumulation, accurate recordkeeping, cleaning immediately prior to the rainy season to remove accumulated trash and other pollutants, and proper storage and disposal of collected material (CASQA, 2003).

7.3. Implementation Schedule

The proposed implementation schedule shall consist of a phased approach as discussed below and outlined in Table 7-1. The implementation schedule allows the responsible jurisdictions and responsible agencies time to gather additional monitoring data to better quantify bacteria loading to the SCR and prioritize implementation actions. The schedule would allow 8 years from the effective date to meet the dry-weather load and waste load allocations and 14 years from the effective date to meet the wet-weather load and waste load allocations in the SCR Estuary and Reaches 3, 5, 6, and 7.

Table 7-1: Implementation Schedule

Deadline	Task
Effective date of the TMDL	WLAs assigned to non-MS4 point sources must be attained.
1 year after the effective date of the TMDL	Responsible jurisdictions and agencies for the MS4 WLAs must submit a comprehensive in-stream bacteria water quality monitoring plan for the SCR Watershed. The plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. Once the coordinated monitoring plan is approved by the Executive Officer, monitoring shall commence within 6 months.

Deadline	Task
3 years after the effective date of this TMDL	Responsible jurisdictions and agencies for the MS4 WLAs shall submit a draft Implementation Plan to the Regional Board outlining how each intends to cooperatively or individually achieve compliance with the WLAs. The report shall include implementation methods, an implementation schedule, proposed milestones, and outfall monitoring.
4 years after the effective date of this TMDL	Interim LAs and MS4 WLAs apply.
No longer than 4 years after the effective date of this TMDL	The Regional Board shall reconsider this TMDL if: (1) monitoring and any voluntary local reference system studies justify a revision, or (2) US EPA publishes revised recommended bacteria criteria, or (3) the Regional Board adopts a separate Basin Plan amendment, suspending recreational uses during high flows.
5 years after the effective date of this TMDL	Responsible jurisdictions and agencies for the MS4 WLAs shall provide a verbal update to the Regional Board on the progress of TMDL implementation.
6 months after receipt of Regional Board comments on the draft Implementation Plan	Responsible jurisdictions and agencies for the MS4 WLAs shall submit a final Implementation Plan and begin additional outfall monitoring.
11 years after effective date of this TMDL	For SCR Estuary: Achieve compliance with the applicable LAs and MS4 WLAs, expressed in terms of geometric mean objectives and allowable exceedance days of the single sample objectives for summer dry weather (April 1 to October 31) and winter dry weather (November 1-March 31). For SCR Reaches 3, 5, 6, and 7: Achieve compliance with the applicable LAs and MS4 WLAs, expressed in terms of geometric mean objectives and allowable exceedance days of the single sample objectives for dry weather.

Deadline	Task
17 years after the effective date of this TMDL	For SCR Estuary and Reaches 3, 5, 6, and 7: Achieve compliance with the applicable LAs and MS4 WLAs, expressed in terms of geometric mean objectives and allowable exceedance days of the single sample objectives for wet weather.

8 Monitoring Program

8.1 Ambient Monitoring

Responsible jurisdictions and agencies for the MS4 WLAs are jointly responsible for developing and implementing a comprehensive monitoring plan to assess compliance with the waste load allocations in the TMDL. The monitoring plan should include all applicable bacteria water quality objectives and the sampling frequency must be adequate to assess compliance with the 30-day geometric mean objectives. Responsible jurisdictions and agencies may build upon existing monitoring programs in the SCR watershed when developing the bacteria water quality monitoring plan. At a minimum, at least one sampling station will be located in each impaired reach.

8.2 Compliance Monitoring

Compliance monitoring will assess attainment of the geometric mean water quality objectives and allowable exceedances of the single sample objectives for the SCR Estuary and Reaches 3, 5, 6, and 7. Compliance with interim WLAs will be assessed using in-stream monitoring. Compliance with final WLAs will be assessed using both in-stream monitoring and outfall monitoring as described in the following section.

8.2.1 MS4 Compliance Monitoring

Responsible jurisdictions and agencies for the MS4 WLAs shall submit an outfall monitoring plan as part of their implementation plan. The outfall monitoring plan shall propose an adequate number of representative outfalls to be sampled, a sampling frequency, and protocol for enhanced outfall monitoring as a result of an in-stream exceedance. Responsible jurisdictions and agencies can use existing outfall monitoring stations in the Ventura MS4 permit, where appropriate for both the permit and TMDL objectives.

Responsible jurisdictions and agencies shall assess compliance at the outfall monitoring sites identified in the implementation plan. Compliance shall be based on the allowable number of exceedance days, except in wet-weather, compliance can alternatively be based on an allowable load.

Responsible jurisdictions and agencies must also assess compliance at in-stream monitoring sites. If the number of exceedance days is greater than the allowable number of exceedance days, then the responsible jurisdictions and agencies shall conduct additional outfall monitoring, beyond the routine outfall monitoring proposed in the implementation plan. If the collective outfall monitoring shows attainment of WLAs, then MS4 discharges shall not be held responsible for in-stream exceedances for this time period.

8.2.2 Non-MS4 Permittee and Nonpoint Source Monitoring

Monitoring will also be implemented as part of WDR and waiver requirements, and through implementation of the Nonpoint Source Enforcement Policy. NPDES Permittees will conduct monitoring for all applicable bacteria water quality objectives to ensure that they are attaining WLAs and water quality objectives are being met. NPDES permits for the Saugus and Valencia WRPs shall include effluent monitoring for *E. coli* and the NPDES permit for the Ventura WRF shall include effluent monitoring for total coliform, fecal coliform, and enterococcus. The Conditional Waiver will require bacteria monitoring for discharges from irrigated lands.

8.3 Special Studies

Responsible jurisdictions and agencies within the watershed may conduct special studies designed to help refine waste load allocations and/or assist with TMDL implementation. The following are potential special studies

- Monitoring a local inland reference watershed to quantify the loading of indicator bacteria from background/natural sources.
- Source characterization.
- Water quality modeling to better define the effectiveness of implementation strategies.

9 Cost Considerations

The purpose of this cost analysis is to provide the Regional Board with a reasonable range of potential costs of implementing this TMDL and to address stakeholder concerns about costs. This cost estimate attempts to account for a range of economic factors and requires a number of assumptions regarding the extent and cost of implementing many of the measures. This section describes how the costs were derived for various implementation strategies and provides a summary of costs for each strategy. In many cases, cost estimates for previous bacteria TMDLs, such as the Ballona Creek Bacteria TMDL, were extrapolated to the SCR watershed. While land use data and other conditions were specific to the SCR watershed, some of the unit costs and other assumptions were pulled from previous TMDLs.

In reviewing the cost estimates, it should be noted that there are multiple additional benefits associated with the implementation of these strategies. Many of the structural and non-structural BMPs to address bacteria loading could also reduce the loading of other contaminants, which could assist in meeting the requirements of other Santa Clara River TMDLs.

9.1 Non-Structural BMPs

The costs for a number of non-structural source control measures have been estimated for the entire Los Angeles Region (Devinny et al., 2004), which has an area of 3,100 square miles. The source control measure costs for the SCR watershed were scaled down proportionally. The SCR watershed is approximately 1,600 square miles. The watershed is 5.7% urban (Table 4-1), resulting in 91 square miles of urban area that could need to be treated to comply with the TMDL. The following represent the approximate values for the SCR watershed for source control measures:

- Enforcement of litter ordinances - $0.26 million per year
- Public education - $0.15 million per year
- Improved street cleaning - $0.21 million per year
- Increased storm drain cleaning - $0.79 million per year

In addition to the costs for these source control measures, an estimated $1 million per year was added for additional bacteria source control specifically, such as finding and eliminating hot spots, sewer overflows and other sources of elevated bacteria that may affect either dry or wet weather flows. It is assumed that non-structural controls can be used to treat 20% of the urbanized portion of the watershed.

Summary:

- Annual Costs: $2.41 million per year

9.2 Structural BMPs

In the implementation section of this report (section 7.2), structural BMPs were discussed in terms of regional and sub-regional BMPs. Regional and sub-regional BMPs are very similar except that they differ in scope and scale (e.g., regional infiltration systems vs. local infiltration systems). Therefore, for the purposes of the cost analysis, costs are estimated for general BMP types, which could be scaled up or down depending on if sub-regional or regional BMPs were implemented. In all cases, land acquisition costs were excluded from the cost estimate.

9.2.1 Local Capture Systems

Cisterns are a common type of local capture system. To estimate costs of cisterns, it is assumed that cisterns will be installed only at schools and public facilities, since these types of controls are more easily implemented on these land uses, as opposed to residential or commercial sites. Schools and public facilities cover 1.2% of the SCR watershed (Table 4-1), resulting in an area of 19.2 square miles. Thus, schools and public facilities represent approximately 20% of the urbanized portion of the watershed treated with cisterns.

In the Ballona Creek Bacteria TMDL, it was estimated that it would take up to 2,260 cisterns to treat the 3.9 square miles of school/government land in the Ballona Creek watershed. Scaling this to the SCR watershed, up to 11,126 cisterns could be installed in the SCR Watershed to manage the flow from all schools and public facilities. Assuming a unit cost of $1/gallon and a cistern size of 10,000 gallons, the total cost would be $111 million.

Operation and maintenance costs for cisterns are based on the amount of water pumped. Based on the Ballona Creek Bacteria TMDL, it is assumed that approximately 70,000 gallons per year of runoff would be captured by each cistern. Additional assumptions include:

- 3 horsepower pump;
- Flow rate of 10 gallons per minute;
- Unit energy cost of $0.10 per kilowatt-hour.

Using the standard equation of W=Power*Volume/Flow, which for these assumptions is:

W = (3hp) * (.745kW/hp) * (70,000gal/yr/cistern) / ((10gal/min) * (60min/hr)) =
261 kW-hr/cistern/yr

For 11,126 cisterns and using an energy cost of $0.10 per kilowatt-hour, the total operation and maintenance cost for electrical power is $0.3 million per year.

Summary:

- Capital costs – $111 million
- Operation and Maintenance Costs - $0.3 million per year

9.2.2 Vegetated Treatment Systems

Vegetated swales are a typical vegetated treatment system. Based on case studies, the ratio of swale surface area to drainage area is 1,000 square feet per acre (CASQA, 2003). The mid range cost to construct a swale for treatment of a 10-acre drainage area is approximately $19,000 (adjusted to 2010 dollars) (CASQA, 2003). Assuming swales are used to treat 20% of the urbanized portion of the SCR watershed (20% of 90.1 square miles, or 11,533 acres), the capital cost would be approximately $22 million dollars. The annual maintenance cost is estimated at 5% of the construction cost; annual maintenance costs are estimated at $1 million dollars.

Summary:

- Capital costs – $22 million
- Operation and Maintenance Costs - $1 million per year

9.2.3 Infiltration Systems

Local, on-site or subwatershed-based infiltration projects may be placed in parks, public land, vacant property, and other open spaces within the SCR Watershed. Assuming infiltration devices are used to treat 20% of the urbanized portion of the watershed, the area to be treated would be equal to 11,533 acres. Staff determined that 2307 infiltration trenches, each designed to treat 0.5 inches of runoff from a five-acre area, could be used to treat 11,533 acres. Based on an estimated construction cost of $7 per cubic feet (CASQA, 2003, adjusted for inflation), it would cost $63,000 per infiltration device to treat 0.5 inches of runoff from a five-acre area. This results in a total cost of $145 million. The annual maintenance cost is estimated at 5% of the construction cost; annual maintenance costs are estimated at $7.3 million dollars.

Summary

- Capital Costs - $145 million
- Operation and Maintenance Costs - $7.3 million per year

9.2.4 Media Filtration

The construction cost of a sand/organic filter system depends on the drainage areas, expected efficiency, and other design parameters. Case studies conducted in 1997 indicate cost ranges from $6,600 to $11,000 to treat a drainage area of 5 acres or less. Assuming that 20% of the urbanized portion of the watershed will be treated with sand filters designed for a 5-acre drainage area and a unit construction price of $12,000 dollars (adjusted for inflation), the estimated construction cost of sand/organic filters for 20% of the urbanized portion of the watershed would be $28 million dollars. Annual maintenance costs average approximately 5% of construction costs; annual maintenance costs are estimated at $1.4 million dollars.

Summary

- Capital Costs - $28 million
- Operation and Maintenance Costs - $1.4 million per year

9.2.5 On-Farm BMPs

The Natural Resources Conservation Service (NRCS) provides knowledgeable assistance to farmers in reducing soil mobilization. NRCS staff can provide technical assistance on installing on-farm BMPs. The NRCS website (http://efotg.nrcs.usda.gov/treemenuFS.aspx) provides cost estimates for various on-site BMPs. On-farm BMPs may include buffer crops, filter strips and sedimentation basins. The cost of implementing each of these BMPs would vary depending on the extent with which they are installed. The costs may further increase if productive land is replaced by non-productive BMPs. Table 9-1 summarizes the estimated costs for various on-farm BMPs.

Table 9-1. Per acre costs for potential on-farm BMPs

BMP	Cost (per acre)	Annual O & M Cost (per acre)
Field Border	$373	$8.15
Filter Strip	$1002	$15.28
Sedimentation Basin	$10,000	$196

(NRCS, 2000)

Often replacing a traditional irrigation system with a drip irrigation system can aid in reducing the mobilization of sediment (and associated contaminants). Improved maintenance of the systems may further reduce farm runoff. Maintenance for micro-irrigation systems cost about $40/acre/year (NRCS, 2000).

9.2.6 Diversion and/or Treatment

The cost estimates for storm drain diversions are based on the cost analysis for the Santa Monica Bay Beaches Bacteria TMDL, the Marina del Rey Harbor Mothers Beach and Back Basins Bacteria TMDL, and the Los Angeles Harbor Bacteria TMDL (Inner Cabrillo Beach and Main Ship Channel) (LARWQCB, 2002a, 2002b, 2003b, 2004). The annualized capital cost to construct 10 low-flow diversions is estimated at $717,386, assuming financing for 20 years at 7 percent. The operation and maintenance costs, for all 27 diversions, are estimated at $1.7 million. The number of low-flow diversions necessary to attain the SCR Bacteria TMDL is unknown. Flow modeling may determine the optimum number of low-flow diversions necessary to comply with the WLAs.

9.3 Costs of Monitoring

The costs of monitoring are based on the in-stream monitoring requirements and the MS4 outfall monitoring requirements. For a purpose of a cost estimate, it is assumed that one in-stream monitoring will be sampled in each impaired reach, for a total of 5 monitoring sites. Based on prices of bacteriological analysis from a local laboratory, the cost per sample is $34 for analyzing *E. coli* and total coliform, $40-$65 for analyzing total coliform and fecal coliform, and $70 for analyzing enterococcus. Assuming a monitoring frequency of 5 times a month for each monitoring site, the annual cost for in-stream monitoring is estimated at $7350 for the Estuary and $8160 for Reaches 3, 5, 6, and 7. The cost for outfall monitoring is estimated at $123 per sample for permittees located at the Estuary and Reaches 1 and 2, and $34 per sample for permittees located at Reach 3 and above. The number of outfall monitoring locations in the watershed will be proposed as part of the implementation plan.

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Appendix A

Data Used to Calculate Freshwater Reference System Exceedance Probabilities

Wet Weather ***E.coli***

Exceedance	19%
Number of Data Points	70
Number > WQO	13

Waterbody	NumQual	E.coli	SampleDate	Study*
Deer Creek	=	86	10/27/04	Beach
Deer Creek	=	140	10/28/04	Beach
Deer Creek	=	10	10/29/04	Beach
Deer Creek	<	10	10/30/04	Beach
Deer Creek	=	220	12/5/04	Beach
Deer Creek	=	150	12/6/04	Beach
Deer Creek	<	10	12/7/04	Beach
Deer Creek	=	10	12/8/04	Beach
Deer Creek	<	10	1/29/05	Beach
Deer Creek	<	10	1/30/05	Beach
Deer Creek	<	10	1/31/05	Beach
Deer Creek	<	10	2/1/05	Beach
Deer Creek	<	10	2/12/05	Beach
Deer Creek	=	10	2/13/05	Beach
Deer Creek	<	10	2/14/05	Beach
Deer Creek	=	10	2/15/05	Beach
Leo Carrillo	=	190	1/29/05	Beach
Leo Carrillo	=	150	1/30/05	Beach
Leo Carrillo	=	370	1/31/05	Beach
Leo Carrillo	=	75	2/1/05	Beach
Leo Carrillo	=	41	2/12/05	Beach
Leo Carrillo	=	870	2/13/05	Beach
Leo Carrillo	=	41	2/14/05	Beach
Leo Carrillo	=	90	2/15/05	Beach
San Mateo	=	31	1/18/05	Beach
San Mateo	=	41	1/25/05	Beach
San Mateo	=	169	2/1/05	Beach
San Mateo	=	52	2/8/05	Beach
San Mateo	=	10	2/16/05	Beach
San Mateo	=	20	2/17/05	Beach
San Onofre	=	6815	10/27/04	Beach
San Onofre	=	3654	10/28/04	Beach
San Onofre	=	684	10/29/04	Beach
San Onofre	=	98	11/9/04	Beach

Waterbody	NumQual	E.coli	SampleDate	Study*
San Onofre	<	10	12/14/04	Beach
San Onofre	=	74	1/18/05	Beach
San Onofre	=	132	1/29/05	Beach
San Onofre	=	20	2/8/05	Beach
San Onofre	=	457	2/12/05	Beach
San Onofre	=	158	2/13/05	Beach
San Onofre	=	84	2/14/05	Beach
San Onofre	=	20	2/15/05	Beach
San Onofre	=	20	2/16/05	Beach
San Onofre	=	84	2/17/05	Beach
Solstice Creek	=	1400	10/27/04	Beach
Solstice Creek	=	120	10/28/04	Beach
Solstice Creek	=	110	10/29/04	Beach
Solstice Creek	=	65	10/30/04	Beach
Solstice Creek	=	3000	12/5/04	Beach
Solstice Creek	=	100	12/6/04	Beach
Solstice Creek	<	10	12/7/04	Beach
Solstice Creek	=	20	12/8/04	Beach
Solstice Creek	=	10	1/29/05	Beach
Solstice Creek	=	20	1/30/05	Beach
Solstice Creek	=	41	1/31/05	Beach
Solstice Creek	=	63	2/1/05	Beach
Solstice Creek	=	52	2/12/05	Beach
Solstice Creek	=	10	2/13/05	Beach
Solstice Creek	=	20	2/14/05	Beach
Solstice Creek	=	10	2/15/05	Beach
Cristianitos Creek	=	1160	1/8/05	NL
Bell Canyon Creek	=	58.5	1/7/05	NL
Bell Creek	=	182.0	1/3/06	NL
Fry Creek	=	12.5	2/12/05	NL
Fry Creek	=	254.9	3/29/06	NL
Sespe Creek	=	10	12/4/04	NL
Bear Creek Matilija	=	10	12/4/04	NL
Arroyo Sequit	=	1583.3	12/28/04	NL
Arroyo Sequit	=	469.9	1/7/05	NL
Arroyo Sequit	=	431.2	4/5/06	NL

* Beach: Microbiological Water Quality at Reference Beaches in Southern California During Wet Weather (SCCWRP Technical Report 448)
NL: Assessment of Water Quality Concentrations and Loads from Natural Landscapes (SCCWRP Technical Report 500)

Dry Weather ***E. coli***

	Single Sample Maxium
Exceedance	1.6%
Number of Data Points	450
Number > WQO	7

Waterbody	NumQual	Result	SampleDate	Season	Study*
Arroyo Seco	=	15	6/9/05	Summer	NL
Arroyo Seco	=	10	9/6/05	Summer	NL
Arroyo Seco	<	10	05/31/2006	Summer	FIB
Arroyo Seco	=	52	06/07/2006	Summer	FIB
Arroyo Seco	=	30	06/14/2006	Summer	FIB
Arroyo Seco	=	31	06/21/2006	Summer	FIB
Arroyo Seco	=	41	06/28/2006	Summer	FIB
Arroyo Seco	=	74	07/05/2006	Summer	FIB
Arroyo Seco	<	10	07/11/2006	Summer	FIB
Arroyo Seco	=	122	07/18/2006	Summer	FIB
Arroyo Seco	=	110	07/25/2006	Summer	FIB
Arroyo Seco	=	20	08/01/2006	Summer	FIB
Arroyo Seco	<	10	08/08/2006	Summer	FIB
Arroyo Seco	<	10	08/15/2006	Summer	FIB
Arroyo Seco	<	10	08/22/2006	Summer	FIB
Arroyo Seco	=	10	08/29/2006	Summer	FIB
Arroyo Seco	<	10	09/05/2006	Summer	FIB
Arroyo Seco	<	10	09/12/2006	Summer	FIB
Arroyo Seco	=	31	09/19/2006	Summer	FIB
Arroyo Seco	=	148	09/26/2006	Summer	FIB
Arroyo Seco	=	10	10/03/2006	Summer	FIB
Arroyo Seco	=	10	10/10/2006	Summer	FIB
Arroyo Seco	=	30	10/17/2006	Summer	FIB
Arroyo Seco	<	10	10/24/2006	Summer	FIB
Arroyo Seco	<	10	10/31/2006	Summer	FIB
Arroyo Seco	<	10	11/07/2006	Winter	FIB
Arroyo Seco	<	10	11/14/2006	Winter	FIB
Arroyo Seco	<	10	11/21/2006	Winter	FIB
Arroyo Seco	<	10	11/28/2006	Winter	FIB
Arroyo Seco	<	10	12/05/2006	Winter	FIB
Arroyo Seco	<	10	12/19/2006	Winter	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Arroyo Seco	<	10	12/26/2006	Winter	FIB
Arroyo Seco	<	10	01/02/2007	Winter	FIB
Arroyo Seco	<	10	01/11/2007	Winter	FIB
Arroyo Seco	<	10	01/18/2007	Winter	FIB
Arroyo Seco	<	10	01/23/2007	Winter	FIB
Arroyo Seco	<	10	02/06/2007	Winter	FIB
Arroyo Seco	<	10	02/15/2007	Winter	FIB
Arroyo Seco	<	10	02/20/2007	Winter	FIB
Arroyo Seco	=	10	03/06/2007	Winter	FIB
Arroyo Seco	<	10	03/13/2007	Winter	FIB
Arroyo Seco	<	10	03/20/2007	Winter	FIB
Arroyo Seco	<	10	03/27/2007	Winter	FIB
Arroyo Seco	=	10	04/03/2007	Summer	FIB
Arroyo Seco	=	74	04/10/2007	Summer	FIB
Arroyo Seco	<	10	04/17/2007	Summer	FIB
Arroyo Seco	<	10	04/26/2007	Summer	FIB
Arroyo Seco	<	10	05/01/2007	Summer	FIB
Arroyo Seco	<	10	05/08/2007	Summer	FIB
Bear Creek Matilija	=	10	6/22/05	Summer	NL
Bear Creek Matilija	=	5	9/15/05	Summer	NL
Bear Creek Matilija	=	20	6/2/06	Summer	NL
Bear Creek WFSGR	=	10	6/17/05	Summer	NL
Bear Creek WFSGR	=	5	9/8/05	Summer	NL
Bear Creek WFSGR	=	17.3	6/1/06	Summer	NL
Bell Canyon Creek	=	52	9/2/05	Summer	NL
Bell Canyon Creek	=	173	05/17/2006	Summer	FIB
Bell Canyon Creek	=	10	05/25/2006	Summer	FIB
Bell Canyon Creek	<	10	05/31/2006	Summer	FIB
Bell Canyon Creek	=	241	06/09/2006	Summer	FIB
Bell Canyon Creek	=	63	06/15/2006	Summer	FIB
Bell Canyon Creek	=	20	06/21/2006	Summer	FIB
Bell Canyon Creek	=	820	06/30/2006	Summer	FIB
Bell Canyon Creek	=	209	07/07/2006	Summer	FIB
Bell Canyon Creek	=	20	07/12/2006	Summer	FIB
Bell Canyon Creek	=	75	07/18/2006	Summer	FIB
Bell Canyon Creek	=	373	07/25/2006	Summer	FIB
Bell Canyon Creek	=	146	08/04/2006	Summer	FIB
Boden Canyon Creek	=	63	05/17/2006	Summer	FIB
Boden Canyon Creek	=	18600	05/26/2006	Summer	FIB
Boden Canyon Creek	=	98	06/02/2006	Summer	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Boden Canyon Creek	=	31	06/07/2006	Summer	FIB
Boden Canyon Creek	=	20	06/14/2006	Summer	FIB
Boden Canyon Creek	=	20	06/21/2006	Summer	FIB
Boden Canyon Creek	=	10	06/28/2006	Summer	FIB
Boden Canyon Creek	<	10	03/07/2007	Winter	FIB
Boden Canyon Creek	<	10	03/15/2007	Winter	FIB
Boden Canyon Creek	=	41	03/21/2007	Winter	FIB
Boden Canyon Creek	=	52	03/28/2007	Winter	FIB
Boden Canyon Creek	=	41	04/04/2007	Summer	FIB
Boden Canyon Creek	=	146	04/11/2007	Summer	FIB
Boden Canyon Creek	=	272	04/18/2007	Summer	FIB
Boden Canyon Creek	<	10	04/26/2007	Summer	FIB
Boden Canyon Creek	=	120	05/02/2007	Summer	FIB
Boden Canyon Creek	<	10	05/09/2007	Summer	FIB
Boden Canyon Creek	<	10	05/16/2007	Summer	FIB
Boden Canyon Creek	=	10	05/23/2007	Summer	FIB
Boden Canyon Creek	=	226	05/30/2007	Summer	FIB
Cattle Creek EFSGR	=	10	6/17/05	Summer	NL
Cattle Creek EFSGR	=	25.5	9/8/05	Summer	NL
Cattle Creek EFSGR	=	14.1	6/1/06	Summer	NL
Cold Creek	=	40.5	6/9/05	Summer	NL
Cold Creek	=	5	9/6/05	Summer	NL
Cold Creek	<	10	05/15/2006	Summer	FIB
Cold Creek	<	10	05/26/2006	Summer	FIB
Cold Creek	=	30	05/31/2006	Summer	FIB
Cold Creek	=	20	06/06/2006	Summer	FIB
Cold Creek	=	52	06/13/2006	Summer	FIB
Cold Creek	=	74	06/20/2006	Summer	FIB
Cold Creek	=	41	06/27/2006	Summer	FIB
Cold Creek	<	10	07/06/2006	Summer	FIB
Cold Creek	=	10	07/12/2006	Summer	FIB
Cold Creek	<	10	07/19/2006	Summer	FIB
Cold Creek	=	10	07/26/2006	Summer	FIB
Cold Creek	<	10	08/02/2006	Summer	FIB
Cold Creek	=	20	08/09/2006	Summer	FIB
Cold Creek	=	108	08/16/2006	Summer	FIB
Cold Creek	=	74	08/23/2006	Summer	FIB
Cold Creek	<	10	08/30/2006	Summer	FIB
Cold Creek	=	10	09/06/2006	Summer	FIB
Cold Creek	<	10	09/13/2006	Summer	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Cold Creek	<	10	09/20/2006	Summer	FIB
Cold Creek	<	10	09/27/2006	Summer	FIB
Cold Creek	<	10	10/04/2006	Summer	FIB
Cold Creek	<	10	10/11/2006	Summer	FIB
Cold Creek	=	41	10/18/2006	Summer	FIB
Cold Creek	<	10	10/25/2006	Summer	FIB
Cold Creek	<	10	11/01/2006	Winter	FIB
Cold Creek	<	10	11/08/2006	Winter	FIB
Cold Creek	<	10	11/15/2006	Winter	FIB
Cold Creek	=	10	11/20/2006	Winter	FIB
Cold Creek	<	10	11/29/2006	Winter	FIB
Cold Creek	<	10	12/06/2006	Winter	FIB
Cold Creek	<	10	12/20/2006	Winter	FIB
Cold Creek	<	10	01/03/2007	Winter	FIB
Cold Creek	<	10	01/10/2007	Winter	FIB
Cold Creek	<	10	01/24/2007	Winter	FIB
Cold Creek	<	10	02/07/2007	Winter	FIB
Cold Creek	<	10	02/14/2007	Winter	FIB
Cold Creek	=	10	02/21/2007	Winter	FIB
Cold Creek	<	10	03/01/2007	Winter	FIB
Cold Creek	<	10	03/07/2007	Winter	FIB
Cold Creek	<	10	03/14/2007	Winter	FIB
Cold Creek	<	10	03/21/2007	Winter	FIB
Cold Creek	<	10	03/28/2007	Winter	FIB
Cold Creek	<	10	04/05/2007	Summer	FIB
Cold Creek	<	10	04/11/2007	Summer	FIB
Cold Creek	<	10	04/18/2007	Summer	FIB
Cold Creek	<	10	04/27/2007	Summer	FIB
Cold Creek	=	20	05/02/2007	Summer	FIB
Cold Creek	=	20	05/09/2007	Summer	FIB
Coldbrook NFSGR	=	10	6/17/05	Summer	NL
Coldbrook NFSGR	=	15	9/8/05	Summer	NL
Coldbrook NFSGR	=	14.1	6/1/06	Summer	NL
Cristianitos Creek	=	25.5	6/7/05	Summer	NL
Cucamonga Creek	<	10	05/16/2006	Summer	FIB
Cucamonga Creek	<	10	05/26/2006	Summer	FIB
Cucamonga Creek	<	10	05/30/2006	Summer	FIB
Cucamonga Creek	<	10	06/06/2006	Summer	FIB
Cucamonga Creek	<	10	06/13/2006	Summer	FIB
Cucamonga Creek	<	10	06/20/2006	Summer	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Cucamonga Creek	<	10	06/27/2006	Summer	FIB
Cucamonga Creek	<	10	07/05/2006	Summer	FIB
Cucamonga Creek	<	10	07/11/2006	Summer	FIB
Cucamonga Creek	<	10	07/18/2006	Summer	FIB
Cucamonga Creek	<	10	07/25/2006	Summer	FIB
Cucamonga Creek	=	6	08/01/2006	Summer	FIB
Cucamonga Creek	<	10	08/15/2006	Summer	FIB
Cucamonga Creek	<	10	08/22/2006	Summer	FIB
Cucamonga Creek	=	40	08/29/2006	Summer	FIB
Cucamonga Creek	<	10	09/05/2006	Summer	FIB
Cucamonga Creek	<	10	09/19/2006	Summer	FIB
Cucamonga Creek	=	10	09/26/2006	Summer	FIB
Cucamonga Creek	<	10	10/03/2006	Summer	FIB
Cucamonga Creek	<	10	10/10/2006	Summer	FIB
Cucamonga Creek	<	10	10/17/2006	Summer	FIB
Cucamonga Creek	=	10	10/24/2006	Summer	FIB
Cucamonga Creek	<	10	10/31/2006	Summer	FIB
Cucamonga Creek	=	10	11/07/2006	Winter	FIB
Cucamonga Creek	<	10	11/21/2006	Winter	FIB
Cucamonga Creek	<	10	11/28/2006	Winter	FIB
Cucamonga Creek	<	10	12/05/2006	Winter	FIB
Cucamonga Creek	=	180	12/12/2006	Winter	FIB
Cucamonga Creek	<	10	12/20/2006	Winter	FIB
Cucamonga Creek	<	10	12/27/2006	Winter	FIB
Cucamonga Creek	<	10	01/03/2007	Winter	FIB
Cucamonga Creek	<	10	01/16/2007	Winter	FIB
Cucamonga Creek	<	10	01/23/2007	Winter	FIB
Cucamonga Creek	<	10	01/30/2007	Winter	FIB
Cucamonga Creek	<	10	02/06/2007	Winter	FIB
Cucamonga Creek	=	30	02/13/2007	Winter	FIB
Cucamonga Creek	<	10	02/20/2007	Winter	FIB
Cucamonga Creek	<	10	02/28/2007	Winter	FIB
Cucamonga Creek	<	10	03/06/2007	Winter	FIB
Cucamonga Creek	<	10	03/20/2007	Winter	FIB
Cucamonga Creek	=	10	03/27/2007	Winter	FIB
Cucamonga Creek	<	10	04/03/2007	Summer	FIB
Cucamonga Creek	<	10	04/17/2007	Summer	FIB
Cucamonga Creek	<	10	04/24/2007	Summer	FIB
Cucamonga Creek	<	10	05/01/2007	Summer	FIB
Day Creek Canyon	<	10	05/17/2006	Summer	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Day Creek Canyon	<	10	05/26/2006	Summer	FIB
Day Creek Canyon	=	10	05/31/2006	Summer	FIB
Day Creek Canyon	=	160	06/07/2006	Summer	FIB
Day Creek Canyon	=	10	06/14/2006	Summer	FIB
Day Creek Canyon	<	10	06/21/2006	Summer	FIB
Day Creek Canyon	=	10	06/28/2006	Summer	FIB
Day Creek Canyon	=	10	07/05/2006	Summer	FIB
Day Creek Canyon	=	10	07/12/2006	Summer	FIB
Day Creek Canyon	=	10	07/19/2006	Summer	FIB
Day Creek Canyon	<	10	07/26/2006	Summer	FIB
Day Creek Canyon	=	20	08/02/2006	Summer	FIB
Day Creek Canyon	=	20	08/09/2006	Summer	FIB
Day Creek Canyon	=	4	08/16/2006	Summer	FIB
Day Creek Canyon	<	10	08/23/2006	Summer	FIB
Day Creek Canyon	<	10	08/30/2006	Summer	FIB
Day Creek Canyon	=	10	09/06/2006	Summer	FIB
Day Creek Canyon	<	10	09/13/2006	Summer	FIB
Day Creek Canyon	<	10	09/20/2006	Summer	FIB
Day Creek Canyon	<	10	09/27/2006	Summer	FIB
Day Creek Canyon	<	10	10/04/2006	Summer	FIB
Day Creek Canyon	<	10	10/11/2006	Summer	FIB
Day Creek Canyon	<	10	10/18/2006	Summer	FIB
Day Creek Canyon	=	30	10/25/2006	Summer	FIB
Day Creek Canyon	<	10	11/01/2006	Winter	FIB
Day Creek Canyon	<	10	11/08/2006	Winter	FIB
Day Creek Canyon	<	10	11/15/2006	Winter	FIB
Day Creek Canyon	<	10	11/22/2006	Winter	FIB
Day Creek Canyon	<	10	11/29/2006	Winter	FIB
Day Creek Canyon	<	10	12/06/2006	Winter	FIB
Day Creek Canyon	<	10	12/13/2006	Winter	FIB
Day Creek Canyon	<	10	12/19/2006	Winter	FIB
Day Creek Canyon	<	10	12/27/2006	Winter	FIB
Day Creek Canyon	<	10	01/03/2007	Winter	FIB
Day Creek Canyon	<	10	01/10/2007	Winter	FIB
Day Creek Canyon	<	10	01/17/2007	Winter	FIB
Day Creek Canyon	=	10	01/24/2007	Winter	FIB
Day Creek Canyon	<	10	01/31/2007	Winter	FIB
Day Creek Canyon	<	10	02/07/2007	Winter	FIB
Day Creek Canyon	<	10	02/14/2007	Winter	FIB
Day Creek Canyon	=	10	02/21/2007	Winter	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Day Creek Canyon	=	20	02/27/2007	Winter	FIB
Day Creek Canyon	=	10	03/07/2007	Winter	FIB
Day Creek Canyon	<	10	03/14/2007	Winter	FIB
Day Creek Canyon	<	10	03/21/2007	Winter	FIB
Day Creek Canyon	<	10	03/28/2007	Winter	FIB
Day Creek Canyon	<	10	04/04/2007	Summer	FIB
Day Creek Canyon	<	10	04/11/2007	Summer	FIB
Day Creek Canyon	<	10	04/18/2007	Summer	FIB
Day Creek Canyon	<	10	04/25/2007	Summer	FIB
Day Creek Canyon	<	10	05/02/2007	Summer	FIB
Day Creek Canyon	=	10	05/09/2007	Summer	FIB
Fry Creek	=	10	6/13/05	Summer	NL
Fry Creek	=	10	5/18/06	Summer	NL
Hurkey Creek	=	5500	05/31/2006	Summer	FIB
Hurkey Creek	=	10	06/07/2006	Summer	FIB
Hurkey Creek	=	31	06/14/2006	Summer	FIB
Hurkey Creek	<	10	06/21/2006	Summer	FIB
Hurkey Creek	=	41	06/28/2006	Summer	FIB
Hurkey Creek	=	20	07/05/2006	Summer	FIB
Hurkey Creek	<	10	07/12/2006	Summer	FIB
Hurkey Creek	=	10	01/03/2007	Winter	FIB
Hurkey Creek	<	10	01/10/2007	Winter	FIB
Hurkey Creek	=	10	01/17/2007	Winter	FIB
Hurkey Creek	=	150	01/24/2007	Winter	FIB
Hurkey Creek	=	30	01/31/2007	Winter	FIB
Hurkey Creek	=	10	02/07/2007	Winter	FIB
Hurkey Creek	<	10	02/21/2007	Winter	FIB
Hurkey Creek	=	10	03/07/2007	Winter	FIB
Hurkey Creek	<	10	03/14/2007	Winter	FIB
Hurkey Creek	<	10	03/23/2007	Winter	FIB
Hurkey Creek	<	10	03/28/2007	Winter	FIB
Hurkey Creek	<	10	04/04/2007	Summer	FIB
Hurkey Creek	<	10	04/11/2007	Summer	FIB
Hurkey Creek	<	10	04/18/2007	Summer	FIB
Lachusa Canyon	=	132	05/15/2006	Summer	FIB
Lachusa Canyon	=	52	05/26/2006	Summer	FIB
Lachusa Canyon	=	20	06/02/2006	Summer	FIB
Lachusa Canyon	=	108	06/06/2006	Summer	FIB
Lachusa Canyon	=	10	06/13/2006	Summer	FIB
Lachusa Canyon	=	63	06/20/2006	Summer	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Lachusa Canyon	=	20	06/27/2006	Summer	FIB
Lachusa Canyon	<	10	07/06/2006	Summer	FIB
Lachusa Canyon	=	52	07/12/2006	Summer	FIB
Lachusa Canyon	=	31	07/19/2006	Summer	FIB
Lachusa Canyon	<	10	07/26/2006	Summer	FIB
Lachusa Canyon	=	10	08/02/2006	Summer	FIB
Lachusa Canyon	=	31	08/09/2006	Summer	FIB
Lachusa Canyon	<	10	08/16/2006	Summer	FIB
Lachusa Canyon	=	10	08/23/2006	Summer	FIB
Lachusa Canyon	<	10	08/30/2006	Summer	FIB
Lachusa Canyon	<	10	09/06/2006	Summer	FIB
Lachusa Canyon	=	41	09/13/2006	Summer	FIB
Lachusa Canyon	<	10	09/20/2006	Summer	FIB
Lachusa Canyon	=	161	09/27/2006	Summer	FIB
Lachusa Canyon	<	10	10/04/2006	Summer	FIB
Lachusa Canyon	<	10	10/11/2006	Summer	FIB
Lachusa Canyon	=	10	10/18/2006	Summer	FIB
Lachusa Canyon	<	10	10/25/2006	Summer	FIB
Lachusa Canyon	=	10	11/01/2006	Winter	FIB
Lachusa Canyon	=	10	11/08/2006	Winter	FIB
Lachusa Canyon	=	10	11/15/2006	Winter	FIB
Lachusa Canyon	<	10	11/20/2006	Winter	FIB
Lachusa Canyon	=	10	11/29/2006	Winter	FIB
Lachusa Canyon	=	20	12/06/2006	Winter	FIB
Lachusa Canyon	=	10	12/20/2006	Winter	FIB
Lachusa Canyon	<	10	01/03/2007	Winter	FIB
Lachusa Canyon	<	10	01/10/2007	Winter	FIB
Lachusa Canyon	=	10	01/24/2007	Winter	FIB
Lachusa Canyon	<	10	02/07/2007	Winter	FIB
Lachusa Canyon	=	10	02/14/2007	Winter	FIB
Lachusa Canyon	<	10	02/21/2007	Winter	FIB
Lachusa Canyon	<	10	03/01/2007	Winter	FIB
Lachusa Canyon	=	52	03/07/2007	Winter	FIB
Lachusa Canyon	<	10	03/14/2007	Winter	FIB
Lachusa Canyon	=	20	03/21/2007	Winter	FIB
Lachusa Canyon	=	10	03/28/2007	Winter	FIB
Lachusa Canyon	<	10	04/05/2007	Summer	FIB
Lachusa Canyon	<	10	04/11/2007	Summer	FIB
Lachusa Canyon	=	10	04/18/2007	Summer	FIB
Lachusa Canyon	=	10	04/27/2007	Summer	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Lachusa Canyon	=	63	05/02/2007	Summer	FIB
Lachusa Canyon	=	10	05/09/2007	Summer	FIB
Mill Creek	=	10	6/20/05	Summer	NL
Mill Creek	=	5	9/12/05	Summer	NL
Mill Creek	<	10	05/16/2006	Summer	FIB
Mill Creek	<	10	05/26/2006	Summer	FIB
Mill Creek	<	10	05/30/2006	Summer	FIB
Mill Creek	<	10	06/06/2006	Summer	FIB
Mill Creek	<	10	06/14/2006	Summer	FIB
Mill Creek	<	10	06/21/2006	Summer	FIB
Mill Creek	<	10	06/27/2006	Summer	FIB
Mill Creek	<	10	07/03/2006	Summer	FIB
Mill Creek	=	10	07/12/2006	Summer	FIB
Mill Creek	=	2	07/19/2006	Summer	FIB
Mill Creek	=	3.1	07/25/2006	Summer	FIB
Mill Creek	=	5.1	08/02/2006	Summer	FIB
Mill Creek	=	1	08/08/2006	Summer	FIB
Mill Creek	=	2	08/16/2006	Summer	FIB
Mill Creek	=	2	08/22/2006	Summer	FIB
Mill Creek	=	6.3	08/29/2006	Summer	FIB
Mill Creek	=	20.9	09/05/2006	Summer	FIB
Mill Creek	=	1	09/13/2006	Summer	FIB
Mill Creek	=	3.1	09/19/2006	Summer	FIB
Mill Creek	=	1	09/26/2006	Summer	FIB
Mill Creek	=	1	10/03/2006	Summer	FIB
Mill Creek	=	1	10/10/2006	Summer	FIB
Mill Creek	=	2	10/17/2006	Summer	FIB
Mill Creek	=	3.1	10/24/2006	Summer	FIB
Mill Creek	=	1	10/31/2006	Summer	FIB
Mill Creek	<	1	11/07/2006	Winter	FIB
Mill Creek	<	1	11/15/2006	Winter	FIB
Mill Creek	<	1	11/22/2006	Winter	FIB
Mill Creek	<	1	12/05/2006	Winter	FIB
Mill Creek	=	1	12/12/2006	Winter	FIB
Mill Creek	=	1	12/19/2006	Winter	FIB
Mill Creek	<	1	01/02/2007	Winter	FIB
Mill Creek	<	1	01/11/2007	Winter	FIB
Mill Creek	<	1	01/17/2007	Winter	FIB
Mill Creek	<	1	01/23/2007	Winter	FIB
Mill Creek	=	2	01/30/2007	Winter	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Mill Creek	=	8.5	02/06/2007	Winter	FIB
Mill Creek	=	1	02/13/2007	Winter	FIB
Mill Creek	<	1	02/21/2007	Winter	FIB
Mill Creek	<	1	03/06/2007	Winter	FIB
Mill Creek	<	1	03/13/2007	Winter	FIB
Mill Creek	<	1	03/21/2007	Winter	FIB
Mill Creek	<	1	04/03/2007	Summer	FIB
Mill Creek	<	1	04/10/2007	Summer	FIB
Mill Creek	<	1	04/18/2007	Summer	FIB
Mill Creek	<	1	05/01/2007	Summer	FIB
Mill Creek	<	1	05/08/2007	Summer	FIB
Mill Creek	=	1	05/15/2007	Summer	FIB
Mill Creek	=	1	05/22/2007	Summer	FIB
Mill Creek	<	1	05/29/2007	Summer	FIB
Piru Creek	=	10	6/22/05	Summer	NL
Piru Creek	=	5	9/16/05	Summer	NL
Piru Creek	=	41	6/2/06	Summer	NL
San Juan Creek	=	25	5/23/05	Summer	NL
San Juan Creek	=	52	9/1/05	Summer	NL
San Juan Creek	=	20	05/17/2006	Summer	FIB
San Juan Creek	=	30.5	5/18/06	Summer	NL
San Juan Creek	=	75	05/25/2006	Summer	FIB
San Juan Creek	=	31	05/31/2006	Summer	FIB
San Juan Creek	=	187	06/09/2006	Summer	FIB
San Juan Creek	=	259	06/15/2006	Summer	FIB
San Juan Creek	=	110	06/21/2006	Summer	FIB
San Juan Creek	=	41	06/30/2006	Summer	FIB
San Juan Creek	=	173	07/07/2006	Summer	FIB
San Juan Creek	=	41	07/12/2006	Summer	FIB
Santiago Creek	=	10	6/7/05	Summer	NL
Santiago Creek	=	15	9/2/05	Summer	NL
Santiago Creek	=	10	05/17/2006	Summer	FIB
Santiago Creek	<	10	05/25/2006	Summer	FIB
Santiago Creek	<	10	05/31/2006	Summer	FIB
Santiago Creek	=	10	06/09/2006	Summer	FIB
Santiago Creek	=	134	06/15/2006	Summer	FIB
Santiago Creek	=	10	06/21/2006	Summer	FIB
Santiago Creek	=	20	06/30/2006	Summer	FIB
Santiago Creek	=	41	07/07/2006	Summer	FIB
Santiago Creek	=	31	07/12/2006	Summer	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Santiago Creek	=	121	07/18/2006	Summer	FIB
Sespe Creek	=	10	6/22/05	Summer	NL
Sespe Creek	=	5	9/15/05	Summer	NL
Sespe Creek	=	52	6/2/06	Summer	NL
Seven Oaks Dam	=	10	6/20/05	Summer	NL
Seven Oaks Dam	=	5	9/12/05	Summer	NL
Silverado Creek	=	46.5	5/25/05	Summer	NL
Silverado Creek	=	12.5	9/1/05	Summer	NL
Silverado Creek	=	10	5/17/06	Summer	NL
Solstice Canyon	=	20	05/15/2006	Summer	FIB
Solstice Canyon	=	52	05/26/2006	Summer	FIB
Solstice Canyon	=	41	06/02/2006	Summer	FIB
Solstice Canyon	=	135	06/06/2006	Summer	FIB
Solstice Canyon	=	20	06/13/2006	Summer	FIB
Solstice Canyon	=	131	06/20/2006	Summer	FIB
Solstice Canyon	=	52	06/27/2006	Summer	FIB
Solstice Canyon	<	10	07/06/2006	Summer	FIB
Solstice Canyon	<	10	07/12/2006	Summer	FIB
Solstice Canyon	=	10	07/21/2006	Summer	FIB
Solstice Canyon	=	20	07/26/2006	Summer	FIB
Solstice Canyon	=	20	08/02/2006	Summer	FIB
Solstice Canyon	=	10	08/09/2006	Summer	FIB
Solstice Canyon	=	10	08/16/2006	Summer	FIB
Solstice Canyon	=	20	08/23/2006	Summer	FIB
Solstice Canyon	=	20	08/30/2006	Summer	FIB
Solstice Canyon	=	20	09/06/2006	Summer	FIB
Solstice Canyon	=	200	09/13/2006	Summer	FIB
Solstice Canyon	=	20	09/20/2006	Summer	FIB
Solstice Canyon	<	10	09/27/2006	Summer	FIB
Solstice Canyon	<	10	10/04/2006	Summer	FIB
Solstice Canyon	<	10	10/11/2006	Summer	FIB
Solstice Canyon	=	10	10/18/2006	Summer	FIB
Solstice Canyon	<	10	10/25/2006	Summer	FIB
Solstice Canyon	<	10	11/01/2006	Winter	FIB
Solstice Canyon	<	10	11/08/2006	Winter	FIB
Solstice Canyon	=	10	11/15/2006	Winter	FIB
Solstice Canyon	<	10	11/20/2006	Winter	FIB
Solstice Canyon	<	10	11/29/2006	Winter	FIB
Solstice Canyon	=	160	12/06/2006	Winter	FIB
Solstice Canyon	<	10	12/20/2006	Winter	FIB

Waterbody	NumQual	Result	SampleDate	Season	Study*
Solstice Canyon	<	10	01/03/2007	Winter	FIB
Solstice Canyon	=	20	01/10/2007	Winter	FIB
Solstice Canyon	<	10	01/24/2007	Winter	FIB
Solstice Canyon	<	10	02/07/2007	Winter	FIB
Solstice Canyon	<	10	02/14/2007	Winter	FIB
Solstice Canyon	<	10	02/21/2007	Winter	FIB
Solstice Canyon	<	10	03/01/2007	Winter	FIB
Solstice Canyon	=	41	03/07/2007	Winter	FIB
Solstice Canyon	=	10	03/14/2007	Winter	FIB
Solstice Canyon	=	10	03/21/2007	Winter	FIB
Solstice Canyon	=	20	03/28/2007	Winter	FIB
Solstice Canyon	<	10	04/05/2007	Summer	FIB
Solstice Canyon	<	10	04/11/2007	Summer	FIB
Solstice Canyon	<	10	04/18/2007	Summer	FIB
Solstice Canyon	<	10	04/27/2007	Summer	FIB
Solstice Canyon	=	20	05/02/2007	Summer	FIB
Solstice Canyon	=	20	05/09/2007	Summer	FIB
Tenaja Creek	=	20.5	6/15/05	Summer	NL
Tenaja Creek	=	10	5/18/06	Summer	NL

* NL: Assessment of Water Quality Concentrations and Loads from Natural Landscapes (SCCWRP Technical Report 500)
FIB: Fecal Indicator Bacteria (FIB) Levels During Dry Weather from Southern California Reference Streams (SCCWRP Technical Report 542)