DRAFT STAFF REPORT, INCLUDING SUBSTITUTE ENVIRONMENTAL DOCUMENTATION

FOR

PART 3 OF THE WATER QUALITY CONTROL PLAN FOR INLAND SURFACE WATERS, ENCLOSED BAYS, AND ESTUARIES OF CALIFORNIA—BACTERIA PROVISIONS AND A WATER QUALITY STANDARDS VARIANCE POLICY

AND

AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA—BACTERIA PROVISIONS AND A WATER QUALITY STANDARDS VARIANCE POLICY

CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

JUNE 30, 2017

DIVISION OF WATER QUALITY

STATE WATER RESOURCES CONTROL BOARD

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Edmund G. Brown Jr., *Governor*

California Environmental Protection Agency
Matthew Rodriquez, *Secretary*

State Water Resources Control Board
www.waterboards.ca.gov

Felicia Marcus, *Chair*
Steven Moore, *Vice-Chair*
Tam M. Doduc, *Member*
Joaquin Esquivel, *Member*
Dorene D'Adamo, *Member*
Michael Lauffer, *Acting Executive Director*
Jonathan Bishop, *Chief Deputy Director*
Eric Oppenheimer, *Chief Deputy Director*

Prepared by:

Stephanie Rose
Environmental Scientist
Division of Water Quality
State Water Resources Control Board
California Environmental Protection Agency

Michael Gjerde
Engineering Geologist
Division of Water Quality
State Water Resources Control Board
California Environmental Protection Agency

TABLE OF CONTENTS

Executive Summary 1

1 Introduction 4

1.1 Purpose of the Staff Report 4

1.2 Intended Use of the Staff Report by Agencies 4

2 Project Description 5

2.1 Project Title 5

2.2 Project Objectives 5

2.3 Description of the Bacteria Provisions 5

2.3.1 New Beneficial Use 6

2.3.2 Water Quality Objectives 6

2.3.3 Implementation Provisions 8

2.3.4 Effective Date of the Bacteria Provisions and their Implementation 9

2.4 Location and Boundaries of the Project 9

2.5 Permits and Other Approvals Required to Implement the Bacteria Provisions. 10

2.6 Environmental Review and Consultation Requirements 10

2.6.1 California Environmental Quality Act 10

2.6.2 Reasonably Foreseeable Methods of Compliance 11

2.6.3 Early Public Consultation/Scoping 11

2.6.4 Focused Stakeholder Group Outreach Meetings 12

2.6.5 CEQA Scoping Meetings 12

2.6.6 Compliance with AB 52: Consultation with California Native American Tribes 12

2.6.8 Scientific Peer Review 13

2.6.9 Water Code Section 13241 13

2.6.10 Other Requirements 14

2.7 Issues Eliminated from Further Consideration after Early Outreach and Public Consultation 14

2.8 Project Contacts 19

3 Regulatory Background 20

3.1 Regulatory History 20

3.1.1 Statement of Necessity for a new Beneficial Use Definition 20

3.2 Bacteria in Fresh Waters 21
3.3 Bacteria in Ocean Waters 23
3.4 Existing Bacteria Objectives 24
3.4.1 Ocean Plan 25
3.4.2 Freshwater Plans and Policies 26
3.4.3 Regional Water Quality Control Board Basin Plans 26
3.5 Existing TMDLs to Implement Bacteria Objectives 28
3.6 Related Regulatory Actions 29
3.7 Related Projects or Studies 29
4 Geographical Scope 32
4.1 Bioregions of California 32
4.1.1 Modoc Bioregion (CERES 2011a) 32
4.1.2 Klamath/North Coast Bioregion (CERES 2011b) 34
4.1.3 Sacramento Valley Bioregion (CERES 2011c) 36
4.1.4 Bay Area/Delta Bioregion (CERES 2011d) 37
4.1.5 Sierra Bioregion (CERES 2011e) 39
4.1.6 San Joaquin Valley Bioregion (CERES 2011f) 40
4.1.7 Central Coast Bioregion (CERES 1996) 41
4.1.8 Mojave Desert Bioregion (CERES 2011g) 42
4.1.9 Colorado Desert Bioregion (CERES 2011h) 43
4.1.10 South Coast Bioregion (CERES 2011i) 45
4.2 Hydrologic Regions of California 47
4.2.1 North Coast Hydrologic Region 47
4.2.2 San Francisco Bay Hydrologic Region 49
4.2.3 Central Coast Hydrologic Region 49
4.2.4 South Coast Hydrologic Region 50
4.2.5 Central Valley Hydrologic Region 50
4.2.6 Lahontan Hydrologic Region 51
4.2.7 Colorado River Hydrologic Region 52
4.3 Marine Ecosystems in California and Sensitive Habitats 52
4.3.1 Kelp beds 52
4.3.2 Surfgrass and Eelgrass Beds 53

4.3.3 Rocky Reef Habitat 54
4.3.4 Shellfish Beds 54
4.3.5 Soft-bottom Habitats, Wetlands, Estuaries, and Nursery Grounds 55
4.3.6 Areas of Special Biological Significance 56
5 Analysis of Project Options 63
5.1 Beneficial Uses 63
5.1.1 Issue A - Limited REC-1 Beneficial Use Definition for Fresh Waters 63
5.2 Water Quality Objectives 64
5.2.1 Issue B - Freshwater Bacteria Indicators 64
5.2.2 Issue C - Estuarine Water Bacteria Indicators 65
5.2.3 Issue D - Marine Water Bacteria Indicators 67
5.2.4 Issue E - Level of Public Health Protection for Illness Rate for Fresh and Marine Waters 68
5.2.5 Issue F - Averaging Period to Determine Compliance for Fresh and Marine Waters 71
5.3 Implementation 73
5.3.1 Issue G - Addressing Natural Sources of Bacteria Levels in Fresh and Marine Waters 73
5.3.2 Issue H - High Flow Suspension of Objectives for Fresh Waters 75
5.3.3 Issue I - Seasonal Suspension of Beneficial Uses 77
5.4 Water Quality Standards Variance 78
5.4.1 Issue J - Identify a Statewide Mechanism for Adopting a Water Quality Standards Variance Applicable to Any Pollutant. 78
6 Reasonably Foreseeable Methods of Compliance 83
6.1 Traditional Point Source Controls 84
6.1.1 Chlorine 84
6.1.2 Ultraviolet Light 84
6.2 Storm Water (Industrial, Construction, Caltrans and MS4 permits) 84
6.2.1 Structural BMPs 85
6.2.2 Non-Structural BMPs 86
6.3 Non-Point Source 88
6.3.1 Agricultural BMPs 89
6.3.2 Dairy and Livestock-Related BMPs 89
7 Environmental Effects of the Bacteria Provisions (Environmental Checklist) 91
7.1 Introduction 91

7.1.1 Impact Methodology 92
7.1.2 Level of Analysis 92
7.2 Environmental Setting 93
7.3 Environmental Impacts 96
7.3.1 Aesthetics 96
7.3.2 Agricultural and Forest Resources 96
7.3.3 Air Quality 98
7.3.4 Biological Resources 104
7.3.5 Cultural Resources 110
7.3.6 Geology and Soils 112
7.3.7 Greenhouse Gas Emissions 114
7.3.8 Hazards and Hazardous Materials 118
7.3.9 Hydrology and Water Quality 120
7.3.10 Land Use and Planning 122
7.3.11 Mineral Resources 122
7.3.12 Noise and Vibration 123
7.3.13 Population and Housing 131
7.3.14 Public Services 131
7.3.15 Recreation 133
7.3.16 Transportation / Traffic 134
7.3.17 Utilities and Service Systems 136
7.4 Mandatory Findings of Significance 138
8 Other Environmental Considerations 139
8.1 Growth-Inducing Impacts 139
8.1.1 Types of Growth 139
8.1.2 Existing Obstacles to Growth 140
8.1.3 Potential for Compliance with the Bacteria Provisions to Induce Growth 140
8.2 Cumulative Impacts Analysis 141
8.2.1 Program Cumulative Impacts 141
8.2.2 Project Cumulative Impacts 145
9 Alternatives Analysis 148
9.1 Alternative 1 - No Project Alternative 148

9.2 Alternative 2 - Regional Water Board Alternative 148
9.3 Alternative 3 - Revised Objectives with No Implementation Alternative 148
9.4 Alternative 4 – U.S. EPA's Estimated Illness Rate of 36/1000 Recreators Alternative 149
9.5 Alternative 5 - Non-U.S. EPA Estimated Illness Rate Alternative 149
9.6 Alternative 6 – No separate more stringent Lake Tahoe bacteria objective 150
9.7 Analysis of Project Alternatives - Conclusion 150
10 Water Code Sections 13241 & 13242 and Antidegradation 151
10.1 Past, Present and Future Beneficial Uses of Water 151
10.2 Environmental Characteristics and Water Quality of the Hydrographic Unit Under Consideration 152
10.3 Water Quality Conditions that Could Reasonable be Attained Through Coordinated Control of All Factors Affecting Water Quality 152
10.4 Economic Considerations 152
10.5 The Need for Developing Housing 154
10.6 The Need to Develop and Use Recycled Water 154
10.7 Antidegradation 155
10.8 Human Right to Water 156
11 Scientific Peer Review 157
12 References 164
Appendix A. Abbreviations and Definitions 171
Appendix B. Existing Bacteria TMDLs 175
Appendix C. Calculations of Illness Rates 178

LIST OF FIGURES

Figure 1. California Bioregions 33
Figure 2. California Hydrologic Regions and Aquifers 48
Figure 3. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Northern North Coast Regional Board 58
Figure 4. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Southern North Coast Regional Water Board and the San Francisco Bay Regional Water Board....59
Figure 5. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Northern Central Coast Regional Water Board 59
Figure 6. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Southern Central Coast Regional Water Board and Northern Channel Islands....60
Figure 7. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Southern Channel Islands and Los Angeles, Santa Ana and San Diego Regional Water Boards 61

LIST OF TABLES

Table 1. REC-1 Bacteria Water Quality Objectives 2
Table 2. REC-1 Bacteria Water Quality Objectives 8
Table 3. Focused Stakeholder Group Meetings 12
Table 4. Title 22 Recycled Water Criteria....15
Table 5. U.S. EPA 2012 Recreation Water Quality Criteria 24
Table 6. Water Quality Objectives for Bacteria: Fresh Waters Designated REC-1 27
Table 7. U.S. EPA's 2012 Recreational Water Quality Criteria 70
Table 8. Potential Clean Water Act Section 303(d) Listing Impacts....95
Table 9. Federal and California Ambient Air Quality Standards....102
Table 10. Common Sound Levels 124
Table 11. Noise Emission Levels for Typical Installation Equipment 129
Table 12. Noise Abatement Measures 130
Table 13. Summary of Peer Review of Scientific Basis for Bacteria Provisions Elements 158

Executive Summary

The State Water Resources Control Board (State Water Board) is proposing Part 3 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays and Estuaries of California (ISWEBE Plan)—Bacteria Provisions and a Water Quality Standards Variance Policy, and an amendment to the Water Quality Control Plan for Ocean Waters of California (Ocean Plan)—Bacteria Provisions and a Water Quality Standards Variance Policy (hereafter Bacteria Provisions). The Bacteria Provisions include updated water quality objectives and provisions for *Escherichia coli* (*E. coli*) and enterococci bacteria to protect human health for the beneficial use of water contact recreation (REC-1) in fresh, estuarine, and marine waters. The Bacteria Provisions also include implementation elements for control of bacteria, including reference system and natural sources exclusion approaches, high flow suspensions, seasonal suspensions, and a definition of the limited water contact recreation (LREC-1) beneficial use. In addition, the Bacteria Provisions identify an existing mechanism for adopting water quality standards variances (WQS Variance) for pollutants and waterbodies.

The Bacteria Provisions would supersede any numeric water quality objectives for bacteria for the REC-1 beneficial use in Regional Water Quality Control Board (Regional Water Board) Water Quality Control Plans (Basin Plans), except for site-specific numeric water quality objectives for bacteria.

The Bacteria Provisions include the following:

1) Beneficial use definition:
   - Limited water contact recreation (LREC-1) beneficial use definition and provisions for designation
2) Bacteria water quality objectives for REC-1:
   - Numeric water quality objectives for fresh, estuarine, and marine waters.
   - Risk protection level.
   - Averaging period to determine compliance.
3) Implementation Provisions:
   - Reference system/antidegradation approach.
   - Natural sources exclusion approach.
   - High flow suspension of the REC-1 beneficial use.
   - Seasonal suspension of the REC-1 beneficial use.
4) Process for adopting WQS Variances consistent with 40 Code of Federal Regulations section 131.14.

The purpose of this document is to present the basis for and rationale applied in the development and analysis of the Bacteria Provisions, and present other alternatives considered in accordance with the California Environmental Quality Act (CEQA).

The Bacteria Provisions are intended to protect human health by reducing the risk of illness associated with exposure to water containing fecal bacteria. The Bacteria Provisions are based on recent epidemiological studies and research, conducted locally and nationally, on the most appropriate bacterial indicators.

In 2012, pursuant to Clean Water Act section 304(a), U.S. EPA issued new recreational water quality criteria recommendations for protecting human health in all coastal and non-coastal waters designated for primary contact recreation use (U.S. EPA 2012). The bacteria water quality objectives in the Bacteria Provisions (Table 1) are based on the 2012 criteria.

Table 1. REC-1 Bacteria Water Quality Objectives

Applicable Waters	Objective Elements	Estimated Illness Rate (NGI): 32 per 1,000 water contact recreators	
		Magnitude	
	Indicator	GM (cfu/100 mL)	STV (cfu/100 mL)
All waters, except Lake Tahoe, where the salinity is less than 10 ppth 95 percent or more of the time	*E. coli*	100	320
Lake Tahoe	*E. coli*	17	55
All waters, where the salinity is equal to or greater than 10 ppth 95 percent or more of the time	Enterococci	30	110

The waterbody GM shall not be greater than the applicable GM magnitude in any six-week interval, calculated weekly. The applicable STV shall not be exceeded more than 10 percent of the time, calculated monthly.

NGI = National Epidemiological and Environmental Assessment of Recreational Water gastrointestinal illness rate

GM = geometric mean
STV = statistical threshold value
cfu = colony forming units
mL= milliliters

ppth = parts per thousand

Lake Tahoe is designated as an Outstanding National Resource Water and is renowned for its extraordinary clarity, purity, and deep blue color. As such, the Lahontan Regional Water Board adopted separate water quality objectives for recreational uses based on a lower illness rate to maintain the lake's unique characteristics. The Bacteria Provisions maintain the current level of protection found in the Lahontan Basin Plan by adjusting the illness rate used in the 2012 recommended criteria to match that currently set to protect Lake Tahoe while updating the bacterial indicator organism to *E. coli*. Additionally, the Lahontan Basin Plan contains fecal coliform bacteria water quality objectives that are generally applicable to all surface waters within the region and not expressly established for the reasonable protection of the REC-1 beneficial use. Part 3 of the ISWEBE would not supersede the regional fecal coliform bacteria objectives. It would establish additional numeric *E. coli* and enterococci bacteria water quality objectives for the REC-1 beneficial use applicable to waters within the Lahontan region that have the REC-1 beneficial use.

Any of the bacteria water quality objectives shall be implemented, where applicable, through National Pollutant Discharge Elimination System (NPDES) permits, water quality certifications,

waste discharge requirements, and waivers of waste discharge requirements, except for discharges for which load allocations or waste load allocations are assigned by a total maximum daily load (TMDL) established before the effective date of the Bacteria Provisions.

A reference system/antidegradation approach and a natural sources exclusion approach are included as implementation provisions for the control of bacteria within the context of a TMDL. At times, natural bacteria levels exceed bacteria objectives, even in undeveloped areas. Unless natural sources of bacteria are addressed, dischargers might be required to treat their discharges more than necessary.

The Bacteria Provisions also include implementation provisions for the suspension of the REC-1 beneficial use under specific conditions. The conditions include high flows, periods of low flow, or frozen conditions when water contact recreation uses would be dangerous or not permitted.

The definition of a LREC-1 beneficial use is also included in the Bacteria Provisions. This beneficial use definition can be utilized by the Regional Water Boards and the State Water Board to designate uses of water that support limited recreational activities involving body contact with water, where the activities are predominately limited by physical conditions such as very shallow water depth or restricted access and, as a result, body contact with water and ingestion of water is infrequent or insignificant.

Lastly, the Bacteria Provisions describe U.S. EPA's regulatory framework for the adoption of a WQS Variance that the State Water Board and Regional Water Boards can use to implement adaptive management approaches to improve water quality applicable to all pollutants (40 C.F.R. § 131.14). The WQS Variance is not limited to bacteria.

1 Introduction

The Bacteria Provisions would adopt the U.S. EPA 2012 Recreational Water Quality Criteria into the Water Quality Control Plans for Inland Surface Waters, Enclosed Bays and Estuaries and the Ocean Waters of California. The Bacteria Provisions include updated water quality objectives and provisions for bacteria to protect human health for the beneficial use of water contact recreation (REC-1). The Bacteria Provisions would apply to fresh, estuarine, and marine waters, include revised indicator organisms [Escherichia coli (*E. coli*) and enterococci], and establish a risk protection level. The Bacteria Provisions also include elements necessary for bacteria control implementation including reference beach and natural sources exclusion approaches, high flow suspensions, seasonal suspensions, and a definition for the LREC-1 beneficial use and a policy for its implementation. In addition, the Bacteria Provisions identify an existing federal regulatory mechanism for adopting a WQS Variance for pollutants and waterbodies.

1.1 Purpose of the Staff Report

The purpose of the Staff Report for the Bacteria Provisions (referred to as the Staff Report) is to provide the supporting information used to develop the Bacteria Provisions. This includes the need for the Bacteria Provisions, technical information to support recommended approaches as well as options for each approach, and alternatives considered in accordance with the California Water Code (Wat. Code) and CEQA. The Staff Report also provides a record of the process used to develop the Provisions, including the environmental review, early consultation requirements, the public participation process discussed in section 2.6, the scientific peer review described in Chapter 11, and an economic analysis described in Chapter 10.

1.2 Intended Use of the Staff Report by Agencies

The State CEQA Guidelines require that the project description include, among other things, a statement briefly describing the intended uses of the Environmental Impact Report (EIR). (Cal. Code Regs., tit. 14, § 15124, subd. (d).) The agencies expected to use this Staff Report in decision making are described below.

The State Water Board will use this Staff Report in determining whether to adopt the Bacteria Provisions. A Water Board may use the information contained within the Staff Report for future decision making and/or permitting. Furthermore, the Bacteria Provisions include implementation elements in order to help achieve the applicable water quality objectives. Therefore, if the project is approved, permitted storm water dischargers, the Water Board, and TMDL entities, where they are considered public agencies for purpose of CEQA, may be considered responsible agencies and may use the Final Substitute Environmental Document (SED) adopted by the State Water Board in their decision-making actions to comply with the Bacteria Provisions.

2 Project Description

The Water Boards' regulations for implementation of CEQA require the Staff Report to include a brief description of the Bacteria Provisions. (Cal. Code Regs., tit. 23, § 3777 subd. (b)(1).) This chapter provides information about the Bacteria Provisions, including (1) an overview of the objectives, (2) a general description of the project's technical characteristics, (3) environmental review and consultation requirements, (4) a discussion of issues eliminated from full consideration after outreach and public consultation, and (5) project contacts.

2.1 Project Title

This project is titled "Part 3 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Bacteria Provisions and a Water Quality Standards Variance Policy; and Amendment to the Water Quality Control Plan for Ocean Waters of California—Bacteria Provisions and a Water Quality Standards Variance Policy" and is referred to collectively as the Bacteria Provisions.

2.2 Project Objectives

The Bacteria Provisions would adopt the U.S. EPA 2012 Recreational Water Quality Criteria into the ISWEBE and Ocean Plan.

While some Regional Water Boards have adopted new bacteria indicators (*E. coli* and/or enterococci), none have adopted the U.S. EPA 2012 Recreational Water Quality Criteria. U.S. EPA 2012 Recreational Water Quality Criteria recommends bacteria indicators for inland surface waters and ocean waters at two different risk levels that U.S. EPA indicated as equally protective for recreational activities. The Bacteria Provisions seek to establish consistent statewide water quality objectives for California waters.

The Bacteria Provisions also are intended to provide Regional Water Boards with tools and direction in addressing specific issues related to applying the Bacteria Objectives. Issues that the Bacteria Provisions seek to address are:

1) Natural sources of high levels of indicator bacteria, which may be addressed through either a reference system/antidegradation approach or a natural sources exclusion approach.
2) Conditions when the REC-1 beneficial use may temporarily not exist, which may be addressed through a high flow suspension and/or a seasonal suspension.
3) An averaging period to determine compliance for fresh and marine waters.
4) Allowance for a Limited REC-1 beneficial use designation.

In addition, the Bacteria Provisions refer to the federal regulatory mechanism for adopting a WQS Variance to allow for additional implementation actions applicable to all pollutants and water segments consistent with 40 Code of Federal Regulations section 131.14.

2.3 Description of the Bacteria Provisions

The following provides a summary of the Bacteria Provisions. For an in-depth analysis of the proposals, see Chapter 5.

2.3.1 New Beneficial Use

The Bacteria Provisions would establish a definition for a beneficial use where recreational uses of a waterbody are limited. The LREC-1 definition allows a beneficial use designation that recognizes that body contact is limited in the waterbody due to physical conditions, such as restricted access and very shallow depths. The state has waterbodies that have been channelized, and/or lined with concrete or other materials that protect the channel from erosion and provide flood protection. In some cases these waterbodies have been fenced to limit contact with the waterbodies during storm events to protect the public from drowning, while in dry weather the water flow is non-existent or very low. Due to these restrictions, contact with the water is minimal and incidental ingestion is infrequent or unlikely. Under these conditions the REC-1 beneficial use is not an accurate description of the beneficial use of the waterbody.

2.3.2 Water Quality Objectives

The REC-1 beneficial use is defined as uses 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, and use of natural hot springs. Studies have been conducted to link levels of Fecal Indicator Bacteria (FIB)[1] to the risk of illnesses resulting from recreating in waters contaminated by fecal pollution. Using FIB concentrations, it is possible to make a reasonable determination that the beneficial use of REC-1 is potentially impacted.

The Bacteria Provisions include updated water quality objectives for bacteria to protect human health for the beneficial use of REC-1 in fresh, estuarine, and marine waters. The water quality objectives will supersede all existing numeric bacteria objectives to the extent a conflict exists, unless the Bacteria Provisions expressively provide that those conflicting objectives shall remain in effect. The Bacteria Provisions will not supersede narrative bacteria objectives in the Regional Water Board Basin Plans. The Bacteria Provisions also will not supersede any objectives for the Shellfish Harvesting (SHELL) beneficial use.

For fresh waters:

The Bacteria Provisions for fresh waters propose to establish *E. coli* as the sole indicator organism for bacteria based on U.S. EPA 2012 Recreational Water Quality Criteria recommendations. The Bacteria Provisions also proposes to establish U.S. EPA's estimated illness rate of 32 per 1,000 primary contact recreators to protect public health. This is the more conservative estimate of the two illness rates recommended by U.S. EPA and is protective of public health.

For the Lahontan Regional Water Board, this objective will be established for the REC-1 beneficial use, except for Lake Tahoe. As Lake Tahoe is an Outstanding Natural Resource

[1] FIBs are types of bacteria used to detect and estimate the level of fecal contamination of water. They are not generally dangerous to human health but are used to indicate the presence of a health risk as they are found with other pathogenic bacteria.

Water, a lower illness rate and objective will be established for the recreational uses of these waters.

For estuarine waters:
The Bacteria Provisions for estuarine waters proposes to establish *E. coli* as the sole indicator organism for estuarine waters with salinity less than 10 parts per thousand (ppth) 95 percent or more of the time as the sole indicator organism for bacteria based on U.S. EPA 2012 Recreational Water Quality Criteria recommendations. The Bacteria Provisions also proposes to establish U.S. EPA's estimated illness rate of 32 per 1,000 primary contact recreators to protect public health. This is the more conservative estimate of the two illness rates recommended by U.S. EPA and is protective of public health.

The Bacteria Provisions for estuarine waters proposes to establish Enterococci as the sole indicator organism for estuarine waters for which in which the salinity is equal to or greater than 10 ppth 95 percent or more of the time as the sole indicator organism for bacteria based on U.S. EPA 2012 Recreational Water Quality Criteria recommendations. The Bacteria Provisions also proposes to establish U.S. EPA's estimated illness rate of 32 per 1,000 primary contact recreators to protect public health. This is the more conservative estimate of the two illness rates recommended by U.S. EPA and is protective of public health.

For marine waters:
The Bacteria Provisions for marine waters proposes to establish Enterococci as the sole indicator organism for bacteria based on U.S. EPA 2012 Recreational Water Quality Criteria recommendations. The establishment of U.S. EPA's estimated illness rate of 32 per 1,000 primary contact recreators is to protect public health. This is the more conservative estimate of the two illness rates recommended by U.S. EPA and is protective of public health.

Table 2. REC-1 Bacteria Water Quality Objectives

Applicable Waters	Objective Elements	Estimated Illness Rate (NGI): 32 per 1,000 water contact recreators	
		Magnitude	
	Indicator	GM (cfu/100 mL)	STV (cfu/100 mL)
All waters, except Lake Tahoe, where the salinity is less than 10 ppth 95 percent or more of the time	*E. coli*	100	320
Lake Tahoe	*E. coli*	17	55
All waters, where the salinity is equal to or greater than 10 ppth 95 percent or more of the time	Enterococci	30	110

The waterbody GM shall not be greater than the applicable GM magnitude in any six-week interval, calculated weekly. The applicable STV shall not be exceeded more than 10 percent of the time, calculated monthly.

NGI = National Epidemiological and Environmental Assessment of Recreational Water gastrointestinal illness rate
GM = geometric mean
STV = statistical threshold value
cfu = colony forming units
mL= milliliters
ppth = parts per thousand

2.3.3 Implementation Provisions

The Bacteria Provisions contain several implementation provisions, including the identification of approaches for characterizing natural sources of bacteria within the context of a TMDL, the temporary suspension of the REC-1 beneficial use under specific conditions, and the designation of the LREC-1 beneficial use based on a use attainability analysis (UAA). Lastly, the Bacteria Provisions includes an existing mechanism for the application of a WQS Variance consistent with 40 Code of Federal Regulations section 131.14.

The Bacteria Provisions provide that natural sources of bacteria levels may be addressed through TMDLs using either a reference system/antidegradation approach or a natural sources exclusion approach. These approaches allow dischargers an approach to address natural sources of bacteria, rather than to treat their discharges more than necessary. The reference system/antidegradation approach has two implementation goals in the context of TMDL development for bacteria objectives: (1) bacteriological water quality is at least as good as that of a natural (reference) system, and (2) no degradation of existing water quality is allowed, where it is better than the natural system. The natural sources exclusion approach is an alternative to the reference system/antidegradation approach. Natural sources include direct inputs from birds, terrestrial and aquatic animals, wrack line and aquatic plants, or other natural sources that discharge to the receiving waters. The natural sources exclusion approach requires the control of all anthropogenic sources of bacteria and the identification and quantification of natural sources of bacteria. Exceedances are allowed based on residual exceedances due to natural sources.

The temporary suspension of REC-1 objectives due to high flows would be limited to periods when specific conditions exist that are both unsafe for REC-1 uses and when the objective is temporarily not attainable. This proposal is being considered for fresh waters during extreme high water flows where the REC-1 use is temporarily unattainable.

In addition, the temporary seasonal suspensions of REC- 1 objectives would be permitted when low flows or frozen conditions exist due to seasonal fluctuations creating unsafe conditions for REC-1 uses.

Designation of the LREC-1 beneficial use could be allowed if a use attainability analysis is performed and finds that body contact is limited in a waterbody due to physical conditions, such as restricted access and very low water depths. The designation of the LREC-1 beneficial use could include the development of site specific bacteria objectives.

Lastly, a WQS Variance would be permitted for all pollutants or waterbody segments consistent with federal and state regulations. Any WQS Variance must adhere to applicable state and federal regulations and be approved by U.S. EPA.

2.3.4 Effective Date of the Bacteria Provisions and their Implementation

Generally, the Bacteria Provisions become effective upon adoption by the State Water Board and approval by the state Office of Administrative Law and U.S. EPA, which typically occurs a few months after the State Water Board adoption. Once approved, the numeric water quality objectives contained in the Bacteria Provisions will immediately supersede objectives for bacteria contained in any water quality control plan to the extent any conflict exists. (Wat. Code, § 13170.)

The bacteria water quality objectives shall be implemented, where applicable, through permits, water quality certifications, waste discharge requirements (WDRs), waivers of WDRs, and future TMDLs once the Water Boards incorporate the conditions into the discharger's permit or requirements. This process would generally be done permit-by-permit as the permits are issued, modified, or renewed. The majority of National Pollutant Discharge Elimination System (NPDES) permits will not need to be revised to reflect the Bacteria Provisions as current effluent limits in most NPDES permits are based on Department of Public Health guidelines for indicator bacteria to protect designated beneficial uses for REC-1 or agriculture, including irrigation of food crops. These effluent limits are typically more stringent than bacteria water quality objectives in the Bacteria Provisions.

2.4 Location and Boundaries of the Project

The state CEQA Guidelines require identification of the "precise location and boundaries of the project [to be] shown on a detailed map." The location of the State Water Board's project is all surface waters of the state and all marine waters of the state. The boundaries of the marine waters of the state extend three nautical miles into the Pacific Ocean from the line of mean lower low water marking the seaward limits of inland waters and three nautical miles from the line of mean lower low water on the mainland and each seaward physical point (an island, rock, breakwater, etc.). This necessarily includes the geographies of the nine Regional Water Boards

within California, as set forth in the Geographic Scope chapter and the maps located therein (Chapter 4) of this Staff Report.

2.5 Permits and Other Approvals Required to Implement the Bacteria Provisions

After adoption by the State Water Board, the Bacteria Provisions must be submitted to the California Office of Administrative Law for review and approval. Because the Bacteria Provisions include the adoption of new water quality standards, pursuant to the Federal Water Pollution Control Act Amendments of 1972, as amended (33 U.S.C. § 1251 et seq., also known as the Clean Water Act), section 303, subdivision (c), the Provisions' water quality standards must also be submitted to U.S. EPA for review and approval.

Except as may be required by other environmental review and consultation requirements as described below, no other agency approvals are expected to be required to implement the final Bacteria Provisions. Beyond analyzing the reasonably foreseeable methods of compliance, the Staff Report is not required to, and therefore does not analyze the details related to the project-specific actions that might be implemented by any particular permittee as a result of the State Water Board's project. (see Cal. Code Regs., tit. 23, § 3777, subd. (c); Pub. Resources Code § 21159, subd. (d).)

2.6 Environmental Review and Consultation Requirements

The Staff Report includes the State Water Board's SED required to satisfy the provisions of the CEQA, pursuant to Public Resources Code sections 21080.5, 21159 and CEQA Guidelines sections 1520 through 15253, and the State Water Board's Regulations for Implementation of the California Environmental Quality Act of 1970, California Code of Regulations, title 23, sections 3720 through 3781. These requirements are listed below, along with other regulatory process requirements.

2.6.1 California Environmental Quality Act

CEQA authorizes the Secretary for Natural Resources to certify that state regulatory programs meeting certain environmental standards are exempt from many of the procedural requirements of CEQA, including the preparation of a separate EIR, negative declaration, or initial study. (Pub. Resources Code, § 21080.5.) The Secretary for Natural Resources has certified as exempt the State Water Board's Basin/208 Planning Program for the protection, maintenance, and enhancement of water quality in California. (Cal. Code Regs., tit. 14, § 15251(g).) Exempt regulatory programs include the Water Boards' adoption or approval of water quality standards and provisions to implement water quality standards, such as the Bacteria Provisions. (Cal. Code Regs., tit. 23, § 3775-3781.) Therefore, the Staff Report includes the SED required for compliance with CEQA, and a separate CEQA document will not be prepared. The State Water Board must still comply with CEQA's goals and policies, including the policy of avoiding significant adverse effects on the environment where feasible. (Cal. Code. Regs., tit. 14, § 15250.)

According to the State Water Board regulations for the implementation of CEQA (Cal. Code Regs., tit. 23, § 3777), the SED shall consist of a written report prepared for the board containing an environmental analysis of the project; a completed environmental checklist (where

the issues identified in the checklist must be evaluated in the checklist or elsewhere in the SED); and other documentation as the board may include. The SED is required to contain, at a minimum, the following information:

1) A brief description of the project;
2) An identification of any significant or potentially significant adverse environmental impacts of the proposed project;
3) An analysis of reasonable alternatives to the project and mitigation measures to avoid or reduce any significant or potentially significant adverse environmental impacts; and
4) An environmental analysis of the reasonably foreseeable methods of compliance. The environmental analysis shall include, at a minimum, all of the following:
    a. An identification of the reasonably foreseeable methods of compliance with the project;
    b. An analysis of any reasonably foreseeable significant adverse environmental impacts associated with those methods of compliance;
    c. An analysis of reasonably foreseeable alternative methods of compliance that would have less significant adverse environmental impacts; and
    d. An analysis of reasonably foreseeable mitigation measures that would minimize any unavoidable significant adverse environmental impacts of the reasonably foreseeable methods of compliance. (Cal. Code Regs., tit. 23, § 3777, subd. (b).)

Accordingly, these analyses are contained in Chapter 2 and Chapters 6 through 9 of this Staff Report.

2.6.2 Reasonably Foreseeable Methods of Compliance

The SED for the Bacteria Provisions is required to include an environmental analysis of the reasonably foreseeable methods of compliance with the Bacteria Provisions. (Cal. Code Regs., tit. 23, § 3777, subd. (b)(4); Pub. Resources Code, § 21159, subd. (a).) In developing the environmental analysis, the State Water Board is not required to conduct a site-specific project level analysis of the methods of compliance, but the environmental analysis shall account for a reasonable range of environmental, economic, and technical factors. (Cal. Code Regs., tit. 23, § 3777, subd. (c); Pub. Resources Code, § 21159, subd. (d).) A general description of the reasonably foreseeable methods of compliance is contained in Chapter 6 of the Staff Report and the environmental analysis of the reasonably foreseeable methods of compliance is contained in Chapter 7 of this Staff Report.

2.6.3 Early Public Consultation/Scoping

CEQA requires the State Water Board to seek early public consultation with public agencies and members of the public prior to circulating the draft SED. (Cal. Code Regs., tit. 23, § 3775.5, subd. (a).) The consultation may include one or more scoping meetings to engage the stakeholders and public agencies early in the planning and formulation stages of the project to scope the range of actions, alternatives, reasonably foreseeable methods of compliance, significant impacts, and cumulative impacts, if any, that should be analyzed in the study and mitigation measures that will reduce impacts to a less than significant level, and to eliminate from the project any elements found not to be important. (Cal. Code Regs., tit. 23, § 3775.5, subd. (b).) A scoping meeting for the Bacteria Provisions was held in February 2007 in Sacramento, California. Although development of the Bacteria Provisions was delayed due to

shifting staff resources to other State Water Board priority plans and policies, oral and written comments received during the scoping meeting were considered.

2.6.4 Focused Stakeholder Group Outreach Meetings

In April, May and June of 2014, State Water Boards staff held six focus group meetings with municipal stormwater agencies, environmental groups, dairy and agriculture groups, publicly owned treatment works and water reuse agencies and counties' departments of public health (Table 3). The objective of the meetings was to provide an overview of the development of an existing mechanism for adopting water quality standards variances (WQS Variance) for pollutants and waterbodies and to receive early input on the scope of the proposed project. Selected meeting participants were provided an issue paper that provided an overview of the fundamentals of the Bacteria Provisions. Comments on the issue paper were solicited. A summary of the comments received can be found at:

http://www.waterboards.ca.gov/bacterialobjectives/docs/matrix_comments.pdf

Table 3. Focused Stakeholder Group Meetings

Focus Group	Meeting Date and Locations
Municipal Storm Water Agencies (Southern California)	April 25, 2014, Costa Mesa
Environmental Groups	April 25, 2014, Costa Mesa
Counties' Department of Public Health	May 12, 2014, Sacramento
Dairy and Agriculture	May 13, 2014, Sacramento
Public Owned Treatment Work dischargers and Water Reuse Agencies	July 14, 2014, Sacramento
Municipal Storm Water Agencies (Northern California)	May 21, 2014, Sacramento

2.6.5 CEQA Scoping Meetings

Scoping Meetings for this project were held on January 28 and February 10, 2015 in Sacramento, CA and Costa Mesa, CA respectively. These meetings were conducted to seek input from public agencies and members of the public of the range of project actions, alternatives, reasonable foreseeable methods of compliance, significant impacts to be analyzed, cumulative impacts if any, and mitigation measures. Notices and materials for these meetings are available at http://www.waterboards.ca.gov/bacterialobjectives/. Comment letters received are available at http://www.swrcb.ca.gov/bacterialobjectives/comments022015.shtml.

2.6.6 Compliance with AB 52: Consultation with California Native American Tribes

AB 52 (Gatto, 2014) established a new category of resources in CEQA called Tribal Cultural Resources:

'Tribal cultural resources' are either of the following: (1) Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following: (A) Included or determined to be eligible for inclusion in the California Register of Historical Resources. (B) Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1. (2) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1. In applying the criteria set forth in subdivision (c) of Section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe. (Pub. Resources Code, § 21074.)

Assembly Bill 52 also established a consultation process with all California tribes on the Native American Heritage Commission List. Consultation with a California Native American tribe that has requested such consultation may assist a lead agency in determining whether the project may adversely affect tribal cultural resources, and if so, how such effects may be avoided or mitigated. AB 52 requires formal notice to California tribes of an opportunity to consult with the lead agency prior to the release of a negative declaration, mitigated negative declaration, or EIR if the tribe is traditionally and culturally affiliated with the geographic area of the proposed project.

The requirements to consider tribal cultural resources and to consult with California tribes apply to CEQA projects for which the lead agency issues a notice of preparation or a notice of intent to adopt a negative declaration or mitigated negative declaration on or after July 1, 2015. The State Water Board considers Assembly Bill 52's requirements as also applying to preparation of an SED.

The State Water Board sent letters (dated May 10, 2016) via certified mail to 14 tribal communities, including all of the California tribes registered at the time to receive Assembly Bill 52 notices. The State Water Board received one response to the letters requesting consultation within the 30 days (or at any other time) following the tribes' receipt of the letters. State Water Board staff contacted the tribe to arrange a preliminary meeting to present an overview of the Bacteria Provisions; however, the tribe's Cultural Resource Manager indicated the tribe no longer required consultation.

2.6.8 Scientific Peer Review

In 1997, section 57004 was added to the California Health and Safety Code (Senate Bill 1320-Sher) which requires external scientific peer review of the scientific basis for any rule proposed by any board, office or department within California Environmental Protection Agency (CalEPA). Scientific peer review is a mechanism for ensuring that regulatory decisions and initiatives are based on sound science. Scientific peer review also helps strengthen regulatory activities, establishes credibility with stakeholders and ensures that public resources are managed effectively. The scientific and technical information that support the Bacteria Provisions have already gone through the peer review process prior to the development of the proposed objectives and implementation strategies. Chapter 11 describes the prior external scientific peer reviews previously performed that relate to each requisite element contained in the Bacteria Provisions.

2.6.9 Water Code Section 13241

In accordance with Water Code section 13241, the Water Boards are required to establish water quality objectives to "ensure the reasonable protection of beneficial uses and the prevention of nuisance." In doing so, the Water Boards shall consider the following factors:

1) Past, present, and probable future beneficial uses of water.
2) Environmental characteristics and water quality of the hydrographic unit under consideration.
3) Water quality conditions that could be reasonably attained through coordinated control of all factors affecting water quality.
4) Economic considerations.
5) The need for developing new housing.
6) The need to develop and use recycled water.

Discussion of the six factors are in Chapter 10, however, several factors (including economic considerations) are also discussed in Chapter 5 within the discussion of policy issues.

2.6.10 Other Requirements

Climate change is described in Chapter 7. Antidegradation and the human right to water are described in Chapter 10.

2.7 Issues Eliminated from Further Consideration after Early Outreach and Public Consultation

Several issues were identified during early stakeholder outreach that did not fit within the scope of the Bacteria Provisions or as not requiring further action by the State Water Board. These issues are listed below:

Issue - Compliance Schedules

The State Water Board presently has a Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits (Compliance Schedule Policy), Resolution No. 2008-0025, which became effective on December 17, 2008. The Compliance Schedule Policy limits compliance schedules to a maximum of 10 years from the adoption, revision or new interpretation of a water quality objective, with two exceptions: A compliance schedule may exceed ten years in a permit that either is a "single permitting action" (as defined by the policy) or has a permit limitation that implements or is consistent with the waste load allocations specified in a permit a TMDL. The Compliance Schedule Policy supersedes all existing provisions authorizing compliance schedules in Basin Plans, except for existing compliance schedule provisions in TMDL implementation plans that were in effect as of the effective date of the policy. Additionally, nothing in the Compliance Schedule Policy precludes the Regional Water Boards from authorizing longer compliance schedules as part of a new or revised standard, provided that the Water Boards adequately justify the compliance schedule length, and that the State Water Board and U.S. EPA approve the new or revised standard.

Issue Description

Compliance schedules provide facilities additional time to implement publicly owned treatment works (POTWs) upgrades or modifications, but can prolong achievement of water quality standards. For bacteria, many major POTWs in California are already subject to existing State

Water Board Division of Drinking Water (DDW) (formerly California Department of Public Health (CDPH) guidelines based on recycled wastewater effluent recommendations that are more stringent than the REC-1 bacteria water quality objectives that are being proposed. Using the current treatment practices, these facilities have little difficulty meeting permit conditions based the proposed objectives. Therefore, the consideration of compliance schedules and interim requirements would not be necessary for POTWs. Nonetheless, the Compliance Schedule Policy allows flexibility when compliance schedules are needed.

Without State Water Board action, compliance schedules and interim requirements will be established by Regional Water Board permit writers in accordance with the Compliance Schedule Policy (Resolution No. 2008-0025). This Compliance Schedule Policy provides uniform provisions authorizing compliance schedule and statewide consistency in the implementation of these provisions in the state's NPDES program.

Issue - Calculations of Effluent Limits for Publicly Owned Treatment Works

There is no statewide policy applicable to calculating effluent limitations for bacterial indicators. Instead, effluent NPDES permit limits for bacteria are established by individual Regional Water Board permit writers. Currently effluent limits in NPDES permits for POTWs and other dischargers of human origin wastewater are based on recycled water criteria (Cal. Code Regs., tit.. 22, Chapter 3) (referred to as Title 22 in this document).

Issue Description

The NPDES regulations at 40 Code of Federal Regulations section 122.45(d) require that all permit limits be expressed, unless impracticable, as average monthly limits and average weekly limits for POTWs. However, U.S. EPA recommends that maximum daily limits be used in lieu of average weekly limits for POTWs when calculating limits for water quality-based standards (as opposed to technology-based standards).

The U.S. EPA 2012 Recreational Water Quality Criteria for bacteria includes both Geometric Mean (long-term average) values and Statistical Threshold Values. Specifically, the U.S. EPA 2012 Recreational Water Quality Criteria "recommends that permitting authorities use an effluent limit derivation approach that considers both the Geometric Mean and Statistical Threshold Value in the limit calculations and which results in short- and long-term effluent limits that derive from and comply with all applicable criteria expressions."

However, many POTWs permits already contain effluent limits for bacteria to protect designated beneficial uses for water contact recreation or agriculture, including irrigation of food crops. These effluent limits are typically more stringent than limits based on both the existing and the proposed Basin Plan receiving water objectives for bacteria indicators. The guidelines used to derive these effluent limits are based on Title 22 recycled water criteria which require a degree of treatment representing about a 5-log reduction in the virus content of the water (Table 4).

Table 4. Title 22 Recycled Water Criteria

Wastewater Category	Average Limitation	Maximum Limitation

Disinfected secondary- or tertiary-2.2 recycled water	Total coliform median of 2.2 MPN/100mL over that last seven analyses	Total coliform median of 23 MPN/100mL in more than 1 sample in any 30-day period
Disinfected secondary-23 recycled water	Total coliform median of 23 MPN/100mL over that last seven analyses	Total coliform median of 240 MPN/100 mL in more than 1 sample in any 30-day period

*MPN= Most probable number

Under Title 22, recycled water may be used as a source of supply for either non-restricted or restricted recreational impoundments. Non-restricted recreational impounds are defined as impoundments in which no limitations are imposed on body-contact water recreational activities. The Department of Public Health recommends that discharges to water contact recreational waters achieve effluent limits comparable to Title 22 water recycling criteria since the receiving waters are analogous to non-restricted recreational impoundments. The Department of Public Health recommends that where the dilution ratio is less than 20:1, facilities be required to meet the disinfected 2.2 recycled water criteria, and where the dilution is greater that 20:1 or the discharger can demonstrate that the body contact recreation use is not present when the dilution is less than 20:1, it recommends the disinfected secondary-23 recycled water criteria.

U.S. EPA's Permit Compliance System database indicates that 39 out of 134 major POTWs in California have effluent limitations that reflect Regional Water Boards objectives for water contact recreational fresh waters; the majority has effluent limits based on the Department of Public Health's recycled water standards. Few facilities appear to receive dilution credit for bacteria (i.e., objectives are typically applied at end-of-pipe). However, limits for only 57 minor facilities are available in U.S. EPA's Permit Compliance System. Note that anti-backsliding provisions may prevent use of the U.S. EPA 2012 Recreational Water Quality Criteria to establish effluent limits for dischargers that currently are required to meet the Department of Public Health criteria.

Without State Water Board action, permit writers will continue to specify effluent limitations according to existing Regional Water Board practices. This could lead to the current indicators (e.g., fecal coliform and total coliform) being retained in permit limits. Changing the Title 22 recycled water criteria is out of the scope of this amendment. Such a changed would require a regulatory change in the Title 22 recycled water criteria

Issue - Mixing Zones for Point Sources

There is no statewide policy on the application of mixing zones for point sources that contain bacteria. Provisions for mixing zones are contained in the Basin Plans of the San Francisco Bay Region, the Los Angeles Region, the Central Valley Region, the Lahontan Region, and the San Diego Region. Data in U.S. EPA's Permit Compliance System database on effluent limits for California dischargers indicate that bacteria objectives are typically applied end-of-pipe and thus no mixing zone is applied.

The Ocean Plan has a statewide policy regarding mixing zones for toxic pollutants that apply within the zone of initial dilution[2] of waste discharges into the ocean. These are implemented through NPDES permits. Marine bacteria discharges are required to be limited such that bacterial standards are maintained in shellfish harvesting and water-contact sport areas and are not part of the initial dilution limitations. There is no initial zone of dilution allowed for discharges in or near kelp beds[3] and State Water Quality Protection Areas[4].

Issue Description

A mixing zone is a volume of water allocated for mixing with a wastewater discharge where applicable water quality criteria or objectives can be exceeded without causing adverse effects to the overall water body. Mixing zones for bacteria could be allowed in situations where no potential for impairment exists (e.g., deep-water discharges).

The majority of effluent limits for major POTWs discharging to fresh water in California are based on the Department of Public Health's guidelines, which are derived from recycled water standards and applied end-of-pipe.

The majority of effluent limits for major POTWs discharging to marine waters in California are subject to the Ocean Plan and apply to areas of shellfish harvesting or water-contact recreation and not to the discharge itself. However discharge is prohibited in areas of State Water Quality Protection Areas and from Kelp Beds.[5]

---

[2] The Ocean Plan, Appendix I Definition of Terms: INITIAL DILUTION is the process which results in the rapid and irreversible turbulent mixing of wastewater with ocean water around the point of discharge. For a submerged buoyant discharge, characteristic of most municipal and industrial wastes that are released from the submarine outfalls, the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing. Initial dilution in this case is completed when the diluting wastewater ceases to rise in the water column and first begins to spread horizontally. For shallow water submerged discharges, surface discharges, and nonbuoyant discharges, characteristic of cooling water wastes and some individual discharges, turbulent mixing results primarily from the momentum of discharge. Initial dilution, in these cases, is considered to be completed when the momentum induced velocity of the discharge ceases to produce significant mixing of the waste, or the diluting plume reaches a fixed distance from the discharge to be specified by the Regional Water Board, whichever results in the lower estimate for initial dilution.

[3] The Ocean Plan, Appendix I Definition of Terms: KELP BEDS, for purposes of the bacteriological standards of this plan, are significant aggregations of marine algae of the genera Macrocystis and Nereocystis. Kelp beds include the total foliage canopy of Macrocystis and Nereocystis plants throughout the water column.

[4] The Ocean Plan, Appendix I Definition of Terms: State Water Quality Protection Areas (SWQPAs) are nonterrestrial marine or estuarine areas designated to protect marine species or biological communities from an undesirable alteration in natural water quality. All Areas of Special Biological Significance (ASBS) that were previously designated by the State Water Board in Resolutions 74-28, 74-32, and 75-61 are now also classified as a subset of State Water Quality Protection Areas and require special protections afforded by this Plan.

[5] The Ocean Plan, Appendix I Definition of Terms: The "Initial* Dilution Zone" of wastewater outfalls shall be excluded from designation as "kelp* beds" for purposes of bacterial standards, and Regional Water Boards should recommend extension of such exclusion zone where warranted to the State Water Board

With no statewide policy, existing Regional Water Board policies and procedures will apply. Regional Water Boards would likely continue their current practices for allowing mixing zones where appropriate.

Issue - Effluent Monitoring and Reporting Frequencies

There is no statewide policy for monitoring frequency for bacteria in facility discharges to fresh or marine waters. The Ocean Plan does outline monitoring frequencies for ambient coastal storm water discharges and the California Code of Regulations, Title 17, section 7958 (referred to as Title 17 in this document) set monitoring frequency for ambient marine recreational waters. Permit writers determine monitoring frequencies on a case-by-case basis for NPDES programs, usually requiring larger dischargers to monitor more frequently than smaller dischargers.

Issue Description

NPDES regulations (40 C.F.R. § 122.48(b)) require that NPDES permits include monitoring specifications (e.g., type, interval) sufficient to yield data representative of the monitored activity. Permit writers may take into account the existing treatment processes at a facility, the size of the discharge and receiving water characteristics when determining an optimal monitoring frequency. For example, a large major Publicly Owned Treatment Work discharging at or near a heavily use beach may be given a higher monitoring frequency than a small minor facility discharging upstream of a lightly used beach.

With no statewide policy, Regional Water Board staff will continue to establish monitoring frequencies in permits based on current practices and site-specific conditions.

Issue - Analytical Methods

There is no statewide policy that identifies analytical methods for *E. coli* or enterococci in fresh or marine waters.

Issue Description

U.S. EPA approved analytical methods for measuring fecal coliform, total coliform, *E. coli*, and enterococci in *ambient waters* are contained in 40 Code of Federal Regulations Part 136 (U. S. EPA, 2003). In its 2004 rule establishing bacteria criteria for coastal waters, U. S. EPA specified that membrane filtration methods (methods 1103.1, 1603, or 1604 for *E. coli* and methods 1106.1 or 1600 for enterococci) or any equivalent method that measures viable bacteria can be used for determining *E. coli* and enterococci densities in the coastal recreation waters to which the rule applies.

(for consideration under Chapter III. J.). Adventitious assemblages of kelp plants on waste discharge structures (e.g., outfall pipes and diffusers) do not constitute kelp* beds for purposes of bacterial standards.

The methods identified in U.S. EPA's 2004 rule do not apply to *effluent*s. U.S. EPA has now issued analytical methods for measuring enterococci and *E. coli* in wastewater (U.S. EPA, 2007). The Bacteria Provisions include the U.S. EPA recommended use of method 1603 or equivalent for monitoring *E. coli* and method 1600 or equivalent for monitoring enterococci.

With no Bacteria Provisions, there is no specified method for implementation of the criteria (e.g., impairment determinations, compliance monitoring). Therefore, any method for determining bacteria densities may be used, including methods based on the most probable number and newly developed rapid methods that may or may not be comparable to the methods used in the studies on which U.S. EPA based its 1986 criteria guidance.

2.8 Project Contacts

For Fresh Waters:

Stephanie Rose, Inland Planning Standards & Implementation Unit Environmental Scientist
Email: Stephanie.Rose@waterboards.ca.gov
Phone: (916) 341-5574

For Marine Waters:

Michael Gjerde, Ocean Standards Unit Engineering Geologist
Email: Michael.Gjerde@waterboards.ca.gov
Phone: (916) 341-5283

Project Manager:

Nicholas Martorano, Water Quality Assessment Unit Chief
Email: Nicholas.Martorano@waterboards.ca.gov
Phone: (916) 341-5290

Section Chief:

Rebecca Fitzgerald, Water Quality Standards and Assessment Section
Email: Rebecca.Fitzgerald@waterboards.ca.gov
Phone: (916) 341-5775

Office of Chief Counsel

Stacy Gillespie, Senior Counsel
Email: Stacy.Gillespie@waterboards.ca.gov
Phone: (916) 341-5190

Updates on the Bacteria Provisions can be obtained by subscribing to the electronic subscription mail list for "Freshwater Plans & Policies", under "Water Quality" http://www.waterboards.ca.gov/resources/email_subscriptions/swrcb_subscribe.shtml

3 Regulatory Background

3.1 Regulatory History

The Federal Water Pollution Control Act of 1972, as amended (33 U.S.C. § 1251 et seq.) (Clean Water Act) "is a comprehensive water quality statute designed to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." (*PUD No. 1 of Jefferson City v. Washington Dept. of Ecology* (1994) 511 U.S. 700, 704 (internal quotation marks omitted).) The Clean Water Act requires states to adopt new or revise existing water quality standards for all waters within their boundaries. (33 U.S.C. § 1313(a); 40 C.F.R. § 131.4(a).) If a state does not set water quality standards, or if U.S. EPA determines that the state's standards do not meet the requirements of the Clean Water Act, U.S. EPA promulgates standards for the states. (33 U.S.C. § 1313(b), (c)(3)-(4).) "Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the Act." (40 C.F.R. 131.3(i).) Water quality standards generally consist of three components: designated uses for each water body or segment, water quality criteria for those waters intended to protect the designated uses, and an antidegradation policy. (40 C.F.R §131.6(a), (c), and (d); 40 C.F.R. § 131.13.) In general, "uses" refer to what a water body is or potentially may be used for (40 C.F.R. § 131.3(f)), either by the public or by plants, fish, and other forms of life, with examples as diverse as use as wildlife and riparian habitat, use of water for industrial production, agricultural supply, or use for recreation due to activities such as fishing and swimming in water bodies. (40 C.F.R. 131.10(a).) Most, if not all, water bodies have multiple uses. "Existing uses" are "those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards." (40 C.F.R. § 131.3(e).) "'Designated uses' are those uses specified in water quality standards for each water body or segment whether or not they are being attained." (40 C.F.R. § 131(f).) "Water quality criteria" are "expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use." (40 C.F.R. § 131.3(b).) Antidegradation policies generally must provide three levels (tiers) of water quality protection to maintain and protect existing water uses, high quality waters, and outstanding national resource waters, consistent with 40 Code of Federal Regulations section 131.12.

Under the Porter-Cologne Water Quality Control Act (Wat. Code, § 13000 et seq.), California law designates the State Water Board and the nine Regional Water Boards as the principle state agencies for enforcing federal and state water pollution law. (Wat. Code, §§ 13140, 13160, 13225, 13240.) California law defines "designated uses" and "water quality criteria," respectively, as "beneficial uses" and "water quality objectives." (Wat. Code, § 13050, subds. (f), (h).) Regional Water Boards are required to establish water quality control plans for all areas within their regions (Wat. Code, §13240), and those water quality control plans must designate or establish, in part, beneficial uses within the areas governed by that plan. (Wat. Code § 13050, subd. (j).)

3.1.1 Statement of Necessity for a new Beneficial Use Definition

Beneficial uses form the cornerstone of water quality management and protection in California. The Water Boards carry out their water quality protection authority through, among other actions, the adoption of regional water quality control plans (referred to as "Basin Plans" when adopted by the Regional Water Boards). Through these plans, the Water Boards establish

beneficial uses and designate specific waters within their respective regions where the uses apply. (Wat. Code, §§ 13240, 13050, subd. (j).) Once beneficial uses are designated in Basin Plans, water quality objectives can be established and programs that maintain or enhance water quality can be implemented to ensure the reasonable protection of beneficial uses (Wat. Code, § 13241) for surface waters, ground water, marshes, wetlands, and other waters of the state. The federal Clean Water Act allows states to adopt sub-categories of a use and set the appropriate water quality criteria (objective) to reflect the varying needs of such sub-categories of uses. (40 C.F.R. § 131.10(c).) For example water quality criteria should be set to differentiate "fisheries" between cold water and warm water fisheries.

The LREC-1 beneficial use definition recognizes that recreational activity in water may be limited in the waterbody due to physical conditions, such as restricted access and very low water depths. The state has waterbodies that have been channelized, and/or lined with concrete or other materials that protect the channel from erosion and provide flood protection. In some cases, these waterbodies have been fenced to limit human contact with the waterbodies during storm events to protect the public from drowning, while in dry weather the water flow is non-existent or very low. Due to these restrictions, contact with the water is minimal and incidental ingestion is infrequent or unlikely. Under these conditions, the REC-1 beneficial use is not an accurate definition of the beneficial use of the waterbody.

3.2 Bacteria in Fresh Waters

Bacteria associated with fecal contamination can be found in fresh waters of the state. Anthropogenic sources of the bacteria could be from sewage that enters our waters through ineffective or inoperable wastewater treatment plants, from breaks in the sewer collections systems, or overloaded septic tank systems. Other sources may be associated with runoff from livestock operations or wildlife. Each of these sources of bacteria is addressed throughout the programs that are described below.

Traditional point sources such as wastewater treatment plants have NPDES permits that regulate discharges with effluent limits for bacteria. The Clean Water Act and implementing federal regulations require that NPDES permits include effluent limitations to control all pollutants where necessary to meet water quality standards. Pollutants that require effluent limitations include any pollutant that may be discharged at a level that will cause, or have the reasonable potential to cause, or contribute to an excursion above any standard, including both narrative and numeric criteria (40 C.F.R. § 122.44(d)(1)); see Clean Water Act § 301(b)(1)(C).)[6] Thus, current law requires that permits include effluent limits for bacteria whenever the discharge of these pollutants can cause or contribute to violations of an applicable objective.

All Regional Water Boards include numeric effluent limits for bacteria in wastewater NPDES permits, where necessary. However, effluent limits are not always consistent between the regions, and there are no established statewide procedures for calculating effluent limits for these pollutants.

[6] As used above, "section 301" refers to the section number of the Clean Water Act as enacted by Congress. The same section is codified in title 33 of the United States Code in section 1301. The Staff Report shall refer to the sections of the Clean Water Act and not to the corresponding section appearing in title 33.

U.S. EPA's regulations implementing the NPDES permit requirements (40 C.F.R. § 122) require that permit limits for continuous discharges be expressed as maximum daily and average monthly limits, unless infeasible to do so, for all dischargers other than POTWs. Effluent limits in permits for POTWs must be stated, unless impracticable, as average weekly and average monthly limits.

Stormwater runoff is regulated through the Stormwater Program. The regulatory approach for NPDES-permitted storm water discharges vary from that described above. Clean Water Act section 402(p) addresses storm water discharges. In general, permits are required for storm water from industries, construction activities, municipalities, and state and federal facilities. Historically, program efforts focused on controlling pollutants and implementing good management practices, however, the State and Regional Water Boards have learned that programs having more specific permit requirements are generally more comprehensive and effective in controlling storm water pollutions.

California has several storm water regulatory permits:

1) Construction: Projects that disturb one or more acres of soil or that disturb less than one acre but are a part of a large common plan of development, are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity. The permit is based on a project's overall risk and requires measures to prevent erosion and reduce sediment and other pollutants in their discharges.
2) Industrial: Specific industrial activities must use the best technology available to reduce pollutants in their discharges. In addition, they are required to develop both a storm water pollution prevention plan and a way to monitor their progress.
3) Municipal: Large and small municipal sewer system operators must comply with permits that regulate storm water entering their systems under a two phase system. Phase 1 regulates storm water permits for medium (serving between 100,000 and 250,000 people) and large (serving 250,000) municipalities. The second phase regulates smaller municipalities, including non-traditional small operations, such as military bases, public campuses, and prison and hospital complexes.

Runoff from livestock operations is addressed at the Regional Water Board level by nonpoint source Best Management Practices (BMPs) and other methods. The nonpoint source pollution program typically relies on discharger implementation of management practices to control pollution sources. Nonpoint source pollution results from contact between pollutants and land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification. Generally, preventing or minimizing generation of nonpoint source discharges most effectively controls nonpoint source pollution.

In 2004, the State Water Board adopted a Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program. The Policy outlines the five key elements that must be included in a nonpoint source pollution implementation program. One key element is a description of the management practices and other program elements that will be implemented to achieve and maintain water quality standards. The policy also confirms that all discharges or threatened discharges to waters of the state must be regulated by the water boards. The policy

reiterates that the regulatory tools for non-point source discharges are waste discharge requirements (permits), waivers of waste discharger requirements, and prohibitions.

3.3 Bacteria in Ocean Waters

The Bacteria Provisions add a revised enterococci objective to support REC-1 in marine and estuarine water. Beach water quality is measured as part of beach monitoring program. Samples are collected along the shoreline where most of the recreation occurs. Bacterial indicator concentrations in open water are expected to be lower than those near shore because bacteria sources are mainly from the shoreline or upland areas and would be reduced via mixing and dilution in open water areas.

Bacterial water quality studies along the coastal ocean waters have identified likely pathogen sources based on elevated bacteria levels downstream of the freshwater sources listed above. The fact that exceedances of bacterial objectives are higher at some sampling stations during the wet season than the dry season also suggests that wet-weather-specific sources such as stormwater runoff and sanitary sewer overflows are potential sources of pathogens in the ocean. Wastewater treatment plants are another potential source of bacteria to the receiving water through discharge of treated wastewater at a number of offshore locations.

Recreation, in the form of swimming, diving, surfing, and wading, along California's 800 miles of coastline and area waters generates over 150 million day visits and contributes to the state's $42.9 billion annual ocean economy.[7] The following section breaks down the regulatory activities at the six regions that have coastal marine water recreation which occurs primarily at California's many ocean beaches.

California beaches are monitored in accordance with California Law Assembly Bill 411 (Statutes of 1997) the Beach Bathing Water Quality Standards and Public Notification Program (Beach Safety). Under Assembly Bill 411, public health agencies must monitor beaches with 50,000 annual beach visitors and potential sources of fecal pollution at least weekly from April 1 through October 31 for enterococci, fecal coliform, and total coliform. The State Water Board Resolution 20016-0026 approved up to $1.8 million in state funds annually, upon appropriation by Legislature, to implement the Beach Safety Program. The state funds are allocated to 16 county public health agencies to implement the Beach Safety Program during Fiscal Year 2017-2018. In addition to the state funds, the State Water Board administers and distributes Federal Beaches Environmental Assessment and Coastal Health Act (BEACH Act) of 2000 grant funds. The federal funds provide additional support for California's Beach Safety Program. For fiscal year 2017-2018, California received a preliminary allocation of $510,916 of BEACH Act grant funds.

These funds support the Beach Safety Program which monitors beaches along many miles of California shoreline. Samples are collected and analyzed each year for three fecal indicator bacteria at these beaches. The Beach Safety Program is currently administered by the California State Water Board. There are marine coastal areas with REC-1 in six of the nine

[7] Kildow, Judith, and Charles S. Colgan. "California's Ocean Economy." (2005). The National Ocean Economics Program. Web.

Regional Water Boards: North Coast, San Francisco Bay, Central Coast, Los Angeles, Santa Ana, and San Diego. For each region the following monitoring occurs.

The North Coast Region has 71 beaches covering 119 miles of coastline. The Beach Safety Program monitors 19 beaches covering 18 miles of the most visited coastline in the region. The San Francisco Bay Region has 72 beaches covering 85 miles of coastline. The Beach Safety Program monitors 45 beaches covering 46 miles of the most visited coastline in the region. The Central Coast Region also has 109 beaches covering 134 miles of coastline. The Beach Safety Program monitors 45 beaches covering 61 miles of the most visited coastline in the region. The Los Angeles Region has 85 beaches covering 81 miles of coastline. The Beach Safety Program monitors 60 beaches covering 62 miles of the most visited coastline in the state. The Santa Ana Region has 11 beaches covering 101 miles of bays, harbors and coastline. The Beach Safety Program monitors 11 beaches covering 87 miles of the most visited beach sites in the region. The San Diego Region also has 92 beaches covering 150 miles of bays, harbors and coastline. The Beach Safety Program monitors 59 beaches covering 75 miles of the most visited beach sites in the region.

3.4 Existing Bacteria Objectives

The current regulatory limits that are intended to protect human health from the effects of bacteria due to water contact recreation are discussed below. The relationship between these limits and other limits for bacteria in water, such as drinking water guidelines and beach notifications are discussed later in this chapter.

Recreational bacteria standards for the protection of human health have been recommended by U.S. EPA as part of the National Recommended Water Quality Criterion since 1976. The recommendations provided by U.S. EPA were updated in 1986 and again in 2012 based on updated science and epidemiological studies. The U.S. EPA 2012 Recreational Water Quality Criteria notes that either enterococci or *E. coli* can be selected as an indicator for fresh waters, but only enterococci can be selected as an indicatory for marine waters. Additionally, U.S. EPA states that either estimated illness rate (36/1000 recreators or 32/1000 recreators) is protective of REC-1 uses. U.S. EPA 2012 Recreational Water Quality Criteria are intended as guidance to states and tribes in developing criteria to protect swimmers from exposure to water that contains organisms indicating the presence of fecal contamination.

Bacteria in California are currently regulated, in part, through water quality objectives established in the Regional Water Boards' Basin Plans and the Ocean Plan.

Table 5. U.S. EPA 2012 Recreation Water Quality Criteria

Criteria Elements	**Recommendation 1 Estimated Illness Rate (NGI): 36 per 1,000 primary contact recreators**		**OR**	**Recommendation 2 Estimated Illness Rate (NGI): 32 per 1,000 primary contact recreators**	
	Magnitude			**Magnitude**	
Indicator	**GM (cfu/100 mL)[a]**	**STV (cfu/100 mL)[a]**		**GM (cfu/100 mL)[a]**	**STV (cfu/100 mL)[a]**

Enterococci (marine and fresh)	35	130		30	110
OR					
***E. coli* – (fresh)**	126	410		100	320
Duration and Frequency: The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected STV magnitude in the same 30-day interval. NGI = NEEAR – GI illness, NEEAR = National Epidemiological and Environmental Assessment of Recreational Water GM = geometric mean STV = statistical threshold value cfu = colony forming units mL = milliliters					

a U.S. EPA recommends using U.S. EPA Method 1600 (U.S. EPA, 2002a) to measure culturable enterococci, or another equivalent method that measures culturable enterococci and using U.S. EPA Method 1603 (U.S. EPA, 2002b) to measure culturable *E. coli*, or any other equivalent method that measures culturable *E. coli.*

3.4.1 Ocean Plan

The Ocean Plan focuses on the protection of beneficial use and meeting water quality objectives by addressing the discharge of pollutants.

Water-Contact Standards

Both the State Water Board and the CDPH have established standards to protect water contact recreation in coastal waters from bacterial contamination. The State Water Board has adopted bacterial objectives for ocean waters used for REC-1. Currently these reflect the bacteriological Title 17 standards for coastal waters adjacent to public beaches and public water contact sports areas in ocean waters.

State Water Board Water-Contact Standards

For ocean waters the REC-1 standards apply to the area within the zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline. In addition, the REC-1 objectives apply to all kelp beds and other recreational areas designated by the Regional Water Boards. The following bacterial objectives currently apply within these areas throughout the water column:

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

1) Total coliform density shall not exceed 1,000 per 100 mL;
2) Fecal coliform density shall not exceed 200 per 100 mL; and
3) Enterococci density shall not exceed 35 per 100 mL.

Single Sample Maximum:

1) Total coliform density shall not exceed 10,000 per 100 mL;
2) Fecal coliform density shall not exceed 400 per 100 mL;

3) Enterococci density shall not exceed 104 per 100 mL; and
4) Total coliform density shall not exceed 1,000 per 100 mL when the fecal coliform/total coliform ratio exceeds 0.1.

3.4.2 Freshwater Plans and Policies

Currently, there are no statewide objectives for bacteria that apply to freshwater designated for primary contact recreation (REC-1).

3.4.3 Regional Water Quality Control Board Basin Plans

Eight Regional Water Board Basin Plans contain water quality objectives for bacteria to protect the REC-1 beneficial use. However, most are not currently consistent with each other, or with the U.S. EPA 2012 Recreational Water Quality Criteria. The Basin Plan for the Lahontan Regional Water Board contains bacteria indicator water quality objectives that are not associated with the REC-1 beneficial use, although they have been applied for the protection of REC-1. The Bacteria Provisions will, on a statewide basis, provide efficient and consistent implementation without the need for each Regional Water Board to amend their individual Basin Plans. The Bacteria Provisions will establish consistent water quality objectives for bacteria for statewide waters designated with the REC-1 beneficial use.

Table 6 summarizes the numeric bacteria objectives for protection of the REC 1 use applicable to each Region.

Table 6. Water Quality Objectives for Bacteria: Fresh Waters Designated REC-1

Regional Water Board	Indicator Organism	Geometric Mean[a]	Maximum
North Coast (1)	Fecal coliform	50/100 mL[b]	400/100 mL[c]
San Francisco Bay (2)	Fecal coliform	200/100 mL	400/100 mL[d]
	Total coliform	240/100 mL[b]	10,000/100 mL
	Enterococci	35/100 mL	104/100 mL
	E. coli[e]	126/100 mL	235 – 576/100 mL[f]
	Enterococci[e]	33/100 mL	61 – 151/100 mL[f]
Central Coast (3)	Fecal coliform	200/100 mL	400/100 mL[c]
Los Angeles (4)	*E. coli*	126/100 mL	235/100 mL
Central Valley (5)			
• **Sacramento and San Joaquin Basins**	Fecal coliform	200/100 mL	400/100 mL[c]
• **Folsom Lake**	Fecal coliform	100/100 mL	200/100 mL[c]
• **Tulare Lake Basin**	Fecal coliform	200/100 mL	400/100 mL[c]
Lahontan (6)[g,h]	Fecal coliform	20/100 mL[i]	40/100 mL[c]
- Susanville Hydrologic Unit	Fecal coliform	20/100 mL[i]	75/100 mL[c]
Colorado River (7)[j]	*E. coli*	126/100 mL	400/100 mL
	Enterococci	33/100 mL	100/100 mL
	Fecal coliform	200/100 mL	400/100 mL[c]
Santa Ana (8)	Fecal coliform	200/100 mL	
	E. coli	126/100 mL	147 – 374/100 mL[k]
San Diego (9)	Fecal coliform	200/100 mL	400/100 mL[c]
	E. coli[e]	126/100 mL	235 – 576/100 mL[f]
	Enterococci[e]	33/100 mL	61 – 151/100 mL[f]

REC-1 = primary contact recreation designated use
a. Based on at least 5 samples over a 30-day period.
b. Based on median of samples.
c. 10 percent of samples cannot exceed maximum.
d. Based on the 90th percentile value.
e. Included in Basin Plans as supplemental criteria to either fecal coliform or total coliform criteria.
f. Maximum values determined based on frequency and density of recreational use.
g. Basin Plan also contains a narrative objective that states that waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes.
h. The bacteria objectives for Region 6 apply to all waters independent of designated beneficial uses.
i. Based on any number of samples
j. Colorado River has maxima of 235/100mL for *E. coli* and 61/100mL for enterococci.
k. Santa Ana Basin Plan Chapter 5 page 5-106, table for ssv calculation based on activity.

Lahontan Regional Water Board
Chapter 3 of the Lahontan Regional Water Board's Basin Plan states:

> Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes.
>
> The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100ml, nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100ml. *The log mean shall ideally be based on a minimum of not less than five samples collected as evenly spaced as practicable during any 30-day period. However, a log mean concentration exceeding 20/100ml for any 30-day period shall indicate violation of this objective even if fewer than five samples were collected.* (3-4)

These narrative and numeric objectives apply to all surface waters (including wetlands) within the Lahontan Region regardless of the designated beneficial uses for those waters. Consequently, the Bacteria Provisions will not supersede those objectives. However, the Bacteria Provisions would apply to all applicable waters within the Lahontan Region that are designated with the REC-1 beneficial use.

3.5 Existing TMDLs to Implement Bacteria Objectives

The Clean Water Act contains two strategies for managing water quality. One is a technology-based approach that envisions requirements to maintain a minimum level of pollutant management using the best available technology. The other is a water quality-based approach that relies on evaluating the condition of surface waters and setting limitations on the amount of pollution that the water can be exposed to without adversely affecting the beneficial uses of those waters. Section 303(d) of the Clean Water Act bridges these two strategies. Section 303(d) of the Clean Water Act (33 U.S.C. § 1313 (d)) and 40 Code of Federal Regulations. Section 130.7(b) requires states to identify water bodies where technology-based effluent limitations and other required controls fail to meet water quality objectives and are not supporting their beneficial uses (referred to as impaired waters). These substandard or impaired waters are placed on the Clean Water Act section 303(d) List of Water Quality Limited Segments (impaired water bodies).

For waters on this list (and where the U.S. EPA administrator deems they are appropriate) the states are to develop TMDLs. A TMDL must account for all sources of the pollutants that caused the water to be listed. Federal regulations require that the TMDL, at a minimum, account for contributions from point sources (federally permitted discharges) and contributions from nonpoint sources. The TMDL includes a calculation of how much the pollutant loading must be reduced and a plan of action to do so. A TMDL is not fully self-implementing, but serves as an informational tool or goal for the establishment of further pollution controls. Appendix B lists Bacteria TMDLs developed due to impairment to the REC-1 beneficial use. Bacteria TMDLs may need to be updated to be consistent with the Bacteria Provisions as time and workload allow.

3.6 Related Regulatory Actions

For Ocean Waters:
Title 17 has established minimum protective bacteriological standards for coastal waters adjacent to public beaches and for public water-contact sports areas in ocean waters. These standards were adopted in 1999 under Assembly Bill 411. The standards are identical to the objectives currently contained in the Water Quality Control Plan – Ocean Waters of California. When a public beach or public water-contact sports area fails to meet these standards, CDPH or the local public health officer may post warning signs or otherwise restrict use of the public beach or public water-contact sports area until the standards are met. The Title 17 regulations impose more frequent monitoring and more stringent posting and closure requirements on certain high-use public beaches that are located adjacent to a storm drain that flows during the summer.

For beaches not covered under Assembly Bill 411 regulations, CDPH imposes the same standards as contained in Title 17 and requires weekly sampling. However, the county health officer is allowed discretion in making posting and closure decisions.

For Fresh Waters:
Currently, in California there is no statewide policy for establishing effluent limits for indicator bacteria. However, many of the permits for POTWs contain effluent limits for indicator bacteria to protect designated beneficial uses for water contact recreation or agriculture, including irrigation of food crops. The effluent limits are typically more stringent than limits based on existing Basin Plan water quality objectives for bacteria indicators. These guidelines are based on the Title 22 recycled water criteria which includes a degree of treatment representing about a 5-log reduction in the virus content of the water (see Table 4).

Under Title 22, recycled water may be used as a source of supply for either nonrestricted or restricted recreational impoundment. Nonrestricted recreational impoundments are defined as impoundments in which no limitations are imposed on body-contact water recreational activities. DDW recommends that dischargers to REC-1 waters achieve effluent limits comparable to Title 22 water recycling criteria since the receiving waters are analogous to nonrestricted recreational impoundments. DDW recommends that where the dilution ratio is less than 20:1, facilities be required to meet the disinfected 2.2 recycle water criteria, and where the dilution is greater than 20:1 or the discharge can demonstrate that the body contact recreation use is not present when the dilution is less than 20:1, it recommends the disinfected secondary-23 recycle water criteria.

However, the Title 22 recycled water criteria are based on total coliforms; U.S. EPA's current recommendation for bacterial indicators includes only enterococci and *E. coli*. In addition, because *E. coli* is a subset of the total coliform group, the Title 17 *E. coli* standards for making beach closure or recreational water posting decisions in fresh waters (median of 100/100 mL, STV of 320/100 mL) are not as stringent as the total coliform standards for recycled water (median of 2.2 - 23/100 mL, maximum of 23 - 240/100 mL).

3.7 Related Projects or Studies

Introduction
This Staff Report draws on U.S. EPA's 2012 Recreational Water Quality Criteria document. Other studies have been considered in its development and they are listed in the Reference Chapter of this document.

The following studies, workshops, and legislation have also been considered in the development of this Staff Report:

Study: Wet and Dry Weather Beach Epidemiology Studies - Southern California Coastal Water Research Project (SCCWRP)
http://www.sccwrp.org/ResearchAreas/BeachWaterQuality/CaliforniaEpidemiologicalStudies.aspx

Study: Evaluation of Microbial Source Tracking Methods using Mixed Fecal Sources in Aqueous Test Samples
http://ftp.sccwrp.org/pub/download/DOCUMENTS/AnnualReports/2003_04AnnualReport/ar27-griffith_328-337.pdf

Study: The Surfer Health Study: Microbial Water Quality Measurements Supporting a Combined Wet Weather Surfer Epidemiology and QMRA Study in San Diego, CA
http://ftp.sccwrp.org/pub/download/DOCUMENTS/ConferencePresentations/WaterInstituteConf_May2015_Steele.pdf

Study: Alpha-Testing of Rapid Microbiological Methods for Measuring Recreational Water Quality
http://www.sccwrp.org/ResearchAreas/BeachWaterQuality/AlphaTestingOfRapidMethods.aspx

Project: Side-by-Side Beta Testing of Rapid Methods
http://www.sccwrp.org/ResearchAreas/BeachWaterQuality/SideBySideBetaTestingOfRapidMeth

Project: SFEI Central and Northern California Reference Beaches Contract

Workshop: Fecal Source Identification and Associated Risk Assessment Tools
http://www.sccwrp.org/Meetings/Workshops/SourceIdentificationWorkshop.aspx

Legislation: The legislature established a beach monitoring program in 1997 through Assembly Bill 411 (amending Health and Safety Code (HSC) §§ 115880, 115885, and 115915). Assembly Bill 411 requires local health officials to monitor beaches with storm drains that discharge during dry weather and visited by more than 50,000 people per year for bacterial contamination using 3 bacterial indicators at least weekly from April 1 through October 31. Local officials must post beach notifications where bacterial standards are not met. The monitoring provisions are not mandatory in the years the state does not provide sufficient funds for the counties to conduct the monitoring.

Assembly Bill 1946 (2000 – Health and Safety code § 115910) requires that local health officials report beach closures and postings resulting from failure to meet bacterial standards established by DPHS to the State Water Board for monthly online posting and an annual report.

Senate Bill 482 (2011 – amending Health and Safety §§ 115875-115915 and adding § 115881) redirected the responsibility for beach monitoring protocols from CDPH to the State Water Board, but left with CDPH the responsibility to establish minimum standards for the sanitation of public beaches.

4 Geographical Scope

California contains a wide variety of bioregions, from desert environments below sea level, to coastal areas, to alpine areas of 14,000 feet or more in elevation. The diversity of geography in conjunction with variations in temperature and moisture leads to a significant diversity of biological resources. California has the highest total number of species and the highest number of endemic species within its borders as compared with any other state. California also has the highest number of rare species (species typically listed under the federal Endangered Species Act [ESA] or the California ESA), and about one-third of those species are at risk, meaning these species have the potential for local or global extinction.

4.1 Bioregions of California

California is divided geographically into bioregions (CBC 2008), classified by relatively large areas of land or water, which contain characteristic, geographically distinct assemblages of natural communities and species. The biodiversity of flora, fauna, and ecosystems that characterize a bioregion tend to be distinct from that of other bioregions. California is divided into 10 bioregions: Modoc, Klamath/North Coast, Sacramento Valley, Bay Area/Delta, Sierra, San Joaquin Valley, Central Coast, Mojave Desert, South Coast, and Colorado Desert (Figure 1).

4.1.1 Modoc Bioregion (CERES 2011a)

The Modoc Bioregion, an area of stark contrast to the rest of the state, extends across California's northeast corner from Oregon to Nevada, and south to the southern border of Lassen County. From many vantage points, the view to the west is of forests and mountains, while the vista to the east is high desert characteristic of Nevada. Much of this sparsely populated bioregion consists of forests, mountains, high desert, valleys, piney woodlands, and volcanic remains in its natural state.

Location, Cities, and Population

Bounded by Oregon on the north and Nevada on the east, the Modoc bioregion extends westward across the Modoc Plateau, encompassing the Lassen and Modoc national forests. It includes all or part of seven counties: Modoc, and Lassen, and the eastern end of Shasta, Siskiyou and Tehama, northern edges of Butte and Plumas. Because bioregions have only fuzzy lines and can take in portions of several counties, it is difficult to estimate their populations precisely. But the rural nature of the Modoc Bioregion is reflected in the populations of the two counties totally contained within its boundaries: Modoc, 10,700, and Lassen, 29,800. According to 1990 census figures, Modoc has the smallest population of all 10 bioregions, with fewer than 81,000. The largest cities are Alturas, the Modoc County seat; Susanville, the Lassen County seat; Burney in eastern Shasta County, and Maglia in northern Butte County.

Figure 1. California Bioregions

The Northern Paiute and the Paiute-Shoshone tribes are native to this bioregion. Indian reservations include Fort Bidwell, Alturas, Cedarville, Likely, and Lookout Rancherias; and Pit River, all in Modoc County.

Main highways are U.S. Highway 395 and state routes 299, 139, 89, 44, and 36.

Industry
Ranching remains the major agricultural industry, and timber is a significantly large employer.

Climate and Geography
The climate features hot, dry summers and cold, moist winters with snow at higher elevations. Geography is varied in the Modoc Bioregion, with volcanic areas and wetlands to the west and high desert to the east. Lassen Volcanic National Park, which is studded with lakes and crowned by 10,457-foot Lassen Peak; Tule Lake, and Clear Lake National Wildlife Refuges, Ahjumawi Lava Springs State Park, and Lava Beds National Monument are on the western side. The eastern side, which resembles its neighbor, Nevada, has desert alkali lakes, Honey Lake Valley, and Modoc National Wildlife Refuge. The last volcanic activity at Mount Lassen was in 1915.

The bioregion includes Modoc and Lassen National Forests and part of the Klamath National Forest. The largest lakes are Lake Almanor in Plumas County, Eagle Lake in Lassen County, Lower Klamath Lake in Siskiyou County, and Goose Lake in Modoc County. The Pit River flows southwest from the rugged Warner Mountains in eastern Modoc and Lassen counties across the Modoc Plateau and into the Sacramento River.

Plants and Wildlife
Juniper and sagebrush cover much of the eastern side of the Modoc Bioregion, while yellow and Jeffrey pine, white fir, mixed conifer, cedar, and aspen are common in the more mountainous and forested areas to the west. Rare plants include yellow arrowleaf, balsam root, long-haired star tulip, spiny milkwort, Ash Creek ivesia, Raven's lomatium, and woolly stenotus.

Wildlife include bald eagles, antelope, greater sandhill cranes, ospreys, Canada geese, black-crowned night herons, mule deer, muskrats, pronghorn, cinnamon teal, northern pintails, Swainson's hawks, sage grouse, rainbow trout, marmots, hummingbirds, great horned owls, black bears, coyotes, porcupine, Modoc sucker, goshawk, bank swallow, Shasta crayfish, sage grouse, and Lost River sucker.

4.1.2 Klamath/North Coast Bioregion (CERES 2011b)

The Klamath/North Coast Bioregion in California's northwestern corner extends roughly one-quarter of the way down the 1,100-mile coast and east across the Coastal Range and into the Cascades. This bioregion is famous for its rocky coastline, salmon fishing, and lush mountain forests of spectacular ancient redwoods and Douglas fir. Redwood National Park and numerous state parks, rivers, wilderness areas, and four national forests are in this bioregion.

Location, Cities, and Population
Ten counties make up the Klamath/North Coast Bioregion: Del Norte, most of Siskiyou, Humboldt, Trinity, Mendocino, Lake, and the northwestern portions of Shasta, Tehama, Colusa, and Glenn. Its boundaries are the Oregon border on the north, and the southern borders of

Lake and Mendocino counties on the south. Despite the huge area of this bioregion, its population is only about 410,000 according to 1990 census figures. The bioregion extends from the Pacific Coast eastward more than halfway across California to the Modoc Plateau and the Sacramento Valley floor. The Hoopa Valley, Yurok, Karok, Paiute-Shoshone, and Pomo-Kato Indians are native to various parts of this bioregion.

The largest cities are Redding -- a Northern California crossroad on Interstate 5 -- and Eureka, a Humboldt County seaport. Smaller cities include Clearlake, Ukiah, Arcata, Fort Bragg, Yreka, Mendocino, and Crescent City. Main highways are I-5, U.S. 101, and state Highways 36, 299, 96, and 3, which cross mountains and can be steep and winding.

Industry

Along the coast, redwood trees hundreds or thousands of years old are a cherished natural resource and major tourist attraction. These forests are home to the endangered marbled murrelet, a seabird that nests in old-growth, and the threatened northern spotted owl, whose decline prompted severe reductions in federal timber harvest sales to preserve its habitat. Listing of the owl under the federal ESA and other 1990s environmental actions caused economic impacts upon the once-booming timber industry, such as forcing closure of many sawmills and dislocation of workers. Communities once dependent on timber activities are being forced to diversify their economies, and are encouraging the growth of tourism, improving infrastructure, and seeking ways to attract and accommodate new businesses. Cattle ranching, dairy farming, and fishing are popular traditional industries of the bioregion.

Climate and Geography

Much of the Klamath/North Coast Bioregion is covered by forest -- the Klamath, Shasta-Trinity, Six Rivers, and Mendocino National Forests, Jackson State Forest, and private forests, including the famous Headwaters ancient redwood forest in Humboldt County. This mountainous bioregion includes the North Coast Range and the Klamath, Siskiyou, Marble, Salmon, Trinity, and Cascade mountains. The Klamath/North Coast is the state's wettest climate, with rainfall distribution varying widely from an average annual 38 inches at Fort Bragg to 80 or more inches in the King Range National Conservation Area. The coastal climate is cool, moist, and often foggy, with rainy winters at lower elevations and snow in the higher mountains. Inland the climate is drier with low rainfall in winter and hot, dry summers.

Major rivers include the Eel, Trinity, Klamath, Russian, Smith, Salmon, Scott, Mad, and Mattole, which flows into the Pacific Ocean near seismically active Cape Mendocino. Clear Lake, Whiskeytown Lake, Clair Engle, and the western part of Shasta are the largest lakes in the bioregion.

Plants and Wildlife

Vegetation includes mixed conifer habitat of white fir, Douglas fir, ponderosa pine, Sierra lodgepole pine, incense cedar, sugar pine, red pine, Jeffrey pine, mountain hemlock, knobcone pine, western red cedar, red alder, redwood, tanoak, Pacific madrone, and chaparral. Rare plants include Sebastopol meadowfoam, Burke's goldfields, Humboldt Bay owl's clover, Calistoga ceanothus, Baker's navarretia, coast lily, swamp harebell, Tracy's sanicle, Snow Mountain willowherb, marsh checkerbloom, pale yellow stonecrop, Scott Mountain phacelia, McDonald's rock cress, Klamath Mountain buckwheat, Oregon fireweed, Adobe lily, dimorphic snapdragon, Colusa layia, Indian Valley brodiaea, and Stebbins' lewisia.

Wetlands provide places for resting, nesting, feeding and breeding for native and migrating birds and waterfowl. Wildlife in the bioregion includes deer, fox, black bear, mountain lion, California clapper rail, Aleutian Canada geese, Roosevelt elk, osprey, fisher, bank swallow, Coho salmon, king salmon, otis blue butterfly, bald eagle, Point Arena mountain beaver, Swainson's hawk, willow flycatcher, western sandpiper, and Oregon silverspot butterfly. Rare species include northern spotted owl, marbled murrelet, American peregrine falcon, Lotis blue butterfly, Trinity bristle snail, red-legged frog, Siskiyou Mountains salamander, Pacific fisher, Del Norte salamander, Karok Indian snail, wolverine, goshawk, and Chinook salmon.

4.1.3 Sacramento Valley Bioregion (CERES 2011c)

The Sacramento Valley Bioregion, a watershed of the Sierra Nevada, is rich in agriculture, but is also significant as the seat of California's state government. Lying halfway between the Pacific Ocean and the Sierra Nevada, the Sacramento Valley affords convenient travel time to San Francisco and Lake Tahoe. The bioregion encompasses the northern end of the great Central Valley, stretching from Redding to the southeast corner of Sacramento County. Its southern boundary borders the northern edge of the Sacramento-San Joaquin River Delta. Sacramento, the home of California's state Capitol, sits at the confluence of the Sacramento and American Rivers.

Location, Cities, and Population

The broad, flat valley that comprises this bioregion touches nine counties, including all of Sutter, most of Sacramento, and Yolo, and portions of Butte, Colusa, Glenn, Placer, Shasta, Tehama, and Yuba counties. Sacramento, with a population of about 400,000, is the bioregion's largest city and ranks seventh in the state behind Fresno, Long Beach, San Francisco, San Jose, San Diego, and Los Angeles. Other large cities, all smaller than Sacramento, include Redding, Chico, Davis, West Sacramento, and Roseville. More than 1.5 million people inhabit this bioregion, making it the fourth most populous of the 10 bioregions, based on 1990 census figures. The cultural roots of the region date from Native American inhabitants, such as the Wintun Indians, to 19th century settlers who established and worked the farms and ranches.

Two of the state's major interstate highways, I-5, the state's main north-south artery, and transcontinental I-80, intersect in Sacramento. Other main highways include U.S. Highway 50, and State Highways 99, 44, 113, 70, and 20.

Industry

Agriculture and state government are important industries in the Sacramento Valley bioregion, but only three of the counties -- Sutter, Yolo, and Colusa -- rank among California's top 20 agricultural producers. Still, the valley is known for tomatoes, rice, and olives, among other prominent crops produced in the plentiful fields and orchards.

Food canneries, high-technology, and biotechnology play a significant role. The bioregion once had a substantial military presence with three Air Force bases, but downsizing changed the picture, closing Mather, then adding McClellan to the closure list, but sparing Beale. Shipping is important in the port of West Sacramento.

Climate and Geography

The changing of the seasons is more evident in the Sacramento Valley than in the coastal regions to the west. Summer hot spells that drive daytime temperatures into triple digits are

relieved by cooling “Delta breezes” that carry moist air from San Francisco Bay eastward through the Delta and into the Sacramento area. The brief, mild autumn ends when tule fog blankets the valley for much of the winter season from December into February, keeping temperatures chilled. Except during droughts, rainfall is frequent in winter, but snowfall is unusual because temperatures, particularly in the daytime, normally remain well above freezing.

The Sacramento Valley is flat for the most part, but is situated within view of mountains, which are particularly visible on clear days. To the west, the coastal range foothills loom on the horizon, while the snow-capped peaks of the Sierra Nevada can be seen to the east.

The valley's two major rivers -- the Sacramento and American -- carry water that originates in the Sierra Nevada south and west into the Sacramento-San Joaquin River Delta. The Delta supplies water to about two-thirds of California's 32 million residents. Other rivers include the Consumnes -- the largest free-flowing river in the Central Valley -- the lower Feather, Bear, and Yuba Rivers.

Plants and Wildlife

Oak woodlands, riparian forests, vernal pools, freshwater marshes, and grasslands provide the major natural vegetation of the Sacramento Valley Bioregion. The Sacramento Valley is the most prominent wintering site for waterfowl, attracting more than 1.5 million ducks and 750,000 geese to its seasonal marshes along the Pacific Flyway. Species include northern pintails, snow geese, tundra swans, sandhill cranes, mallards, grebes, peregrine falcons, heron, egrets, and hawks. Black-tailed deer, coyotes, river otters, muskrats, beavers, ospreys, bald eagles, salmon, steelhead, and swallowtail butterflies are just some of the wildlife that abounds in this bioregion. Species on the endangered species list include the winter-run Chinook salmon, delta smelt, giant garter snake, and the western yellow-billed cuckoo.

4.1.4 Bay Area/Delta Bioregion (CERES 2011d)

The Bay Area/Delta Bioregion is one of the most populous, encompassing the San Francisco Bay Area and the Sacramento-San Joaquin River Delta. Environmentally, the bioregion is the focus of debate over conflicting demands for the water that flows through the Delta, supplying two-thirds of California's drinking water, irrigating farmland, and sustaining fish and wildlife and their habitat. Under a historic accord in 1994, competing interests initiated a process for working together to “fix” the Delta.

Location, Cities, and Population

The bioregion fans out from San Francisco Bay in a jagged semi-circle that takes in all or part of 12 counties, including the state's top six in family income: Marin, Contra Costa, Santa Clara, Alameda, Solano, San Mateo, as well as the counties of San Francisco, Sonoma, Napa, San Joaquin, and parts of Sacramento, and Yolo. Major cities include San Francisco, Santa Rosa, Oakland, Berkeley, Vallejo, Concord, and San Jose. Though of moderate size, the Bay-Delta Bioregion is the second most populous bioregion, next to the South Coast, with 6.6 million people, based on the 1990 census.

The Bay Area/Delta Bioregion extends from the Pacific Ocean to the Sacramento Valley and San Joaquin Valley bioregions to the northeast and southeast, and a short stretch of the eastern boundary joins the Sierra Bioregion at Amador and Calaveras counties. The bioregion is bounded by the Klamath/North Coast on the north and the Central Coast Bioregion to the south.

Major highways are Interstate 80, which concludes its transcontinental journey in San Francisco, I-280, I-580 and I-680, U.S. 101. State highways include 1, 12, 24, 29, 84, 92, 113, 116, 121, and 128.

Industry

Prominent industries of this bioregion include banking, high-technology and biotechnology, wine-making, fishing, shipping, oil refining, dairy farming, beer brewing, and fruit ranching. The Pacific coastal area of this bioregion features Point Reyes National Seashore, John Muir Woods National Monument, Golden Gate National Recreation Area, and numerous state parks and state beaches.

Climate and Geography

The temperatures in this Mediterranean climate don't vary much year-around. The coast experiences relatively cool, often foggy summers, mild falls, and chilly, rainy winters. Further inland, hot dry summers and warm autumns are followed by mild, wet winters. Snowfall is rare. The bioregion is mostly hilly with low coastal mountains and several peaks rising above 3,000 feet, including Mt. Diablo at 3,849 feet, in a state park. Coastal prairie provides grazing for wild and domestic animals, including dairy cattle.

The bioregion is named for its two major watersheds, San Francisco Bay and the Delta. Major rivers include the Russian, Gualala, Napa, Petaluma, and Alameda, and Putah Creeks. A network of reservoirs and canals comprise the State Water Project delivery system. Lake Berryessa in Napa County is the largest lake.

Plants and Wildlife

The habitats and vegetation of the Bay Area/Delta Bioregion are as varied as the geography. Coastal prairie scrub, mixed hardwoods and valley oaks are found among the rolling hills and mountains that descend to the ocean. Redwoods abound in Santa Cruz County. Coastal salt marsh lies around San Francisco Bay, and freshwater marshes are found in the Delta. Eucalyptus, manzanita, northern coastal scrub, California buttercups, goldfields, and Tiberon mariposa lily also are popular in the bioregion. Rare plants include Marin western flax, Baker's manzanita, Point Reyes checkerbloom, and Sonoma sunshine. Salt and freshwater marshes provide pickleweed, great bulrush, saltbush, and cattail.

Wetlands in the Bay-Delta -- brackish and freshwater -- furnish resting, nesting, feeding and breeding places for birds and waterfowl along the Pacific Flyway. These marshes, rich in biodiversity, are popular and necessary wintering spots for migrating birds.

Birds include canvasback, western grebe, black-crowned night heron, great egret, snowy egret, California brown pelican, white pelican, gull, acorn woodpecker, golden eagle, western bluebird, Caspian tern, American avocet, and cedar waxwing. Marine life includes Chinook salmon, harbor seal, sea lion, leopard shark, and bat ray. Other wildlife includes grey fox, mule deer, bobcat, raccoon, Pacific tree frog, and the swallowtail and painted lady butterfly.

Endangered species include the California least tern, California black rail and clapper rail, Smith's blue butterfly, salt marsh harvest mouse, California freshwater shrimp, northwestern pond turtle, and tidewater goby.

4.1.5 Sierra Bioregion (CERES 2011e)

The Sierra Bioregion is a vast and rugged mountainous area extending some 380 miles along California's eastern side and largely contiguous with Nevada. Named for the Sierra Nevada mountain range it encompasses, the Sierra Bioregion includes magnificent forests, lakes, and rivers that generate much of the state's water supply. It shares Lake Tahoe with Nevada and features eight national forests, three national parks -- Yosemite, Kings Canyon and Sequoia -- numerous state parks, historical sites, wilderness, special recreation and national scenic areas, and mountain peaks, including 14,495-foot Mt. Whitney.

Location, Cities, and Population

Eighteen counties, or their eastern portions, comprise the Sierra Bioregion: Alpine, Amador, Butte, Calaveras, El Dorado, Fresno, Inyo, Kern, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tulare, Tuolumne, and Yuba. The bioregion extends from the northern edge of the Plumas National Forest south to Tejon Pass in the Tehachapi Mountains about 30 miles southeast of Bakersfield. The northern half of the Sierra Bioregion is bordered by the Nevada state line to the east and the Sacramento Valley floor to the west. The southern half of the Sierra extends westward from the Nevada state line and the western edge of the Bureau of Land Management's California Desert Conservation Area to the San Joaquin Valley floor. California's historic Mother Lode region of 19th century Gold Rush fame is in the Sierra Bioregion.

Scattered throughout the mountains are small cities such as Truckee, Placerville, Quincy, Auburn, South Lake Tahoe, and Bishop. The Sierra Nevada Ecosystem Project (SNEP) fixed the Sierra population at 650,000, which is consistent with 1990 census figures.

Major routes for vehicular traffic are Interstate 80, U.S. Highways 50 and 395, and state highways 4, 49, 70, 88, 89, 108, 120, and 178. Some mountain roads at higher elevations are closed in winter because of snow, and highways frequently require chains or snow tires for travel.

Industry

High tech has emerged as a significant industry in the Sierra, introducing satellite, on-line, and computer software companies and stimulating entrepreneurial small businesses. This growing segment of the economy joins staples such as hydropower, tourism and recreation. Other industries include logging, cattle ranching, and -- in the northern Sierra foothills -- apple orchards and wineries.

Climate and Geography

The climate varies with the elevation, offering cold snowy winters and cool summers at higher elevations and rainy winters and mild summers in the foothills. Summers are dry. Snowy winters in the northern Sierra are crucial to California's water supply, which depends heavily upon spring snowmelt to feed the reservoirs of the State Water Project and a portion of the federal Central Valley Project. The projects supply about two-thirds of California's water for drinking, irrigation, and industrial use. Snowfall also is welcomed by the ski industry and a myriad of other businesses that serve and supply skiers. Mild dry mountain summers accommodate outdoor sports and activities, but when high pressure areas push temperatures upward and gusty winds blow, California is vulnerable to wildfires that consume thousands of acres of brush and timber every year.

National forests of the Sierra Bioregion are the Plumas, Tahoe, Sierra, Eldorado, Stanislaus, Sequoia, Inyo, and Toiyabe. Major rivers include the American, Feather, Yuba, Cosumnes, Tuolumne, Merced, San Joaquin, Kern, Owens, Kings, Carson, Truckee, Walker, and Stanislaus. Mono Lake east of Yosemite is famous for its peculiar tufa formations rising from the lake bed.

Plants and Wildlife

The Sierra Bioregion is rich in biodiversity, containing over half the plant species found in California and more than 400 of the state's terrestrial wildlife species, or about two-thirds of the birds and mammals and half the reptiles and amphibians. The variety of habitat types include annual grassland, blue oak savannah, chaparral, ponderosa pine, black oak woodland, mixed conifer, red fir, riparian, alpine meadow, Jeffrey pine, sagebrush, and bitter brush.

Animals that inhabit the Sierra Bioregion include lodgepole chipmunk, mountain beaver, California mountain king snake, black bear, wolverine, California big horn sheep, Pacific fisher, mule deer, and mountain lion. The California Golden Trout -- the state fish -- is native to the Southern Sierra. Birds include the northern goshawk, mountain chickadee, pine grosbeak, California spotted owl, mountain quail, willow flycatcher, bald eagle, and great grey owl.

4.1.6 San Joaquin Valley Bioregion (CERES 2011f)

The San Joaquin Valley Bioregion in the heart of California is the state's top agricultural producing region. The bioregion is bordered on the west by the coastal mountain ranges. Its eastern boundary joins the southern two-thirds of the Sierra bioregion, which features Yosemite, Kings Canyon, and Sequoia National Parks.

Location, Cities, and Population

Eight counties comprise the San Joaquin Valley bioregion, including all of Kings County, most of Fresno, Kern, Merced, and Stanislaus counties, and portions of Madera, San Luis Obispo, and Tulare counties. This growing bioregion, the third most populous out of ten, has an estimated 2 million people, according to 1990 census data. The largest cities are Fresno, Bakersfield, Modesto, and Stockton. Some of California's poorest cities are in Fresno, Kern, and Tulare counties. At its northern end, the San Joaquin Valley bioregion borders the southern end of the Sacramento Valley bioregion. To the west, south, and east, the bioregion extends to the edges of the valley floor. Native people of the bioregion include the Mono and Yokut Indians. Native lands include the Tule River Indian Reservation in Tulare County, Cold Springs Rancheria, and Table Mountain and Big Sandy Reservations in Fresno County, and Santa Rosa Rancheria in Kings County.

Interstate 5 and State Highway 99 are the major north-south roads that run the entire length of the bioregion. Other main routes include State Highways 33, 41, 43, 65, 132, 140, 178, 180, and 198.

Industry

The San Joaquin Valley is California's leading agricultural producing bioregion, and five of its counties -- Fresno, Kern, Tulare, Merced, and Stanislaus-- rank among the state's top 10 counties in farm production value. Oil and gas also are important industries in the San Joaquin bioregion. The deepest wells and about half of the largest oil fields are found in Kern County,

as is the Elkhorn Hills Naval Petroleum Reserve. Lemoore Naval Air Station west of Visalia also is in this bioregion.

Climate and Geography

Well-suited for farming, the bioregion is hot and dry in summer with long, sunny days. Winters are moist and often blanketed with heavy fog. The broad, flat valley is ringed by the Diablo and Coast Ranges on the west and the Sierra Nevada foothills on the east. Habitat includes vernal pools, valley sink scrub and saltbush, freshwater marsh, grasslands, arid plains, orchards, and oak savannah. The growth of agriculture in the Central Valley has converted much of the historic native grassland, woodland, and wetland to farmland.

The major river is the San Joaquin, with tributaries of the lower Stanislaus, Tuolumne, Merced, and Fresno rivers. The California Aqueduct extends the entire length of the bioregion. The southern portion of the bioregion includes the Kings, Kaweah, and Kern rivers, which drain into closed interior basins. No significant rivers or creeks drain into the valley from the Coast Range.

Plants and Wildlife

Historically, millions of acres of wetlands flourished in the bioregion, but stream diversions for irrigation dried all but about 5 percent. Precious remnants of this vanishing habitat are protected in the San Joaquin Valley bioregion in publicly owned parks, reserves, and wildlife areas. Seasonal wetlands are found at the Kern National Wildlife Refuge west of Delano, owned by the U.S. Fish and Wildlife Service. It attracts a variety of ducks, shorebirds, and song birds, as well as peregrine falcons.

The Tule Elk State Reserve west of Bakersfield, owned by the state Department of Parks and Recreation, features the habitat of the tule elk -- natural grassland with ponds and marshes. The reserve sustains four endangered species -- the San Joaquin kit fox, blunt-nosed leopard lizard, San Joaquin antelope squirrel, and Tipton kangaroo rat -- the threatened plant Hoover's woolystar, and other rare species, such as western pond turtles, tricolored blackbird, and northern harrier. Endangered species of the bioregion also include the California tiger salamander, Swainson's hawk, and giant and Fresno kangaroo rat. Other rare species include the western yellow-billed cuckoo and valley elderberry longhorn beetle.

About one-fifth of the state's remaining cottonwood and willow riparian forests are found along the Kern River in the South Fork Wildlife Area. Great blue herons, beavers, coyotes, black bears, mountain lions, red-shouldered hawks, and mule deer can be seen in the wildlife area. Other wildlife viewing sites are Millerton Lake State Recreation Area west of Madera, Little Panoche Wildlife Area near Los Banos, and the Valley Grasslands of Merced County, which attract 500,000 to 1 million birds each winter to lands owned by the state Departments of Fish and Game and Parks and Recreation, Fish and Wildlife Service, and privately. The San Luis Dam and Reservoir area, jointly operated by the state Department of Water Resources and U.S. Bureau of Reclamation, draws wintering bald eagles, abundant ducks, gopher snakes, San Joaquin kit foxes, and black-tailed deer.

Rare plants in the bioregion include Mason's lilaeopsis, San Joaquin woollythreads, and California hibiscus.

4.1.7 Central Coast Bioregion (CERES 1996)

The Central Coast Bioregion features coastal scenery, with a mild, seasonally moist, and sometimes foggy climate that favors rich farmland and vineyards. This highly agricultural region is famous for artichokes, garlic, and an array of fruits and vegetables. Other industries include wine-making, dairy, and cattle ranching. The coast supports a brisk fishing industry, and oil production along the southern end of the bioregion.

Industry

The bioregion extends some 300 miles from just north of Santa Cruz to just south of Santa Barbara, and inland to the floor of the San Joaquin Valley. It encompasses the counties of Santa Cruz, Monterey, San Benito, Santa Barbara, and portions of Los Angeles, San Luis Obispo, Fresno, Merced, Stanislaus, and Ventura. The region includes military installations Fort Ord, Camp Roberts, and Vandenberg Air Force Base. The geography offers coastal mountain ranges including the Santa Lucia and Santa Ynez, and coastal sand dunes. Vegetation includes chaparral, mixed hardwood and redwood forests in the bioregion's northern coastal area, and oak woodlands. The Los Padres National Forest covers much of the southern portion of the bioregion. The Salinas and Cuyama rivers feed the bioregion's two major watersheds.

4.1.8 Mojave Desert Bioregion (CERES 2011g)

The Mojave Bioregion is one of California's largest bioregions and a desert showcase. The eastern boundary is contiguous with the borders of Nevada and Arizona. To the north and west, the Mojave borders the Sierra bioregion, and to the south, it is bounded by the South Coast and Colorado Desert bioregions.

Location, Cities, and Population

Seven counties make up the Mojave bioregion: nearly all of San Bernardino, most of Inyo, the southeastern tips of Mono and Tulare, the eastern end of Kern, northeastern desert area of Los Angeles, and a piece of northern-central Riverside County. The largest cities are Palmdale -- one of California's fastest-growing communities -- Victorville, Hesperia, Ridgecrest, and Barstow. The Mojave Bioregion, historically a sparsely populated expanse of desert, had nearly 612,000 people as of the 1990 census, but is growing rapidly, as urban congestion and housing costs push people farther into the open areas.

Native Americans lands in the Mojave bioregion include the Chemehuevi Indian Reservation on the Colorado River, Twenty-nine Palms Indian Reservation, Fort Mojave Indian Reservation, and Fort Mojave Trust Lands, which both straddle the California-Nevada border.

Industry

The Mojave bioregion is the home of three national parks—Death Valley, East Mojave, and Joshua Tree—under the National Park Service. The state Department of Parks and Recreation manages the Providence Mountains State Recreational Area near Goffs in eastern San Bernardino County, and the U.S. Fish and Wildlife Service operates Havasu National Wildlife Refuge on the Colorado River near Lake Havasu.

Military installations include Edwards Air Force Base in Kern, Los Angeles, and San Bernardino counties; Twenty-nine Palms Marine Corps Air Ground Combat Center, Fort Irwin Military Reservation, Inyokern Naval Ordnance Test Station, and China Lake U.S. Naval Ordnance Test Station in San Bernardino, Inyo, and the eastern end of Kern counties. Much of the desert is under the U.S. Bureau of Land Management, which manages the Desert Tortoise Natural Area

northeast of Palmdale, and Harper Lake near Barstow. The BLM has created a multi-agency, multi-species plan for the desert that designates certain areas for habitat, multiple uses, and development. It is designed to conserve habitat, foster economic development, and streamline the permitting process for development.

Major highways in the bioregion are Interstates 15, 40, U.S. Highway 395, and State Highways 18, 58, 62, and 127, and 247.

Mining -- including lucrative gold mining -- is a major industry in the Mojave bioregion. Off-road vehicle riding is a popular sport in the desert, which offers many trails across the plains and through the scrub. Ranching and livestock grazing are significant economic interests in this bioregion.

Climate and Geography

The Mojave bioregion is the western extension of a vast desert that covers Southern Nevada, the southwestern tip of Utah, and 25 million acres of Southern California -- one quarter of the state. The climate is hot and dry in summer. Winters are cool to cold, depending on the elevation, with occasional rainstorms that can quickly turn a gulch or dry lake into a flash flood zone.

The landscape is mostly moderately high plateau with elevations averaging 2,000 to 3,000 feet and isolated peaks that exceed 6,000 and 7,000 feet. Though appearing barren and remote, the desert teems with biodiversity, and more than 90 percent is within three miles of a paved road or off-road vehicle track.

Palm oases provide water for wildlife, as do many streams and springs. In prehistoric times, the bioregion contained great desert lakes, which have long since evaporated and seeped underground. This bioregion has the lowest elevation in North America, 282 feet below sea level in Death Valley National Park. The Mojave, Amargosa, and Colorado Rivers are the largest rivers in this mostly arid bioregion.

Plants and Wildlife

Common habitats of the Mojave bioregion are: desert wash, Mojave creosote bush, scattered desert saltbush, Joshua tree scrub, alkali scrub, palm oasis, juniper-pinyon woodland, and some hardwood and conifer forests at higher elevations. Cottonwood willow riparian forest is rare habitat in this bioregion, as is alkali marsh and open sandy dunes.

Rare animals include the Mohave ground squirrel, prairie falcon, Le Conte's thrasher, Nelson's bighorn sheep, gray vireo, desert tortoise, pale big-eared bat, Amargosa vole, and Mohave tui chub, an olive-brown and silver fish, and the cottontail marsh pupfish, found only in Death Valley National Park. Parks and recreation areas that provide water are the home of snowy plovers, least sandpipers, killdeer, white pelicans, teal, and thousands of migratory wading shore birds, as well as eagles, harriers, falcons, owls, coyotes, badgers, great blue herons, least Bell's vireos, red-tailed hawks, and Canada geese.

Rare plants include white bear poppy, Barstow woolly sunflower, alkali mariposa lily, Red Rock poppy, Mojave monkeyflower, and Stephen's beardtongue.

4.1.9 Colorado Desert Bioregion (CERES 2011h)

The Colorado Desert Bioregion in the southeastern corner of California extends from the Mexican border north to San Bernardino County and the southern edge of the Joshua Tree National Park, east to the Colorado River and Arizona, and west into Riverside and San Diego counties. This agriculturally rich bioregion is semi-arid, but heavily irrigated.

Location, Cities, and Population

With a population of about 375,000, according to 1990 census figures, the Colorado Desert is the second least populous of the ten bioregions. Only the Modoc Bioregion has fewer people. The bioregion encompasses all of Imperial County, the southeastern portion of Riverside County, the eastern end of San Bernardino County, and the eastern portion of San Diego County. Its most prominent cities are Palm Springs, Rancho Mirage, El Centro, and the smaller, but landmark communities of Blythe, Coachella, and Calexico. The bioregion is home to the Fort Yuma Indian Reservation in Imperial County and Arizona, the Colorado River Indian Reservation in Riverside County, and the Campo and Manzanita Indian Reservations in San Diego County. Imperial County has the state's lowest median family income.

Major highways are Interstate 10 in Riverside County, Interstate 8 in Imperial and San Diego counties, and State Highways 111 and 115 in Imperial County.

Industry

Imperial County is one of California's top-ranking agricultural counties and a producer of cotton. Military installations include the Chocolate Mountains Naval Aerial Gunnery Range and the Naval Desert Test Range.

Climate and Geography

The Colorado Desert is the western extension of the Sonoran desert that covers southern Arizona and northwestern Mexico. It is a desert of much lower elevation than the Mojave Desert to the north, and much of the land lies below 1,000 feet elevation. Mountain peaks rarely exceed 3,000 feet. Common habitat includes sandy desert, scrub, palm oasis, and desert wash. Summers are hot and dry, and winters are cool and moist.

The Colorado River flows along the entire eastern boundary of the Colorado Desert bioregion on its way to Yuma, Ariz., where the two states and Mexico come together. The only other river of significant size in this bioregion is the polluted New River, which flows from Mexico into the Salton Sea, the region's largest body of water, on the border of Imperial and Riverside counties. The Salton Sea was created in 1905 when the Colorado River broke through an irrigation project and flooded a saline lake bed, creating an inland sea, which now lies about 235 feet below sea level and is some 35 miles long and 15 miles wide.

Anza Borrego Desert State Park, located mostly in eastern San Diego County, but jutting into Imperial County, is the bioregion's largest recreation area, covering 600,000 acres. It offers more than 225 bird species and dozens of mammals, amphibians, and reptiles. Bighorn sheep can be seen there, as well as thrashers and owls.

Plants and Wildlife

Other species in the Colorado Desert are Yuma antelope ground squirrels, white-winged doves, muskrats, southern mule deer, coyotes, bobcats, and raccoons. Rare animals include desert

pupfish, flat-tailed horned lizard, prairie falcon, Andrew's dune scarab beetle, Coachella Valley fringe-toed lizard, Le Conte's thrasher, black-tailed gnatcatcher, and California leaf-nosed bat.

Rare plants include Orcutt's woody aster, Orocopia sage, foxtail cactus, Coachella Valley milk vetch, and crown of thorns.

Picacho State Recreation Area on the Arizona border, operated by the state Department of Parks and Recreation, offers boat rides on the Colorado River from which can be seen migratory cormorants, mergansers, white pelicans, and wintering bald eagles. Trails into the rugged backcountry lead to the habitat of desert bighorn sheep, feral burros, golden eagles, and nesting prairie falcons.

The Salton Sea National Wildlife Refuge features open water, salt marshes, freshwater ponds, and desert scrub, which attract nearly 400 bird species, including great roadrunners, Gambel's quail, Albert's towhees, endangered Yuma clapper rails, egrets, plovers, northern pintails, Canada geese, snow geese, rough-legged hawks, peregrine falcon, terns, yellow-headed blackbirds, hooded orioles, and white-faced ibises. The refuge is operated by the state Departments of Fish and Game and Parks and Recreation, and the U.S. Fish and Wildlife Service.

Dos Palmas Preserve, near Indio, owned by the U.S. Bureau of Land Management, offers a lush desert oasis with a restored wetlands that accommodates endangered desert pupfish. The preserve attracts an array of wildlife, such as hooded orioles, warblers, snowy egrets, ospreys, American avocets, and horned lizards. The western fringe of the Imperial National Wildlife Refuge, located mostly in Arizona, is also in this bioregion.

4.1.10 South Coast Bioregion (CERES 2011i)

The South Coast Bioregion is an area of starkly contrasting landscapes ranging from rugged coastal mountains, world-famous beaches, rustic canyons, rolling hills, and densely populated cities. The bioregion extends from the southern half of Ventura County to the Mexican Border and east to the edge of the Mojave Desert. Two of California's largest metropolitan areas -- Los Angeles and San Diego -- are in this bioregion.

Location, Cities, and Population

Bounded on the north by the southern end of the Los Padres National Forest, the bioregion extends some 200 miles south to Mexico, east to the Mojave Desert and west to the Pacific Ocean. The bioregion encompasses all or part of six counties: the coastal half of Ventura County, all of Orange County, most of Los Angeles County, the southwestern edge of San Bernardino County, the western end of Riverside County, and the western two-thirds of San Diego County. Major cities include Los Angeles, San Diego, Long Beach, Santa Ana, Anaheim, Riverside, and San Bernardino. The South Coast, home to two of the state's largest cities, is the most populous bioregion with more than 19.5 million people, according to 2010 census figures.

Metropolitan Los Angeles, a major transportation hub, is crisscrossed by a network of freeways that have names as well as numbers. For example, Interstate 5, California's main north-south highway, is known in different segments as the Golden State Freeway, the Santa Ana Freeway,

and the San Diego Freeway. Other major routes are Interstates, 8, 10, 15, 110, 210, 405, 605, and 805, U.S. 101, and State Highways 1 (the Pacific Coast Highway), 57, 60, 74, 76, 78, 91, 118, and 126.

As in much of California, the people of the South Coast bioregion reflect the state's cultural history. The Native American population includes many bands of Mission Indians, and the Spanish and Mexican heritage is evident in architecture, geographic names, and a large Spanish-speaking population. Rapid growth, employment opportunity, and a mild, mostly dry climate has attracted immigrants from all over the world, particularly in metropolitan Los Angeles.

Industry

Major industries include oil, agriculture, fishing, shipping, movies and television, banking and finance, computers, and aerospace, which has declined with the ending of the Cold War. Military installations include Camp Pendleton Marine Corps Base, the former El Toro Marine Corps Air Station, March Air Force Base, Miramar Naval Air Station, North Island Naval Air Station, and Point Mugu Naval Pacific Missile Test Center.

Climate and Geography

The year-round mild climate and varied geographical features of the South Coast contribute to its great popularity. Hot dry summers with predictable wildfires are followed by wet winters with storms that can trigger mudslides on fire-denuded slopes. Smog remains a serious problem in the South Coast bioregion, particularly the Los Angeles basin, but air quality regulations have helped to control it.

The South Coast bioregion is a study in contrasts -- ocean and desert, flatlands and mountains, including 11,500-foot San Gorgonio Peak in Riverside County. Major rivers and their watersheds are: the Santa Clara, Los Angeles, Santa Ana, San Gabriel, San Luis Rey, San Jacinto, Santa Margarita, and San Diego. Publicly owned or managed lands include four national forests: the Angeles, Los Padres, Cleveland, and San Bernardino; numerous parks, state beaches, historic parks; and federal wilderness, recreation and wildlife areas, including Malibu Creek and Point Mugu State Parks, Bolsa Chica Ecological Reserve, Torrey Pines State Reserve, and Sweetwater and Tijuana National Wildlife Refuges. In San Diego, Orange and Riverside counties, the state's Natural Community Conservation Planning pilot program involving local, state, and federal partners is helping to protect the coastal sage scrub habitat of the threatened California gnatcatcher. In the Santa Monica Mountains, the National Park Service, Santa Monica Mountains Conservancy, and state Department of Parks and Recreation are helping to preserve spectacular habitat. In Ventura County, endangered California condors are protected at the Sespe Condor Sanctuary.

Plants and Wildlife

Tremendous urbanization in the South Coast bioregion has brought about the most intense effects on natural resources of any bioregion, resulting in alteration and destruction of habitat and proliferation of exotic or non-native species. In fact, the popular palm tree is not native to the Golden State. Habitat varies widely, from chaparral, juniper-pinyon woodland, and grasslands at lower elevations to mixed hardwood forest, southern oak, southern Jeffrey pine and southern yellow pine at higher levels. Along the coast, where real estate is especially prized, salt marshes and lagoons no longer are common habitat. But efforts are underway from Ventura County to the Mexican border to preserve and restore coastal wetlands.

The bioregion is home to mountain lions, coyotes, badgers, grey foxes, kit foxes, black bears, raccoons, mule deer, hawks, herons, golden eagles, ospreys, peregrine falcons, desert iguanas, dolphins, whales, endangered brown pelicans, and California sea lions. Rare animals include the Stephen's kangaroo rat, monarch butterfly, San Diego horned lizard, Peninsula desert bighorn sheep, orange-throated whiptail, California least tern, Belding's savannah sparrow, least Bell's vireo, Santa Ana sucker, arroyo southwestern toad and Tehachapi pocket mouse.

Rare plants include San Diego barrel cactus, Conejo buckwheat, Plummer's mariposa lily, mountain springs bush lupine, Otay tarplant, Laguna Mountains jewel flower, San Jacinto prickly phlox, and Mt. Gleason Indian paintbrush.

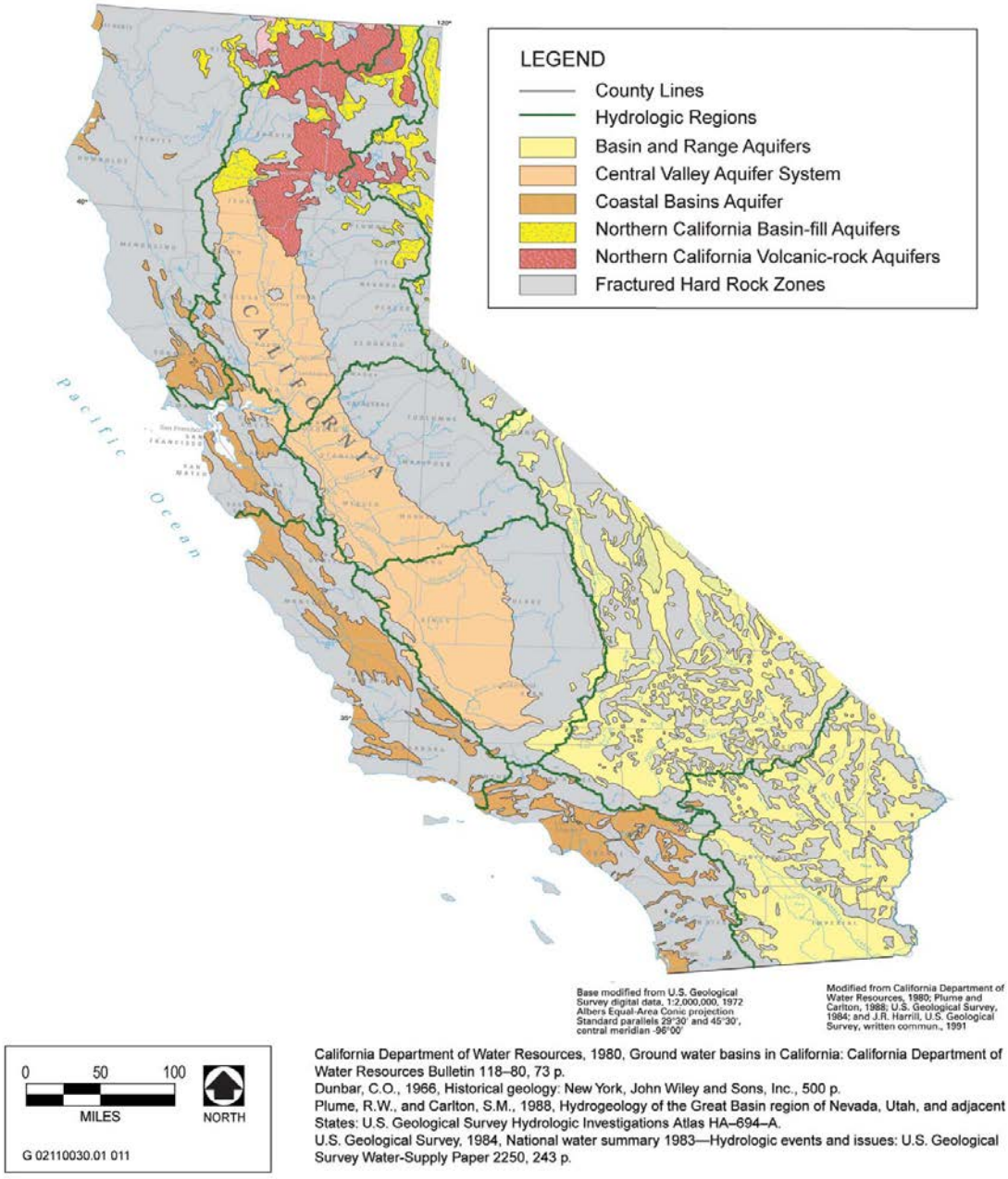
4.2 Hydrologic Regions of California

Hydrologists divide California into 10 hydrologic regions (CalWater 1999) (Figure 2). The regional water boards are defined (for the most part) by the boundaries of these hydrologic regions, as described in Water Code section 13200. Hydrologic regions are further divided into hydrologic units, hydrologic areas, and hydrologic subareas.

4.2.1 North Coast Hydrologic Region

The North Coast hydrologic region covers approximately 12.46 million acres (19,470 square miles) and encompasses the counties of Siskiyou, Del Norte, Trinity, Humboldt, Mendocino, Sonoma, and small areas of Marin. The region, extending from the Oregon border south to

Figure 2. California Hydrologic Regions and Aquifers



California Department of Water Resources, 1980, Ground water basins in California: California Department of Water Resources Bulletin 118–80, 73 p.
Dunbar, C.O., 1966, Historical geology: New York, John Wiley and Sons, Inc., 500 p.
Plume, R.W., and Carlton, S.M., 1988, Hydrogeology of the Great Basin region of Nevada, Utah, and adjacent States: U.S. Geological Survey Hydrologic Investigations Atlas HA–694–A.
U.S. Geological Survey, 1984, National water summary 1983—Hydrologic events and issues: U.S. Geological Survey Water-Supply Paper 2250, 243 p.

Tomales Bay, includes portions of four geomorphic provinces—the northern Coast Range, the Mad River drainage, the Klamath Mountains, and the coastal mountains. The majority of the

population is located along the Pacific Coast and in the inland valleys north of the San Francisco Bay Area. The northern mountainous portion of the region is rural and sparsely populated, and most of the area is heavily forested. A majority of the surface water in the North Coast hydrologic region is committed to environmental uses because of the "wild and scenic" designation of most of the region's rivers. Average annual precipitation in this hydrologic region ranges from 100 inches in the Smith River drainage to 29 inches in the Santa Rosa area.

Water bodies that provide municipal water include the Smith, Mad, and Russian Rivers. Areas providing agricultural water are more widespread than those for domestic, municipal and industrial use, as they occur in all of the hydrologic units within the region. Many of the smaller communities and rural areas are generally supplied by small local surface water and groundwater systems. Water recreation occurs in all hydrologic units on both fresh and salt water, attracting over 10 million people annually. Coastal areas receiving the greatest recreational use are the ocean beaches, the lower reaches of rivers draining to the ocean, and Humboldt and Bodega Bays. The Russian, Eel, Mad, Smith, Trinity, and Navarro Rivers and Redwood Creek provide the most freshwater recreational use.

Groundwater aquifers in the northeastern portion of the North Coast hydrologic region consist primarily of volcanic rock aquifers and some basin-fill aquifers. Coastal basin aquifers are predominantly found in the southern portion of this hydrologic region and along the northern coast. In general, though, a large percentage of this region is underlain by fractured hard rock zones that may contain localized sources of groundwater.

4.2.2 San Francisco Bay Hydrologic Region

The San Francisco Bay hydrologic region covers approximately 2.88 million acres (4,500 square miles) and encompasses the county and city of San Francisco and portions of Marin, Sonoma, Napa, Solano, San Mateo, Santa Clara, Contra Costa, and Alameda. Significant geographic features include the Santa Clara, Napa, Sonoma, Petaluma, Suisun-Fairfield, and Livermore valleys; the Marin and San Francisco peninsulas; San Francisco, Suisun, and San Pablo bays; and the Santa Cruz Mountains, Diablo Range, Bolinas Ridge, and Vaca Mountains of the Coast Range. Major rivers in this hydrologic region include the Napa and Petaluma, which drain to San Francisco Bay. Although this is the smallest hydrologic region in the state, it contains the second largest human population.

Coastal basin aquifers are the primary type of aquifer system in this region. They can be found along the perimeter of San Francisco Bay extending southeast into the Santa Clara Valley, as well as in the Livermore Valley. The northeastern portion of this region, which includes the eastern Sacramento–San Joaquin Delta, is underlain by a portion of the Central Valley aquifer system. The remaining areas in this region are underlain by fractured hard rock zones.

4.2.3 Central Coast Hydrologic Region

The Central Coast hydrologic region covers approximately 7.22 million acres (11,300 square miles) in central California, and includes all of Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara Counties, most of San Benito County, and parts of San Mateo, Santa Clara, and Ventura Counties. Groundwater is the primary source of water in the region, accounting for approximately 75 percent of the annual supply. Most of the freshwater in this region is found in coastal basin aquifers, with localized sources of groundwater also occurring in fractured hard rock zones throughout the region.

4.2.4 South Coast Hydrologic Region

The South Coast hydrologic region includes all of Orange County; most of San Diego and Los Angeles Counties; parts of Riverside, San Bernardino, and Ventura Counties; and a small portion of Kern and Santa Barbara Counties. Because it is the most populous area of the state, it is divided into three water quality control regions. Los Angeles Regional Water Board, encompasses portions of Ventura and Los Angeles counties. Santa Ana Regional Water Board encompasses portions of San Bernardino, Riverside, and Orange Counties. San Diego Regional Water Board encompasses portions of Orange, Riverside, and San Bernardino Counties. Approximately half of California's population, or about 17 million people, live within the boundaries of the South Coast hydrologic region. This, combined with its comparatively small surface area of approximately 6.78 million acres (10,600 square miles) gives it the highest population density of any hydrologic region in California. Major population centers include the metropolitan areas surrounding Ventura, Los Angeles, San Diego, San Bernardino, Orange County, and Riverside. Water use efficiency measures and water recycling efforts play a significant role in addressing increasing water use from population growth.

Groundwater is what supplies approximately 23 percnt of the region's water in normal years and about 29 percent in drought years. Like the Central Coast hydrologic region, the majority of aquifers in this region are coastal basin aquifers. In the eastern central portion of the region includes lies a small section of basin and range aquifer and the remainder of the region is comprises fractured hard rock zones.

4.2.5 Central Valley Hydrologic Region

The Central Valley hydrologic region is the largest in California, and encompasses the three subregions described below.

4.2.5.1 Sacramento River Hydrologic Subregion

The Sacramento River hydrologic subregion, which corresponds to roughly the northern third of the Central Valley Regional Water Board, covers 27,246 square miles and includes all or a portion of 20 predominately rural northern California counties. The subregion extends from the crest of the Sierra Nevada in the east to the summit of the Coast Range in the west, and from the Oregon border north downstream to the Sacramento–San Joaquin River Delta (Delta). It includes the entire drainage area of the Sacramento River, the largest river in California, and its tributaries.

Groundwater in the northern half of this hydrologic subregion is, for the most part, contained in volcanic rock aquifers and some basin-fill aquifers. The southwestern half of this subregion is underlain by part of the Central Valley aquifer system. The remaining areas that comprise the southeastern half of the subregion and portions of the northern half of the subregion are underlain by fractured hard rock zones. Surface water quality in this hydrologic subregion is generally good. Groundwater quality in the Sacramento River subregion is also generally good, although there are localized problems.

4.2.5.2 San Joaquin River Hydrologic Subregion

The San Joaquin River hydrologic subregion is bordered on the east by the Sierra Nevada and on the west by the coastal mountains of the Diablo Range, and extends from the southern boundaries of the Delta to the northern edge of the San Joaquin River in Madera. It consists of

the drainage area of the San Joaquin River, which at approximately 300 miles long is one of California's longest rivers. The San Joaquin River hydrologic subregion, which corresponds to roughly the middle third of the Central Valley Regional Water Board, covers approximately 9.7 million acres (15,200 square miles). Roughly half of the Delta is within this hydrologic region, which extends south from just below the northeastern corner of Sacramento County and east to include the southern third of El Dorado County, almost all of Amador County, all of Calaveras, Mariposa, Madera, Merced, Stanislaus, and Tuolumne counties, the western slope of Alpine County, and the portions of the Delta in Contra Costa, Alameda, and San Joaquin Counties.

A portion of the Central Valley aquifer system underlies nearly all of the eastern half of this subregion, while the western half of this subregion consists of fractured hard rock zones. The groundwater quality throughout this hydrologic region is generally good and usable for most urban and agricultural uses, although localized problems occur.

4.2.5.3 Tulare Lake Hydrologic Subregion

The Tulare Lake hydrologic subregion is located in the southern end of the San Joaquin Valley, and includes all of Tulare and Kings Counties and most of Fresno and Kern Counties. Major cities include Fresno, Bakersfield, and Visalia. The region, which corresponds to approximately the southern third of the Central Valley Regional Water Board, covers approximately 10.9 million acres (17,000 square miles). A small area at the southern end of this region is underlain by basin and range aquifers, while a majority of the western half is underlain by a portion of the Central Valley aquifer system The eastern half, once again, consists of fractured hard rock zones.

4.2.6 Lahontan Hydrologic Region

The Lahontan hydrologic region encompasses two subregions: the North Lahontan, extending north from the Oregon border near Mono Lake on the east side of the Sierra, and the South Lahontan, extending south to the crest of the San Gabriel and San Bernardino mountains and the divide between watersheds draining south toward the Colorado River and those draining northward.

4.2.6.1 North Lahontan Hydrologic Subregion

The North Lahontan hydrologic subregion extends south from the Oregon border approximately 270 miles to the South Lahontan region. Extending east to the Nevada border, it consists of the western edge of the Great Basin, and water in the region drains eastward toward Nevada. Groundwater in the northern half of this subregion is primarily contained in basin-fill and volcanic rock aquifers, with some fractured hard rock zones. The southern half of this region is dominated by fractured hard rock zones, but small segments of basin and range aquifers also exist in this part of the subregion. The subregion, corresponding to approximately the northern half of the Lahontan Regional Water Board, covers approximately 3.91 million acres (6,110 square miles) and includes portions of Modoc, Lassen, Sierra, Nevada, Placer, El Dorado, Alpine, Mono, and Tuolumne Counties.

In general, the water quality in the North Lahontan hydrologic region is good. In basins in the northern portion of the region, groundwater quality is widely variable. The groundwater quality along these basin margins tends to be of higher quality, but the potential for future groundwater pollution exists in urban and suburban areas where single-family septic systems have been

installed, especially in hard rock areas. Groundwater quality in the alpine basins ranges from good to excellent.

4.2.6.2 South Lahontan Hydrologic Subregion

The South Lahontan hydrologic subregion in eastern California, which includes approximately 21 percent of the state, covers approximately 21.2 million acres (33,100 square miles). This region contains both the highest (Mount Whitney) and lowest (Death Valley) surface elevations of the contiguous United States. It is bounded on the west by the crest of the Sierra Nevada and on the north by the watershed divide between Mono Lake and East Walker River drainages; on the east by Nevada and the south by the crest of the San Gabriel and San Bernardino mountains and the divide between watersheds draining south toward the Colorado River and those draining northward. The subregion includes all of Inyo County and parts of Mono, San Bernardino, Kern, and Los Angeles Counties.

This subregion contains numerous basin and range aquifers, separated by fractured hard rock zones. Although the quantity of surface water is limited in the South Lahontan hydrologic subregion, the quality is very good, being greatly influenced by snowmelt from the eastern Sierra Nevada. However at lower elevations, groundwater and surface water quality can be degraded, both naturally from geothermal activity, and as a result of human-induced activities. Drinking water standards are most often exceeded for TDS, fluoride, and boron content.

Groundwater near the edges of valleys generally contains lower TDS content than water beneath the central part of the valleys or near dry lakes.

4.2.7 Colorado River Hydrologic Region

The southeast portion of California consists of the Colorado River hydrologic region, which contains 12 percent of the state's land area. The Colorado River forms most of the region's eastern boundary except for a portion of Nevada at the northeast, and extends south to the Mexican border. The region includes all of Imperial County, approximately the eastern one-fourth of San Diego County, the eastern two-thirds of Riverside County, and the southeastern one-third of San Bernardino County. It includes a large portion of the Mojave Desert and has variable arid desert terrain that includes many bowl-shaped valleys, broad alluvial fans, sandy washes, and hills and mountains. Aquifers in this region are nearly all of the basin and range type.

4.3 Marine Ecosystems in California and Sensitive Habitats

California's marine ecosystem is diverse and contains sensitive habitats that may require special consideration of protection. Sensitive habitats are ecosystems that support high-value organisms, species diversity, and ecosystem complexity. Sensitive marine habitats that should be considered prior to siting a desalination facility include: kelp beds, eelgrass beds, surfgrass beds, rocky reefs, oyster beds, market squid nurseries, and foraging grounds and reproductive habitat for state and federally managed species. These biologically diverse habitats provide habitat for larval recruitment, settlement, and development. (Moyle and Cech 2004; Allen and Horn 2006) Sensitive habitats are also important areas for feeding, reproduction, and protection from predation.

4.3.1 Kelp beds

Kelp beds are common in areas with rocky substrates because kelp often attaches to hard substrates. Kelp reproduces by releasing spores into the water column that are carried by currents before the spores settle to the bottom and geminate. Giant kelp, Macrocystis pyrifera, releases spores continuously from spring to fall in California's coastal waters. The spores differentiate into sperm and eggs and fertilization occurs in the water column. Many of the spores, sperm, and eggs become food for other organisms in the marine food web. The planktonic reproductive life stages of kelp are at risk of entrainment in surface water systems. Fertilized eggs that avoid predation and entrainment, and settle on suitable substrate develop into the adult organisms that make up kelp beds.

Kelp beds can extend for miles along the coastline and form habitats that function similar to terrestrial rainforests in terms of their biological productivity and support of species diversity. Kelp beds are aggregations of marine algae of the order Laminariales, including species in the genera Macrocystis, Nereocystis, and Pelagophycus. Kelp beds include the total foliage canopy throughout the water column and provide vertical stratification similar to trees in a rainforest. Kelp beds provide structurally complex habitat that supports a diversity and abundance of invertebrates, fish, and mammals. Invertebrates and fish differentially utilize the holdfast (attaches kelp to substrate), thallus (body of the kelp), and kelp canopy (upper fronds) as shelter. For example, kelp perch (Brachyistyus frenatus) will often hide in the kelp fronds or canopy to feed on crustaceans and avoid predation, whereas the holdfast typically shelters crabs, brittle stars, worms and other invertebrates. (Moyle and Cech 2004) Disturbances to kelp beds, including complete or partial removal, can result in reductions in fish abundance and community composition in temperate regions. (O'Connor and Anderson 2010)

Kelp beds also provide habitat for rare and endangered species including white abalone, black abalone, giant black sea bass, and the Southern sea otter. The Southern sea otter and fish such as the California sheephead (Semicossyphus pulcher) are critical to the health of the kelp beds because they feed on purple urchins (Stronglyocentrotus purpuratus) that graze on the holdfasts of kelp. In the absence of predation by species like the California sheephead, urchin populations can increase to the point where they can graze an entire kelp bed to the point of creating urchin barrens, or areas where there are numerous urchins but no kelp. (Tegner et al. 2007)

In addition to the ecological function of kelp beds, aggregations of kelp have been shown to reduce wave energy, trap sediment, and reduce coastal erosion. The kelp canopy is also valuable from an economic standpoint because it can be harvested for algin or direct human consumption. Algin is an emulsifying and thickening agent that is used in a wide range of products including: cosmetics, shampoo, food additives (e.g. in ice cream, jelly, and salad dressing), medicine tablets, toothpaste, dental molds, paint, and textile dyes. (Bedolfe 2012; Reish 1995)

4.3.2 Surfgrass and Eelgrass Beds

Surfgrass and eelgrass beds are home to a diverse invertebrate ecosystem and provide habitat for larval and juvenile fish and crustacean species, as well as octopuses. Eelgrass and surfgrass beds provide foraging habitat and shelter from predation for many species including, California spiny lobster, halibut, and rockfish and other commercially and recreationally valuable fish. (Jones et al. 2013) The size and quality of a seagrass bed has been linked to species abundance, species density, individual growth, and mortality. (Gorman et al. 2009) Seagrass

beds are critical near shore habitats for a variety of species because the beds serve as nursery grounds for many invertebrates and fishes. (Larkum et al. 2006) Additionally, the sea grasses are highly productive and may reduce greenhouse gasses by serving as a carbon dioxide (CO_2) sink. (NOAA 2011)

4.3.3 Rocky Reef Habitat

Rocky reefs sustain high levels of biodiversity because of the high level of habitat complexity. Rocky reef habitats support kelp beds and provide protection for an abundance and diversity of other algae, invertebrate species (e.g. clams, crustaceans), fish, and other organisms. Rocky reefs also serve as rearing grounds for many species including larval and juvenile fish (Allen and Horn 2006) and support a number of commercially valuable species including: abalone, sea urchin, spiny lobster, California halibut, Pacific mackerel, rockfish, and several species of crab. Protecting and maintaining these sensitive rocky habitats promotes continued biological productivity of the species that rely on the habitat.

Rocky reef habitats are economically important in California because the biodiversity at the reefs attracts recreational fishermen, divers, and snorkelers. These recreational activities are an important revenue generator for many coastal communities as millions of people participate in these activities each year. (Pendleton and Rooke 2010) Beyond the aesthetic and recreational value of rocky reef habitats, organisms found in these habitats can be beneficial to humans in other ways. For example, recent studies discovered proteins found in the blood of keyhole limpets, a rocky reef inhabitant, have been used to treat certain types of bladder cancer. (Aarntzen et al. 2012)

4.3.4 Shellfish Beds

Shellfish of many varieties are abundant along the coast of California. Oysters, mussels, clams, abalone and scallops are popular types of shellfish eaten by many Californians. During spawning events, bivalves release eggs and sperm into the water column. Spawning events can be triggered by a variety of environmental conditions. (Helm et al. 2004) These zygotes (fertilized eggs) develop into larvae and eventually settle on a suitable substrate. Mussels generally settle on hard rocky surfaces and secrete long byssal threads for attachment. (Wilker 2010) Mussels are a food source for marine animals and have historically served as a food source to coastal communities. They also provide shelter for smaller organisms in rocky intertidal zones. (Singh et al. 2013) For the past several decades, however, natural mussel beds have been in decline and the direct causes are not yet understood. (California Department of Fish and Game 2010)

Demand for these bivalves as a food source in California has led to studies evaluating the necessary conditions and habitat for oyster growth. Much of the research has been driven by the mariculture industry (ocean farming) which raises oysters, and other types of marine animals, for human consumption. There are five species of oyster that currently grow in California, although Ostrea lurida is the only native species. (Status of the Fisheries Report 2008) Generally, oysters live in more brackish environments than mussels, such as estuaries, but can tolerate a wide range of saline conditions compared to other shellfish. (Status of the Fisheries Report 2008) They live on soft mud or fine grain sandy bottoms and interestingly, temperature has been found to be an important determinate for oyster reproduction and feeding. (Barrett 1963) Natural oyster beds have been steadily declining for decades, most likely

because of their sensitivity to pollutants and other changed to natural environmental conditions. (Barrett 1963)

4.3.5 Soft-bottom Habitats, Wetlands, Estuaries, and Nursery Grounds

Soft-bottom habitats are the most extensive benthic habitats of the continental shelf and slope in California. Soft bottom habitats often contain an abundance of infaunal invertebrates like clams, snails, and worms that burrow into the benthic sediment. The fish that inhabit the soft bottom habitats typically have flat bodies (e.g. flatfish, skates, rays) and may also bury themselves or burrow in benthic sediments. Some non-flat bodied fish species like sculpins, rockfishes, and surfperches can also be found in soft-bottom habitats. Soft-bottom fish typically feed on pelagic and benthic invertebrates and other soft-bottom fish species. In addition to the ecological importance of soft-bottom habitats, the resident fish species are important to commercial and recreational fisheries. (Allen and Horn 2006)

Inland waterways provide habitat for various marine species, as well as freshwater and nutrient inputs to estuaries and the ocean. Bays and estuaries contain emergent coastal wetlands, mudflats, and seagrass meadows, which are subject to tidal fluctuations and changing salinity conditions. Enclosed bays and estuaries support an extensive food chain and provide refuge, spawning, and rearing habitat for many marine species, including commercially valuable California halibut, white seabass, herring, and various salmonids. Clams, oysters, staghorn sculpin, starry flounder, leopard shark, and California skate are found in mudflats. Many common coastal birds, such as the long-billed curlew, marbled godwit, black-necked stilt, oyster catcher, and gulls forage and nest in these areas, in addition to endangered and threatened birds like the western snowy plover, Belding's savannah sparrow, California least tern, and lightfooted clapper rail. Estuaries and bays are economically, environmentally, and recreationally important areas in California, yet more than 90 percent of the original areas have been degraded or eliminated. (Resources Agency 1995) Habitat degradation and habitat loss are some of the primary factors that influence population declines and species extinction. (Tilman et al. 1994)

Nursery grounds are habitats where juvenile invertebrates or fish are present at higher densities, grow faster, and avoid predation more successfully than in different habitats. (Beck et al. 2003) Productive nursery grounds contribute to a larger total biomass of a populaton and a greater number of individuals that survive to adulthood. Productive nurseries are critical to sustain healthy adult populations. (Beck et al. 2003) Some species will spawn their young at the nursery grounds, like the Pacific herring that spawn their eggs directly on the seagrass beds (Allen and Horn 2006) and market squid that deposit fertilized egg cases along the ocean floor in sandy, flat bottom habitats. (Zeidberg et al. 2011; Zeidberg et al. 2012.) Other species, such as the California grunion, deposit their young in beach sand where the young will hatch and then move into juvenile habitats. (Allen and Horn 2006) Some of these species serve as an important part of the marine food web. For example, market squid serve as a major food source for species like salmon, swordfish, tuna, and certain sea birds and marine mammals. (Morjohn et al. 1978; Vojkovich 1998; CalCOFI 2013.)

Organisms use nursery grounds to forage and avoid predation until they are able to grow and transition into the adult habitats. Species that use nursery grounds have at least some disjunction between the adult and juvenile habitat. (Beck et al. 2003.) Species like bay scallops, and killifish do not have nurseries; however, species like northern anchovy and kelp

bass do have nursery grounds. (Allen and Horn 2006) Critical nursery habitats for fish and some shellfish species include seagrass beds, wetlands, bays, estuaries, and coastal lagoons. While these highly productive habitats are not exclusively utilized by juvenile organisms, they are habitats where larvae metamorphose, develop into sub-adult stages, and then move to adult habitats. (Beck et al. 2003.)

The value of a nursery may be site specific and is dependent on the following factors: larval supply, structural complexity, predation, competition, food availability, water depth, physical and chemical characteristics and water quality, disturbance patterns, tidal flows, spatial pattern (size, shape, fragmentation, connectivity), relative location (to larval supply, other juvenile habitats, or adult habitats). (Beck et al. 2003) These factors should be examined in addition to the nursery characteristics described above when determining whether or not a habitat serves as nursery grounds and the relative value of those nursery grounds. (Beck et al. 2003.)

4.3.6 Areas of Special Biological Significance

California has designated 34 State Water Quality Protection Areas – These are called Areas of Special Biological Significance (ASBS). These 34 ocean areas are monitored and maintained for water quality by the State Water Board. ASBS cover much of the length of California's coastal waters. They support an unusual variety of aquatic life, and often host unique individual species. ASBS are basic building blocks for a sustainable, resilient coastal environment and economy. These 34 ocean areas occur along the coast of six out of the nine Regional Water Boards.

There are eight ASBS located in the North Coast Region:

- Jughandle Cove (#1),
- Del Mar Landing (#2),
- Gerstle Cove (#3),
- Bodega (#4),
- Saunders Reef (#5),
- Trinidad Head (#6),
- King Range (#7), and
- Redwoods National Park (#8).

The San Francisco Bay Region has six ASBS located in the San Francisco Bay Region:

- James V. Fitzgerald (#9),
- Farallon Islands (#10),
- Duxbury Reef (#11),
- Point Reyes Headlands (#12),
- Double Point (#13), and
- Bird Rock (#14).

Located in the Central Coast Region are seven ASBS:

- Año Nuevo (#15),
- Pacific Grove (#19),
- Carmel Bay (#34),
- Point Lobos (#16),

- Julia Pfeiffer Burns (#18),
- San Miguel, Santa Rosa, and Santa Cruz Islands (#17), and
- Salmon Creek Coast (#20).

There are eight ASBS are located in the Los Angeles Region:

- San Nicolas Island and Begg Rock (#21),
- Santa Barbara and Anacapa Islands (#22),
- San Clemente Island (#23),
- Laguna Point to Latigo Point (#24),
- Northwest Santa Catalina Island (#25),
- Western Santa Catalina Island (#26),
- Farnsworth Bank (#27), and
- Southeast Santa Catalina (#28).

There are two ASBS are located in the Santa Ana Region:

- Robert E. Badham (#32) and
- Irvine Coast (also located in the San Diego Region) (#33).

There are four ASBS are located in the San Diego Region:

- Irvine Coast (also located in the Santa Ana Region) (#33),
- La Jolla (#29),
- Heisler Park (#30), and
- San Diego-Scripps (#31).

Figure 3. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Northern North Coast Regional Board

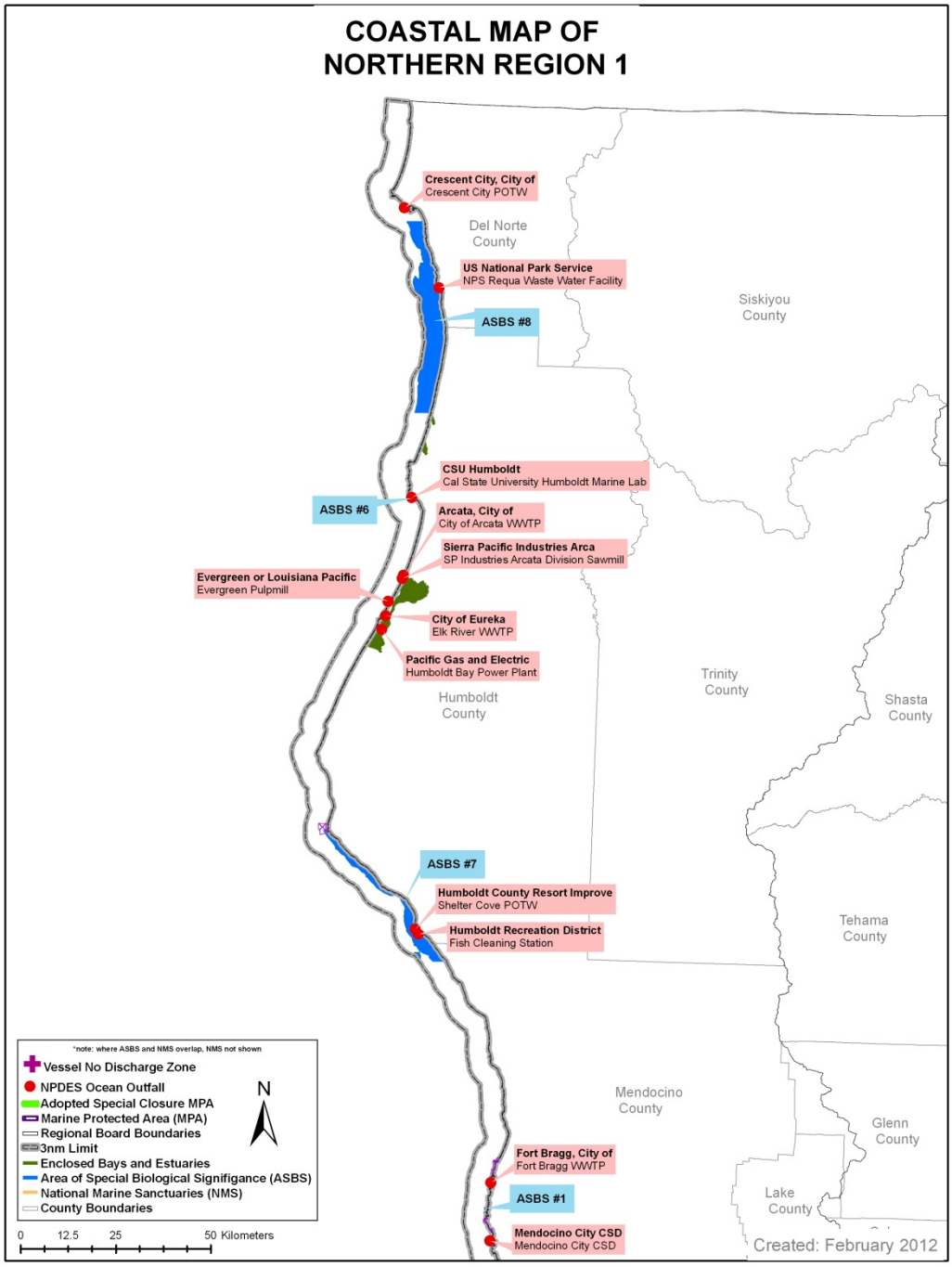


Figure 4. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Southern North Coast Regional Water Board and the San Francisco Bay Regional Water Board

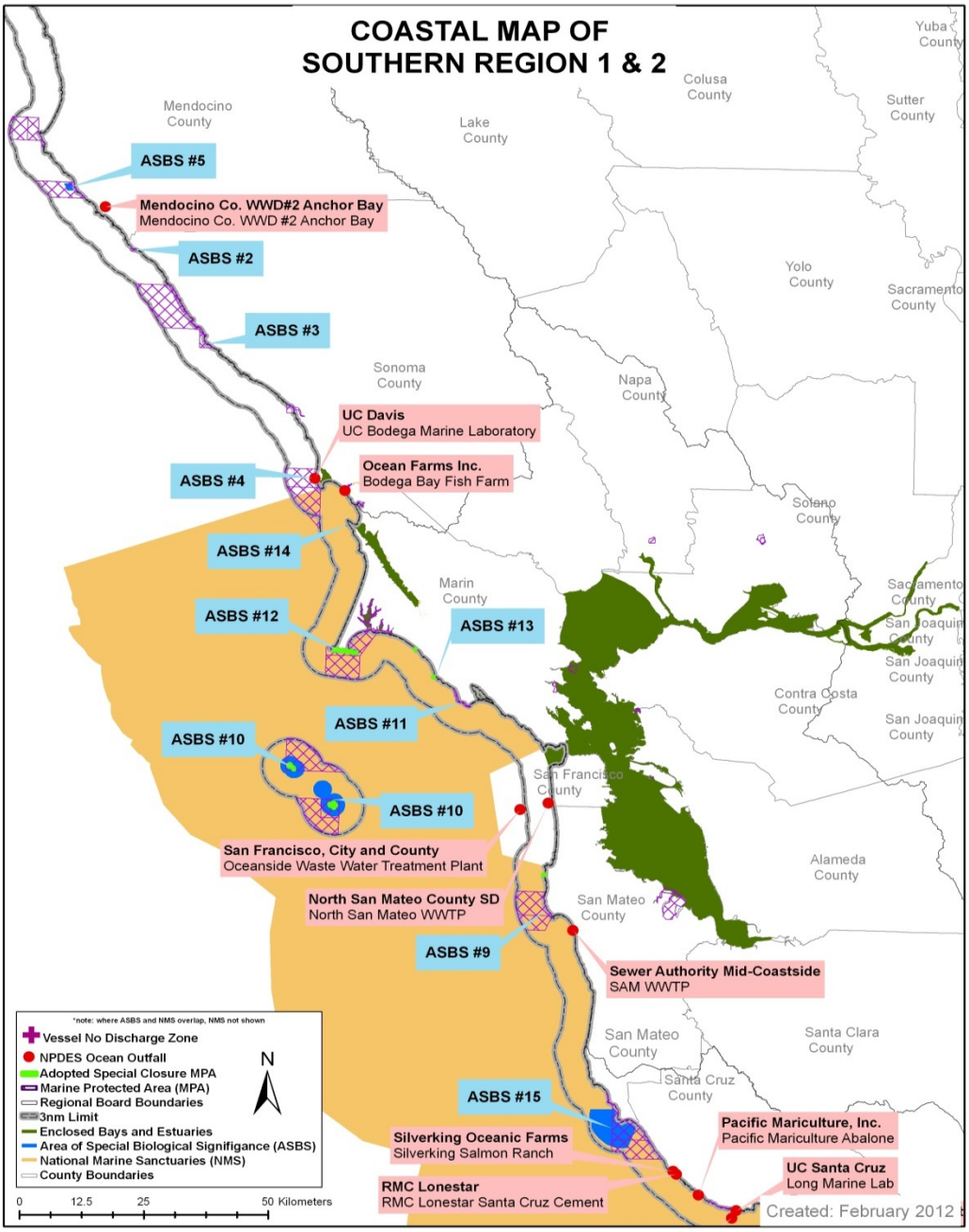


Figure 5. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Northern Central Coast Regional Water Board

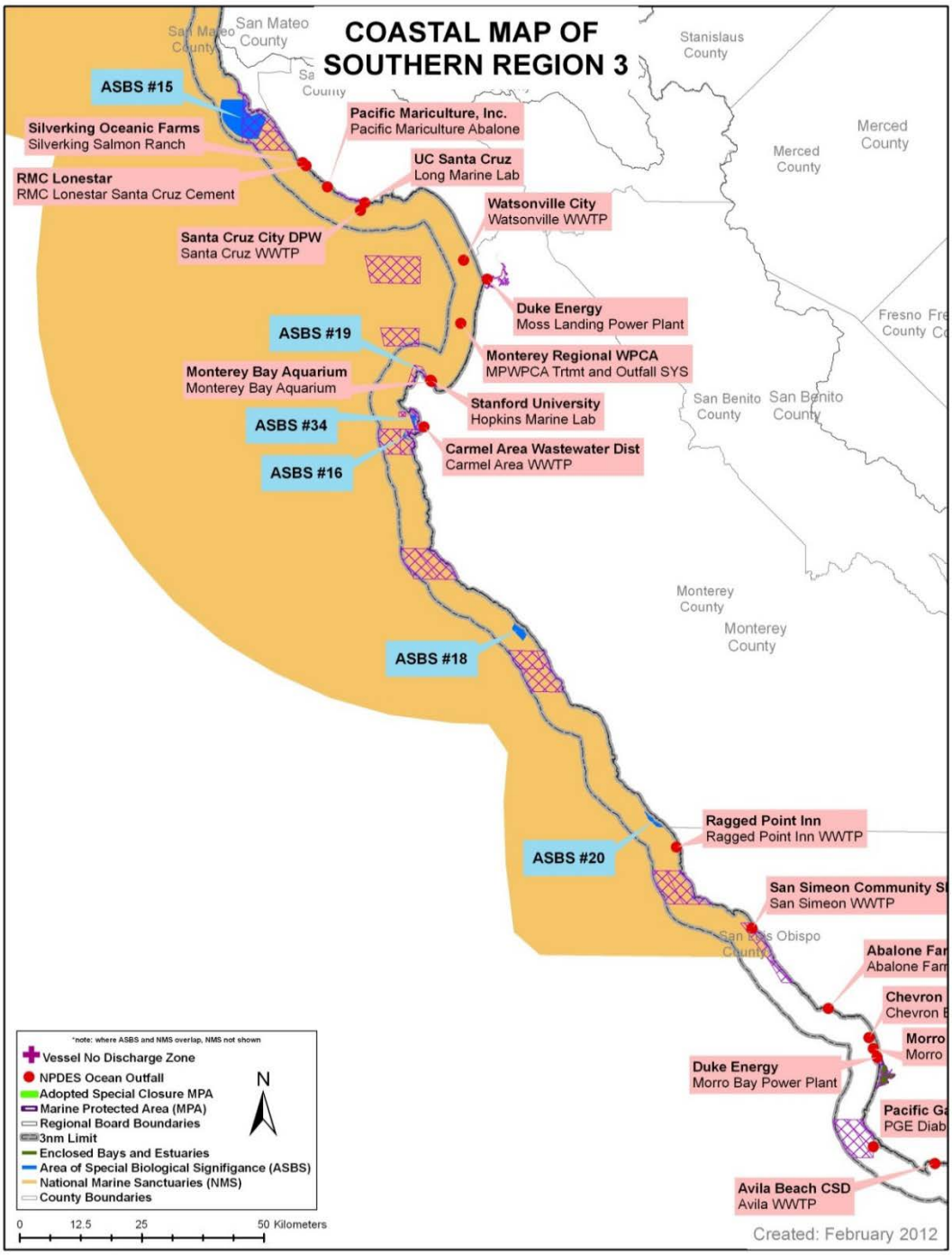


Figure 6. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Southern Central Coast Regional Water Board and Northern Channel Islands

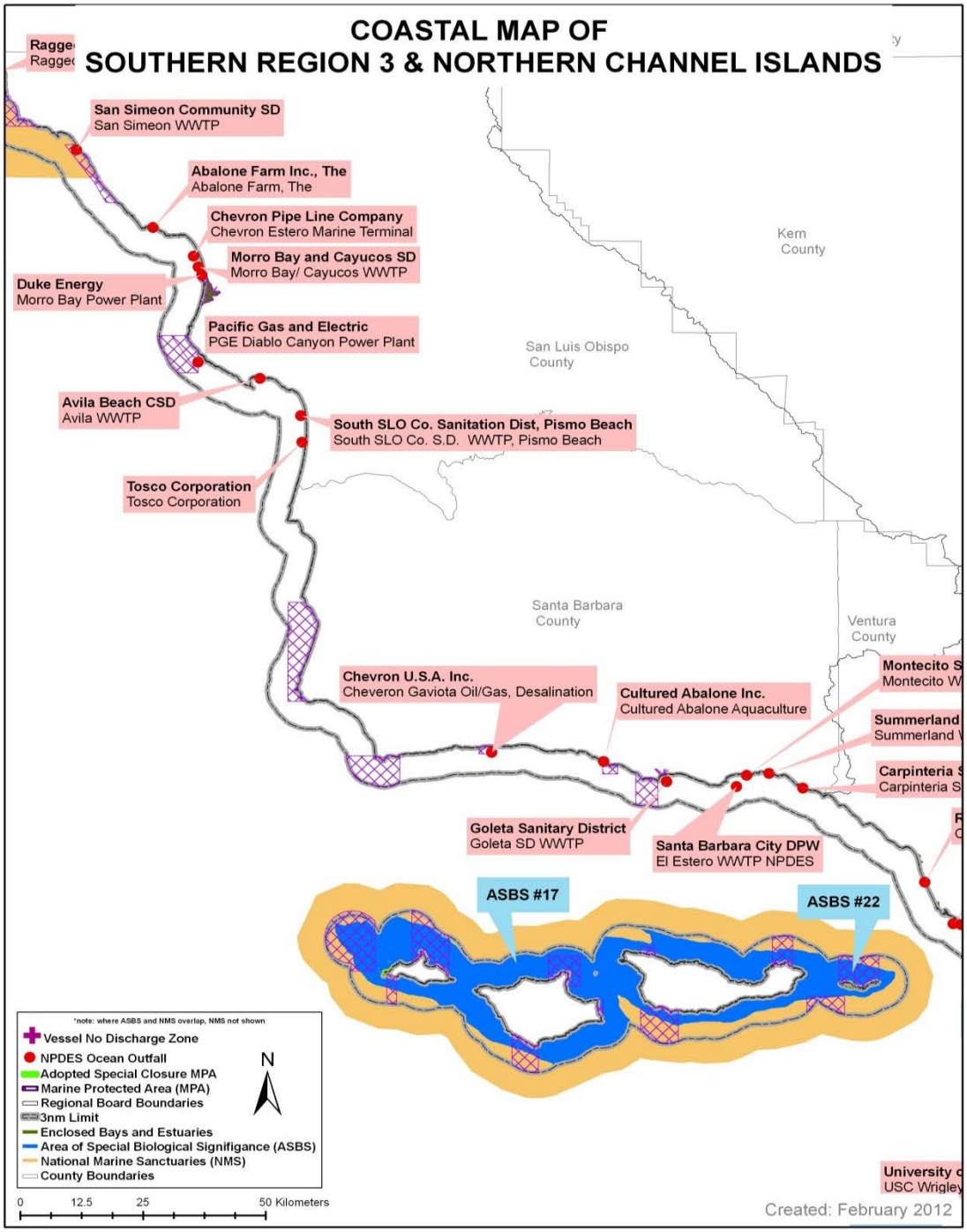
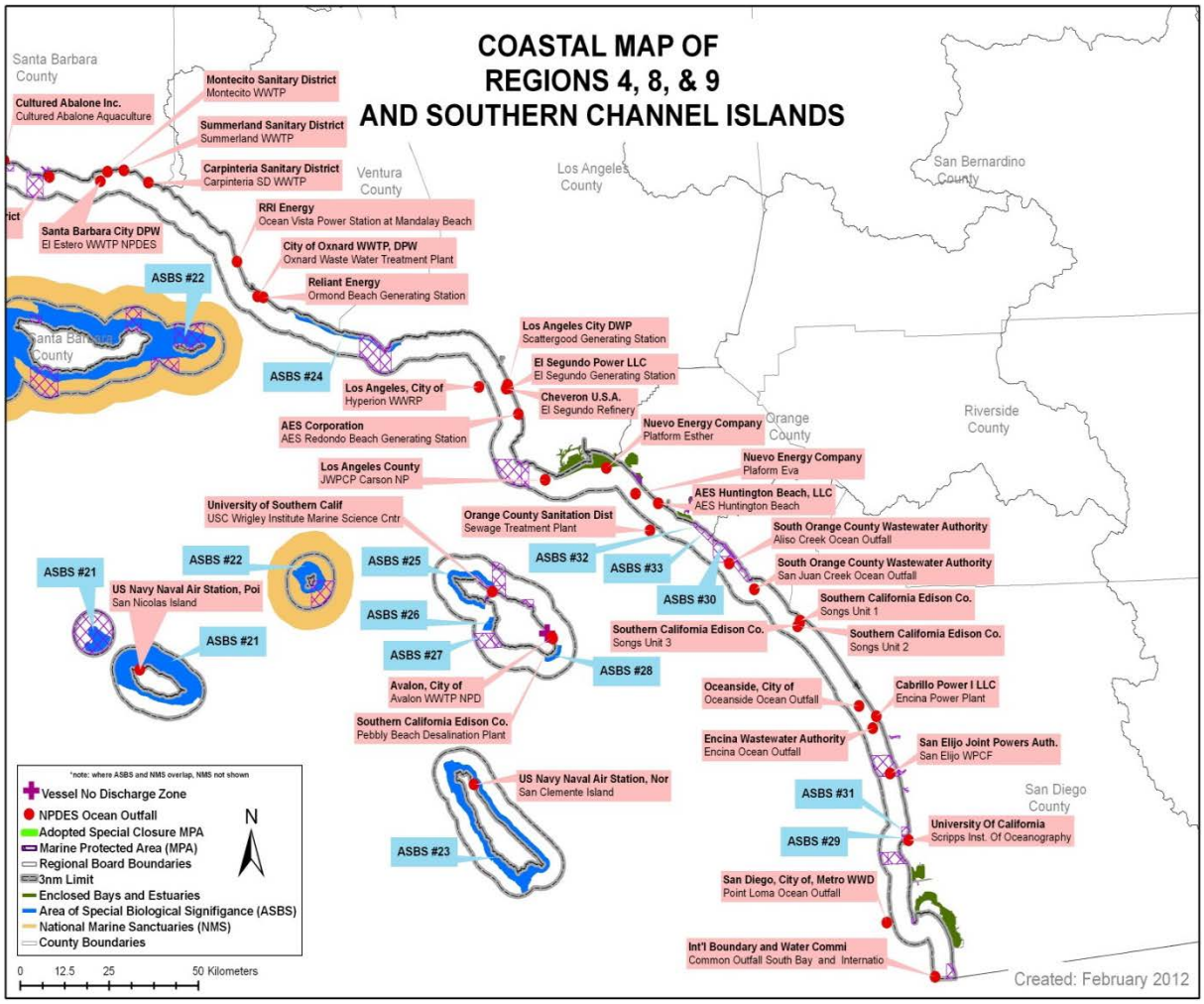


Figure 7. ASBS Boundaries, MPA Boundaries, Wastewater Outfall Points, Marine Sanctuary Boundaries, and Enclosed Bays in Southern Channel Islands and Los Angeles, Santa Ana and San Diego Regional Water Boards


COASTAL MAP OF
REGIONS 4, 8, & 9
AND SOUTHERN CHANNEL ISLANDS
Santa Barbara County
Ventura County
Los Angeles County
San Bernardino County
Orange County
Riverside County
San Diego County
Montecito Sanitary District
Montecito WWTP
Cultured Abalone Inc.
Cultured Abalone Aquaculture
Summerland Sanitary District
Summerland WWTP
Carpinteria Sanitary District
Carpinteria SD WWTP
RRI Energy
Ocean Vista Power Station at Mandalay Beach
Santa Barbara City DPW
El Estero WWTP NPDES
City of Oxnard WWTP, DPW
Oxnard Waste Water Treatment Plant
Reliant Energy
Ormond Beach Generating Station
ASBS #22
ASBS #24
Los Angeles City DWP
Scattergood Generating Station
El Segundo Power LLC
El Segundo Generating Station
Los Angeles, City of
Hyperion WWRP
Cheveron U.S.A.
El Segundo Refinery
AES Corporation
AES Redondo Beach Generating Station
Nuevo Energy Company
Platform Esther
Nuevo Energy Company
Plaform Eva
Los Angeles County
JWPCP Carson NP
AES Huntington Beach, LLC
AES Huntington Beach
University of Southern Calif
USC Wrigley Institute Marine Science Cntr
Orange County Sanitation Dist
Sewage Treatment Plant
South Orange County Wastewater Authority
Aliso Creek Ocean Outfall
South Orange County Wastewater Authority
San Juan Creek Ocean Outfall
ASBS #21
ASBS #22
ASBS #25
ASBS #32
ASBS #33
ASBS #30
US Navy Naval Air Station, Poi
San Nicolas Island
ASBS #26
ASBS #27
ASBS #28
Southern California Edison Co.
Songs Unit 1
Southern California Edison Co.
Songs Unit 3
Southern California Edison Co.
Songs Unit 2
Avalon, City of
Avalon WWTP NPD
Southern California Edison Co.
Pebbly Beach Desalination Plant
Oceanside, City of
Oceanside Ocean Outfall
Cabrillo Power I LLC
Encina Power Plant
Encina Wastewater Authority
Encina Ocean Outfall
San Elijo Joint Powers Auth.
San Elijo WPCF
US Navy Naval Air Station, Nor
San Clemente Island
ASBS #31
ASBS #29
ASBS #23
University Of California
Scripps Inst. Of Oceanography
San Diego, City of, Metro WWD
Point Loma Ocean Outfall
Int'l Boundary and Water Commi
Common Outfall South Bay and Internatio
*note: where ASBS and NMS overlap, NMS not shown
Vessel No Discharge Zone
NPDES Ocean Outfall
Adopted Special Closure MPA
Marine Protected Area (MPA)
Regional Board Boundaries
3nm Limit
Enclosed Bays and Estuaries
Area of Special Biological Signifigance (ASBS)
National Marine Sanctuaries (NMS)
County Boundaries
N
0 12.5 25 50 Kilometers
Created: February 2012

5 Analysis of Project Options

This chapter describes the major amendment-related issues identified during the scoping and development process, and provides a discussion of the State Water Board's rationale for the Bacteria Provisions as currently proposed in this Staff Report.

5.1 Beneficial Uses

5.1.1 Issue A - Limited REC-1 Beneficial Use Definition for Fresh Waters

Present Statewide Provisions
The Los Angeles Regional Water Quality Control Board water quality control plan (basin plan) presently has waters with the beneficial use designation of LREC-1. There is no other basin plan or statewide water quality control plan that contains a definition or designation for the LREC-1 beneficial use.

Issue Description
Limited Water Contact is a beneficial use that recognizes that body contact is limited in the waterbody due to physical conditions, such as restricted access or very shallow water. The LREC-1 beneficial use definition from the Los Angeles Water Board's Basin Plan is "uses of water for recreational activities involving body contact with water where full REC-1 use is limited by physical conditions such as very shallow water depth and restricted access, and as a result, ingestion of water is incidental and infrequent."

The state has waterbodies that have been channelized, and/or lined with concrete or other materials that protect the channel from erosion, in order to provide flood protection. In some cases, the area around the waterbodies has been fenced to limit contact during storm events to protect the public from drowning; while in dry weather the water flow is non-existent or very low. Due to these restrictions, contact with the water is minimal, incidental ingestion is infrequent or unlikely, and the REC-1 beneficial use is not an accurate definition of the beneficial use of the waterbody.

In triennial reviews, Regional Water Boards can identify the need to review and, if appropriate, modify selected beneficial uses and water quality objectives. A use attainability analysis would be required to determine whether the LREC-1 use is appropriate and that the REC-1 use is not attained. Among the information required for the designation of the LREC-1 beneficial use is 1) the condition of the waterbody, noting how access is restricted, 2) information on the low flows present in the waterbody during non-storm events, and 3) how the waterbody has been modified and whether the waterbody could be restored to its original condition.

Options
Option 1: No Action. Under this option, no changes would occur in the definition or designation of LREC-1 beneficial use.

Option 2: Under this option, de-designation of beneficial uses of appropriate waterbodies would be encouraged as part of a Regional Water Board's triennial review process. Waterbodies with inappropriate beneficial use designation could be de-designated and the appropriate water quality objectives applied. Less stringent water quality objectives

would conserve limited resources of those agencies that discharge to these waterbodies.

Option 3: Include the following LREC-1 beneficial use definition: Uses of water that support limited recreational activities involving body contact with water, where the activities are predominantly limited by physical conditions such as very shallow water depth or restricted access and, as a result, body contact with water and ingestion of water is infrequent or insignificant.

Option 4: Adopt a policy statement in the ISWEBE supporting the designation of the LREC-1 beneficial use.

Recommendation
Adopt Options 3 and 4.

5.2 Water Quality Objectives

5.2.1 Issue B - Freshwater Bacteria Indicators

Present Statewide Provisions
Water quality objectives for indicator bacteria in fresh waters are currently established by Regional Water Boards in their individual Basin Plans. Types of indicator bacteria in the Region's Basin Plan include fecal and total coliform, as well as U.S. EPA's recommended indicators for fresh waters (*E.coli* and enterococci).

Issue Description
Currently, the Regional Water Boards Basin Plans contain a mix of bacteria indicators. See Table 6 for a listing of the current freshwater bacteria indicators adopted by the nine Regional Water Boards. The U.S. EPA 2012 Recreational Water Quality Criteria recommend the use of enterococci and/or *E. coli* for freshwater bacteria indicators.

The U.S. EPA 2012 Recreational Water Quality Criteria is based on the latest studies which conclude that fecal and total coliform are not good indicators of human sources of contamination. Studies have also found that while enterococci acts as a good indicator in some freshwaters, it can exist and multiply in other freshwaters and create false positives in samples. *E. coli* has been found to be the most reliable indicator organism in all fresh waters.

To ensure that the most effective bacteria indicator is used to prevent illness in freshwaters, it is more effective to adopt statewide standards, rather than having each Regional Water Board updating their standards individually.

Options
Option 1: No Action. While some Regional Water Boards have updated their freshwater bacteria standards to *E. coli*, others have not, or they have retained the outdated indicators of fecal and total coliform when adopting updated standards. By leaving existing bacteria indicator in place, not all Regional Water Boards would have updated indicators as recommended in the U.S. EPA 2012 Recreational Water Quality Criteria.

Option 2: Use only enterococci as an indicator organism. As noted above, studies[8] have found that in some cases enterococci will multiply in some freshwaters and create false positives in samples while *E. coli* does not have this drawback. Using enterococci bacteria could lead to false positives would be ineffective and could result in needless work investigating violations of standards, when no real violation has occurred. Outdated indicators such as total or fecal coliform would be rescinded under this option freeing up money that could be spent on additional sampling for a single bacteria indicator.

Option 3: Use only *E. coli* as an indicator organism. Using *E. coli* as the indicator organism for freshwater bacteria objectives is the most effective method to protect the REC-1 beneficial use. *E. coli* does not have the limitation that enterococci has in regards to false positives. The U.S. EPA 2012 Recreational Water Quality Criteria has recommended its use for freshwater. Outdated indicators such as total or fecal coliform would be rescinded under this option freeing up money that could be spent on additional sampling for a single bacteria indicator.

Option 4: Use both *E. coli* and enterococci as indicator organisms. While the use of two indicators would appear to provide better protection of the REC-1 beneficial use, it could also lead to false positives from the enterococci indicator in freshwaters. Additionally, the use of two indicators would be more expensive because a test for each indicator organism would need to be conducted for every sample. As there is the chance of false positives from enterococci, spending money for these tests would be wasteful. Allowing the use of one indicator would free up money that could be spent on additional monitoring for that single indicator.

Recommendation
Adopt Option 3.

5.2.2 Issue C - Estuarine Water Bacteria Indicators

Present Statewide Provisions
Six of the nine Regional Water Boards (North Coast, San Francisco, Central Coast, Los Angeles, Santa Ana, and San Diego) have some estuarine waters within their boundaries. All of these Regional Water Boards except the Sana Ana Water Board use the same water quality indicator for freshwaters as for estuarine waters. The Santa Ana Water Board uses a fecal coliform indicator for their estuarine waters.

Issue Description
As estuarine waters can vary in salinity, the objective for these waters should be based on the salinity of the estuarine waters.

[8] Cohen, J., Darling, R., Dichter, G., Dobrovolny, L., Esmon, P., Garfield, L., Greenberg, N., & McGee, C. 2001. South Yuba River Enterococci Studies. Prepared for South Yuba River Citizens League, October 2001, and
Wade, T.J., N. Pai, J.N.S. Eisenberg , and J.M. Colford, Jr. 2003. Do U.S. Environmental Protection Agency Water Quality Guidelines for Recreational Waters Prevent Gastrointestinal Illness? A systematic review and meta-analysis. Environmental Health Perspectives, 111: 1102-1109.

Thus the bacteria objective indicator for estuarine waters where the salinity is equal to or greater than 10 ppth 95 percent or more of time should be the same as the ocean water indicator organism, i.e., enterococci.

For estuarine waters where the salinity is less than 10 ppth 95 percent or more of time the bacteria objective indicator should be the same as the freshwater indicator, i.e., *E. coli*. The salinity levels used to determine these indicators are based on the salinity levels established by 40 Code of Federal Regulations section 131.38 (b)(3).

Options

Option 1: No Action. While some Regional Water Boards have updated their estuarine bacteria standards to *E. coli*, others have not, or they have retained the outdated indicators of fecal and/or total coliform when adopting updated standards. By leaving existing bacteria indicators in place, not all Regional Water Boards would have updated indicators as recommended in the U.S. EPA 2012 Recreational Water Quality Criteria. Additionally as the Regional Water Boards don't have estuarine indicators based on salinity, the adoption of salinity based indicators will provide a better estuarine indicator in these regions.

Option 2: Adopt *E. coli* only as the estuarine bacteria indicator. Using only E.coli as the estuarine bacteria indicator would lead to incorrect results when sampling the saltier (equal to or greater than 10 ppth 95 percent salinity) estuarine waters. *E. coli* do not survive well in saline waters and thus was not a recommended species for criteria in marine or saline estuarine waters.

Option 3: Adopt enterococci only as the estuarine bacteria indicator. Using Enterococci only as the estuarine bacteria indicator could lead to incorrect results. As noted above, studies[9] have found that in some cases enterococci will multiply in some freshwaters and create false positives in samples while *E. coli* does not have this drawback. Using a bacteria indicator which could lead to false positives would be ineffective and could result in needless work investigating violations of standards, when no real violation has occurred. Outdated indicators such as total or fecal coliform would be rescinded under this option freeing up money that could be spent on additional sampling for a single bacteria indicator.

Option 4: Adopt both *E. coli* and enterococci as indicator organisms based on the estuarine water's salinity. Using a different bacteria indicator based on salinity will allow for more precise results. Using *E.coli* when the salinity is less than 10 ppth 95 percent or more of the time will insure that the correct indicator for estuarine water of lower salinity is used. Using Enterococci when higher salinity estuarine waters (when the salinity is less than 10 ppth 95 percent or more of the time) will ensure that correct results from the indicator organism of Enterococci.

Recommendation

[9] Cohen, J., Darling, R., Dichter, G., Dobrovolny, L., Esmon, P., Garfield, L., Greenberg, N., & McGee, C. 2001. South Yuba River Enterococci Studies. Prepared for South Yuba River Citizens League, October 2001, and Wade, T.J., N. Pai, J.N.S. Eisenberg , and J.M. Colford, Jr. 2003. Do U.S. Environmental Protection Agency Water Quality Guidelines for Recreational Waters Prevent Gastrointestinal Illness? A systematic review and meta-analysis. Environmental Health Perspectives, 111: 1102-1109.

Adopt Option 4.

5.2.3 Issue D - Marine Water Bacteria Indicators

Present Statewide Provisions

The Ocean Plan and all of the Regional Water Boards' Basin Plans have existing minimum protective bacteriological standards consistent with those established by Title 17 for FIB for water contact recreation in ocean beaches. (Cal. Code Regs. tit. 17 § 7958.)

The current bacteriological standards established by Title 17 are not consistent with the U.S. EPA 2012 Recreational Water Quality Criteria. The Title 17 bacteriological standards use three fecal indicator bacteria, enterococci, total coliform and fecal coliform to protect water contact recreation in coastal waters. See Tables 2 and 6 for current and proposed REC-1 water contact standards. Title 17 requires public health agencies to perform beach water quality monitoring for FIB and to provide notification for public safety.

Issue Description

This issue considers updating the statewide bacteria indicator for marine waters, using U.S. EPA 2012 Recreational Water Quality Criteria recommendations for REC-1 water quality. The U.S. EPA recommendation is for a single indicator organism, enterococci.

Changing the Ocean Plan's REC-1 contact standards to require only enterococci would still leave in effect the Title 17 bacteriological standards for FIB, to which local public health agencies performing beach water quality monitoring and public notification must adhere. Although the State Water Board has the authority to change or update the Ocean Plan's REC-1 objectives, the Title 17 minimum protective bacteriological standards for coastal waters would still require public beach monitoring using multiple indicators until either a legislative or regulatory change.

Options

Option 1: No Action. The Ocean Plan and all Regional Water Boards with marine waters currently have bacteriological standards established by Title 17. The objectives use three indicators which are enterococci, total coliform and fecal coliforms. The continued use of total and fecal coliforms is not supported by the U.S. EPA 2012 Recreational Water Quality Criteria recommendations.

Option 2: Use enterococci as a sole indicator. Change the Ocean Plan Water-Contact Bacterial Standards to match the U.S. EPA 2012 Recreational Water Quality Criteria enterococci standard for water quality evaluation of 303(d) listing and TMDL requirements. The existing use of total coliform and fecal coliform for water quality evaluation is not supported by the U.S. EPA studies.

Recommendation

Adopt Option 2.

Changing the Ocean Plan's REC-1 water-contact standards to require only enterococci would still leave in effect the Title 17 bacteriological standards for FIB for ocean recreation. Local public health agencies performing beach water quality monitoring and public notification must continue to adhere to the Title 17 minimum bacteriological standards. Harmonizing the Ocean

Plan REC-1 water contact standards and Title 17 bacteriological standards for beach notification could be considered in the future but would require a statutory change that is outside the scope of this project.

5.2.4 Issue E - Level of Public Health Protection for Illness Rate for Fresh and Marine Waters

Present Statewide Provisions

Freshwater

Water quality objectives for bacteria for recreation in fresh waters are currently established by the Regional Water Boards in their individual Basin Plans and consequently there is no statewide policy regarding the level of protection for REC-1 uses. The San Francisco Bay Regional Water Board, Central Coast Regional Water Board, Central Valley Regional Water Board[10], Colorado River Regional Water Board, Santa Ana Regional Water Board and San Diego Regional Water Board all have REC-1 water quality objectives that are based on freshwater estimated illness rates of 8 illnesses per 1,000 primary contact recreators (recreators)[11]. In the North Coast and the Lahontan Regional Water Boards, the REC-1 bacteria objectives for fecal coliform are more stringent than the 200/100ml criterion established by U.S. EPA in 1976. In the Lahontan Regional Water Board, the current bacterial objective is a log mean of 20/100 ml of fecal coliform. This objective is not linked to any specific beneficial use and applies to all waters within the region. In the North Coast Regional Water Board the current bacteria objective is a geometric mean of 50/100ml of fecal coliform. The stringency of the objectives established within the Lahontan and North Coast regions results in more protective illness rates.

Marine waters

Currently, the objectives for enterococci under the California regulatory system for marine waters relies on an enterococci geometric mean of 35 cfu/100 ml and a Single Sample Maximum standard of 104 cfu/100 ml. The current geometric mean is consistent with the U.S. EPA 2012 Recreational Water Quality Criteria of 36 illnesses per 1,000 recreators. The current Single Sample Maximum is more consistent with the recommended Statistical Threshold Value for the estimated illness rate of 32 illnesses per 1,000 recreators.

Issue Description

Currently the basis for most of California's water quality objectives for bacteria is based on U.S. EPA's 1986 Recommended Water Quality Criteria and U.S. EPA's 1976 Quality Criteria for Water. In 2012, U.S. EPA issued another report to determine the National Epidemiological and Environmental Assessment of Recreational Water – Gastrointestinal Illness rate (NGI). There was a fundamental change in the methodology for calculating the estimated illness rate in the NGI from the previous 1986 report. The estimated illness rate in the 1986 report counted gastrointestinal illnesses only when a fever was present. The 2012 NGI report counted all gastrointestinal illness whether or not a fever was present. Data from previous and current epidemiological studies were assessed in the U.S. EPA 2012 Recreational Water Quality Criteria report to determine the currently recommended criteria. During these studies U.S. EPA determined that the previous estimated illness rate of 8 illnesses (gastrointestinal illness and

[10] The bacteria objective for Folsom Lake is 100/ml of fecal coliform.

[11] Numbers of illnesses are based on the 1986 report, where gastro-intestinal illnesses only counted if accompanied by a fever.

fever) per 1,000 recreators is equivalent to 36 NGI (all gastrointestinal illness regardless of a fever) per 1,000 recreators for freshwaters. For marine waters the previous illness rate of 19 illnesses (gastrointestinal illness and fever) is equivalent to 36 NGI (all gastrointestinal illness regardless of a fever) per 1,000 recreators.

After receiving comments that the new NGI illness rate was not protective of swimmers, the U.S. EPA conducted a cut point analysis of the data. In the cut point analysis the U.S. EPA developed two possible recommended illness rates that U.S EPA determined both to be protective of public health. The U.S. EPA's recommended illness rates are 36 NGI per 1,000 recreators and 32 NGI per 1,000 recreators. While both recommended illness rates are considered protective of public health, the 32 NGI per 1,000 would require a more stringent threshold for Fecal Indicator Bacteria (see Table 7 below).

Another aspect of the U.S. EPA 2012 Recreational Water Quality Criteria is a change from the Single Sample Maximum (with the option of using four different use intensities) to a Statistical Threshold Value. A Single Sample Maximum has been used in California as a fecal indicator value that must never be exceeded. The change from Single Sample Maximum to Statistical Threshold Value occurred because treating the Single Sample Maximum as a never-to-be-exceeded value imparts a level of protection much more stringent than intended in 1986. The Statistical Threshold Value in the U.S. EPA 2012 Recreational Water Quality Criteria is set at a 90 percentile value of the geometric mean, which can be exceeded just 10 percent of the time. The Statistical Threshold Value has been determined to be statistically consistent with the geometric mean of the new recommended recreational water quality criteria. Table 7 below shows the two U.S. EPA recommended illness rates and their corresponding geometric means and Statistical Threshold Values associated with each U.S. EPA recommended illness rate.

Lake Tahoe has been designated as an Outstanding National Resource Water and is renowned for its extraordinary clarity and purity, and deep blue color. Additionally, Lake Tahoe has an exception from the safe drinking water filtration requirements when using the lake for drinking water. As such, the Lahontan Regional Water Board adopted separate water quality objectives for the lake to maintain its unique characteristics. The bacteria objective geometric mean for Lake Tahoe is 20cfu/100 mL of fecal coliform. The equivalent *E. coli* objective would be 17cfu/100mL.

Presently, the numeric objective for the North Coast Regional Water Board is lower than the proposed objective. Their Basin Plan also has a narrative objective, which will not be superseded by the Bacteria Provisions. Their narrative objective states: "The bacteriological quality of waters of the North Coast Region shall not be degraded beyond natural background levels." The use of this narrative objective will allow the North Coast Water Board to prevent the degradation of the water quality of their waters.

Table 7. U.S. EPA's 2012 Recreational Water Quality Criteria

Criteria Elements	Recommendation 1 Estimated Illness Rate (NGI): 36 per 1,000 primary contact recreators			Recommendation 2 Estimated Illness Rate (NGI): 32 per 1,000 primary contact recreators	
	Magnitude			Magnitude	
Indicator	**GM (cfu/100 mL)[a]**	**STV (cfu/100 mL)[a]**		**GM (cfu/100 mL)[a]**	**STV (cfu/100 mL)[a]**
Enterococci (marine and fresh)	35	130	**OR**	30	110
OR					
***E. coli* – (fresh)**	126	410		100	320
Duration and Frequency: The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected STV magnitude in the same 30-day interval. NGI = NEEAR – GI illness, NEEAR = National Epidemiological and Environmental Assessment of Recreational Water GM = Geometric Mean STV = Statistical Threshold Value cfu = colony forming units mL = milliliters					

a U.S. EPA recommends using U.S. EPA Method 1600 (U.S. EPA, 2002a) to measure culturable enterococci, or another equivalent method that measures culturable enterococci and using U.S. EPA Method 1603 (U.S. EPA, 2002b) to measure culturable *E. coli*, or any other equivalent method that measures culturable *E. coli.*

Options

Option 1: No action – If the State Water Board does not take action, Regional Water Boards will need to continue to specify water quality objectives for bacteria in their Basin Plans. They may adopt objectives reflecting risk levels recommended by U.S. EPA or objectives based on other recommendations. Having each Regional Water Board set their own estimated risk levels within their region would mean that there would be no statewide consistency for bacteria objectives for the protection of the REC-1 beneficial use.

Option 2: Use U.S. EPA's 2012 Recreation Water Quality Criteria illness rate of 36 illnesses per 1,000 recreators. This rate is equivalent to the previous illness rate of 8 illnesses per 1,000 recreators in fresh waters. U.S. EPA has asserted that an illness rate of this level is protective of public health. This option would supersede all Regional Water Boards' REC-1 numeric bacteria objectives, except for site-specific numeric objectives, and would lead to statewide consistency for REC-1 bacteria objectives. Using this option would be consistent with previous illness rates for bacterial objective values used in current storm water permits and TMDLs. The geometric mean would also be consistent with the current geometric mean for marine waters.

Option 3: Use U.S. EPA's 2012 Recreation Water Quality Criteria illness rate of 32 illnesses per 1,000 recreators. This is a slightly more conservative illness rate than the 1986

recommendations. U.S. EPA has stated that this estimated illness rate is also protective of public health. This option would supersede Regional Water Boards REC-1 numeric bacteria objectives, except site-specific numeric objectives, and would lead to statewide consistency for REC-1 bacteria objectives. This risk management approach would require a more stringent geometric mean than the current objective for marine waters. This would have the benefits of better protection of public health, but it may lead to increased frequency of storm water permit violations.

Option 4: Continue to maintain a higher standard for Fecal Indicator Bacteria for Lake Tahoe which is designated as an Outstanding National Resource Water. Under this option Lake Tahoe would retain an equivalent objective to their bacteria objective of 20/100 ml fecal coliform (17cfu/100ml for *E.coli*).

Option 5: For estuarine waters, use the illness rate for the water quality objectives associated with the bacteria indicator organism used for testing. For waters with a lower salinity where *E.coli* is the recommended indicator organism, use the illness rate as noted in Option 3 above. Where estuarine waters are of a high salinity and enterococci is the recommended indicator organism, use the illness rate recommended as noted in Option 3 above.

Recommendation
Adopt a combination of Options 3, 4, and 5.

5.2.5 Issue F - Averaging Period to Determine Compliance for Fresh and Marine Waters

Present Statewide Provisions
There is no statewide policy for determining the averaging period for compliance with geometric mean bacteria water quality objectives. Compliance with permit limits is currently determined based on the averaging periods specified by Regional Water Boards in their Basin Plans or in Department of Public Health guidelines and recommendations.

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

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

The U.S. EPA 2012 Recreational Water Quality Criteria recommends a geometric mean and a Statistical Threshold Value to be used to determine compliance. The U.S. EPA 2012 Recreational Water Quality Criteria states that “The waterbody geometric mean should not be greater that the selected geometric mean magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected Statistical Threshold Value magnitude in the same 30-day interval.”

Geometric means are most applicable in identifying whether a chronic contamination problem exists and whether a source analysis should be conducted to determine the cause. As noted above, the U.S. EPA 2012 Recreational Water Quality Criteria recommends an averaging period of 30 days. A seasonal average (beach season) and a yearly average period were suggested during the comment period for U.S. EPA's criteria document.

The Los Angeles Water Board studied this issue and tested various methods of determining compliance with a geometric mean[12]. Their studies recommend using a rolling geometric mean, calculating a geometric mean weekly using 5 or more samples for rolling six week periods. Their study showed that there is not much difference between the number of exceedances when using different methods to calculate the geometric mean. However, different ways of calculating the geometric mean can lead to disincentives to sampling more frequently. The recommended method eliminates this disincentive and allows a permittee to sample more frequently without a penalty. Using a 6 week period also helps to insure that at least enough samples are available to calculate the geometric mean if one sample is lost due to weather, lab failure, or other means.

Additionally the epidemiology studies used in the development of the U.S. EPA 2012 Recreational Water Quality Criteria use a yearly or seasonal exposure duration. In the draft 2012 Recreational Water Quality Criteria document, U.S. EPA stated that a duration period for the objective could be up to 3 months. In the final U.S. EPA 2012 Recreational Water Quality Criteria document, the recommended duration was changed to monthly in order to inform the public more quickly. As noted above, staff has indicated that a 6-week interval, calculated weekly will help to insure that more data are used in determining compliance with the objective and thus will be more statically accurate. Calculating the data weekly will help get the information out to the public quickly and insuring a better health perspective.
For the STV, the current U.S. EPA 2012 Recreational Water Quality Criteria recommend is a duration of 30 days. Using a 6-week duration will lead to additional data in the calculation lead to a more statistically robust result (as noted above). Using a rolling average to calculate the STV could result in the reporting violations over a 6-week period where the actual violation no longer exists.

Options
Option 1: No action – With no statewide policy, existing Regional Water Board policies and procedures will apply. The Regional Water Boards could specify the period of time (if any) over which data would be collected to calculate a geometric mean. This could lead to inconsistencies in the application of the geometric mean criteria across the state. The current Ocean Plan specifies a 30-day period.

Option 2: Specify a 30-day averaging period. U.S. EPA's 2012 Recreation Water Quality Criteria recommends a 30–day averaging period. This option would be consistent with U.S. EPA's recommendation, but would not take advantage of the additional time for sample collection that would result in a better level of statistical significance due to increased sample size.

[12] Reconsideration of Certain Technical Matters of the Santa Monica Bay Beaches Bacteria TMDLs; the Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL; and the Los Angeles Harbor Inner Cabrillo Beach and Main shop Channel Bacteria TMDL: - Staff Report – Los Angeles Water Board

Option 3: Specify a different average period, such as a seasonal average, i.e. beach season or a yearly average. While some beaches outside of California have a season (summer) when swimmers use the waters, California beaches tend to have swimmers for a longer period of time than just the summer. Many of the beaches tend to be used year round. Using a seasonal average or yearly average could lead to less exceedances due to the smoothing out of the geometric mean during a longer average period.

Option 4: Specify the geometric mean duration as a 6-week rolling GM calculated weekly. The duration for the STV shall be calculated monthly. This insures that sufficient data are collected to have a more statistically robust calculation. To determine attainment of the water quality standard, the GM values shall be applied based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 6 week period). This also insures that STV data does not report violations that no longer exist.

Recommendation
Adopt Option 4.

5.3 Implementation

5.3.1 Issue G - Addressing Natural Sources of Bacteria Levels in Fresh and Marine Waters

Present Statewide Provisions
There is no statewide policy regarding the use of a reference system/antidegradation approach or a natural sources exclusion approach in the context of TMDLs. However, the San Francisco Bay Water Board, the Los Angeles Water Board, and the San Diego Water Board have each adopted amendments to their Basin Plans, which allow these approaches when developing TMDLs.

Issue Description
The purpose of using Fecal Indicator Bacteria is to monitor levels of fecal contamination in the state's waters. However, in every waterbody there are natural sources such as birds, fish, and wildlife that contribute some level of FIB into the water. Natural sources include direct inputs from birds, terrestrial and aquatic animals, wrack line and aquatic plants, or other unidentified sources within the receiving waters. Conventional methods of monitoring for FIB cannot distinguish between anthropogenic sources and natural sources.

Natural bacteria levels may exceed bacteria objectives even in undeveloped areas. Without a means to address natural sources of bacteria, dischargers might be required to treat their discharges more than necessary. However, requirements placed upon anthropogenic dischargers may not reduce the actual sources of bacteria if those sources are natural. TMDLs have addressed this using a combination of a reference system/antidegradation approach and a natural sources exclusion approach, but there is no statewide framework that would provide efficient and consistent use of these tools.

Federal regulations (40 C.F.R. § 130.7) require that TMDLs include waste load allocations for point sources and load allocations for nonpoint sources and natural background levels and that the individual sources for each must be identified and enumerated. The TMDL for a given pollutant and waterbody is the total amount of pollutant that can be assimilated by the receiving

water while still achieving objectives. The TMDL is equal to the sum of individual waste load allocations, load allocations, and background.

The reference system/antidegradation approach has two implementation goals in the context of TMDL development: (1) bacteriological water quality is at least as good as that of a natural (reference) system, and (2) no degradation of existing water quality is allowed, where it is better than the natural system (antidegradation).

The natural sources exclusion approach is an alternative to the reference system/antidegradation approach. The natural sources exclusion approach requires the control of all anthropogenic sources of bacteria and the identification and quantification of natural sources of bacteria. Exceedances are allowed based on residual exceedances of natural sources.

Both approaches allow a certain frequency of exceedance of the bacteria water quality objectives' STV. By allowing an exceedance of the STV, but not the geometric mean, the data distribution of the water quality associated with the geometric mean is not changed and thus the level of protection is not changed. The STV is a percentile of the expected water quality sampling distribution of the GM objective value that is set at a 90 percentile, so that 90 percent of the distributed data is below the STV and 10 percent is above the STV. In the reference system/antidegradation and natural source exclusion approaches, the STV can change to a different percentile of the distributed data, but the geometric mean remains, ensuring the same level of protection of water quality.

The reference system/antidegradation approach and the natural sources exclusion approach are appropriate within the context of a TMDL. The TMDL process includes the robust analysis necessary to characterize bacteria sources and it provides an appropriate venue for determining the appropriateness of applying either approach.

Options

Option 1: No action – With no action, individual Regional Water Boards will continue to have the option to adopt or not adopt a reference systems/antidegradation approach or the natural sources exclusion approach into their Basin Plans. For regions that have not already added either of these approaches to their Basin Plans, an amendment to their Basin Plan would be required to authorize the use of one or both of these approaches prior to their use in a TMDL. Currently only the Los Angeles Water Board and the San Diego Water Board have adopted amendments to their Basin Plans allowing the use of both of these approaches in their TMDLs. The San Francisco Bay Water Board has adopted an amendment to its Basin Plan allowing for the use of a reference system/antidegradation approach.

Option 2: Allow reference system/antidegradation or natural sources exclusion approaches. A provision allowing all of the Regional Water Boards to use a reference system/antidegradation or a natural sources exclusion approach can be included in an amendment to the ISWEBE Plan and the California Ocean Plans. Under this option Regional Water Boards will not be required to add these options to their individual Basin Plans prior to using either of these approaches. This option will allow resources for remediation to be directed toward anthropogenic sources instead of areas with natural source of bacteria.

Option 3: Prohibit the use of reference system/antidegradation or natural sources exclusion approach. This option would require all waters to meet the objectives regardless of the source of the bacteria. If any waters exceed the objective, dischargers will be required to treat the discharges water in order to meet the objective. Under this option dischargers may potentially be require to treat natural sources of bacteria in order for some water bodies to meet the objective at all times. This could require the diversion of natural water bodies to a treatment plant or the development of in-stream treatment systems. Such requirements could adversely affect valuable aquatic life and wildlife beneficial uses supported by natural water bodies in the state by requiring the treatment of natural sources of bacteria. This would also lead to the expenditure of unnecessary resources and monies.

Recommendation
Adopt Option 2.

5.3.2 Issue H - High Flow Suspension of Objectives for Fresh Waters

Present Statewide Provisions
There is no statewide policy regarding the use of a high flow suspension of bacteria objectives for fresh waters. The Los Angeles Water Board is the only Regional Water Board that has adopted an amendment to their Basin Plan, which allows this approach.

Issue Description
California has many engineered flood control channels and other water bodies that become unsafe for REC-1 and many REC-2 uses during high flow conditions. Under specific conditions where REC-1 activities are considered unsafe, the suspension of objectives that are intended to protect these uses may be allowed.

Engineered channels are defined as inland, flowing surface waters bodies with box, V-shaped or trapezoidal configurations that are often lined on the sides and/or bottom with concrete. These channels have been constructed to reduce the incidence of flooding by conveying storm water runoff to the ocean or to other discharge points as efficiently as possible. These modifications create life-threatening “swiftwater” conditions during and immediately following significant storm events. As a result, the REC-1 and REC-2 uses are not fully attainable during and immediately following storm events. Often swift water rescue teams are formed and put on alert for response in these conditions. These channels are often fenced and locked to keep persons out at all times, or when storms are forecasted.

Additionally, there may be rivers or streams that during specific conditions convey high flows at rates that make the river unsafe for recreational uses. Often these dangerous sections of streams or rivers are due to their natural shape or due to modifications that create swift channels when flows are above a certain level. As a result, the REC-1 and REC-2 uses are not fully attainable during and immediately following storm events as in the case of engineered channels.

States may remove a designated use which is not an existing use, as defined in 40 Code of Federal Regulations, section 131.3, or establish sub-categories of a use if the state can demonstrate that attaining the designated use is not feasible due to factors set out in 40 Code of Federal Regulations, section 131.10(g).

A use attainability analysis would need to be developed for any channels or rivers that are seeking a high flow suspension of the objectives. The UAA must demonstrate that the engineered channels or the river could not meet either of the following factors listed in section 131.10(g), demonstrating that attaining the use is infeasible:

> (2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating state water conservation requirements to enable uses to be met; or
>
> (4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use.

Factor (2) would apply as "water levels" would prevent attainment of the use when high flows make swimming or being in or around the water unsafe. Factor (4) could also apply as "hydrologic modifications preclude attainment of the use, and it is not feasible to restore the water body to its original condition…", as the hydrologic modifications made for flood control or other reasons result in unsafe conditions when combined with high flows.

The UAA and the resulting exemptions only apply to water contact recreational activities associated with the swimmable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use, non-contact water recreation involving incidental water contract regulated under the REC-2 use, and the associate bacteriological objectives set to protect those activities. Water quality objectives set to protect (1) other recreational uses associated with the fishable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use, and (2) other REC-2 uses (e.g., uses involving the aesthetic aspects of water) shall still remain in effect at all times.

This exemption would not relieve or diminish obligations to reduce bacteria loading at other locations on a water body or channel that are considered safe for recreation.

Options

Option 1: No action – The Los Angeles Water Board's existing high flow suspension would remain. Regional Water Boards without a high flow suspension in their Basin Plans would be required to adopt a Basin Plan amendment if they desire to have a high flow suspension policy. Without a statewide provision for high flow exemptions there will be inconsistencies in the high flow suspension usage. Each region wishing to approve high flow exemptions will need to amend their Basin Plans which will be a less effective way to use the resources of the individual Regional Water Boards.

Option 2: Allow high flow suspension of bacteria objectives for engineered channels, rivers, and streams. Develop guidance for high flow suspensions which the Regional Water Boards could use to assess which waters would be appropriate for high flow suspensions. The necessity of treatment of discharges during high flows to meet the REC-1 objective would be avoided with this option. This option would lead to statewide consistency in the usage of high flow suspensions and would be a more effective use of the resources of the State and Regional

Water Boards. This option would not circumvent the need for a UAA before allowing a high flow suspension for any particular water body.

Option 3: Affirmatively prohibit high flow suspension, but specifically provide that the Los Angeles Water Board may continue to use its existing high flow suspension policy for waters within its region. Under this option, treatment of discharges during high flow would be required, with the exception of the Los Angeles Regional Water Board consistent with its existing high flow suspension policy. This option would result in statewide inconsistency by allowing only one Regional Water Board to use this process.

Option 4: Adopt a policy statement in the ISWEBE supporting the use of high flow suspension.

Recommendation
Adopt Option 4.

5.3.3 Issue I - Seasonal Suspension of Beneficial Uses

Present Statewide Provisions
Presently there are no statewide provisions for seasonal suspension for seasonal low flows or intermittent uses.

Issue Description
Seasonal conditions in some waterbodies may make the REC-1 beneficial uses unattainable for extended portions of the year. Some seasonal conditions that may affect the REC-1 beneficial use include frigid conditions in the mountains that result in frozen lakes, reservoirs, streams, or ponds, and very arid conditions during the summer in desert regions that result in extremely low flows, such as:

1. Ephemeral Streams—surface water with a channel that is at all times above the water table and flows only in direct response to precipitation or snowmelt, or
2. Intermittent Streams—A stream whose channel bottom is alternately above and below the groundwater table for different portions of the year. An intermittent stream does not maintain a perennial surface flow, although permanent pools of standing water may be present at points along the stream.

A seasonal suspension for seasonal low flows or intermittent uses would require a use attainability analysis. A use attainability analysis is a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological and economic factors as described in 40 Code of Federal Regulations section 131.10(g). These factors include:

- Naturally occurring pollutant concentrations prevent the attainment of the use; or
- Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating state water conservation requirements to enable uses to be met; or
- Human caused conditions or source of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or

- Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or
- Physical conditions relate to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
- Controls more stringent than those require by sections 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact.

The Use Attainability Analysis for Seasonal Suspension must be approved by the applicable Regional Water Board, the State Water Board and U.S. EPA.

Options

Option 1: No action. Regional Water Boards would be required to adopt a Basin Plan amendment if they desire to allow for season suspensions. Without a statewide provision for seasonal exemptions there will be inconsistencies in the seasonal suspension usage. Each region wishing to approve seasonal exemptions will need to amend their Basin Plans which will be a less effective way to use the resources of the individual Regional Water Boards. If Seasonal Suspensions are not allowed, dischargers may be required to protect the REC-1 beneficial use during a time when it does not exist.

Option 2: Allow season suspension of bacteria objectives. Develop guidance for seasonal suspensions which the Regional Water Boards could use to assess which waters would be appropriate for seasonal suspensions. The necessity of treatment of discharges during the times when the REC-2 beneficial use does not exist will be avoided with this option. This option would lead to statewide consistency in the usage of seasonal suspensions and would be a more effective use of the resources of the State and Regional Water Boards. This option would not circumvent the need for a UAA before allowing a seasonal suspension for any particular water body.

Option 3: Affirmatively prohibit season suspension. Under this option, treatment of discharges during times when the REC-1 beneficial use does not exist would be required.

Option 4: Adopt a policy statement in the ISWEBE supporting the use of Seasonal suspension.

Recommendation

Adopt Option 4.

5.4 Water Quality Standards Variance

5.4.1 Issue J - Identify a Statewide Mechanism for Adopting a Water Quality Standards Variance Applicable to Any Pollutant.

Present Statewide Provisions

U.S. EPA guidance indicates that a WQS Variance can be used to provide a mechanism by which NPDES permits can be written where discharger compliance with the underlying water quality standards is demonstrated to be infeasible at the present time within the meaning of 40 Code of Federal Regulations § 131.10(g). A WQS Variance applies to all pollutants, not just

bacteria. Regional Water Boards (except for the recent adoption by the Central Valley Regional Water Board) in California have not adopted general variance policies but the State Water Board has adopted policies allowing consideration of exceptions from provisions of specific state plans. These exception policies are in the Ocean Plan and the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP). The exception policies allow the State Water Board, in compliance with CEQA, subsequent to a public hearing, and with the concurrence of the U.S. EPA, to grant exceptions where it determines that granting the exception will not compromise protection of waters for beneficial uses, and that the public interest will be served. The SIP provides an exception for priority pollutants but does not address nonpriority pollutants. An additional exception policy is found in the Thermal Plan. The Thermal Plan allows the Regional Water Boards, with the concurrence of the State Water Board, in accordance with Clean Water Act section 316(a), to grant an exception from the specific temperature objectives contained in the Plan. The Central Valley Regional Water Board adopted a policy to issue variances from meeting water quality standards for NPDES dischargers. It would be useful for the State Water Board to identify the method for adopting water quality standard variances for non-priority pollutants in cases where a compliance schedule is not appropriate or is not allowed as there are no references or mention of WQS Variances in current state plans or policies.

Issue Description

40 Code of Federal Regulations section 131.3(o) defines a WQS variance as "a time-limited designated use and criterion for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable conditions during the term of the water quality standard variance." A water quality variance is subject to the provisions of 40 Code of Federal Regulations section 131.14. The federal regulations governing variances where recently amended. (80 Fed. Reg. 51048 (August 21, 2015).) Prior to the amendments states were required to adopt a variance procedure into their state regulations before adopting variances. The recently revised federal regulations now establish an explicit regulatory framework for the adoption of WQS variances, including the applicability, requirements for submission to U.S. EPA, and how WQS variances are implemented within NPDES permits. As such, states no longer are required to adopt variance provisions prior to applying for variances.

The WQS Variance provision would authorize the Regional Water Boards to adopt WQS variances in accordance with requirements outlined in 40 Code of Federal Regulations section 131.14. The WQS Variance would establish a consistent procedure for adopting variances by referencing the federal requirements,. Because there is no reference to general WQS variances in state statute or regulations a policy statement and reference to the current federal requirements will be informative rather than regulatory. The following section specifically outlines the provisions of 40 Code of Federal Regulations section 131.14.

> *Water quality standards variances.*
> *States may adopt WQS variances, as defined in § 131.3(o). Such a WQS variance is subject to the provisions of this section and public participation requirements at § 131.20(b). A WQS variance is a water quality standard subject to U.S. EPA review and approval or disapproval.*
>
> ***(a) Applicability.***

(1) *A WQS variance may be adopted for a permittee(s) or water body/waterbody segment(s), but only applies to the permittee(s) or water body/waterbody segment(s) specified in the WQS variance.*
(2) *Where a State adopts a WQS variance, the State must retain, in its standards, the underlying designated use and criterion addressed by the WQS variance, unless the State adopts and U.S. EPA approves a revision to the underlying designated use and criterion consistent with §§ 131.10 and 131.11. All other applicable standards not specifically addressed by the WQS variance remain applicable.*
(3) *A WQS variance, once adopted by the State and approved by U.S. EPA, shall be the applicable standard for purposes of the Act under § 131.21(d) through (e), for the following limited purposes. An approved WQS variance applies for the purposes of developing NPDES permit limits and requirements under 301(b)(1)(C), where appropriate, consistent with paragraph (a)(1) of this section. States and other certifying entities may also use an approved WQS variance when issuing certifications under section 401 of the Act.*
(4) *A State may not adopt WQS variances if the designated use and criterion addressed by the WQS variance can be achieved by implementing technology-based effluent limits required under sections 301(b) and 306 of the Act.*

(b) Requirements for Submission to U.S. EPA.
(1) *A WQS variance must include:*
(i) *Identification of the pollutant(s) or water quality parameter(s), and the water body/waterbody segment(s) to which the WQS variance applies. Discharger(s)-specific WQS variances must also identify the permittee(s) subject to the WQS variance.*
(ii) *The requirements that apply throughout the term of the WQS variance. The requirements shall represent the highest attainable condition of the water body or waterbody segment applicable throughout the term of the WQS variance based on the documentation required in (b)(2) of this section. The requirements shall not result in any lowering of the currently attained ambient water quality, unless a WQS variance is necessary for restoration activities, consistent with paragraph (b)(2)(i)(A)(**2**) of this section. The State must specify the highest attainable condition of the water body or waterbody segment as a quantifiable expression that is one of the following:*
(A) *For discharger(s)-specific WQS variances:*
(1) *The highest attainable interim criterion; or*
(2) *The interim effluent condition that reflects the greatest pollutant reduction achievable; or*
(3) *If no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.*
(B) *For WQS variances applicable to a water body or waterbody segment:*
(1) *The highest attainable interim use and interim criterion; or*
(2) *If no additional feasible pollutant control technology can be identified, the interim use and interim criterion that reflect the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State*

adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.

(iii) *A statement providing that the requirements of the WQS variance are either the highest attainable condition identified at the time of the adoption of the WQS variance, or the highest attainable condition later identified during any reevaluation consistent with paragraph (b)(1)(v) of this section, whichever is more stringent.*

(iv) *The term of the WQS variance, expressed as an interval of time from the date of U.S. EPA approval or a specific date. The term of the WQS variance must only be as long as necessary to achieve the highest attainable condition and consistent with the demonstration provided in paragraph (b)(2) of this section. The State may adopt a subsequent WQS variance consistent with this section.*

(v) *For a WQS variance with a term greater than five years, a specified frequency to reevaluate the highest attainable condition using all existing and readily available information and a provision specifying how the State intends to obtain public input on the reevaluation. Such reevaluations must occur no less frequently than every five years after U.S. EPA approval of the WQS variance and the results of such reevaluation must be submitted to U.S. EPA within 30 days of completion of the reevaluation.*

(vi) *A provision that the WQS variance will no longer be the applicable water quality standard for purposes of the Act if the State does not conduct a reevaluation consistent with the frequency specified in the WQS variance or the results are not submitted to U.S EPA as required by (b)(1)(v) of this section.*

(2) *The supporting documentation must include:*

(i) *Documentation demonstrating the need for a WQS variance.*

(A) *For a WQS variance to a use specified in section 101(a)(2) of the Act or a sub-category of such a use, the State must demonstrate that attaining the designated use and criterion is not feasible throughout the term of the WQS variance because:*

(1) *One of the factors listed in § 131.10(g) is met, or*

(2) *Actions necessary to facilitate lake, wetland, or stream restoration through dam removal or other significant reconfiguration activities preclude attainment of the designated use and criterion while the actions are being implemented.*

(B) *For a WQS variance to a non-101(a)(2) use, the State must submit documentation justifying how its consideration of the use and value of the water for those uses listed in § 131.10(a) appropriately supports the WQS variance and term. A demonstration consistent with paragraph (b)(2)(i)(A) of this section may be used to satisfy this requirement.*

(ii) *Documentation demonstrating that the term of the WQS variance is only as long as necessary to achieve the highest attainable condition. Such documentation must justify the term of the WQS variance by describing the pollutant control activities to achieve the highest attainable condition, including those activities identified through a Pollutant Minimization Program, which serve as milestones for the WQS variance.*

(iii) *In addition to paragraphs (b)(2)(i) and (ii) of this section, for a WQS variance that applies to a water body or waterbody segment:*

(A) *Identification and documentation of any cost-effective and reasonable best management practices for nonpoint source controls related to the pollutant(s) or*

water quality parameter(s) and water body or waterbody segment(s) specified in the WQS variance that could be implemented to make progress towards attaining the underlying designated use and criterion. A State must provide public notice and comment for any such documentation.
(B) *Any subsequent WQS variance for a water body or waterbody segment must include documentation of whether and to what extent best management practices for nonpoint source controls were implemented to address the pollutant(s) or water quality parameter(s) subject to the WQS variance and the water quality progress achieved.*

(c) Implementing WQS variances in NPDES permits. *A WQS variance serves as the applicable water quality standard for implementing NPDES permitting requirements pursuant to § 122.44(d) of this chapter for the term of the WQS variance. Any limitations and requirements necessary to implement the WQS variance shall be included as enforceable conditions of the NPDES permit for the permittee(s) subject to the WQS variance.*

Options
Option 1: No Action. Under the no action alternative, the State Water Board would not go forward with identifying the existing WQS Variance authority under 40 Code of Federal Regulations section 131.14 within the Bacteria Provisions. The process for obtaining a WQS variance would still exist but not be specifically identified as a regulatory option.

Option 2*: Identify the process for adopting a WQS variance as defined in 40 Code of Federal Regulations section 131.14.* The provisions establish an explicit regulatory framework for the adoption of WQS variances, including the applicability, requirements for submission to U.S. EPA, and how WQS variances are implemented within NPDES permits. A WQS variance must be approved by U.S. EPA.

Recommendation
Adopt Option 2.

6 Reasonably Foreseeable Methods of Compliance

The Bacteria Provisions do not specify or mandate the manner of compliance. However, the State Water Board's SED for the proposed project is required to include an analysis of the reasonably foreseeable methods of compliance with the project. (Cal. Code Regs., tit. 23, § 3777; Publ. Res. Code § 21159). The Bacteria Provisions would update the Bacteria Objectives for fresh and ocean waters and are not expected to significantly change the reasonably foreseeable methods of compliance. All of the Regional Water Board Basin Plans have existing bacteria objectives. The Bacteria Provisions will lead to statewide consistency in the indicator organisms and protection level to protect the REC-1 beneficial use, but they are not significantly more stringent than the existing objectives. In most areas the Bacteria Provisions will most likely not lead to additional implementation efforts or the addition of new methods of compliance.

The WQS Variance provision will allow for a WQS variance to be adopted instead of removing a designated beneficial use for a water body where such use is not now attainable but can be expected to be attainable with reasonable progress towards improving water quality. There are no reasonably foreseeable impacts associated with adopting the WQS Variance provision statewide since the variance would be maintaining the status quo to the highest attainable use, and all other applicable standards would continue to apply while making progress toward achieving the objective at issue. Any reasonably foreseeable methods of compliance that could be proposed at this time would be speculative because the specific pollutants or standards addressed by a variance are unknown. Any adoption of a variance for a specific pollutant or standard would be subject to environmental analysis at the time of adoption or issuance.

The reasonably foreseeable methods of compliance for the Bacteria Objectives are presented below and outline methods currently in use today. The possible environmental effects that could be caused by compliance methods are presented in Section 8. The actual compliance strategies will be selected by local agencies, Regional Water Boards, and other permittees. As the compliance strategies are implemented locally they will at that time require a site specific environmental analysis.

A common mechanism for addressing persistent exceedances of the Bacteria Provisions Objectives is through the development of a targeted TMDL. According to section 303(d)(1)(A) of the Clean Water Act, "Each state shall identify those waters within its boundaries for which the effluent limitations…are not stringent enough to implement any water quality standard applicable to such waters." The Clean Water Act also requires states to establish a priority ranking of Water Quality Limited Segments and to establish TMDLs for such waters. The purpose of a TMDL is to restore and protect the beneficial uses of an impaired waterbody. 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. TMDLs must be established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge between effluent limitations and water quality. In summary, a TMDL represents a strategy to restore an impaired waterbody so the water quality can once again meet applicable water quality standards.

During the development of the Bacteria Provisions, several stakeholder and public meetings were held in which the various likely methods of compliance were discussed. This section

provides a description of the reasonably foreseeable methods we would anticipate dischargers would continue to implement in order to achieve compliance with the Bacteria Provisions through the TMDL process.

6.1 Traditional Point Source Controls

Traditional point sources such as wastewater treatment plants have NPDES permits that regulate their discharges, with effluent limits for bacteria. The main point source dischargers are the POTWs which mostly have more stringent freshwater bacteria effluent limits than those being proposed by the Bacteria Provisions. These freshwater limits are derived from the Title 22 recycled water criteria. Therefore, the bacteria limits in these provisions would not specifically apply to POTW dischargers. However, POTWs often contribute to fresh or marine receiving waters where the specific bacteria objectives of these provisions would apply[13] but this would not be expected to impact POTW discharge requirements.

6.1.1 Chlorine

Chlorination is often used to eliminate harmful bacteria and other microorganisms in drinking water and POTWs. Although chlorine is a cost-effective means of disinfection in water treatment, chlorine residuals in water discharges has detrimental effects on aquatic life both in fresh and salt water environments. Thus, every discharger that uses chlorine has the potential to cause acute toxicity. Therefore, a chlorination-dechlorination process must be used and maintained. This process has proven very effective in treating POTW effluent and would be considered effective in providing a reasonably foreseeable method of continued compliance with the new Bacteria Objectives.

6.1.2 Ultraviolet Light.

The use of ultraviolet light (UV) or ozone in water purification can be a viable alternative to chlorine-dechlorination use. Over 20 percent of POTWs across the nation are utilizing UV disinfection to eliminate chlorine residual toxicity all together[2]. Although many of these processes are viable, some of the alternatives can be more costly than others. However, these methods will continue to provide another reasonably foreseeable method of compliance to the new Bacteria Objectives.

6.2 Storm Water (Industrial, Construction, Caltrans and MS4 permits)

Storm water runoff is regulated through the Storm Water Program. The regulatory approach for NPDES-permitted storm water discharges differ from that of traditional point sources. Clean Water Act section 402(p) addresses storm water dischargers. In general, permits are required for storm water from industries, construction activities, municipalities, and state and federal facilities. Many of the approaches for controlling storm water within these permits are listed below.

[13] See SWRCB. 2006. Total Residual Chlorine and Chlorine-Produced Oxidants Policy of California. Substitute Environmental Document located at: http://www.swrcb.ca.gov/water_issues/programs/state_implementation_policy/docs/rvsd_cl_sed_063006_accept.pdf

The Los Angeles Regional Water Quality Control Board's recent implementation plan for "TMDL for Indicator Bacteria in San Gabriel River, Estuary and Tributary" (June 10, 2015) and the American Society of Civil Engineers report "Pathogens in Urban Stormwater Systems" (August 2014)[14] provide very good overviews of the implementation measures that provide reasonably foreseeable methods of compliance.

A number of strategies exist to reduce bacterial loading and concentration in California's fresh and marine waters. Combinations of measures are often necessary to reduce bacteria to levels that meet water quality objectives. These measures are categorized as structural BMPs and non-structural BMPs.

6.2.1 Structural BMPs

Structural BMPs involve the use of constructed systems to treat or divert water at either the point of generation or discharge to either the storm water system or to receiving waters. While the creation and operation of these systems can create temporary environmental impacts, their purpose is to perform long term reduction of bacteria sources through water capture and potential treatment. Examples of structural BMPs can be local or regional in scale and are briefly described below.

6.2.1.1 Local Capture Systems

These are often the simplest systems that contribute to the control of bacteria from the watershed by reducing the volume of runoff and reducing peak flows. The BMPs within this system are designed to capture runoff from relatively clean surfaces, such as roofs, so that water can be used again without treatment. These systems may include containers as small as rain barrels, or they may include the construction of large cisterns, and other containers to hold large quantities of rainwater for reuse or recharge. The capacities of these local systems range from around 55 gallons to thousands of gallons and can be situated above or below ground.

6.2.1.2 Infiltration Systems

This general class of systems reduces bacteria contaminated runoff through increased on-site infiltration. This method involves the use of alternative paving materials, retention grading, and infiltration basins. The effectiveness of these infiltration systems is based primarily on the soil characteristics. Specific BMPs include permeable paving systems such as pervious concrete, pervious asphalt, pervious paving blocks, grass pavers, and pervious crushed stone. The local infiltration systems can be effective for storm water management for areas ranging from individual lots to several city blocks.

Regional infiltration systems are generally large basins capable of detaining the entire volume of a design storm and infiltrating the volume over an extended period. Constructed wetlands and other regional biofiltration systems provide some flood mitigation and treatment of different pollutants. Water quality benefits are primarily accomplished by impounding water and allowing it to slowly percolate in surface soil and vegetation and eventually to groundwater. Use of these systems depends on the suitability of soils for infiltration and appropriately located open space.

[14] See ASCE. 2014. Pathogens in Urban Stormwater Systems located at: http://www.asce-pgh.org/Resources/EWRI/Pathogens%20Paper%20August%202014.pdf

6.2.1.3 Media Filtration

These systems incorporate media filtration to control bacteria through separation of fine particulates and associated pollutants. During the filtration process, storm water is captured and either directed by gravity or pumped through media such as sand, anthracite, compost, zeolite or combinations of natural and engineered substrates. Media filters can be integrated directly into existing storm drain systems, but are generally off-line facilities requiring a diversion structure.

6.2.1.4 Vegetated Treatment Systems

These systems contribute to control of bacteria from the watershed by the use of soils and vegetation as the media to filter and treat storm water prior to discharge into surface or sub-surface waters. They work through a combination of biofiltration, retention, infiltration, and evapotranspiration to reduce the amount of runoff. BMPs within this category include swales, filter strips, bioretention areas, and storm water planters. These can be installed on-site or in street medians, parking lots, or curb extensions.

6.2.1.5 Detention Facility

A general group of larger systems to control bacteria are regional detention facilities. They can be upstream of an infiltration facility, constructed wetland or disinfection plant, to equalize flows and reduce sediment loading. These are basins that can be shallow, lined with vegetation, and separated into multiple bays to improve their water quality function. Unlike infiltration systems, regional detention facilities do not require favorable soil. Detention facilities can also be deep steep walled basins, or underground vaults when space is a limiting factor. However, they are not effective as a stand-alone bacteria treatment option.

6.2.1.6 Diversion and/or Treatment

A diversion and/or treatment Best Management Practice (BMP) routes urban runoff away from the storm drain system or waterway and redirects the flow through a series of tanks and pumps into the sanitary sewer or other treatment system. There, the contaminated runoff receives treatment and filtration before being reused or discharged.

6.2.2 Non-Structural BMPs

Non-structural BMPs are prevention practices designed to improve water quality through the repair of existing systems and the development of control programs that include, but are not limited to, prevention, education, and regulation. These programs are described below.

6.2.2.1 Public Education and Outreach

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

Local agencies can provide educational materials to the public through television, radio, online and print media. These agencies can also create information for educators and schools, develop community events, and support volunteer monitoring and cleanup programs.

6.2.2.2 Repair of Aging Infrastructure

Aging sanitary and storm water infrastructure can be a significant source of bacteria pollution in many areas of California[15]. They can cause pollution through sanitary sewer overflows caused by blockages, line breaks, cracks, and other sewer defects, exfiltration of sewage from sanitary sewers, and infiltration of groundwater. Upgrading, repairing, or slip-lining faulting sanitary sewer pipes will reduce pollution by eliminating the leaks in those pipes. Additionally, upgrading or repairing the storm drain pipes can minimize the infiltration of contaminated groundwater into the system.

6.2.2.3 Maintenance of Storm Water Systems

Maintenance activities are very important to keep storm water systems working effectively. Storm drains can accumulate trash, sediment, organic matter and animal waste over time. As a result they can become secondary reservoirs for bacteria and other pollutants. Storm drain cleaning is typically done on a several year cycle and can be done more frequently in "priority basins" where elevated bacteria in storm water systems have been identified[16]

6.2.2.4 Pet, Bird and Other Urban Wildlife

The density of pets and other wildlife in urban areas can be quite high[17]. This makes the proper disposal of pet waste and pet control programs increasingly important in urban areas. Some of the elements of an effective pet control program are enforcing pet waste ordinances and leash laws, allowing natural riparian buffers to grow along streams to dissuade pet access and properly maintaining off-leash dog parks.

Birds are a common source of bacteria both at beaches and in inland urban areas. Some of the potential control strategies include public education to reduce feeding, habitat modification (exclusion barriers), deterrence measures (such as motion active sprinklers and sonic devices), dispersion measures (falcons have been used), chemical repellents, reproductive controls and occasional removal.

Mammals can also be a key source of bacteria in some urban streams. Fecal matter from wildlife can enter streams through direct overland flow into streams or as it becomes concentrated by animals, such as raccoons, living in storm drains and facilities. While you cannot really control urban wildlife, control strategies can be employed to reduce their impact. These strategies include modifying habitat and reducing urban food sources, installing storm drain inlet and outlet grates and trash racks, more frequent cleaning of storm drains to remove animal waste, and as a last resort relocating wildlife by trapping.

6.2.2.5 Good Housekeeping/Trash Management

Good housekeeping approaches include establishing and enforcing ordinances for commercial, industrial and multi-family facilities. These can include increased inspection and enforcement of grease removal equipment for restaurants, monitoring trash enclosures, and cleaning private catch basins and drain inlets.

6.2.2.6 Septic Systems and Other Onsite Wastewater Treatment Systems

---

[15] See ASCE. 2014. Pathogens in Urban Stormwater Systems located at: http://www.asce-pgh.org/Resources/EWRI/Pathogens%20Paper%20August%202014.pdf page 145.
[16] Ibid. page 148
[17] Ibid. page 150

Onsite wastewater treatment systems include a variety of on-site systems for the collections, storage, treatment, neutralization, or stabilization of sewage that occurs on a property. OWTSs include traditional septic systems, as well as other small on-site treatment systems. Poorly functioning systems can present a significant threat of bacterial pollution. Proper management of OWTS at the local level can decrease this bacterial risk.

On June 19, 2012, the State Water Board adopted Resolution No. 2012-0032,"The Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (OWTS Policy)." This Policy establishes a statewide, risk-based, tiered approach for the regulation and management of OWTS installations and replacements and sets the level of performance and protection expected from OWTS.

In accordance with Water Code section 13290 et seq., the OWTS Policy sets standards for systems that are constructed or replaced, that are subject to a major repair, that pool or discharge waste to the surface of the ground, and that have affected, or will affect, groundwater or surface water to a degree that makes it unfit for drinking water or other uses, or cause a health or other public nuisance condition. The OWTS Policy also includes minimum operating requirements for OWTS. These operating requirements may include siting and construction constraints. In addition, there may be specific requirements for OWTS near certain waters listed for nitrogen or pathogens as impaired under Clean Water Act section 303(d)[18]. These are requirements that will be in accordance with local TMDL implementation plans to address pathogen (bacteria) impairments where applicable. The implementation of the OWTS Policy should help reduce the contribution of bacteria from poorly operating systems.

6.2.2.7 Improved Street Cleaning

This management measure involves employing paving cleaning practices such as street sweeping on a regular basis to minimize trash, sediment, debris and other pollutants (including bacteria and fecal matter) that might end up contaminating receiving waters. While street cleaning is not focused on bacteria reduction, it is part of an important public works activity to minimize runoff pollution from streets in the urban environment.

6.2.2.8 Storm Drain Stenciling

Storm drain inlet stenciling is a good way to inform the public about the direct effects of discharging polluted runoff to receiving water. Again, while not focused on bacteria, this can be a useful housekeeping measure as people have been observed discarding pet waste directly into storm drains.

6.3 Non-Point Source

Nonpoint Source (NPS) pollution comes from a variety of sources that do not originate from regulated point sources. NPS pollution generally occurs when rainfall flows off the land, roads, buildings, and other features of the landscape. This diffuse runoff carries pollutants into drainage ditches, lakes, rivers, wetlands, bays, and aquifers. The federal Clean Water Act requires states to develop a program to protect the quality of water resources from the adverse

[18] See State Water Board Water Quality Control Policy for Siting, Design, Operation and Maintenance of Onsite Wastewater Treatment Systems (OWTS Policy) located at: http://www.waterboards.ca.gov/water_issues/programs/owts/summary.shtml

effects of NPS water pollution. The NPS Program aims to minimize NPS pollution from land use activities in agriculture, urban development, forestry, recreational boating and marinas, hydromodification and wetlands. Bacteria pollution is usually not the main focus of the NPS program but is one of the components of runoff from certain activities that may utilize some additional reasonably foreseeable methods of compliance outlined below in response to the Bacteria Provisions.

6.3.1 Agricultural BMPs

Agriculture BMPs are developed to improve sediment and erosion management practices. It is also important to implement irrigation management practices to reduce or eliminate dry weather runoff from fields. The focus of these BMPs is usually to reduce nutrient and sediment runoff. However, associated bacteria loads make these BMPs important options to consider. Listed below are some of the practices that may be implemented as outlined in the TMDL report for the San Gabriel River, Estuary and Tributaries[19] implementation Staff Report to help control bacteria pollution:

- Avoid bare fields by planting cover crops or leaving plant debris in field
- Minimize road erosion by grading or using gravel 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 a 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

6.3.2 Dairy and Livestock-Related BMPs

The state water quality regulations for confined animal facilities[20] are often implemented in Waste Discharge Requirements and General Orders issued by Regional Water Boards[21]. These require each facility to implement a Waste Management Plan and a Nutrient Management Plan. The Waste Management Plans require dairy and livestock-related BMPs to control discharges of bacteria at their source. These BMPs include buffers and filter strips protecting streams and drainages from direct runoff. Improved manure storage areas and ponds also reduce the likelihood that stormwater will wash bacteria into nearby watersheds. These BMPs often focus on ways to provide separation and control between bacteria generating practices and waterbodies. Some BMPs include biofiltration for runoff from these areas.

---

[19] See Los Angeles Regional Water Quality Control Board. 2015 Substitute Environmental Documents for the San Gabriel River, Estuary, and Tributaries Bacteria Total Maximum Daily Load located at: http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/111_new/SEDSGRBactTMDL.pdf

[20] See Title 27, Division 2, Subdivision 1, California Code of Regulations located at:

[21] http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/r5-2013-0122.pdf

7 Environmental Effects of the Bacteria Provisions (Environmental Checklist)

7.1 Introduction

In accordance with Public Resources Code, section 21080.5, subdivision (c), the Water Boards' Water Quality Control/208 Planning Program has been certified as an exempt regulatory program by the Secretary for Natural Resources. (Cal. Code Regs., tit. 14, § 15251, subd. (g); *id*., tit. 23, § 3775.) The certification means the Water Boards are exempt from having to develop an EIR because the environmental analysis is contained in SED. Chapter 27 of the California Code of Regulations (beginning with section 3720) contains the Water Boards' regulations for implementing the CEQA (referred to as the certified regulatory program). (Pub. Resources Code, § 21000, et seq.) The Water Boards' certified regulatory program incorporates the CEQA Guidelines. (Cal. Code Regs., tit. 14, div. 6, ch. 3, section 15000.) The State Water Board's SED must contain an environmental analysis of its proposed action. The Staff Report, which contains the SED, is being used to satisfy this requirement.

The Water Boards' certified regulatory program must still comply with CEQA's overall objectives to: inform the decision makers and the public about the potentially significant environmental effects of a proposed project; identify ways that significant adverse environmental impacts may be mitigated; and prevent significant, avoidable adverse environmental impacts by changing the proposed project or requiring mitigation measures. There are certain guiding principles that are contained in the CEQA Guidelines that help to inform the Water Board's certified regulatory process and preparation of the SED:

Forecasting: Drafting the environmental analysis necessarily involves some degree of forecasting. While foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can. (Cal. Code Regs., tit. 14, § 15144.)

Speculation: If, after thorough investigation, a lead agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact. (Cal. Code Regs., tit. 14, § 15145.)

Specificity: The degree of specificity required in the environmental analysis will correspond to the degree of specificity involved in the underlying activity which is described in the EIR. (Cal. Code Regs., tit. 14, § 15146.)

Standards for Adequacy: The environmental analysis should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency the analysis is to be reviewed in the light of what is reasonably feasible. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure. (Cal. Code Regs., tit. 14, § 15151.)

This section of the Staff Report identifies and evaluates the potential environmental impacts that may arise from the Bacteria Provisions and the reasonably foreseeable methods of compliance, and contains the Environmental Checklist. It also discusses mitigation, where applicable, to avoid the identified significant or potentially significant impacts. (Cal. Code Regs., tit. 23, § 3777(b).)

7.1.1 Impact Methodology

Any potential environmental impacts associated with the Bacteria Provisions depend upon the specific compliance methods selected by the complying permittee; most of whom will be public agencies subject to their own CEQA obligations. (Pub. Res. Code § 21159.2.) This document has identified broad mitigation approaches that could be considered at a statewide level. Consistent with Public Resources Code section 21159 and the State Water Board's certified regulatory program, the document does not engage in speculation or conjecture, but rather considers the potential environmental impacts of the Bacteria Provisions and reasonably foreseeable methods of compliance, the feasible mitigation measures, and feasible alternatives (including alternative means of compliance) which would meet the project objectives and avoid or reduce the potentially significant impacts of the Bacteria Provisions.

Within each of the subsections discussed below, this document evaluates the potentially significant impacts of the proposed project and implementation alternatives relative to the subject resource area. The implementation alternatives evaluated in this document are evaluated on a state-wide level for impacts for each resource area. Project-level analysis is expected to be conducted by the appropriate public agencies prior to implementation of project specific methods of compliance with the Bacteria Provisions. The environmental analysis in this document assumes that the project specific methods of compliance with the Bacteria Provisions would be designed, installed, and maintained following all applicable state and local laws, regulations, and ordinances. Several handbooks are available and currently used by municipal agencies that provide guidance for the selection and implementation of BMPs. (California Stormwater Quality Association 2003a; 2003b, Water Environment Research Foundation 2005, Caltrans 2010.)

7.1.2 Level of Analysis

The State Water Board is the lead agency for the Bacteria Provisions, while a local or regional agency may be the lead agency for CEQA compliance for approval and implementation of a project specific method of compliance with the Bacteria Provisions.

The State Water Board does not specify the actual means of compliance by which permittees choose to comply with the Bacteria Provisions. However, as required by the State Water Board's certified regulatory program, this Staff Report analyzes the potential environmental impacts of the Bacteria Provisions and the reasonably foreseeable methods of compliance on a statewide level. The specificity of the "activity" described in this Staff Report related to the reasonably foreseeable methods of compliance is of a general nature and the level of analysis of the potentially significant adverse environmental effects is commensurate with that level of detail. At the time of approval of a project-specific compliance project where the detail of the method of compliance is known, a project-level environmental analysis may be performed by the local approval agency.

Project-level impacts of the reasonably foreseeable methods of compliance will necessarily vary depending on the choice of compliance and the size, location, and type of discharger and the environmental resources in and around the project site. It would be speculative to estimate the specific impacts of the Bacteria Provisions caused by implementation of a project-specific compliance method. It is possible that, at a specific site with particularly sensitive environmental resources, implementation with compliance measures could cause potentially significant impacts as compared to baseline conditions. Since it is speculative to estimate the type, size, and location of any particular compliance method (e.g., type of construction activities and type of resources adversely affected by those activities), this evaluation makes no attempt to quantify the impacts associated with implementation or maintenance of a particular compliance method.

Per the requirements of the State Water Board's environmental regulations, the resource analysis in this section includes:

- An identification of any significant or potentially significant adverse environmental impacts of the proposed project;
- An analysis of reasonable alternatives to the project and mitigation measures to avoid or reduce any significant or potentially significant adverse environmental impacts; and
- An environmental analysis of the reasonably foreseeable methods of compliance, including:
    - An identification of the reasonably foreseeable methods of compliance with the project;
    - An analysis of any reasonably foreseeable significant adverse environmental impacts associated with those methods of compliance;
    - An analysis of reasonably foreseeable alternative methods of compliance that would have less significant adverse environmental impacts; and
    - An analysis of reasonably foreseeable mitigation measures that would minimize any unavoidable significant adverse environmental impacts of the reasonably foreseeable methods of compliance. (Cal. Code Regs., tit. 23, § 3777.)

7.2 Environmental Setting

Section 15125(a) of the CEQA Guidelines states: "An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or … at the time environmental review is commenced…. *This environmental setting will normally constitute the baseline physical conditions by which a Lead Agency determines whether an impact is significant*" (emphasis added). Section 5 presents a broad overview of the environmental setting for the state of California related to the Bacteria Provisions. As such, the environmental setting for determining impacts is presented at a general level as each regional water board and permittee may address bacteria with a range of treatment and institutional controls. The following resource sections present additional specific setting information relevant to the assessment of environmental impacts of the Bacteria Provisions.

Under the existing bacteria objectives, water bodies of concern either have bacterial levels well above the objective values or well below. The proposed bacteria objectives, while slightly more stringent than the existing objectives, are not expected to significantly increase the number of water bodies that would be considered out of compliance. State Water Board staff compared

the number of exceedances for several water bodies using the existing bacteria objectives and sampling methods with the new bacteria objectives and sampling methods (Table 8). The results show that even though the new objectives resulted in a greater number of exceedances, the final determinations of whether a water body required listing under 303(d) were the same. The reasonable means of compliance for the Bacteria Provisions are the same as those for the existing bacteria objectives (see Chapters 3 and 5). The water bodies out of compliance with the existing objectives will still be out of compliance under the proposed objectives. As such, compliance measures have already been implemented for these water bodies. These compliance measures are part of the existing baseline condition and environmental impacts associated with those compliance measures are also part of the existing baseline condition.

While the environmental impacts analysis discussed below examines potential impacts associated with implementation of the identified reasonable means of compliance, those impacts, if any, have already occurred or are expected to occur under the existing conditions. Adoption of the Bacteria Provisions is not expected to create any new adverse effects on the environment.

Table 8. Potential Clean Water Act Section 303(d) Listing Impacts

Water Body	Sample Count		Exceedances			Eligible for 303(d) Listing		
	Old*	New**	Old	New – High[1]	New – Low[2]	Old	New – High[1]	New – Low[2]
E. coli								
San Jose Creek Reach 1	30	160	30	137	146	Yes	Yes	Yes
Santa Clara River Reach 5	569	629	295	141	200	Yes	Yes	Yes
Santa Clara River Reach 6	206	235	0	0	0	No	No	No
Los Angeles River Reach 3	247	330	237	314	321	Yes	Yes	Yes
Enterococci								
Abalone Cove Beach	104	111	0	0	0	No	No	No
Hermosa Beach	621	677	326	348	361	Yes	Yes	Yes
Manhattan Beach	770	841	634	693	697	Yes	Yes	Yes
Malibu Lagoon Beach	1523	1560	1284	1298	1316	Yes	Yes	Yes
Long Point Beach	146	157	0	0	1	No	No	No
Rincon Parkway Beach	105	118	2	1	3	No	No	No
Paradise Cove Beach	186	197	70	71	85	Yes	Yes	Yes
Venice Beach	803	868	389	415	444	Yes	Yes	Yes

*Old = the results based on the current water quality objectives for bacteria.
**New = the results based on the proposed water quality objectives for bacteria.
[1]Illness rate of 36 per 1000 recreators.
[2]Illness rate of 32 per 1000 recreators.

7.3 Environmental Impacts

The environmental factors checked below could be potentially affected by this project.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology/Soils
☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials Energy and Mineral Resources	☐ Hydrology/Water Quality
☐ Land Use/Planning	☐ Mineral Resources	☐ Noise
☐ Population/Housing	☐ Public Services	☑ Recreation
☐ Transportation/Traffic	☐ Utilities/Service Systems	☐ Mandatory Findings of Significance

7.3.1 Aesthetics

Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Have a substantial adverse effect on a scenic vista?	☐	☐	☑	☐
b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☑
c. Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☑	☐
d. Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?	☐	☐	☐	☑

7.3.1.1 Impacts and Mitigation

Although the Bacteria Provisions do not require land alteration, it is expected that some minimal land alteration would be associated with several of the reasonably foreseeable methods of compliance. Land alterations may occur if catch basins or other means are employed to divert urban runoff from running directly into streams or other water bodies. While compliance may require the installment of BMPs, it is unlikely that the aesthetics of the natural environment would be adversely affected by improvements to existing infrastructure.

The general aesthetic characteristic of those portions of the state where the Bacteria Provisions would be implemented using structural BMPs or land alteration are mostly densely urbanized.

7.3.1.2 Summary

Implementation of the Bacteria Provisions will have a less than significant effect on aesthetics.

7.3.2 Agricultural and Forest Resources

In determining whether impacts to agricultural resources are significant environmental impacts, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.

Would the project: Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Convert Prime Farmland, Unique Farmland, or Farmland of statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping & Monitoring Program of the California Resources Agency, to non-agricultural uses?	☐	☐	☐	☑
b. Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☑
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)) or timberland (as defined by Public Resources Code § 4526)	☐	☐	☐	☑
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☑
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☑

7.3.2.1 Impacts and Mitigation

The Bacteria Provisions would not affect agriculture or farmland as they do not alter zoning laws or require conversions to different land uses. Significant bacteria generation is not expected on agricultural or forestry lands, therefore the use of structural BMPs is not likely in these areas. For dairy and livestock farming the Bacteria Provisions will not significantly alter the current control programs or the requirement for BMP systems to be installed.

7.3.2.2 Summary

There are no foreseeable impacts on agricultural or forest resources.

7.3.3 Air Quality

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☑	☐
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☑	☐
c. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☑	☐
d. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☐	☑	☐
e. Create objectionable odors affecting a substantial number of people?	☐	☐	☑	☐

Background

State Law

The California Air Resources Board (ARB) is a board within the California Environmental Protection Agency that coordinates local, state and federal air pollution control programs in California. In 1988, the State Legislature adopted the California Clean Air Act (Health & Safety Code, § 39000 et seq.), which established a statewide air pollution control program. The California Clean Air Act's requirements include annual emission reductions, increased development and use of low emission vehicles, and submittal of air quality attainment plans by air districts. The ARB has established state ambient air quality standards, also shown in Table 9. Additionally, the ARB has established state standards for pollutants that have no federal ambient air quality standard, including sulfate, visibility, hydrogen sulfide, and vinyl chloride.

The ARB has established state ambient air quality standards to identify outdoor pollutant levels considered safe for the public. Ambient air quality standards define clean air, and are established to protect even the most sensitive individuals in our communities. An air quality standard defines the maximum amount of a pollutant that can be present in outdoor air without harm to the public's health. In addition to state standards, the federal Clean Air Act (42 U.S.C. § 7401, et seq.) requires U.S. EPA to set national ambient air quality standards (federal standards or national standards). The ARB makes area designations for ten pollutants: ozone, suspended

particulate matter (PM10 and PM2.5), carbon monoxide, nitrogen dioxide, sulfur dioxide, sulfates, lead, hydrogen sulfide, and visibility reducing particles.

After state standards are established, state law requires the ARB to designate each area as attainment, nonattainment, or unclassified for each state standard. The area designations, which are based on the most recent available data, indicate the healthfulness of air quality throughout the state. Classifications determine the applicability and minimum stringency of pollution control requirements.

The gaseous criteria pollutants, particulate matter, and toxic air contaminants, and the associated adverse health effects of these air quality contaminants are summarized below. Daily emissions and pollutant concentrations are used to quantify air pollution. The term "emissions" means the quantity of pollutant released into the air and has units of pounds per day (lbs /day). The term "concentrations" means the amount of pollutant material per volumetric unit of air and has units of parts per million (ppm) or micrograms per cubic meter (µg/m3).

Carbon Monoxide
Exposure to high concentrations of carbon monoxide, a colorless and odorless gas, reduces the oxygen-carrying capacity of the blood, and therefore can cause dizziness and fatigue, impair central nervous system functions, and induce angina in persons with serious heart disease. Carbon monoxide is emitted almost exclusively from the incomplete combustion of fossil fuels. In urban areas, motor vehicles, power plants, refineries, industrial boilers, ships, aircraft, and trains emit carbon monoxide. Motor vehicle exhaust releases most of the carbon monoxide in urban areas. Vehicle exhaust contributes approximately 56 percent of all carbon monoxide emissions nationwide and up to 95 percent in cities. Carbon monoxide is a non-reactive air pollutant that dissipates relatively quickly. As a result, ambient carbon monoxide concentrations generally follow the spatial and temporal distributions of vehicular traffic. Carbon monoxide concentrations are influenced by local meteorological conditions; primarily wind speed, topography, and atmospheric stability. Carbon monoxide from motor vehicle exhaust can become locally concentrated when surface-based temperature inversions combine with calm atmospheric conditions.

Ozone
While ozone serves a beneficial purpose in the upper atmosphere (stratosphere) by reducing potentially harmful ultraviolet radiation, when it reaches elevated concentrations in the lower atmosphere it can be harmful to the human and to sensitive species of plants. Short-term ozone exposure can reduce lung function and increase an individual's susceptibility to respiratory infection. Long-term exposure can impair lung defense mechanisms and lead to emphysema and/or chronic bronchitis. Ozone concentrations build to peak levels during periods of light winds or stagnant air, bright sunshine, and high temperatures. Ideal conditions occur during summer and early autumn. Sensitivity to ozone varies among individuals. About 20 percent of the population is sensitive to ozone, with exercising children being particularly vulnerable. Ozone is formed in the atmosphere by a complex series of chemical reactions under sunlight that involve "ozone precursors." Ozone precursors are categorized into two families of pollutants: oxides of nitrogen and reactive organic compounds. Oxides of nitrogen and reactive organic compounds are emitted from a variety of stationary and mobile sources. While oxides of nitrogen are considered a criteria pollutant, reactive organic compounds are not in this category, but are included in this discussion as ozone precursors. Ozone is the chief component of urban smog and the damaging effects of photochemical smog generally relate to

the concentration of ozone. Meteorology and terrain play major roles in ozone formation. The greatest source of smog producing gases is the automobile.

Nitrogen Dioxide
The major health effect from exposure to high levels of nitrogen dioxide is the risk of acute and chronic respiratory disease. Like ozone, nitrogen dioxide typically is not directly emitted, but it is formed through a rapid reaction between nitric oxide and atmospheric oxygen. Nitric oxide and nitrogen dioxide are collectively called oxides of nitrogen and are major contributors to ozone formation. Nitrogen dioxide also contributes to the formation of respirable particulate matter (see discussion of respirable particulate matter below) and fine particulate matter through the formation of nitrate compounds. At atmospheric concentrations, nitrogen dioxide is only potentially irritating. In high concentrations, the result is a brownish-red cast to the atmosphere and reduced visibility.

Sulfur Dioxide
The major health effect from exposure to sulfur dioxide is acute and chronic respiratory disease. Exposure may cause narrowing of the airways, which may cause wheezing, chest tightness, and shortness of breath. Sulfur dioxide can also react with water in the atmosphere to form acids (or "acid rain"), which can cause damage to vegetation and man-made materials. The main source of sulfur dioxide is coal and fuel oil combustion in power plants and industries, as well as diesel fuel combustion in motor vehicles. Generally, the highest levels of sulfur dioxide are found near large industrial complexes. In recent years, sulfur dioxide concentrations have been reduced by the increasingly stringent controls placed on stationary source emissions of sulfur dioxide and by limiting the sulfur content in fuel. Sulfur dioxide concentrations in southern California have been reduced to levels well below the state and national ambient air quality standards, but further reductions in emissions are needed to attain compliance with ambient air quality standards for sulfates, respirable particulate matter, and fine particulate matter, to which sulfur dioxide is a contributor.

Particulate Matter
Particulate matter pollution consists of very small liquid and solid particles in the air, which can include smoke, soot, dust, salts, acids, and metals. Particulate matter also forms when gases emitted from industries and motor vehicles undergo chemical reactions in the atmosphere. Particulate matter is regulated as respirable particulate matter (inhalable particulate matter less than ten micrometers in diameter). More recently it has been subdivided into coarse and fine fractions, with particulate matter less than 2.5 micrometers in diameter constituting the fine fraction. Major sources of respirable particulate matter include crushing or grinding operations; dust stirred up by vehicles traveling on roads; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions. Fine particulate matter results from fuel combustion (e.g., from motor vehicles, power generation, and industrial facilities), residential fireplaces, and wood stoves. In addition, fine particulate matter can be formed in the atmosphere from gases such as sulfur dioxide, oxides of nitrogen, reactive organic compounds, and ammonia, and elemental carbon. Fine particulate matter is a subset of respirable particulate matter.

The health effects from long-term exposure to high concentrations of particulate matter are increased risk of chronic respiratory disease like asthma and altered lung function in children. Particles with 2.5 to 10 microns in diameter tend to collect in the upper portion of the respiratory

system. Particles that are 2.5 microns or less are so tiny that they can penetrate deeper into the lungs and damage lung tissues. These substances can be absorbed into the bloodstream and cause damage elsewhere in the body. Short-term exposure to high levels of particulate matter has been shown to increase the number of people seeking medical treatment for respiratory distress, and to increase mortality among those with severe respiratory problems. Particulate matter also results in reduced visibility. Ambient particulate matter has many sources. It is emitted directly by combustion sources like motor vehicles, industrial facilities, and residential wood burning, and in the form of dust from ground-disturbing activities such as construction and farming. It also forms in the atmosphere from the chemical reaction of precursor gases.

Toxic Air Contaminants

Toxic air contaminants include air pollutants that can produce adverse public health effects, including carcinogenic effects, after long-term (chronic) or short-term (acute) exposure. One source of toxic air contaminants is combustion of fossil fuels or digester gas. Human exposure occurs primarily through inhalation, although non-inhalation exposure can also occur when toxic air contaminants in particulate form deposit onto soil and drinking water sources and enter the food chain or are directly ingested by humans. Many pollutants are identified as toxic air contaminants because of their potential to increase the risk of developing cancer. For toxic air contaminants that are known or suspected carcinogens, it has been found that there are no levels or thresholds below which exposure is risk free. No ambient air quality standards exist for toxic air contaminants, except that standards for lead, hydrogen sulfide, and vinyl chloride are provided in California Ambient Air Quality Standards. Instead, numerous national, state, and local rules that affect both stationary and mobile emission sources regulate toxic air contaminants emissions. Individual toxic air contaminants vary greatly in the risk they present; at a given level of exposure one toxic air contaminants may pose a hazard that is many times greater than another. Where data are sufficient to do so, a "unit risk factor" can be developed for cancer risk. The unit risk factor expresses assumed risk to a hypothetical population, the estimated number of individuals in a million who may develop cancer as the result of continuous, lifetime (70-year) exposure to one microgram per cubic meter ($\mu g/m^3$) of the toxic air contaminants. Unit risk factors provide a standard that can be used to establish regulatory thresholds for permitting purposes. This is, however, not a measure of actual health risk because actual populations do not experience the extent and duration of exposure that the hypothetical population is assumed to experience. For non-cancer health effects, a similar factor called a Hazard Index is used.

Areas with monitored pollutant concentrations that are lower than ambient air quality standards are designated as "attainment areas" on a pollutant-by-pollutant basis. When monitored concentrations exceed ambient standards, areas are designated as "nonattainment areas." An area that recently exceeded ambient standards, but is now in attainment, is designated as a "maintenance area." Nonattainment areas are further classified based on the severity and persistence of the air quality problem as "moderate" "severe" or "serious." Classifications determine the applicability and minimum stringency of pollution control requirements.

Regulatory Setting

Federal

The U.S. EPA is the federal agency charged with administering the federal Clean Air Act Amendments of 1990, which established a number of requirements. The U.S. EPA oversees state and local implementation of federal Clean Air Act requirements. The Clean Air Act

Amendments require the U.S. EPA to approve State Implementation Plans to meet and/or maintain the national ambient standards.

The federal (and California) ambient air quality standards are shown below.

Table 9. Federal and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	Federal Standards	
			Primary	Secondary
Ozone	1 Hour	0.09 ppm (180 µg/m^3)	-	Same as Primary Standard
	8 Hour	0.070 ppm (137 µg/m^3)	0.075 ppm (147 µg/m^3)	
Respirable Particulate Matter	24 Hour	50 µg/m^3	150 µg/m^3	Same as Primary Standard
	Annual Arithmetic Mean	20 µg/m^3	-	
Fine Particulate Matter	24 Hour	No Separate State Standard	35 µg/m^3	35 µg/m^3
	Annual Arithmetic Mean	12 µg/m^3	12.0 µg/m^3	15.0 µg/m^3
Carbon Monoxide	1 Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	-
	8 Hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)	-	-
Nitrogen Dioxide	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as Primary Standard
	1 Hour	0.18 ppm (339 µg/m^3)	100 ppm (188 µg/m^3)	-
Sulfur Dioxide	Annual Arithmetic Mean	-	0.030 ppm	-
	24 Hour	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)	-
	3 Hour	-	-	0.5 ppm (1300 µg/m^3)
	1 Hour	0.25 ppm (655 µg/m^3)	75 ppb (195 µg/m^3)	-
Lead	30 Day Average	1.5 µg/m^3	-	-
	Calendar Quarter	-	1.5 µg/m^3	Same as Primary Standard

State

The California Air Resources Board is the state agency responsible for coordinating both state and federal air pollution control programs in California. In 1988, the State Legislature adopted the California Clean Air Act, which established a statewide air pollution control program. The California Clean Air Act's requirements include annual emission reductions, increased development and use of low emission vehicles, and submittal of air quality attainment plans by air districts. The California Air Resources Board has established state ambient air quality standards, shown in Table 9. Additionally, the California Air Resources Board has established

state standards for pollutants that have no federal ambient air quality standard, including sulfate, visibility, hydrogen sulfide, and vinyl chloride.

Local
There are 35 local air districts within the state. Each district (referred to as either an Air Pollution Control District or an Air Quality Management District) is responsible for controlling emissions, primarily from stationary sources of air pollution, within their area. Each district develops and adopts an Air Quality Management Plan, which serves as the blueprint to bring their respective areas into compliance with federal and state clean air standards. Rules are adopted to reduce emissions from various sources.

7.3.3.1 Impacts and Mitigation
Because compliance with the Bacteria Provisions would not cause any significant changes in population or employment, it is not expected to generate ongoing traffic-related emissions. It does not require construction of any permanent emissions sources. For these reasons, no permanent changes in air emissions would occur and the Bacteria Provisions would not conflict with applicable air quality plans or violate any air quality standards. Therefore, no air quality impacts would result.

Compliance with the Bacteria Provisions may involve short term and discrete construction activities during TMDL implementation. The TMDL implementation plans should address any short term impacts and identify any mitigation required and should not create any significant air quality impacts. This should also prevent exposure of sensitive receptors to substantial pollutant concentrations.

The Bacteria Provisions would not generate any new traffic-related or construction related emissions. The sampling frequency is the same as under the existing criteria and no additional vehicle trips are required. Therefore, the Bacteria Provisions would not result in a cumulatively considerable net increase of any pollutant for which the project region is in non-attainment of air quality standards and no air quality impacts would result.

Measures to lessen the air emissions caused by vehicle trips or construction equipment include: (1) use of construction, and maintenance vehicles with lower-emission engines; (2) use of soot reduction traps or diesel particulate filters; and (3) use of emulsified diesel fuel.

7.3.3.2 Summary
Adoption of the Bacteria Provisions is projected to have no significant impact on air quality. All foreseeable methods of compliance would not be of the size or scale to result in alteration of air movement, pollution, moisture or temperature, or any change in climate, either locally or regionally. Potential impacts to air quality due to implementation of the Bacteria Provisions should be insignificant.

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential air quality impacts have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

The State Water Board does not direct which compliance measures responsible agencies choose to adopt or the mitigation measures they employ. The State Water Board does, however, recommend that appropriate measures be applied to reduce or avoid potential environmental impacts that may be identified during the environmental review of project-level compliance measures.

7.3.4 Biological Resources

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☐	☑
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☐	☑
c. Have a substantial adverse effect on federally-protected wetlands as defined by Section 404 of the federal Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, *etc.*) through direct removal, filling, hydrological interruption or other means?	☐	☐	☐	☑
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☑
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☑
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☑

A general description of the environmental setting is presented in Section 5 of this document. Those portions of the state where compliance with the Bacteria Provisions are likely to require construction and maintenance activities are densely urbanized and the presence of fish and wildlife species and their supporting habitat severely limited. Any watercourses, riparian habitat

or wetlands downstream from the construction and maintenance activities would not be adversely impacted by these compliance measures. Rather, in the long term these areas would be improved by the reduction in trash, sediments, untreated fecal contamination, and pathogens entering these habitats from upstream sources. In addition, several of the reasonably foreseeable methods of compliance include the installation of buffer strip or restoration of riparian habitat which will improve the biological setting.

Regulatory Setting

Federal Endangered Species Act

Pursuant to the federal ESA, the U. S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Fisheries Service, formerly National Marine Fisheries Service, have regulatory authority over federally listed species. Under the ESA, a permit is required for any federal action that may result in "take" of a listed species. Section 9 of the ESA defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Under federal regulations, take is further defined to include the modification or degradation of habitat where such activity results in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Clean Water Act

Section 404 of the Clean Water Act requires project proponents to obtain a permit from the U.S. Army Corps of Engineers before performing any activity that involves discharge of dredged or fill material into "waters of the United States," including wetlands. Dredge and fill activities involve any activity, such as construction, that results in direct modification (e.g., alteration of the banks, deposition of soils) of an eligible waterway. Waters of the United States include navigable waters, interstate waters, and other waters where the use or degradation or destruction of the waters could affect interstate or foreign commerce, tributaries to any of these waters, and wetlands that meet any of these criteria or that are adjacent to any of these waters or their tributaries. Many surface waters and wetlands in California meet the criteria for waters of the United States.

In accordance with section 401 of the Clean Water Act, projects that apply for a U.S. Army Corps of Engineers permit for discharge of dredged or fill material must obtain water quality certification from the Water Boards indicating that the project would uphold state water quality standards.

California Endangered Species Act

Pursuant to the California Endangered Species Act, a permit from the California Department of Fish and Wildlife is required for projects that could result in take of a plant or animal species that is state listed as threatened or endangered. Under California ESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species. Authorization for take of state-listed species can be obtained through a California Fish and Wildlife Code section 2080.1 consistency determination or a section 2081 incidental take permit.

Section 1600 of the California Fish and Wildlife Code

All diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream or lake in California that supports wildlife resources is subject to regulation by the California Department of Fish and Wildlife, under sections 1600–1603 of the California Fish and Wildlife Code. Section 1601 states that it is unlawful for any agency to substantially divert or obstruct the natural flow or substantially change the bed, channel or bank of any river, stream or

lake designated by California Department of Fish and Wildlife, or use any material from the streambeds, without first notifying California Department of Fish and Wildlife of such activity. The regulatory definition of a stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation. California Department of Fish and Wildlife's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife. Accordingly, a California Department of Fish and Wildlife Streambed Alteration Agreement must be obtained for any project that would result in diversions of surface flow or other alterations to the bed or bank of a river, stream, or lake.

Porter-Cologne Water Quality Control Act
Under the Porter-Cologne Water Quality Control Act, "waters of the state" fall under the jurisdiction of the appropriate regional water board. The regional water board must prepare and periodically update Basin Plans. Each Basin Plan establishes numerical or narrative water quality objectives to protect established beneficial uses, which include wildlife, fisheries and their habitats. Projects that affect wetlands or waters of the state must meet discharge requirements of the regional water board, which may be issued in addition to a water quality certification or waiver under section 401 of the Clean Water Act.

Local Regulations
Numerous California cities and counties have adopted ordinances regulations and policies for the protection and enhancement of natural resources, including heritage trees, important natural features, habitat alteration, and common and special status species.

7.3.4.1 Impacts and Mitigation
The specific location of each compliance measure, if any, would be determined during the implementation of the specific measures and not during the development and adoption of the Bacteria Provisions. In general, the activities that would take place in order to achieve or maintain compliance with the Bacteria Objectives would be similar in nature to current urban activities that are already occurring in the watersheds. Compliance with Bacteria Provisions would not foreseeably:

- Cause a substantial reduction of the overall habitat of a wildlife species.
- Produce a drop in a wildlife population below self-sustaining levels.
- Eliminate a plant or animal community.
- Have a substantial adverse effect on federally protected wetlands.
- Conflict with any local policies or ordinances protecting biological resources.

It is not reasonably foreseeable that either the construction/implementation or maintenance phase of potential projects would result in a significant long-term impact to general wildlife species adapted to developed environments.

The objectives for the Bacteria Provisions are designed to prevent contamination of the state's surface waters that would degrade or inhibit recreational activities. The primary means is by preventing bacteria and other associated pathogens from entering the waterways. Other compliance measures could include treatment programs for impacted waters.

Reasonably foreseeable means of compliance that involve construction activities would be implemented in currently urbanized areas. Since these areas are already fully urbanized, it is unlikely that the construction activities would cause the removal, disturbance or change in diversity of any plant species or cause a change or reduction in the number of any unique, rare or endangered species of plants. Depending on the final location of facilities, however, potential impacts to biological resources including special-status species and habitat, wetlands, and trees protected under local ordinances or policies could occur.

It is not reasonably foreseeable that construction activities would result in the introduction of exotic or invasive plant species into an area. Nor would it result in a barrier to the normal replenishment of existing species. In the case that landscaping is incorporated into the specific project design, however, there is a possibility of disruption of resident native species.

It is possible that direct or indirect impacts to special-status animal species may occur at the project level. Because these animal species are protected by state and/or federal ESAs, impacts to them would be considered potentially significant. Even though it is expected that potential projects would occur in previously developed areas it is possible for special-status species to occur in what would generally be described as urban areas. If these species are present during activities such as ground disturbance, construction, and operation and maintenance activities associated with the potential projects, it could conceivably result in direct impacts to special status species including the following:

- Direct loss of a sensitive species.
- Increased human disturbance in previously undisturbed habitats.
- Mortality by construction or other human-related activity.
- Impairing essential behavioral activities, such as breeding, feeding or shelter/refugia.
- Destruction or abandonment of active nest(s)/den sites.
- Direct loss of occupied habitat.

In addition, potential indirect impacts may include but are not limited to, the following:

- Displacement of wildlife by construction activities.
- Disturbance in essential behavioral activities due to an increase in ambient noise levels and/or artificial light from outdoor lighting around facilities.

It is not reasonably foreseeable that construction activities would result in the introduction of new species. In addition, because potential projects would be established in previously heavily developed areas it is not expected that potential project sites would act as a travel route or regional wildlife corridor. Construction of these facilities would not considerably restrict wildlife movement. A travel route is generally described as a landscape feature (such as a ridgeline, canyon, or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and provide access to necessary resources (e.g. water, food, and den sites). Wildlife corridors are generally an area of habitat, usually linear in nature, which connect two or more habitat patches that would otherwise be fragmented or isolated from one another. Construction activities may impact migratory avian species. These avian species may use portions of potential project sites, including ornamental vegetation, during breeding season and may be protected under the Migratory Bird Treaty Act while nesting. The Migratory Bird Treaty

Act includes provisions for protection of migratory birds under the authority of the U.S. Fish and Wildlife Service and California Fish and Wildlife. The Migratory Bird Treaty Act protects over 800 species including, geese, ducks, shorebirds, raptors, songbirds, and many other relatively common species.

It is not reasonably foreseeable that construction activities would result in the deterioration of existing fish and or wildlife habitat. Potential construction activities would occur in previously developed areas and would not result in the removal of sensitive biological habitats.
The following measures should be implemented to reduce or avoid potential project-level impacts to biological resources:

Assuming any unique species are present, plant number and species diversity could be maintained by either preserving them prior, during, and after the construction or by re-establishing and maintaining the plant communities post construction.

When the specific projects are developed and sites identified, a search of the California Natural Diversity Database could be employed to confirm that any potentially sensitive plant species or biological habitats in the site area are properly identified and protected as necessary. Focused protocol plant surveys for special-status-plant species could be conducted at each site location, if appropriate. If sensitive plant species occur on the project site mitigation would be required consistent with appropriate expert analysis. Mitigation measures shall be developed in coordination with U.S. Fish and Wildlife Service and California Department of Fish and Wildlife. Responsible agencies should endeavor to avoid compliance measures that could result in reduction of the numbers of any unique, rare or endangered species of plants, and instead opt for siting physical compliance measures sufficiently upstream or downstream of sensitive areas to avoid any impacts.

In the case that landscaping is incorporated into the specific project design, the possibility of disruption of resident native species could be avoided or minimized by using only plants native to the area. Use of exotic invasive species or other plants listed in the Exotic Pest Plant of Greatest Ecological Concern in California should be prohibited (California Exotic Pest Plant Council 1999).

Responsible agencies should endeavor to avoid compliance measures that could result in significant impacts to unique, rare or endangered (special-status) species, should any such species be present at locations where such compliance measures might otherwise be performed. Mitigation measures, however, could be implemented to ensure that potentially significant impacts to special status animal species are less than significant. When the specific projects are developed and sites identified a search of the California Natural Diversity Database could be employed to confirm that any potentially special-status animal species in the site area are properly identified and protected as necessary. Focused protocol animal surveys for special-status animal species should be conducted at each site location.

If special-status animal species are potentially near the project site area two weeks prior to grading or the construction of facilities and per applicable U.S. Fish and Wildlife Service and/or California Department of Fish and Wildlife protocols, pre-construction surveys to determine the presence or absence of special-status species would be conducted. The surveys should extend off site to determine the presence or absence of any special-status species adjacent to the project site. If special-status species are found to be present on the project site or within the

buffer area, mitigation should be required consistent with appropriate expert analysis. To this extent, mitigation measures would be developed in coordination with the U.S. Fish and Wildlife Service and California Department of Fish and Wildlife to reduce potential impacts.

If construction activities occur at locations where they would foreseeably adversely impact species migration or movement patters, mitigation measures previously described could be implemented to ensure that impacts which may result in a barrier to the migration or movement of animal is less than significant. Any site-specific wildlife crossings should be evaluated in consultation with California Department of Fish and Wildlife. If a wildlife crossing would be significantly impacted in an adverse manner, then the design of the project should include a new wildlife crossing in the same general location.

If construction occurs during the avian breeding season for special status species and/or Migratory Bird Treaty Act -covered species, generally February through August, then prior (within two weeks) to the onset of construction activities, surveys for nesting migratory avian species would be conducted on the project site following U.S. Fish and Wildlife Service and/or California Department of Fish and Wildlife guidelines. If no active avian nests are identified on or within 200 feet of construction areas, no further mitigation would be necessary.

Alternatively, to avoid impacts, the agencies implementing the compliance measures may begin construction after the previous breeding season for covered avian species and before the next breeding season begins. If a protected avian species was to establish an active nest after construction was initiated and outside of the typical breeding season (February – August), the project sponsor, would be required to establish a buffer of 200 feet or other measure that would result in equivalent mitigation between the construction activities and the nest site.

If active nest for protected avian species are found within the construction footprint or within the 200-foot buffer zone, construction would be required to be delayed within the construction footprint and buffer zone until the young have fledged or appropriate mitigation measures responding to the specific situation are developed in coordination with U.S. Fish and Wildlife Service or California Department of Fish and Wildlife. These impacts are highly site specific, and assuming they are foreseeable, they would require a project-level analysis and mitigation plan.

Finally, to the extent feasible, responsible agencies should endeavor to avoid compliance measures that could result in significant barriers to the beneficial migration or movement of animals. No significant impact is anticipated after mitigation.

7.3.4.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts to biological resources have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Adverse impacts to biological resources are not expected to occur due to the nature of the areas where potential compliance activities for Bacteria Provisions would be located. Most areas are already extensively developed and the presence of significant biological resources is unlikely. In the event that specific compliance projects do encounter biological resources,

measures can be identified to avoid or reduce potential impacts to less than significant levels, and these projects would need to have an independent environmental review done by the agency conducting the work.

7.3.5 Cultural Resources

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Cause a substantial adverse change in the significance of a historical resource as defined in section 15064.5?	☐	☐	☐	☑
b. Cause a substantial adverse change in the significance of an archaeological resource as defined in section 15064.5?	☐	☐	☐	☑
c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☑
d. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☑
e. Cause a substantial adverse change in the significance of a Tribal Cultural Resource as defined in Public Resources Code section 21074?	☐	☐	☐	☑

Historic Resources

An historical resource includes resources listed in or eligible for listing in the California Register of Historical Resources. The California Register includes resources on the National Register of Historic Places, as well as California State Landmarks and Points of Historical Interest. Properties that meet the criteria for listing also include districts which reflect California's history and culture, or properties which represent an important period or work of an individual, or yield important historical information. Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified as local historical resources are also considered a historical resource (California Office of Historical Preservation 2006). Based on substantial evidence within the administrative record, any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may also be considered to be an historical resource (CEQA Guidelines 15064.5(a)).

Archeological Resources

An archeological site may be considered an historical resource if it is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military or cultural annals of California or if it meets the criteria for listing on the California Register. (Pub. Resources Code, § 5020.1(j); Cal. Code Regs., tit. 14, § 4850.)

If an archeological site is not an historical resource, but meets the definition of a "unique archeological resource" as defined in Public Resources Code, section 21083.2, then it should be treated in accordance with the provisions of that section.

Tribal Cultural Resources

AB 52 (Gatto, 2014) established a new category of resources in CEQA called Tribal Cultural Resources. (Pub. Resources Code, § 21074.) "'Tribal cultural resources' are either of the following: (1) Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following: (A) Included or determined to be eligible for inclusion in the California Register of Historical Resources. (B) Included in a local register of historical resources as defined in subdivision (k) of section 5020.1. (2) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of section 5024.1. In applying the criteria set forth in subdivision (c) of section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe." (Ibid.) Consultation with a California Native American Tribe that has requested such consultation may assist a lead agency in determining whether the project may adversely affect tribal cultural resources, and if so, how such effects may be avoided or mitigated. Whether or not consultation has been requested (no such consultation was requested for the State Water Board's development of the Bacteria Provisions, see Section 2.6.6), the lead agency evaluates whether the project may cause a substantial adverse change in a site, feature, place, cultural landscape, sacred place, or object, with cultural value to a California Native American Tribe.

7.3.5.1 Impacts and Mitigation

This is a statewide level analysis of the potential impacts from the Bacteria Provisions. The specific location of potential impacts would be determined during the implementation of the Bacteria Provisions.

Compliance projects may include maintenance or upgrades to sewage, septic, or stormwater systems. Construction related activities would mostly occur in currently urbanized areas where ground disturbance has previously occurred. Because these areas are already fully urbanized it is unlikely that construction activities would cause a substantial adverse change to historical or archeological resources, destroy paleontological resources, or disturb human remains. Depending, however, on the final location of facilities, potential impacts to cultural resources could occur. Paleontological resources can be found in areas containing fossil-bearing formations. Archaeological resources have been found within urbanized areas. Historic and architectural resources have also been found within urbanized areas. The site-specific presence or absence of these resources is unknown because the specific locations for compliance measures would be determined by responsible agencies at the project level. Installation of these systems could result in minor ground disturbances, which could impact cultural resources if they are sited in locations containing these resources and where disturbances have not previously occurred.

Upon determination of specific locations where construction activities will occur, responsible agencies should complete further investigation, including consultation with Native American tribes, to make an accurate assessment of the potential to affect historic, archaeological, or historic resources or to impact any human remains. If potential impacts are identified, measures

to reduce impact could include project redesign, such as the relocation of facilities outside the boundaries of archeological or historical sites. According to the California Office of Historic Preservation, avoidance and preservation in place are the preferable forms of mitigation for archeological sites. When avoidance is infeasible, a data recovery plan should be prepared which adequately provides for recovering scientifically consequential information from the site. Studies and reports resulting from excavations must be deposited with the California Historical Resources Regional Information Center. No potentially significant impact is anticipated after these measures are taken.

7.3.5.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts to cultural resources have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

While the potential for adverse impacts to cultural resources is very low, there still exists a chance that cultural resources may occur at specific locations where related project compliance measures could be installed. Measures can be identified that could reduce potential impacts to less than significant levels and should be incorporated into site-specific projects carried out by a local agency.

7.3.6 Geology and Soils

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i. Rupture of a known earthquake fault, as delineated in the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines & Geology Special Publication 42.	☐	☐	☐	☑
ii. Strong seismic ground shaking?	☐	☐	☐	☑
iii. Seismic-related ground failure, including liquefaction?	☐	☐	☐	☑
iv. Landslides?	☐	☐	☐	☑
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☑

c.	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☑
d.	Be located on expansive soils, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☑
e.	Have soils incapable of adequately supporting the use of septic tanks or alternate wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☑

7.3.6.1 Impacts and Mitigation

No impact due to exposure of people to, or property to, geologic hazards such as rupture of a known earthquake fault, strong seismic ground shaking, liquefaction, or landslides is expected from the implementation of the reasonably foreseeable methods of compliance. Although areas of the state are subject to geologic hazards, compliance with standard design and construction specifications and the recommendations of geotechnical studies prepared at the project level would reduce the risk of damage from seismic-related hazards. Furthermore, it is not reasonably foreseeable that responsible agencies would choose to comply with the final Bacteria Provisions through structural means in areas where doing so would result in exposure of people or property to geologic hazards. Rather, it is foreseeable that localities would avoid such compliance measures in lieu of other compliance measures.

Wind or water erosion of soils may occur as a short-term impact during construction activities. Siltation or deposition may occur, resulting in reduction in siltation or deposition in downstream areas. Reduction in siltation and deposition in downstream areas may be considered a positive impact as fine sediments may contain toxic pollutants. Little or no impact on erosion of affected watercourses is expected since the flow rate in the watercourses is not impacted by foreseeable methods of compliance.

Construction activities would not cause or accelerate instability due to on- or off-site landslides, lateral spreading, subsidence, expansive soils, liquefaction, or collapse. Project footprints would not be of the size or scale to result in unstable earth conditions, changes in geologic substructures, topography or ground surface relief features, or destruction, covering or modification of any unique geologic or physical features. Implementation of the final Bacteria Provisions may result in minor surface soil excavation during construction activities and result in temporarily unstable soil but would not, due to small size, however, lead to landslides, lateral spreading, subsidence, expansive soils, liquefaction, or collapse. Most of the relevant areas are already urbanized, and have already suffered soil compaction and hardscaping.

To the extent that compliance measures are installed in areas subject to geologic hazards, such as, ground shaking, liquefaction, liquefaction-induced hazards, or landslides, geotechnical studies prepared as part of the pre-design process would identify site-specific soil and subsurface conditions and specify design features that would keep potential seismic related

impacts within acceptable levels. Compliance with existing regulations, building codes, and standards specifications would also keep potential impacts within acceptable levels. The most appropriate measure for potential fault rupture hazards is avoidance (e.g., building setbacks), as most surface faulting is confined to a relatively narrow zone a few feet to tens of feet wide (California Geological Survey 2002).

To the extent that construction activities cause an increase in erosion, typical established best management practices would be used during implementation to minimize offsite sediment runoff or deposition. Construction sites are required to retain sediments on site, either under a CGP permit or through the construction program of the applicable MS4 Phase I and II permit, which are already designed to minimize or eliminate erosion impacts on receiving water. No potentially significant impact is anticipated after these measures are taken.

To the extent that construction activities could result in ground instability, potential impacts could be avoided or mitigated through mapping to site facilities away from areas with unsuitable soils or steep slopes; design and installation in compliance with existing regulations; standard specifications and building codes; ground improvements such as soil compaction; and groundwater level monitoring to ensure stable conditions. No potentially significant impact is anticipated after these measures are taken.

To the extent that any soil is disturbed during construction activities, standard construction techniques, including but not limited to, shoring, piling, and soil stabilization can alleviate any potential impacts. Prior to earthwork, a geotechnical study would be conducted to evaluate geology and soil conditions. No potentially significant impact is anticipated after these measures are taken.

7.3.6.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to geology or soils have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Installation and maintenance of structural control devices and treatment control BMPs are not expected to result in potentially significant environmental effects with regard to geology and soils, because responsible agencies would not reasonably site BMPs where they would risk such impacts. Further, in the unlikely occurrence of such an impact, mitigation measures, which can be applied to reduce and/or eliminate these impacts, are available as described above. These mitigation measures are within the responsibility and jurisdiction of the responsible agencies subject to the final Bacteria Provisions and can or should be adopted by them (Cal. Code Regs., tit. 14, § 15091(a)(2)). The State Water Board does not direct which compliance measures responsible agencies choose to adopt or the mitigation measures they employ. The State Water Board does, however, recommend that appropriate measures be applied to reduce or avoid potential environmental impacts.

7.3.7 Greenhouse Gas Emissions

Would the project:	Potentially Significant Impact	Less Than Significant With	Less Than Significant Impact	No Impact

			Mitigation Incorporated	
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	❒	☐	❒	☑
b. Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	❒	❒	❒	☑

General scientific consensus and increasing public awareness regarding global warming and climate change have placed new focus on the CEQA review process as a means to address the effects of greenhouse gas emissions from proposed projects on climate change.

Global warming refers to the recent and ongoing rise in global average temperature near Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Global warming is causing climate patterns to change. Global warming itself, however, represents only one aspect of climate change.

Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer.

Increases in the concentrations of greenhouse gases in the Earth's atmosphere are thought to be the main cause of human-induced climate change. Greenhouse gases naturally trap heat by impeding the exit of infrared radiation that results when incoming ultraviolet solar radiation is absorbed by the Earth and re-radiated as infrared radiation. The principal greenhouse gases associated with anthropogenic emissions are carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, perfluorocarbon, nitrogen trifluoride, and hydrofluorocarbon. (Health and Safety Code, § 38505, subdivision (g); CEQA Guidelines, § 15364.5) Water vapor is also an important greenhouse gas, in that it is responsible for trapping more heat than any of the other greenhouse gases. Water vapor, however, is not a greenhouse gas of concern with respect to anthropogenic activities and emissions. Each of the principal greenhouse gases associated with anthropogenic climate warming has a long atmospheric lifetime (one year to several thousand years). In addition, the potential heat trapping ability of each of these gases vary significantly from one another. Methane for instance is 23 times more potent than carbon dioxide, while sulfur hexafluoride is 22,200 times more potent than carbon dioxide. (Intergovernmental Panel on Climate Change 2001) Conventionally, greenhouse gases have been reported as "carbon dioxide equivalents." Carbon dioxide equivalents take into account the relative potency of non-carbon dioxide greenhouse gases and convert their quantities to an equivalent amount of carbon dioxide so that all emissions can be reported as a single quantity.

The primary man-made processes that release these greenhouse gases include: (1) burning of fossil fuels for transportation, heating and electricity generation, which release primarily carbon dioxide; (2) agricultural practices, such as livestock grazing and crop residue decomposition and application of nitrogen fertilizers, that release methane and nitrous oxide; and (3) industrial processes that release smaller amounts of high global warming potential gases.

In 2005, Executive Order S-3-05 proclaimed that California is vulnerable to the effects of climate change. To combat those concerns, the Executive Order established a long-range greenhouse gas reduction target of 80percent below 1990 levels by 2050.

Subsequently, Assembly Bill 32, the California Global Warming Solutions Act of 2006 (Chapter 488, Statutes of 2006, enacting § 38500-38599 of the Health and Safety Code) was signed. Assembly Bill 32 requires California to reduce statewide greenhouse gas emissions to 1990 levels by 2020. AB 32 directed the California Air Resources Board to develop and implement regulations that reduce statewide greenhouse gas emissions.

The Climate Change Scoping Plan approved by the California Air Resources Board in December 2008, outlines the state's plan to achieve the greenhouse gas reductions required in Assembly Bill 32.

Senate Bill 97, signed in August 2007 (Chapter 185, Statutes of 2007, enacting § 21083.05 and 21097 of the Public Resources Code), acknowledges that climate change is a prominent environmental issue that requires analysis under CEQA. This bill directed the Office of Planning and Research to prepare, develop, and transmit guidelines for the feasible mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions to the California Resources Agency. Office of Planning and Research developed a technical advisory suggesting relevant ways to address climate change in CEQA analyses. The technical advisory also lists potential mitigation measures, describes useful computer models, and points to other important resources. In addition, amendments to CEQA guidelines implementing Senate Bill 97 became effective on March 18, 2010.

7.3.7.1 Impacts and Mitigation

The operation of construction equipment and the operation of new, or increase in, maintenance equipment would generate greenhouse gas emissions. Greenhouse gas emissions due to construction equipment would be short-term and limited to minor amounts and therefore would not significantly increase greenhouse gas levels in the environment. Greenhouse gas levels are not expected to rise significantly since mitigation measures are available to reduce greenhouse gas emissions due to construction, and maintenance activities.

The California Department of Water Resources has developed a set of BMPs to reduce greenhouse gas emissions from California Department of Water Resources construction and maintenance activities (California Department of Water Resources 2012). These BMPs can be used and/or modified to fit specific situations by the implementing agencies to reduce greenhouse gas emissions from their activities:

BMP 1. Evaluate project characteristics, including location, project work flow, site conditions, and equipment performance requirements, to determine whether specifications of the use of equipment with repowered engines, electric drive trains, or other high efficiency technologies are appropriate and feasible for the project or specific elements of the project.

BMP 2. Evaluate the feasibility and efficacy of performing on-site material hauling with trucks equipped with on-road engines.

BMP 3. Ensure that all feasible avenues have been explored for providing an electrical service drop to the construction site for temporary construction power. When generators must

be used, use alternative fuels, such as propane or solar, to power generators to the maximum extent feasible.

BMP 4. Evaluate the feasibility and efficacy of producing concrete on-site and specify that batch plants be set up on-site or as close to the site as possible.

BMP 5. Evaluate the performance requirements for concrete used on the project and specify concrete mix designs that minimize greenhouse gas emissions from cement production and curing while preserving all required performance characteristics.

BMP 6. Minimize idling time by requiring that equipment be shut down after five minutes when not in use (as required by the state airborne toxics control measure [Cal. Code Regs., tit. 13, § 2485]). Provide clear signage that posts this requirement for workers at the entrances to the site and provide a plan for the enforcement of this requirement.

BMP 7. Maintain all construction equipment in proper working condition and perform all preventative maintenance. Required maintenance includes compliance with all manufacturer's recommendations, proper upkeep and replacement of filters and mufflers, and maintenance of all engine and emissions systems in proper operating condition. Maintenance schedules shall be detailed in an Air Quality Control Plan prior to commencement of construction.

BMP 8. Implement tire inflation program on jobsite to ensure that equipment tires are correctly inflated. Check tire inflation when equipment arrives on-site and every two weeks for equipment that remains on-site. Check vehicles used for hauling materials off-site weekly for correct tire inflation. Procedures for the tire inflation program shall be documented in an Air Quality Management Plan prior to commencement of construction.

BMP 9. Develop a project specific ride share program to encourage carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.

BMP 10. Reduce electricity use in temporary construction offices by using high efficiency lighting and requiring that heating and cooling units be Energy Star compliant. Require that all contractors develop and implement procedures for turning off computers, lights, air conditioners, heaters, and other equipment each day at close of business.

BMP 11. For deliveries to project sites where the haul distance exceeds 100 miles and a heavy-duty class 7 or class 8 semi-truck or 53-foot or longer box type trailer is used for hauling, a SmartWay[22] certified truck would be used to the maximum extent feasible.

The final Bacteria Provisions would not conflict with any plan, amendment, or regulation adopted for the purpose of reducing greenhouse gas emissions. Most greenhouse gas reduction plans include replacing government owned vehicles with low or zero-emission

[22] The U.S EPA has developed the SmartWay truck and trailer certification program to set voluntary standards for trucks and trailers that exhibit the highest fuel efficiency and emissions reductions. These tractors and trailers are outfitted at point of sale or retrofitted with equipment that significantly reduces fuel use and emissions including idle reduction technologies, improved aerodynamics, automatic tire inflation systems, advanced lubricants, advanced powertrain technologies, and low rolling resistance tires.

vehicles. (Marin County 2006, City of Pasadena 2009, City of Citrus Heights 2011, California Department of Water Resources 2012) Implementation of greenhouse gas reduction plans would reduce greenhouse gas emissions from activities undertaken to comply with the final Bacteria Provisions.

In 2007, the California Air Resources Board adopted the Off-Road Diesel Vehicle Regulation (Cal. Code Regs., tit. 13, article 4.8, chapter 9) which, when fully implemented, would significantly reduce emissions from off-road, non-agricultural, diesel vehicles with engines greater than 25 horsepower—the types of vehicles typically used in construction activities. The regulation required owners to replace the engines in their vehicles, apply exhaust retrofits, or replace the vehicles with new vehicles equipped with cleaner engines. The regulation also limited vehicle idling, required sales disclosure requirements, and reporting and labeling requirements. The first compliance date for large fleets was March 1, 2010; however, amendments have been made several times to extend the deadlines. When the regulation is fully implemented, owners of fleets of construction, mining, and industrial vehicles would have to upgrade the performance of their vehicle fleets to comply with the regulation.

The California Air Resources Board Scoping Plan (California Air Resources Board 2008) proposes a comprehensive set of actions designed to achieve the 2020 greenhouse gas emissions reductions required under Assembly Bill 32. While some of the regulations would not be implemented until later, when they do take effect, they would likely result in reduced emissions from construction and maintenance activities. Specific actions in the Scoping Plan that would impact construction and maintenance activities include: low carbon fuel standard (Measure Transportation-2), tire inflation regulation (Measure Transportation-4), the heavy-duty tractor truck regulation (Measure Transporation-7), and commercial recycling (Measure Recycling and Waste-3).

In addition, other efforts by the California Air Resources Board would reduce air pollutant emissions through 2020, including the Diesel Risk Reduction Plan (California Air Resources Board 2000) and the 2007 State Implementation Plan. Measures in these plans would result in the accelerated phase-in of cleaner technology for virtually all of California's diesel engine fleets including trucks, buses, construction equipment, and cargo handling equipment at ports.

7.3.7.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to greenhouse gas emissions have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

With the incorporation of BMPs and compliance with any plans, amendments, or regulations adopted for the purpose of reducing greenhouse gas emissions, projects undertaken to comply with the Bacteria Provisions would not have a significant impact on the environment.

7.3.8 Hazards and Hazardous Materials

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation	Less Than Significant Impact	No Impact

					Incorporated
a.	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☑
b.	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☑
c.	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within ¼ mile of an existing or proposed school?	☐	☐	☐	☑
d.	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5 and, as a result, would it create a significant hazard to the public or to the environment?	☐	☐	☐	☑
e.	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or a public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
f.	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
g.	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☑
h.	Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☑

Hazards and hazardous materials are located throughout the urbanized portion of the state either as naturally occurring or man-made hazards. Contaminated soil and groundwater from commercial and industrial sites such as gas stations, dry cleaners, and manufacturing facilities are located throughout the state. Aboveground and underground storage tanks contain vast quantities of hazardous substances. Thousands of these tanks have leaked or are leaking, discharging petroleum fuels, solvents, and other hazardous substances into the subsurface. These leaks as well as other discharges to the subsurface that result from inadequate handling, storage, and disposal practices can seep into the subsurface and pollute soils and groundwater. During the installation of structural treatment alternatives for implementation of the reasonably foreseeable methods of compliance with the Bacteria Provisions it is possible that both naturally occurring hazards and anthropogenic contaminated soils and groundwater may be encountered. Any such encounters would require site specific mitigation measures to implement BMPs to prevent contamination of surface and ground water and to remove hazardous materials where possible. In any areas where natural hazards or contaminated soils or groundwater is anticipated or discovered local planning agencies should require proper

mitigation measures including erosion control measures and the proper removal and disposal of contaminated soils.

7.3.8.1 Impacts and Mitigation

Implementation of the Bacteria Provisions would not involve generation, transport, use or disposal of hazardous waste. The Bacteria Provisions should bring no change to the physical environment related to hazards and hazardous materials, either directly or indirectly and would have no impact related to hazards, hazardous materials, or public health. In the extremely unlikely event of work around hazardous waste site, measures can be applied, however, to reduce and/or eliminate these impacts and are within the responsibility and jurisdiction of the responsible agencies subject to the Bacteria Provisions and can or should be adopted by them (Cal. Code Regs., tit. 14, § 15091(a)(2)). No mitigation is required since no impact is anticipated.

7.3.8.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to hazards or hazardous materials have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Staff has determined that there are no reasonably foreseeable methods of compliance that would use or produce hazardous waste, or that would generate hazardous conditions. Therefore staff determined that potential impacts from hazards or hazardous materials due to implementation of the Bacteria Provisions should be insignificant and have no impact.

7.3.9 Hydrology and Water Quality

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☑
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (*e.g.*, the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☑
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☑

d.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☑
e.	Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☑
f.	Otherwise substantially degrade water quality?	☐	☐	☐	☑
g.	Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☑
h.	Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☑
i.	Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☑
j.	Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☑

7.3.9.1 Impacts and Mitigation

The Bacteria Provisions are intended to improve water quality through the prevention or removal of pathogens in surface water. The Bacteria Provisions would not violate any water quality standards or waste discharge requirements. Several reasonably foreseeable methods of compliance may have the potential to cause localized flooding if they are not properly planned or constructed. However, such projects are subject to Water Board review and approval as a part of their TMDL implementation plans. The review and approval process would ensure that the projects are designed in such a way that they will not contribute to flooding. Therefore, the Bacteria Provisions would not result in significant impacts related to flooding or drainage systems.

Compliance with the Bacteria Provisions would not place housing or other structures within a 100-year flood hazard area, nor would it expose people and structures to a significant risk of loss, injury, or death by flooding, seiche, tsunami, or mudflow. No impacts are anticipated.

7.3.9.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to hydrology or water quality have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Installation and maintenance of some treatment BMPs could result in less than significant environmental effects with regard to hydrology. Measures, however, can be applied to reduce and/or eliminate these impacts. These measures are within the responsibility and jurisdiction of the responsible agencies subject to the Bacteria Provisions and can or should be adopted by them (Cal. Code Regs., tit. 14, § 15091(a)(2)). This analysis concludes that on a statewide basis there would not be an impact to Hydrology or Water Quality systems directly related to the Bacteria Provisions.

7.3.10 Land Use and Planning

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Physically divide an established community?	☐	☐	☐	☑
b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☑
c. Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☑

7.3.10.1 Impacts and Mitigation

Adoption of the Bacteria Provisions will not divide an established community, conflict with any land use planning, nor conflict with any conservation plans.

7.3.10.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to land use and planning have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Adoption of the Bacteria Provisions will have no impact on land use or planning.

7.3.11 Mineral Resources

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the state?	☐	☐	☐	☑

b.	Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☑

7.3.11.1 Impacts and Mitigation

The Bacteria Provisions will not have a substantial impact on mineral resources. Any mineral resources that may occur within areas chosen for the installation of structural controls will have already been made unavailable by the existence of the current land uses and related infrastructure.

7.3.11.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to mineral resources have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Implementation of the Bacteria Provisions will not further impact any potential mineral resources.

7.3.12 Noise and Vibration

Would the project result in:		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a.	Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☑
b.	Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☑
c.	A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑
d.	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑
e.	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing in or working in the project area to excessive noise levels?	☐	☐	☐	☑
f.	For a project within the vicinity of a private airstrip, would the project expose people residing in or working in the project area to excessive noise levels?	☐	☐	☐	☑

Background

Noise
California Health and Safety Code section 46022 defines noise as "excessive undesirable sound, including that produced by persons, pets and livestock, industrial equipment, construction, motor vehicles, boats, aircraft, home appliances, electric motors, combustion engines, and any other noise-producing objects". The degree to which noise can affect the human environment range from levels that interfere with speech and sleep (annoyance and nuisance) to levels that cause adverse health effects (hearing loss and psychological effects). Human response to noise is subjective and can vary greatly from person to person. Factors that influence individual response include the intensity, frequency, and pattern of noise; the amount of background noise present before the intruding noise; and the nature of work or human activity that is exposed to the noise source.

Sound results from small and rapid changes in atmospheric pressure. These cyclical changes in pressure propagate through the atmosphere and are often referred to as sound waves. The greater the amount of variation in atmospheric pressure (amplitude) leads to a greater loudness (sound level). Sound levels are most often measured on a logarithmic scale of decibels (dB). The decibel scale compresses the audible acoustic pressure levels which can vary from 20 micropascals (□Pa), the threshold of hearing and reference pressure (0 dB), to 20 million □Pa, the threshold of pain (120 dB) (Air & Noise Compliance 2006).

Table 10. Common Sound Levels

Outdoor Sound Levels	Sound Pressure (μPa)	Sound Level (dBA)	Indoor Sound Level
	6,324,555	110	Rock Band at 5m
Jet Over-flight at 300m		105	
	2,000,000	100	Inside NY Subway Train
Gas Lawn Mower at 1m		95	
	632,456	90	Food Blender at 1m
Diesel Truck at 15m		85	
Noisy Urban Area (daytime)	200,000	80	Garbage Disposal at 1m
		75	Shouting at 1m
Gas Lawn Mower at 30m	63,246	70	Vacuum Cleaner at 3m
Suburban Commercial Area		65	Normal Speech at 1m
	20,000	60	
Quiet Urban Area (daytime)		55	Quiet Conversation at 1m
	6,325	50	Dishwasher in Adjacent Room
Quiet Urban Area (nighttime)		45	
	2,000	40	Empty Theater of Library
Quiet Suburb (nighttime)		35	
	632	30	Quiet Bedroom at Night
Quiet Rural Area (nighttime)		25	Empty Concert Hall
Rustling Leaves	200	20	
		15	Broadcast and Recording

			Studios
	63	10	
		5	
Reference Pressure Level	20	0	Threshold of Hearing

Source: Air & Noise Compliance 2006.

To determine ambient (existing) noise levels, noise measurements are usually taken using various noise descriptors. The following are brief definitions of typical noise measurements:

Community Noise Equivalent Level
The community noise equivalent level is an average sound level during a 24-hour day. The community noise equivalent level noise measurement scale accounts for noise source, distance, single-event duration, single-event occurrence, frequency, and time of day. Humans react to sound between 7:00 p.m. and 10:00 p.m. as if the sound were actually 5 decibels higher than if it occurred from 7:00 a.m. to 7:00 p.m. From 10:00 p.m. to 7:00 a.m., humans perceive sound as if it were 10 dBA higher than if it occurred from 7:00 a.m. to 7:00 p.m. due to the lower background noise level. Hence, the community noise equivalent level noise measurement scale is obtained by adding an additional 5 decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m., and 10 dBA to sound levels in the night after 10:00 p.m. and before 7:00 a.m. Because community noise equivalent level accounts for human sensitivity to sound, the community noise equivalent level 24-hour figure is always a higher number than the actual 24-hour average.

Equivalent Noise Level
Equivalent noise level is the average noise level on an energy basis for any specific time period. The equivalent noise level for 1 hour is the energy average noise level during the hour. The average noise level is based on the energy content (acoustic energy) of the sound. Equivalent noise level can be thought of as the level of a continuous noise that has the same energy content as the fluctuating noise level. The equivalent noise level is expressed in units of dBA.

Sound Exposure Level
Sound exposure level is a measure of the cumulative sound energy of a single event. This means that louder events have greater sound exposure level than quieter events. Additionally, events that last longer have greater sound exposure level than shorter events.

Audible Noise Changes
Studies have shown that the smallest perceptible change in sound level for a person with normal hearing sensitivity is approximately 3 decibels. A change of at least 5 decibels would be noticeable and likely would evoke a community reaction. A 10-decibel increase is subjectively heard as a doubling in loudness and would most certainly cause a community response. Noise levels decrease as the distance from the noise source to the receiver increases. Noise generated by a stationary noise source, or "point source," would decrease by approximately 6 decibels over hard surfaces and 9 decibels over soft surfaces for each doubling of the distance. For example, if a noise source produces a noise level of 89 dBA at a reference distance of 50 feet, then the noise level would be 83 dBA at a distance of 100 feet from the noise source, 77 dBA at a distance of 200 feet, and so on over hard surfaces. Generally, noise is most audible when traveling along direct line-of-sight. Barriers, such as walls, berms, or buildings that break the line-of-sight between the source and the receiver greatly reduce noise levels from the source because sound can reach the receiver only by bending over the top of the barrier

(diffraction). Sound barriers can reduce sound levels by up to 20 dBA. If a barrier, however, is not high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

Sensitive Receptors
Land uses that are considered sensitive to noise impacts are referred to as "sensitive receptors." Noise-sensitive receptors consist of, but are not limited to, schools, religious institutions, residences, libraries, parks, hospitals, and other care facilities.

Vibration
In contrast to airborne noise, ground-borne vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of groundborne vibration are trains, buses on rough roads, and construction activities such as blasting, pile-driving and operating heavy earth-moving equipment. The effects of ground-borne vibration include feelable movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. A vibration level that causes annoyance would be well below the damage threshold for normal buildings.

The background vibration velocity level in residential areas is usually 50 VdB or lower, well below the threshold of perception for humans which is around 65 VdB. Most perceptible indoor vibration is caused by sources within buildings such as operation of mechanical equipment, movement of people or slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steelwheeled trains, and traffic on rough roads. If the roadway is smooth, the vibration from traffic is rarely perceptible. The range of interest is from approximately 50 VdB to 100 VdB. Background vibration is usually well below the threshold of human perception and is of concern only when the vibration affects very sensitive manufacturing or research equipment. Electron microscopes and high-resolution lithography equipment are typical of equipment that is highly sensitive to vibration.

General Setting

Noise
Existing noise environments will vary considerably based on the diversity of land uses and densities. In most urban environments automobile, truck, and bus traffic is the major source of noise. Traffic generally produces background sound levels that remain fairly constant with time. Individual high-noise-level events that can occur from time to time include honking horns, sirens, operation of construction equipment, and travel of noisy vehicles like trucks or buses. Air and rail traffic and commercial and industrial activities are also major sources of noise in some areas. In addition, air conditioning and ventilating systems contribute to the noise levels in residential areas, particularly during the summer months.

Regulatory Framework
The no longer extant California Office of Noise Control, California Department of Health Services developed guidelines showing a range of noise standards for various land use categories in the 1976 Noise Element Guidelines. These guidelines are now found in Appendix C of the State of California General Plan Guidelines (Governor's Office of Planning and Research 2003). Cities within the state have generally incorporated this compatibility matrix into their General Plan noise elements. These guidelines are meant to maintain acceptable noise levels in a community setting based on the type of land use. Noise compatibility by different types of land uses is a range from "Normally Acceptable" to "Clearly Unacceptable" levels. The

guidelines are used by cities within the state to help determine the appropriate land uses that could be located within an existing or anticipated ambient noise level.
Some of the reasonably foreseeable methods of compliance have the potential to affect noise levels. Noise within counties and cities are regulated by noise ordinances, which are found in the municipal code of the jurisdiction These noise ordinances limit intrusive noise and establish sound measurements and criteria, minimum ambient noise levels for different land use zoning classifications, sound emission levels for specific uses, hours of operation for certain activities (such as construction and trash collection), standards for determining noise deemed a disturbance of the peace, and legal remedies for violations.

Vibration
Major sources of groundborne vibration would typically include trucks and buses operating on surface streets, and freight and passenger train operations. The most significant sources of construction-induced groundborne vibrations are pile driving and blasting – neither of which would be involved in the installation or maintenance of structural implementation alternatives. Currently, the state of California has no vibration regulations or guidelines.

7.3.12.1 Impacts and Mitigation
Implementation of the Bacteria Provisions would not cause a permanent increase in ambient noise levels. Any related construction and maintenance activities would be intermittent. The remaining thresholds may be exceeded for limited durations depending on the location and ambient noise levels at sites selected.

Increases in noise levels during installation and/or maintenance of some of the implementation alternatives would vary depending on the existing ambient levels at each site. Once a site has been selected, project-level analysis to determine noise impacts would involve: (i) identifying sensitive receptors within a quarter-mile vicinity of the site, (ii) characterizing existing ambient noise levels at these sensitive receptors, (iii) determining noise levels of any and all installation and maintenance equipment, and (iv) adjusting values for distance between noise source and sensitive receptor. In addition, the potential for increased noise levels due to construction activities is limited and short-term. Given the size of the individual projects and the fact that installation would occur in small discrete locations, noise impacts during installation would not foreseeably be greater, and would likely be less onerous than, other types of typical construction activities in urbanized areas, such as ordinary road and infrastructure maintenance activities, building activities, etc. These short-term noise impacts can be mitigated by implementing commonly-used noise abatement procedures, standard construction techniques such as sound barriers, mufflers and employing restricted hours of operation. Applicable and appropriate mitigation measures could be evaluated when specific projects are determined, depending upon proximity of construction activities to receptors.

Overall, noise levels for installation of several of the reasonably foreseeable methods of compliance are governed primarily by the noisiest pieces of equipment. For most construction equipment the engine is the dominant noise source. Typical maximum noise emission levels (Lmax) are summarized, based on construction equipment operating at full power at a reference distance of 50 feet, and an estimated equipment usage factor based on experience with other similar installation projects. The usage factor is a fraction that accounts for the total time during an eight-hour day in which a piece of installation equipment is producing noise under full power. Although the noise levels in Table 11 represent typical values, there can be wide fluctuations in the noise emissions of similar equipment based on two important factors: (1) the operating

condition of the equipment (e.g., age, presence of mufflers and engine cowlings); and (2) the technique used by the equipment operator (aggressive vs. conservative).

Table 11. Noise Emission Levels for Typical Installation Equipment

Equipment	Maximum Noise Level, (dBA) 50 feet from source	Equipment Usage Factor	Total 8-hr Leq exposure (dBA) at various distances	
			50ft	100ft
Foundation Installation			83	77
Concrete Truck	82	0.25	76	70
Front Loader	80	0.3	75	69
Dump Truck	71	0.25	65	59
Generator to vibrate concrete	82	0.15	74	68
Vibratory Hammer	86	0.25	80	74
Equipment Installation			83	77
Flatbed Truck	78	0.15	70	64
Forklift	80	0.27	74	69
Large Crane	85	0.5	82	76

Source: Los Angeles Water Board 2007f

Contractors and equipment manufacturers have been addressing noise problems for many years, and through design improvements, technological advances, and a better understanding of how to minimize exposures to noise, noise effects can be minimized. An operations plan for the specific construction and/or maintenance activities could be developed to address the variety of available measures to limit the impacts from noise to adjacent homes and businesses. To minimize noise and vibration impacts at nearby sensitive sites, installation activities should be conducted during daytime hours to the extent feasible. There are a number of measures that can be taken to reduce intrusion without placing unreasonable constraints on the installation process or substantially increasing costs. These include noise and vibration monitoring to ensure that contractors take all reasonable steps to minimize impacts when near sensitive areas; noise testing and inspections of equipment to ensure that all equipment on the site is in good condition and effectively muffled; and an active community liaison program. A community liaison program should keep residents informed about installation plans so they can plan around noise or vibration impacts; it should also provide a conduit for residents to express any concerns or complaints.

The following measures would minimize noise and vibration disturbances at sensitive areas during installation:

- Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. Newer equipment will generally be quieter in operation than older equipment. All installation equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding).

- Perform all installation in a manner to minimize noise and vibration. Use installation methods or equipment that will provide the lowest level of noise and ground vibration impact near residences and consider alternative methods that are also suitable for the soil condition. The contractor should select installation processes and techniques that create the lowest noise levels.
- Perform noise and vibration monitoring to demonstrate compliance with the noise limits. Independent monitoring should be performed to check compliance in particularly sensitive areas. Require contractors to modify and/or reschedule their installation activities if monitoring determines that maximum limits are exceeded at residential land uses.
- Conduct truck loading, unloading and hauling operations so that noise and vibration are kept to a minimum by carefully selecting routes to avoid going through residential neighborhoods to the greatest possible extent. Ingress and egress to and from the staging area should be on collector streets or higher street designations (preferred).
- Turn off idling equipment.
- Temporary noise barriers shall be used and relocated, as practicable, to protect sensitive receptors against excessive noise from installation activities. Consider mitigation measures such as partial enclosures around continuously operating equipment or temporary barriers along installation boundaries.
- The installation contractor should be required by contract specification to comply with all local noise and vibration ordinances and obtain all necessary permits and variances.

These and other measures can be classified into three distinct approaches as outlined in Table 12.

Table 12. Noise Abatement Measures

Type of Control	Description
Source Control	*Time Constraints* – Prohibiting work during sensitive nighttime hours *Scheduling* – performing noisy work during less sensitive time periods *Equipment Restrictions* – restricting the type of equipment used *Substitute Methods* –using quieter equipment when possible *Exhaust Mufflers* – ensuring equipment have quality mufflers installed *Lubrication and Maintenance* – well maintained equipment is quieter *Reduced Power Operation* – use only necessary power and size *Limit equipment on-site* – only have necessary equipment onsite *Noise Compliance Monitoring* – technician on-site to ensure compliance
Path Control	*Noise barriers* – semi-portable or portable concrete or wooden barriers *Noise curtains* – flexible intervening curtain systems hung from supports *Increased distance* – perform noisy activities further away from receptors
Receptor Control	*Community participation* –open dialog to involve affected parties *Noise complaint process* – ability to log and respond to noise complaints

Source: Adapted from Thalheimer 2000.

Increases in ambient noise levels are expected to be less than significant once measures have been properly applied to reduce potential impacts.

7.3.12.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to noise or vibration have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Construction activities could result in potentially significant environmental effects with regard to noise. Measures, however, are available that can be applied to reduce and/or eliminate these impacts as described above. These mitigation measures are within the responsibility and jurisdiction of the responsible agencies subject to the final Bacteria Provisions and can or should be adopted by them. The State Water Board does not direct which compliance measures responsible agencies choose to adopt or the mitigation measures they employ. The State Water Board does, however, recommend that appropriate measures be applied to reduced or avoid potential environmental impacts.

7.3.13 Population and Housing

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Induce substantial population growth in an area either directly (*e.g.*, by proposing new homes and businesses) or indirectly (*e.g.*, through extension of roads or other infrastructure)?	☐	☐	☐	☑
b. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑
c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑

7.3.13.1 Impacts and Mitigation

It is not reasonably foreseeable that the Bacteria Provisions would induce population growth, affect housing, or displace individuals.

7.3.13.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to population or housing have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions. Implementation of the Bacteria Provisions should have no impacts on population or housing.

7.3.14 Public Services

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the construction of which could cause

significant environmental impacts, in order to maintain acceptable service rations, response times or other performance objectives for any of the public services:

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Fire protection?	☐	☐	☐	☑
b. Police protection?	☐	☐	☐	☑
c. Schools?	☐	☐	☐	☑
d. Parks?	☐	☐	☐	☑
e. Other public facilities?	☐	☐	☐	☑

7.3.14.1 Impacts and Mitigation

Because of the expected location of the proposed project and reasonably foreseeable methods of compliance, it is not expected to be in the vicinity of or affect the objectives for schools, parks, or other public facilities. The final Bacteria Provisions would not require the establishment of new or altered government facilities to provide the services outlined above. However, response times for fire and police protection may be temporarily affected during construction activities, depending on where and when they occur.

There is potential for temporary delays in response times of fire and police vehicles due to road closure/traffic congestion during construction activities. To mitigate potential delays the responsible agencies could notify local emergency and police service providers of construction activities and road closures, if any, and coordinate with the local fire and police providers to establish alternative routes and traffic control during the construction activities. Most jurisdictions have in place established procedures to ensure safe passage of emergency and police vehicles during periods of road maintenance, construction, or other attention to physical infrastructure, and there is no evidence to suggest that installation of these structural devices would create any more significant impediments than other such typical activities. Any construction activity would be subject to applicable building and safety codes and permits. Therefore, the potential delays in response times for fire and police vehicles after mitigation are less then significant.

Since construction activities would not result in development of land uses for residential, commercial, and/or industrial uses nor would the compliance measures result in an increase of growth, it is reasonably foreseeable that the compliance measures would not result in a need for new or altered fire or police protection services. In addition, Emergency Preparedness Plans could be developed in consultation with local emergency providers to ensure that the structural compliance measures would not contribute to an increase in the cumulative demand for fire and police emergency services.

Once structural compliance measures are installed and operating, maintenance and monitoring would be required to verify that the structural BMP is performing properly and as expected. Maintenance and monitoring activities may also cause road closures and/or traffic congestion, but the same measures can be implemented as those for installation of the structures.

7.3.14.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to public services have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Installation and maintenance of structural compliance measures could result in significant environmental effects with regard to public services. Measures, however, can be applied to reduce and/or eliminate any potential impacts, as described above. These mitigation measures are within the responsibility and jurisdiction of the responsible agencies subject to the final Bacteria Provisions and can or should be adopted by them. The State Water Board does not direct which compliance measures responsible agencies choose to adopt or the mitigation measures they employ. The State Water Board does, however, recommend that appropriate measures be applied to reduced or avoid potential environmental impacts.

7.3.15 Recreation

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☑
b. Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☑

7.3.15.1 Impacts and Mitigation

The Bacteria Provisions would not have a substantial impact on recreation. Structural Treatment controls (BMPs), can be installed at or below grade in existing storm drain systems, which should not require any additional land. Therefore, it is not reasonably foreseeable that park land, recreational or open space areas will be needed for the installation of structural controls.

Installation of treatment controls may temporarily impact the usage of existing recreational sites. For instance, bike lanes or parking locations for recreational facilities may be temporarily unavailable during installation of structural controls. These potential impacts will be short in duration and have a less-than-significant effect on recreation.

7.3.15.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to recreation have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

In addition, implementation of the Bacteria Provisions is designed to improve the quality of the affected water bodies and associated beaches and shorelines. This will likely create a positive impact and increase recreational opportunities throughout the watersheds.

7.3.16 Transportation / Traffic

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☑	☐
b. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☑	☐
c. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☑
d. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks?	☐	☐	☐	☑
e. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☑	☐	☐
f. Result in inadequate emergency access?	☐	☐	☐	☑
g. Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☑	☐

7.3.16.1 Impacts and Mitigation

Implementation of the Bacteria Provisions would not result in a change in air traffic patterns nor substantially increase hazards due to design features. The Bacteria Provisions do not conflict with any policies, plans or programs supporting alternative transportation.

To the extent that site-specific projects entail excavation in roadways, such excavations should be marked, barricaded, and traffic flow controlled with signals or traffic control personnel in compliance with authorized local police or California Highway Patrol requirements. These methods would be selected and implemented by responsible local agencies considering project level concerns. Standard safety measures should be employed including fencing, other physical safety structures, signage, and other physical impediments designed to promote safety and minimize pedestrian/bicyclists accidents. It is not foreseeable that this proposal would result in significant increases in traffic hazards to motor vehicles, bicyclists or pedestrians, especially when considered in light of those hazards currently endured in an ordinary urbanized environment.

In order to reduce the impact of construction traffic, implementation of a construction management plan for specified facilities could be developed to minimize traffic impacts upon the local circulation system. A construction traffic management plan could address traffic control for any street closure, detour, or other disruption to traffic circulation. The plan could identify the routes that construction vehicles would use to access the site, hours of construction traffic, and traffic controls and detours. The plan could also include plans for temporary traffic control, temporary signage, location points for ingress and egress of construction vehicles, staging areas, and timing of construction activity which appropriately limits hours during which large construction equipment may be brought on or off site. Potential impacts could also be reduced by limiting or restricting hours of construction so as to avoid peak traffic times and by providing temporary traffic signals and flagging to facilitate traffic movement. It is anticipated that impacts after mitigation would be less than significant.

There is potential for temporary delays in response times of fire and police vehicles due to road closure/traffic congestion during construction activities. To mitigate potential delays the responsible agencies could notify local emergency and police service providers of construction activities and road closures, if any, and coordinate with the local fire and police providers to establish alternative routes and traffic control during the construction activities. Most jurisdictions have in place established procedures to ensure safe passage of emergency and police vehicles during periods of road maintenance, construction, or other attention to physical infrastructure, and there is no evidence to suggest that installation of these structural devices would create any more significant impediments than other such typical activities. Any construction activity would be subject to applicable building and safety codes and permits. Therefore, the potential delays in response times for fire and police vehicles after mitigation are less then significant.

7.3.16.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to transportation/traffic have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

Installation and maintenance of structural compliance measures could result in significant environmental effects with regard to transportation/traffic. Measures, however, can be applied to reduce and/or eliminate any potential impacts, as described above. These mitigation measures are within the responsibility and jurisdiction of the responsible agencies subject to the final Bacteria Provisions and can or should be adopted by them. The State Water Board does not direct which compliance measures responsible agencies choose to adopt or the mitigation measures they employ. The State Water Board does, however, recommend that appropriate measures be applied to reduced or avoid potential environmental impacts.

7.3.17 Utilities and Service Systems

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☑
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts?	☐	☐	☐	☑
c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts?	☐	☑	☐	☐
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☑
e. Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☑
f. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☑
g. Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☑

7.3.17.1 Impacts and Mitigation

Potential projects undertaken to comply with the Bacteria Provisions would not result in the need for a new or substantial alteration to water supply utilities. The implementation of the Bacteria Provisions would not result in the development of any large residential, retail, industrial

or any other development projects that would significantly increase the demand on the current water supply facilities or require new water supply facilities. There would be no impacts related to water supply and no mitigation is required.

Implementation of the Bacteria Provisions would not result in the need for new, nor alterations of existing, sewer of septic tank systems.

Implementation of the Bacteria Provisions would not result in the generation of significant amounts of solid waste.

Potential impacts related to storm drainage due to implementation of possible compliance measures for the Bacteria Provisions include the construction of drainage systems that divert urban runoff into catch basins or water storage areas. These compliance measures are designed to prevent bacteria and vectors from flowing into creeks and waterways from urban areas. Construction of the new storm water drainage systems and facilities should be of a short duration and should have minimal impacts, especially if they are conducted during the dry season. Potential impacts related to construction activities are discussed above in previous sections.

7.3.17.2 Summary

Adoption of the Bacteria Provisions will not cause any change in the compliance methods that have been or will be implemented to address bacteria levels above either the existing or proposed criteria. Any potential impacts related to utilities and services have occurred or will occur under the existing criteria and this baseline condition will not change with the adoption of the Bacteria Provisions.

7.4 Mandatory Findings of Significance

		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a.	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☑	☐	☐
b.	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)	☐	☐	☐	☑
c.	Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☑

The Bacteria Provisions would neither degrade the environment nor adversely affect cultural resources. The installation of structural controls may temporarily impact environmental resources, but as discussed above, implementation of the identified mitigation measures should reduce potential impacts to less-than significant levels.

Adoption of the Bacteria Provisions would not result in significant cumulatively considerable impacts with implementation of mitigation measures. The overall effect of the Bacteria Provisions would be a reduction in the amount of pathogens entering the State's water bodies thereby improving water quality and protecting the beneficial uses of those waters.
The Bacteria Provisions would not, in any way, cause substantial adverse effects on human beings. Where temporary effects have been identified in this document (i.e., transportation/traffic), mitigation measures have also been identified to reduce those impacts to less-than-significant levels.

8 Other Environmental Considerations

This section of the Draft Staff Report identifies and evaluates potential growth-inducing impacts[23] and cumulative impacts[24] that may arise from the Bacteria Provisions.

8.1 Growth-Inducing Impacts

In compliance with the requirements to prepare a draft SED and meet the substantive requirements of CEQA, this section describes the potential for the Bacteria Provisions to cause potential environmental impacts through the inducement of growth (see also Section 7.3.13, Environmental Checklist, Population and Housing). Growth inducement occurs when projects affect the timing or location of either population or land use growth, or create a surplus in infrastructure capacity. Direct growth inducement occurs when, for example, a project accommodates populations in excess of those projected by local or regional planning agencies. Indirect growth inducement occurs when, for example, a project that accommodates unplanned growth consequently (i.e., indirectly) establishes substantial new permanent employment opportunities (for example, new commercial, industrial, or governmental enterprises). Another example of indirect growth is if a construction project generates substantial short-term employment opportunities that indirectly stimulate the need for additional housing and services.

8.1.1 Types of Growth

The primary types of growth that occur are: (1) development of land and (2) population growth. (Economic growth, such as the creation of additional job opportunities, also could occur; however, such growth generally would lead to population growth and, therefore, is included indirectly in population growth.)

Growth in Land Development

Growth in land development considered in this analysis is the possible physical development of residential, commercial, and industrial structures in and around where implementation of the

[23] The State CEQA Guidelines describe growth-inducing impacts as follows:
…[T]he ways in which a proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are impacts which would remove obstacles to population growth…Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects... [In addition,] the characteristics of some projects...may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment. (Cal. Code Regs., Title14, section 15126.2(d).)

[24] The State CEQA Guidelines define cumulative impacts as follows:
"Cumulative impacts" refers to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts:
(a) The individual effects may be changes resulting from a single project or a number of separate projects.
(b) The cumulative impact from several projects is the change in the environment, which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. (Cal. Code Regs., Title14, section 15355).

Bacteria Provisions and reasonably foreseeable methods of compliance may be located. Land use growth is subject to general plans, community plans, parcel zoning, and applicable entitlements and is dependent on adequate infrastructure to support development.

Population Growth

Possible population growth considered in this analysis is the possible growth in the number of persons that live and work in the areas in and around where implementation of the Bacteria Provisions and reasonably foreseeable methods of compliance may be located. Population growth occurs from natural causes (births minus deaths) and net emigration from or immigration to other geographical areas. Emigration or immigration can occur in response to economic opportunities, life style choices, or for personal reasons. Although land use growth and population growth are interrelated, land use and population growth could occur independently from each other. This has occurred in the past where the housing growth is minimal, but population within the area continues to increase. Such a situation results in increasing population densities with a corresponding demand for services, despite minimal land use growth.

Overall development in the state is governed by local General Plans (developed by counties or cities), which are intended to plan for land use development consistent with California law. The General Plan is the framework under which development occurs, and, within this framework, other land use entitlements (such as variances and conditional use permits) can be obtained.

8.1.2 Existing Obstacles to Growth

The environmental analysis is required to discuss ways in which the proposed project could foster economic or population growth or the construction of additional housing. Included in this analysis is consideration as to whether the Bacteria Provisions (or reasonably foreseeable methods of compliance) remove obstacles to population growth or may encourage and facilitate other activities that could significantly affect the environment. (Cal. Code Regs., tit. 14, § 15126.2(d)). Obstacles to growth could include such things as inadequate infrastructure or public services, such as an inadequate water supply that results in rationing, or inadequate wastewater treatment capacity that results in restrictions in land use development. Policies that discourage either natural population growth or immigration also are considered to be obstacles to growth.

8.1.3 Potential for Compliance with the Bacteria Provisions to Induce Growth

Direct Growth Inducement

As some of the reasonably foreseeable methods of compliance of the Bacteria Provisions focus on non-structural BMPs and improvements to storm drain systems located throughout urbanized portions of the watershed, the Bacteria Provisions would not result in the construction of new housing and, therefore, would not directly induce growth.

Indirect Growth Inducement

Two areas of potential indirect growth inducement are relevant to a discussion of the Bacteria Provisions: (1) the potential for compliance with the Bacteria Provisions to generate economic opportunities that could lead to additional immigration; and, (2) the potential for the Bacteria Provisions to remove an obstacle to land use or population growth.

Although the construction activities associated with methods of compliance for the Bacteria Provisions may increase the economic opportunities in an area or region, this construction is not expected to result in or induce substantial or significant growth related to population increase or land use development. The majority of the new jobs that would be created by this construction are expected to be filled by persons already employed and residing in the area or region. The second area of potential indirect growth inducement is through the removal of obstacles to growth. The Bacteria Provisions may require retrofit of existing public services or additional design requirements to new services (services that would occur without the Bacteria Provisions). The drainage systems would not increase as a result of the Bacteria Provisions. As discussed above, any obstacles that may exist to the location of public services and commensurate land use development or to population growth within an area affected by the Bacteria Provisions would not be altered by compliance with the Bacteria Provisions.

8.2 Cumulative Impacts Analysis

In compliance with the requirements to prepare a draft SED and meet the substantive requirements of CEQA, this section describes the potential for the Bacteria Provisions to cause a considerable contribution to a cumulatively significant impact. The fundamental purpose of the cumulative impacts analysis is to ensure that the potential environmental impacts of any individual project are not considered in isolation. Impacts that may be individually less than significant on a project specific basis, could pose a potentially significant impact when considered with the impacts of other past, present, and probable future projects.

The cumulative impact analysis need not be performed at the same level of detail as a "project level" analysis but must be sufficient to disclose potential combined effects that could constitute a cumulative significant adverse impact. The CEQA Guidelines direct that the cumulative impacts analysis either include a list of the past, present and probable future projects producing related or cumulative impacts or provide a summary of projections and cumulative impact analysis contained in an applicable adopted plan or related planning document. (Cal. Code Regs., tit. 14 §15130, subd.(b)(1)).

This draft SED discusses whether the Bacteria Provisions' incremental effect is cumulatively considerable and, where that is the case, describes the significant cumulative impacts of the proposed project in combination with past, present, and probable future projects. CEQA Guidelines direct that this cumulative impact analysis be either provided through the "list approach" of "projections approach". The cumulative impacts from implementation of the Bacteria Provisions are discussed, for this statewide analysis, through analyzing the possible projects that could occur to cause impacts in combination of the Bacteria Provisions in relation to existing land use planning throughout the state, in the following two sections: (1) the program level cumulative impacts, and (2) the project level cumulative impacts. On the program level, impacts from reasonably foreseeable statewide water quality actions and regional activities, including multiple TMDLs and permit requirements may in combination have cumulative impacts. On the project level, it is not possible to provide an environmental analysis of individual probable future projects that could occur to cause impacts that would combine with impacts of the Bacteria Provisions. The cumulative impacts analysis entails a general consideration of construction and other project-level activities that may occur in the vicinity of bacteria and pathogen control implementation measures.

8.2.1 Program Cumulative Impacts

The State Water Board currently is developing or has recently adopted a wide range of statewide policies and significant general permits. The entire list of policies and permits can be found in the State Water Board's Executive Director's report, which is updated on a monthly basis.[25] The majority of these actions are not yet formally proposed but are considered reasonably foreseeable probable future projects, within the temporal scope of implementation of the Bacteria Provisions.

Of the statewide polices and significant general permits, several projects have potential nexus to the methods of compliance for the Bacteria Provisions. These projects could cause environmental impacts that may, in conjunction with impacts of the Bacteria Provisions, cause a cumulative impact. These projects are described in more detail below.

State Implementation Policy
Formal Title: Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California

Description: Adopted in 2005, the SIP applies to discharges of toxic pollutants into the inland surface waters, enclosed bays, and estuaries of California subject to regulation under the state's Porter-Cologne Water Quality Control Act and the federal Clean Water Act. Such regulation may occur through the issuance of NPDES permits or other relevant regulatory approaches. The SIP establishes a standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters in a manner that promotes statewide consistency.

Related Impacts: The SIP is used to derive effluent limitations for wastewater and industrial dischargers for priority pollutants. This policy in combination with other projects could prompt additional upgrades to wastewater and industrial facilities. While there is a nexus between the projects there should not be considerable cumulative impacts.

Toxicity Provisions
Formal Title: Proposed Toxicity Amendment to the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Toxicity Provisions)

Description: The State Water Board anticipates creating the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries with the adoption of Toxicity Provisions. The goals of the Toxicity Provisions include: (a) a new method to determine the toxicity of discharges, (b) statewide numeric objectives, and (c) further standardization of toxicity provisions for NPDES dischargers and facilities subject to WDR and conditional waivers.

Related Impacts: The Toxicity Provisions could demand a higher level of wastewater treatment from wastewater and industrial dischargers. The Toxicity Provisions, in combination with other projects and the Provisions could prompt additional upgrades to wastewater and industrial facilities. The Toxicity Provisions may also require an increase in vehicle use and laboratory supplies for the toxicity monitoring. While there is a nexus between the projects there should not be considerable cumulative impacts.

[25] State Water Board Executive Director's Reports are accessible at: http://www.waterboards.ca.gov/board_info/exec_dir_rpts/

Mercury Provisions
Formal Title: Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California.

Description: Adopted in May 2017, the goals of the Mercury Provisions are to establish the following elements: (1) three beneficial uses pertaining to tribal traditional and cultural use, tribal subsistence fishing use, and subsistence fishing use by other cultures or individuals; (2) one narrative and four numeric mercury water quality objectives to protect numerous beneficial use of water involving human health and aquatic dependent wildlife; and (3) a program of implementation to control mercury discharges.

Related Impacts: The Mercury Provisions could demand a higher level of wastewater treatment from wastewater and industrial dischargers. The Mercury Provisions, in combination with other projects and the Bacteria Provisions could prompt additional upgrades to wastewater and industrial facilities. Also, in some cases mercury can be controlled by controlling sediments. Therefore, impacts from sediment controls could be cumulative, or the controls required for one project may be an acceptable method of compliance for other projects. While there is a nexus between the projects there should not be considerable cumulative impacts.

Biostimulatory Substances Project
Description: State Water Board staff is developing a project to address biostimulatory substances in wadeable streams, including nutrients.

Related Impacts: The Biostimulatory Substances Project could demand a higher level of wastewater treatment from wastewater and industrial dischargers. Also in some cases, nutrients can be controlled by controlling sediments. Therefore, impacts from sediment controls could be cumulatively considerable, or the controls required for one project may be an acceptable method of compliance for other projects. While there is a nexus between the projects there should not be considerable cumulative impacts.

Recycled Water Policy
Description: Adopted in 2009, the purpose of the Recycled Water Policy is to increase the use of recycled water from municipal wastewater sources that meet the definition in Water Code section 13050, subdivision (n), in a manner that implements state and federal water quality laws. The Recycled Water Policy provides direction regarding the appropriate criteria to be used by the State Water Board and the Regional Water Boards in issuing permits for recycled water projects. Additionally, the Recycled Water Policy encourages every region in California to develop a salt/nutrient management plan by 2014 that is sustainable on a long-term basis and that provides California with clean, abundant water. State Water Board staff is drafting a resolution for the State Water Board's consideration in late 2016 regarding updating the Recycled Water Policy.

Related Impacts: The Recycled Water Policy could demand a higher level of wastewater treatment from wastewater and industrial dischargers, so that the water may be reused. The Recycled Water Policy, in combination with other projects could prompt additional upgrades to wastewater and industrial facilities. While there is a nexus between the projects there should not be considerable cumulative impacts.

Procedures for Dredged and Fill Materials (Formerly the Wetlands Policy)
Formal Title: Procedures for Discharges of Dredged or Fill Materials to Waters of the State (Proposed for Inclusion in the Water Quality Control Plan for Inland Surface Waters and Enclosed Bays and Estuaries)

Description: The Procedures for Dredged and Fill Materials has the goal of developing: 1) a wetland definition; 2) wetland delineation procedures; and 3) procedures for applications, and the review and approval of Water Quality Certifications, Waste Discharge Requirements, and waivers of Waste Discharge Requirements for discharges of dredged and fill materials.

Related Impacts: While there is a nexus between the projects there should not be considerable cumulative impacts.

The Trash Amendments
Formal Titles: Amendment to the Water Quality Control Plan for the Ocean Waters of California to Control Trash and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California.

Description: The State Water Board adopted the Amendment to the Ocean Plan and Part I Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Trash Amendments) in April in 2015 and Office of Administrative Law and U.S. EPA approved them in December 2015 and January 2016, respectively. The Trash Amendments include six elements: (1) a water quality objective, (2) applicability, (3) prohibition of discharge, (4) implementation provisions, (5) time schedule, and (6) monitoring and reporting requirements. The Trash Amendments apply to all surface waters of the state, with the exception of those waters within the jurisdiction of the Los Angeles Water Board with trash or debris TMDLs that are in effect prior to the effective date of the Trash Amendments.

Related Impacts: The Trash Amendments require dischargers to control litter and will be implemented through NPDES storm water permits (MS4s, Department of Transportation, Industrial General Permit, and Construction General Permit), Waste Discharge Requirements (WDRs), and waivers of WDRs. These requirements have the potential to decrease bacteria inputs into receiving waters. The Trash Amendments identify cumulative project impacts regarding the potential increase in vehicle use for litter/solid waste collection, and the vehicle use could have a significant cumulative impact. While there is a nexus between the projects there should not be considerable cumulative impacts.

General Storm Water Permits
Description: Major statewide permits for storm water pertain to industry, construction, or MS4s. Municipalities serving between 100,000 and 250,000 people are required to apply for Phase I MS4 permits, while smaller municipalities and non-traditional permittees (e.g. some state parks) are enrolled in the general Phase II MS4 permit. Storm water discharges arising from projects carried out by the California Department of Transportation (Caltrans) are regulated under the unique statewide Caltrans Permit. Construction projects that disturb one or more acres of soil are required to enroll in the Construction General Permit. A defined set of industrial dischargers are required to enroll in the Industrial General Permit. These permits are revised every serval years and the requirements are updated. Also, requirements for recently adopted TMDLs, including bacteria TMDLs are incorporated into the permits periodically.

Related Impacts: Responsible parties may be required to perform activities such as monitoring or outreach and source control, which could increase vehicle use and impacts greenhouse gases and air quality. Additionally, in light of all requirements in the revised permit, statewide projects listed above, and compliance with the Bacteria Provisions, the responsible partly may decide to upgrade storm water infrastructure treatments systems. These methods of compliance would result in earth moving activities, construction and vehicle use. These activities could have impacts to biota, greenhouse gases, geology, noise and utilities, as described in Section 8.2.2. While there is a nexus between the projects there should not be considerable cumulative impacts.

Regional Water Board TMDLs

Description: In addition to the State Water Board developing or adopting projects, the Regional Water Boards have recently adopted and are in the process of developing a variety of amendments to their respective Basin Plans including TMDLs for different pollutants, as well as issuing various permits throughout the state. Examples include: TMDL for Sediment and Temperature in the Scott River Watershed (North Coast Water Board), Napa River Watershed - Sediment TMDL (San Francisco Bay Water Board), Guadalupe River Watershed - Mercury TMDL (San Francisco Bay Water Board), Napa River Watershed – Pathogens (San Francisco Bay Water Board), TMDLs for Nitrogen Compounds and Orthophosphates in the Lower Salinas River Watershed (Central Coast Water Board), Implementation Plans for the TMDLs for Metals in the Los Cerritos Channel and for Metals and Selenium in the San Gabriel River and Impaired Tributaries (Los Angeles Water Board), Central Valley Salinity Alternatives for Long-Term Sustainability (Central Valley Water Board), Truckee River Sediment TMDL (Lahontan Water Board), Coachella Valley Storm Water Channel Bacterial Indicators TMDL (Colorado River Water Board), Recreation Standards for Inland Fresh Surface Waters (Santa Ana Water Board), Revised TMDL Daily Loads for Indicator Bacteria (San Diego Water Board), and Rainbow Creek Nitrogen and Phosphorus TMDLs (San Diego Water Board).

Related Impacts: The main goal of all of the Water Boards' actions is to protect and improve the quality of the state's waters. Implementation measures identified during the development of these policies, amendments, and Basin Plan amendments, as well as the reasonably foreseeable methods of compliance for these actions, may have similar potential impacts as those identified for the Bacteria Provisions, for example, a higher level of treatment of wastewater, sediment controls, and pollutant monitoring.

8.2.2 Project Cumulative Impacts

Projects associated with reasonable foreseeable methods of compliance with the Bacteria Provisions may occur throughout the entire state. It would be speculative to estimate the specific project-level actions that could occur in and around these projects that would contribute to a cumulative effect of the Bacteria Provisions and reasonably foreseeable methods of compliance. Projects associated with reasonably foreseeable methods of compliance would typically occur in urban areas. The other types of actions that may occur in and around these urban areas are infrastructure maintenance, redevelopment projects, and infill projects. The impacts of these types of actions typically involve air quality, noise and traffic associated with construction and, depending on the timing of the implementation of the reasonably foreseeable methods of compliance, these impacts could combine with the potential impacts of the Bacteria Provisions. The cumulative impacts of specific projects designed to comply with the requirements of the Bacteria Provisions should be considered by the implementing municipality

or agency. Implementation of projects related to other nearby projects, however, may result in cumulative effects of the following nature:

1) Noise and Vibration - Local residents in the near vicinity of installation and maintenance activities related to compliance with the Bacteria Provisions may be exposed to noise and possible vibration. The cumulative effects, both in terms of added noise and vibration at multiple implementation sites, and in the context of other unrelated projects, would most likely not be considered cumulatively significant due to the typically minor and temporary nature of the installation and maintenance activities that could cause the noise and possible vibration. However, if deemed a considerable contribution to a cumulative impact, possible mitigation methods include: (1) scheduling installation and maintenance activities during daytime hours; (2) noise and vibration monitoring; (3) noise testing and inspections of equipment; and (4) an active community liaison program.

2) Air Quality - Implementation of the Bacteria Provisions, including the reasonably foreseeable methods of compliance, may cause additional emissions of criteria pollutants and slightly elevated levels of carbon monoxide during BMP installation activities and, to a lesser extent, possible maintenance activities. Implementation of the Bacteria Provisions, in conjunction with all other activities within the area, may contribute to a region's nonattainment status during the installation period. Since installation and maintenance-related emissions are typically minor and temporary, compliance with the Bacteria Provisions is not expected to result in long-term significant cumulative air quality impacts. In the short-term, cumulative impacts could be significant if the combined emissions from the individual projects exceed the threshold criteria for the individual pollutants. In this case, mitigation measures include: (1) use of construction, and maintenance vehicles with lower-emission engines; (2) use of soot reduction traps or diesel particulate filters; and (3) use of emulsified diesel fuel (4) timing construction activities to avoid periods of very poor air quality.

3) Transportation and Circulation - Compliance with the Bacteria Provisions may involve contemporaneous installation activities at a number of sites. Further, installation of treatment controls may occur in the same general time and space as other related or unrelated projects. In these instances, construction activities from all projects could produce cumulative traffic effects which may be significant, depending upon a range of factors including the specific location involved and the precise nature of the conditions created by the dual construction activity. Mitigation to address this potentially significant cumulative impact would involve special coordination efforts by local, regional, and state entities regarding the timing of various construction and other activities adversely affecting traffic. Overall, with this mitigation, significant cumulative impacts are not anticipated since coordination can occur and, as appropriate, transportation mitigation methods are available as discussed previously.

4) Greenhouse Gas Emissions - Compliance with the Bacteria Provisions may involve contemporaneous installation activities at a number of sites. Further, installation of compliance measures, including maintenance activities and additional street sweeping, may occur in the same general time and space as other related or unrelated projects. In these instances, construction activities from all projects could produce greenhouse gas emissions which may have a significant cumulative impact, depending upon a range of factors (e.g., location, vehicular activity, machinery usage, etc.). As stated previously, the construction and maintenance activities associated with implementation of the Bacteria Provisions would

be short term and are not expected to cause substantial greenhouse gas emissions. However, the cumulative effect of greenhouse gases has been identified as a concern within California, the United States, and global climate and, therefore, this impact are considered potentially significant. With the incorporation of BMPs and compliance with greenhouse gas reduction plans, amendments, or regulations, the cumulative effect of greenhouse gas emissions could be reduced to less-than-significant levels.

9 Alternatives Analysis

Applicable regulations (23 Cal. Code Regs., § 3777, subd. (b)(3)) requires the substitute environmental documentation to contain an analysis of range of reasonable alternatives to the project and reasonably foreseeable methods of compliance that could feasibly meet the project objectives and to avoid or substantially reduce any potentially significant adverse environmental impacts.[26] The State Water Board has identified the following five alternatives for analysis.

9.1 Alternative 1 - No Project Alternative

The purpose of assessing a No Project Alternative in an environmental document such as this SED is to allow decision makers and the public to compare the impacts of approving the proposed project with the impacts of not approving the proposed project. The No Project Alternative would involve the State Water Board deciding not to approve the Bacteria Provisions to the Ocean Plan or the ISWEBE.

Under the No Project Alternative the existing Regional Water Boards objectives will remain for fresh water (Section 3.6). This would continue the lack of consistency between different bacteria water quality objectives among existing Basin Plans. In addition, although most of the bacterial objectives currently contained within the Regional Water Board Basin Plans use different indicators and risk levels than those being proposed in the Bacteria Provisions for fresh waters and marine water, proper installation and maintenance of sewer, septic, and storm water systems are required to meet bacteria objectives in both the current Basin Plan objectives and the new statewide Bacteria Objectives. Therefore, the potential impacts due to implementation activities involving construction and maintenance in the Bacteria Provisions would be similar to those already contained in the existing Basin Plans. For marine water the water quality assessments would continue to be based on the Title 17 standards that include Total and Fecal Coliform which are not supported by the U.S. EPA studies. For these reasons, the State Water Board determines that this is not the preferred alternative.

9.2 Alternative 2 - Regional Water Board Alternative

In the Regional Water Board Alternative, the Regional Water Boards would have to adopt fresh and marine water quality objectives for bacteria into each of their respective Basin Plans. If the Regional Water Boards were required to adopt individual amendments (as well as their respective implementation strategies) that were similar to the Bacteria Provisions, the potential environmental impacts would also be similar. There is, however, the potential that the individual Regional Water Boards would develop different bacteria water quality objectives and implementation provisions, resulting in a continued lack of statewide consistency. Furthermore, it would be an inefficient use of staff time (and corresponding costs) to develop up to nine different approaches to bacteria assessments in state waters. For these reasons, the State Water Board determines that this is not the preferred alternative.

9.3 Alternative 3 - Revised Objectives with No Implementation Alternative

[26] See California Code of Regulations – Title 23, section 3777, subd. (b)(3).

The State Water Board could adopt the U.S. EPA 2012 Recreational Water Quality Criteria without the additional implementation approaches (allowing reference system/antidegradation, natural sources exclusion, High Flow Suspension of Objectives, Seasonal Suspension or Limited REC-1, and Variances of Water Quality Standards).

Under this Alternative, each the Regional Water Boards that have not already done so would be required to authorize in their Basin Plans any of the implementation approaches prior to their use in a TMDL. This would be an inefficient use of staff time (and corresponding costs) to develop up to nine different approaches to TMDL implementation in state waters. In addition, the environmental impacts from reasonable and foreseeable methods of compliance would be very similar both with and without the implementation alternatives. Therefore, there would be no environmental benefit with this alternative. For these reasons, the State Water Board determines that this is not the preferred alternative.

9.4 Alternative 4 – U.S. EPA's Estimated Illness Rate of 36/1000 Recreators Alternative

Under this Alternative, the State Water Board would adopt Water Quality Criteria based on the U.S. EPA's National Epidemiological and Environmental Assessment of Recreational Water – Gastrointestinal Illness rate of 36/1,000 recreators. This rate is equivalent to the previous illness rate of 8 illnesses per 1,000 recreators in fresh waters. U.S. EPA has asserted that an illness rate of this level is protective of public health. This option would supersede all Regional Water Boards' REC-1 bacteria objectives and would lead to statewide consistency for REC-1 bacteria objectives. Using this option would be consistent with previous illness rates for bacterial objective values used in current permits and TMDLs. The Geometric Mean would also be consistent with the current Geometric Mean for marine waters. Although the estimated illness rate of 36/1000 recreators rather than 32/1000 recreators may potentially lead to fewer exceedances of the water quality objective, the implementation alternatives and compliance methods with the objectives will be the same.

U.S EPA has provided two estimated illness rates of 32 per 1,000 recreators and 36 per 1,000 recreators that are both considered protective of public health, the lower illness rate of 32 per 1,000 recreators is a more conservative recommendation. The State Water Board feels that this would be more protective of human health. For this reason, the State Water Board determines that this is not the preferred alternative.

9.5 Alternative 5 - Non-U.S. EPA Estimated Illness Rate Alternative

The State Water Board could adopt Water Quality Criteria different from those proposed in the 2012 Recreational Water Quality Criteria report in order to provide a potentially more conservative level of public health protection.

For the State Water Board to adopt more conservative levels of public health protection, the state would have to spend the time, money and personnel hours to perform the necessary studies to provide the scientific justification. Even with the expenditure of these resources, there would be no guarantee that California studies would indicate anything different than what U.S. EPA has already provided. The U.S. EPA assessed data from previous and current epidemiological studies for their report to determine the currently recommended criteria. They

provide a scientifically defensible level of health protection that states can adopt without having to perform their own epidemiological studies and scientific analysis. If the State Water Board were to choose to adopt Water Quality Criteria different from those proposed in the 2012 Recreational Water Quality Criteria report the implementation options and methods of compliance would likely be the same or very similar. For these reasons, the State Water Board determines that this is not the preferred alternative.

9.6 Alternative 6 – No separate more stringent Lake Tahoe bacteria objective

The State Water Board has chosen could choose not to carve out a more stringent objective for Lake Tahoe. While this would simplify the application of water quality objectives in the Tahoe Basin, i.e., one objective for all waters, it would not protect the pristine waters of Lake Tahoe. In addition, as the waters of Lake Tahoe are pristine and antidegradation would apply, and the more stringent proposed objective would be the de facto objective. For these reason, the State Water Board determines that this is not the preferred alternative.

9.7 Analysis of Project Alternatives - Conclusion

The State Water Board has chosen as its preferred alternative to adopt the U.S. EPA 2012 Recreational Water Quality Criteria of E.coli for fresh water and Enterococci for marine water at the more conservative U.S. EPA recommended illness rate of 32/1000 recreators. In addition, the State Water Board will adopt the suite of implementation alternatives outlined in Chapter 6 to provide a framework for protecting public health while not having to remove natural sources of bacteria from the environment and to protect the public during periods when REC-1 activities are not present or safe in designated water bodies.

10 Water Code Sections 13241 & 13242 and Antidegradation

Water Code Section 13241
California Water Code section 13241 requires assessment of specific factors when adopting water quality objectives. These factors consist of:

- Past, present, and probable future beneficial uses of water.
- Environmental characteristics and water quality of the hydrographic unit under consideration.
- Water quality conditions that could be reasonably attained through coordinated control of all factors affecting water quality.
- Economic considerations.
- The need for developing new housing.
- The need to develop and use recycled water.

The Bacteria Provisions would alter existing water quality objectives for state waters; therefore, California Water Code section 13241 does apply to these Bacteria Provisions and the assessment of each factor is discussed below.

10.1 Past, Present and Future Beneficial Uses of Water

The presence of bacteria impairs the established REC-1 beneficial uses present in Regional Water Board's Basin Plans and the Ocean Plan, as discussed in Chapter 5.
The Bacteria Provisions, including the water quality objectives for bacteria and the implementation provisions will protect the REC-1 beneficial uses in state waters. The Bacteria Provisions do not propose to remove any beneficial uses, or to provide a path that would result in the loss of any past, present, or possible future beneficial uses of water. The statewide provisions will provide an effective and consistent protection for REC-1 uses throughout the state.

The Bacteria Provisions will include a LREC-1 beneficial use definition. The LREC-1 beneficial use definition recognizes that body contact is limited in the waterbody due to physical conditions, such as restricted access and very low water depths. The Bacteria Provisions will not designate this beneficial use, but will make a standard definition available for all Regional Water Boards to designate this use where appropriate.

The adoption of a LREC-1 beneficial use or a variance of water quality standards is an option. The State Water Board considers this option to be good public policy. The designation of LREC-1 beneficial use or a variance will require additional work by the Regional Water Board and will be subject to separate public participation prior to adoption by the Regional Water Board and State Water Boards and approval by U.S. EPA.

10.2 Environmental Characteristics and Water Quality of the Hydrographic Unit Under Consideration

The Bacteria Provisions apply to all REC-1 waters of the state. The environmental characteristics of all hydrographic units affected by the Bacteria Provisions are described in Chapter 5.

10.3 Water Quality Conditions that Could Reasonable be Attained Through Coordinated Control of All Factors Affecting Water Quality

The Water Boards are required to ensure that all discharges, regardless of type, comply with all water quality control plans and policies. The proposed water quality objectives for bacteria and implementation provisions can be implemented through NPDES permits issued pursuant to section 402(p) of the Federal Clean Water Act, water quality certifications issued pursuant to section 401 of the Clean Water Act, WDRs, waivers of WDRs, and TMDLs.

10.4 Economic Considerations

Under the requirements of California Water Code sections 13170 and 13241, subdivision (d) and Cal. Code Regs., tit. 23, section 3777, subdivisions (b)(4) and (c), the State Water Board must consider economics when establishing water quality objectives. This consideration of economics is not a cost-benefit analysis, but a consideration of potential costs of a suite of reasonably foreseeable measures to comply with the Bacteria Provisions.

A report titled "Economic Analysis of Proposed Water Quality Objective for Pathogens in the State of California" was prepared under a U.S. EPA contract by Abt Associates to consider the economics of the Proposed Provisions. (Abt Associates, 2017.) The report informed the following discussion of economic considerations.

Bacteria Water Quality Objectives

For freshwater, the Bacteria Provisions remove total and/or fecal coliform (where Basin Plans currently still have these bacteria indicators) and adds *E. coli* (where not all ready added). Epidemiological studies have shown *E. coli* to be a better indicator of the presence of disease-causing pathogens than total and fecal coliform. Therefore, if the current total and/or fecal coliform objectives are not currently being attained, the method and associated costs to achieve compliance with the proposed *E. coli* objective are not expected to be different.

For marine waters, the various Regional Water Board Basin Plans require dischargers to monitor a trio of bacteria indicator organisms to determine compliance with water quality objectives. The Basin Plans incorporate bacteriological standards established in California regulation (California Codie of Regulations, title 17, §s 7952-7962) for marine waters along public beaches which must be monitored for total coliform, fecal coliform, and enterococci for determining compliance. The Bacteria Provisions are proposing to require the sole use of enterococci for determining compliance with recreational water quality objectives. Therefore, for popular public beaches, the Bacteria Provisions will result in reduced monitoring costs.

Monitoring costs will be reduced as monitoring for fecal and/or total coliform will no longer be required. Only monitoring for *E. coli* will be necessary for freshwater, and only enterococci will

be necessary for marine waters. The average anticipated cost savings for municipal wastewater treatment plants for bacteria monitoring is anticipated to be approximately $3,500 per year per facility on average. Extrapolating this to the total population of publically-owned and federally-owned wastewater treatment facilities, the incremental savings associated with monitoring costs is estimate at approximately $789,000 per year.

Monitoring for pathogens is less common at industrial facilities than at publically-owned treatment works; however, it is anticipated that the Bacteria Provisions would produce a similar reduction in monitoring effort for industrial plants possessing bacteria limitations and, thus, a similar reduction in monitoring costs is expected.

The Proposed Amendment may affect the impairment status of water quality segments. The listing status of waterbodies were assessed using the proposed bacteria water quality objectives. Out of the ninety one waterbodies identified as impaired using the proposed bacteria water quality objectives, ninety are already considered impaired on the Clean Water Act section 303(d) list. This resulted in a net increment impairment of one waterbody or an approximate 1.1 percent increase relative to the baseline. When extrapolated, this predicts an approximately 9 net additional impaired waterbodies may be expected under the Proposed Amendments (Abt Associates, 2017).

If an additional number of TMDLs are needed under the revised criteria, there may be an increase in government regulatory costs. U.S. EPA (2001) estimates that TMDL development costs per waterbody typically range from under $26,000 to over $500,000 (2000 year dollars) depending on the number of TMDLs, the level of complexity, and the extent to which impaired waters are clustered together for TMDL development. Costs would range from a minimum of $234,000 ($26,000 x 9) to $4,500,000 ($500,000 x 9).

Level of Public Health Protection for Illness Rate for Fresh and Marine Waters

The Bacteria Provisions recommends the lower of the two illness rates recommended by the U.S. EPA 2012 Recreational Water Quality Criteria document. In fresh water, most but not all wastewater treatment plants currently have discharge requirements set to achieve a lower illness rate based on the Title 22 recycled water criteria. Thus, meeting the illness rate recommendation in the Bacteria Provisions will not cause any additional treatment and no additional treatment costs.

Marine and storm water discharges presently have to meet an objective set to achieve a slightly higher illness rate then the proposed objectives in the Bacteria Provisions. The difference in the illness rates is small and it is unlikely that additional treatment would be necessary to meet the lower illness rate.

Using a sample population of 5 wastewater treatment plants, Abt Associates summarized the process modification needed to comply with the Bacteria Provisions. Only one plant of the five is anticipated to require process modifications to meet the requirements of the Bacteria Provisions. Process modifications were assumed to consist of a four-week study of the facility's treatment processes, chlorine and chlorine storage facilities, cleaning contact basins, installing of baffles to assist mixing in the contact basin, and increasing contact time, depending on current treatment performance. The costs for sample facilities were calculated based on average flows. The annualized process modification costs range from $200,000 to $211,000 (based on a 3 percent or 7 percent annualized cost rate).

Addressing Natural Sources of Bacteria in Fresh and Marine Waters
The use of the reference system/antidegradation approach or a natural sources exclusion approach will allow Regional Water Boards to direct resources for "clean-up" of bacteria to be directed towards anthropogenic sources instead of natural sources of bacteria and thus money and resources will be saved. The specific costs will be considered when each TMDL is adopted. This implementation procedure could result in a decreased incremental control cost in situations where baseline load reductions exceed those required when these implementation provisions are considered.

Averaging Periods to Determine Compliance for Fresh and Marine Waters
No increase costs is expected for using a 6-week rolling average when determining compliance with the Bacteria Provisions. No additional sampling is required by this recommendation. The Los Angeles Regional Water Board staff found no increase in violations when using this method, instead of a 30-day average period. State Water Board staff has also observed no increases in 303(d) listing when using this method. Thus no costs for additional treatment will be necessary.

High Flow Suspension & Seasonal Suspension of Objectives for Fresh Waters
The use of a high flow suspension of the REC-1 beneficial use during periods when it is unsafe for recreation will reduce costs for dischargers. By allowing discharges to not treat wastewater for bacteria during these periods, costs for treatment will be reduced and fewer resources for sampling will be required.

Limited REC-1 beneficial use definition for Fresh Waters
The LREC-1 definition will not lead to increase costs for treatment as this option would lead to less stringent regulations or the elimination of bacteria objectives. Thus costs for treatment and the use of resources for sampling would be reduced.

Water Quality Standards Variance Policy
The use of a variance will not lead to increase costs for treatment as this option would lead to a less stringent objectives. The costs for treatment and the use of resources for sampling would be reduced.

10.5 The Need for Developing Housing

The adoption of the Bacteria Provisions is not expected to constrain housing development in California. Presently waters of the state have bacteria objectives, which in some cases are outdated. The Bacteria Provisions will update all outdated objectives and provide statewide consistency. Monitoring costs will go down in some cases, due to the elimination of the need to monitor for two or more indicators versus monitoring for one indicator. Costs of treatment will remain the same and connection of housing to wastewater treatment plants will not cost more. Additionally, the implementation provisions provide for statewide implementation strategies designed to reduce the unnecessary treatment of waters. As a result, the Bacteria Provisions will not interfere with the need for developing new housing.

10.6 The Need to Develop and Use Recycled Water

The adoption of the Bacteria Provisions is not expected to restrict the need to develop and use recycled water. The Bacteria Provisions will not change any bacteria standard or provisions for recycled waters. Therefore, the Bacteria Provisions are consistent with the need to develop and use recycled water.

Water Code Section 13242

California Water Code section 13242 requires that the program of implementation for achieving the water quality objective within the Bacteria Provisions include a description of the nature of the actions, which are necessary to achieve the objective, time schedules for actions to be taken, and a description of the surveillance to be undertaken to determine compliance with the water quality objective. In compliance with California Water Code section 13242, the Bacteria Provisions includes objectives and implementation actions (See Chapter 6 Analysis of Project Options). A time schedule for compliance can be applied, if needed, in accordance with the Compliance Schedule Policy (Resolution No. 2008-0025). Monitoring and compliance will be determined on a case by case basis by the Regional Water Boards.

10.7 Antidegradation

Federal and state antidegradation policies found at 40 Code of Federal Regulations section 131.12 and in State Water Board Resolution No. 68-16, respectively, imposes levels of protection for state waters depending on the highest quality of the receiving water at issue since 1968 – the year that the State Water Board adopted California's antidegradation policy. Where a receiving water is of higher quality than applicable water quality standards, that high quality must be maintained unless certain conditions are met.

The State Water Board does not anticipate any degradation of water quality as a result of the adoption and implementation of the Bacteria Provisions. Upon adoption of the Bacteria Provisions, the state would have water quality objectives for bacteria and implementation provisions that will apply to all surface waters of the state. The Bacteria Provisions would not result in a degradation of quality standards in those waters as the objectives are more conservative in most cases (see discussion below) than current objectives. Implementation of TMDLs addressing natural sources of bacteria will prevent the unnecessary treatment of natural sources of bacteria that could affect valuable aquatic life and wildlife beneficial uses supported by natural water bodies.

Presently the numeric objective for the Lahontan Regional Water Board is lower than the proposed objectives. The Lahontan Regional Water Board does not have a REC-1 objective. The Bacteria Provisions will adopt the REC-1 objective for the Lahontan Region. The bacteria objective in their Basin Plan applies to all waters independent of beneficial use designation. Additionally their Basin Plan has a narrative objective which states: "Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes", which will not be superseded by The Bacteria Provisions. By applying their narrative objective and their current bacteria objective for all waters, waters within the Region should not be degraded by the proposed higher objective. In addition, the Statement of Policy with Respect to Maintaining High Quality of Waters in California (Resolution No. 68-16) requires high quality water be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies.

Presently the numeric objective for the North Coast Regional Water Board is lower than the proposed objective. Their Basin Plan also has a narrative objective, which will not be superseded by The Bacteria Provisions. Their narrative objective states: "The bacteriological quality of waters of the North Coast Region shall not be degraded beyond natural background levels." The use of this narrative objective will allow the North Coast Water Board to prevent the degradation of the water quality of their waters. In addition, the Statement of Policy with Respect to Maintaining High Quality of Waters in California (Resolution No. 68-16) requires high quality water be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.

As a result, the adoption and implementation of the Bacteria Provisions would not lead to the degradation of any water quality standards and would instead enhance water quality across the state.

10.8 Human Right to Water

California Assembly Bill 685 (AB 685) declares that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes" (Wat. Cod, § 106.3, subd. (a)) and promotes the adoption of policies, regulations, and grant criteria pertinent to those uses of water (ibid., § 106.3, subd. (c)). State Water Board Resolution 2016-0010 adopts the human right to water as a core value, adopts the realization of the human right to water as a top priority for the Water Boards, and directs staff, when submitting a recommendation to the board pertinent to the human right to water, to describe how the right was considered. The Bacteria Provisions do not directly pertain to drinking water. Since the Bacteria Provisions do not apply to drinking water, any effects on the affordability or accessibility of safe clean drinking water would be indirect.

11 Scientific Peer Review

External scientific peer review is a mechanism for ensuring that regulatory decisions and initiatives are based on sound science. External scientific peer review also helps strengthen regulatory activities, establishes credibility with stakeholders, and ensures that public resources are managed effectively. Health and Safety Code section 57004, subdivision (d)(1)-(2), provides:

> No board, department, or office within [CalEPA] Agency shall take any action to adopt the final version of a rule unless all of the following conditions are met: (1) The board […] submits the scientific portions of the proposed rule, along with a statement of the scientific findings, conclusions, and assumptions on which the scientific portions of the proposed rule are based and the supporting scientific data, studies, and other appropriate materials, to the external scientific entity for its evaluation. (2) The external scientific peer review entity, within the timeframe agreed upon by the board, department, or office and the external scientific peer review entity, prepares a written report that contains an evaluation of the scientific basis of the proposed rule.

Health and Safety Code section 57004, subdivision (a)(2), also defines "scientific basis" and "scientific portions" as "the foundations of a rule that are premised upon, or derived from empirical data or other scientific findings, conclusions, or assumptions establishing a regulatory level, standard, or other requirement for the protection of public health or the environment."

Section 57004, subdivision (b) provides that "the agency, or a board, department, of office within [CalEPA] shall enter into an agreement [with a scientific institution or group of higher learning] to conduct external peer review of the scientific basis for any rule proposed for adoption by any board, department, or office within [CalEPA]." As discussed below, one or more Regional Water Quality Control Boards entered into such an agreement with respect to the scientific basis for one or more elements currently contained in the Bacteria Provisions and previously complied with the external peer review statute. As a result, the State Water Board's adoption of those elements shall be deemed to comply with the peer review processes established by Health and Safety Code section 57004.

Evaluation of Need for Peer Review

The regulatory elements proposed within the Bacteria Provisions are listed in Table 13**.** The table identifies the previous amendments and external scientific sources used in developing scientific and policy elements within the Bacteria Provisions. Many of these elements rely on previous Basin Plan amendments, U.S EPA Review and TMDLs and qualify as source documents that have been previously peer reviewed by a recognized expert or body of experts. The current elements of the Bacteria Provisions that are specifically scientifically based (noted as Peer Review Needed?) should not require further scientific review based on previous peer review.

Table 13. Summary of Peer Review of Scientific Basis for Bacteria Provisions Elements

Proposed Amendment Element	Peer Review Needed?	Proposed Approach	Prior Review
Enterococci and E.coli Water Quality Objectives	Yes	Establish Enterococci and E.coli as sole water quality indicators for REC-1	Peer Review of U.S. EPA 2012 Recreational Water Quality Criteria
Bacteria Indicators numeric thresholds	Yes	Propose water quality criteria thresholds based on illnesses rates associated with 32/1000 recreators for REC-1	Peer Review of U.S. EPA 2012 Recreational Water Quality Criteria
Address natural sources of bacteria	Yes	Propose reference beach/Antidegradation approach	Peer Review of RB4 2002 Bacteria TMDLs for Santa Monica Bay Beaches, RB9 2005 Bacteria TMDLs for 20 Beaches and Creeks in the San Diego Region, RB2 2012 Bacteria TMDL for San Pedro Creek and Pacifica State Beaches
Address natural sources of bacteria	Yes	Propose natural sources exclusion approach.	Peer Review of RB9-2008-0028 Basin Plan Amendment for Bacteria Implementation Provision for TMDLs from Natural Uncontrollable Sources
High flow suspension of objectives for fresh waters	No	Allow suspension of REC-1 water quality objectives for specific periods of high flow at site specific locations.	Modeled on RB8-2012-0001 Basin Plan Amendment for Bacteria Objectives …Beneficial Uses
Averaging period to determine compliance (6-week geometric mean and sampling requirements)	No	Use a six-week interval for determination of geometric mean (calculated weekly). The geometric mean should generally be measured using a minimum of 5 samples in a given 6 week period. Calculate the STV monthly.	RB4 Revision for implementing procedures for beaches bacteria TMDLs. Letter dated 08/20/2012.
Variance of water quality standards	No	Create authority to issue a WQS variance in accordance with Tile 40, Code of Federal Regulations, sections 131.10(o) and 131.14.	Establishing the recently promulgated federal requirements and definitions a WQS variance.
Seasonal Suspension	No	REC-1 use unavailable during year due to seasonal conditions.	Requires site specific UAA for each location
Limited Rec-1	No	Where full REC-1 use is limited by physical conditions such as very shallow water depth and restricted access, LREC-1 can be designated.	Modeled on State Water Board Resolution 2005-0015, and Water Quality Order 2005-0004. Requires site specific UAA.

There are two aspects of the Bacteria Provisions that are subject to external peer review. The first is the scientific basis of the enterococci and E.*coli* water quality objectives. The second is the Reference Beach/Antidegradation and natural sources exclusion approaches.

Enterococci and E.coli Water Quality Objectives and their numeric thresholds

The scientific basis of the enterococci and E.*coli* water quality objectives were peer reviewed as part of the U.S. EPA 2012 Recreational Water Quality Criteria. U.S EPA documents go through several rounds of peer review prior to publication, sometimes including specific aspects of U.S. EPA documents being published in peer reviewed journals. In the case of the U.S. EPA 2012 Recreational Water Quality Criteria, the process started with numerous expert workshops that helped to frame the scope and science that was needed for the new criteria. The U.S. EPA 2012 Recreational Water Quality Criteria was developed by an inter-agency workgroup (called the Action Development Process Workgroup) that met weekly for several years. The document went through multiple rounds of internal management review in many different U.S. EPA offices (Office of Science & Technology, Office of Research and Development, Office of General Council, Office of Wetlands Oceans and Watersheds, Office of Wastewater Management, Office of Science Policy, Office of Children's Health Protection, and all Regional offices)[27].

Before the U.S. EPA 2012 Recreational Water Quality Criteria was published, it went through an external Peer-review which consisted of a panel of five external experts, and Public Comment. The peer review is available as the *Meeting Report for The Peer Review of U.S. EPA's Draft Recreational Water Quality Criteria (RWQC) document*[28] *dated November 1, 2011.*

The scientific peer review of the U.S. EPA 2012 Recreational Water Quality Criteria document considered both of the options for public health levels being considered for these Bacteria Provisions (Table 1, page 6 of U.S. EPA 2012 Recreational Water Quality Criteria). With respect to the specific health levels selected and the analyses underlying those values, they were subject to all of the other (internal and external) peer review processes noted above.

The U.S. EPA 2012 Recreational Water Quality Criteria document was published November 26, 2012 after updates resulting from Peer Review and Public Comment, receiving additional rounds of management review from all U.S. EPA offices, and passing Final Agency Review.

Natural sources of bacteria

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. The Reference Beach/Antidegradation approach has been peer reviewed by the San Francisco Bay, Los Angeles, and San Diego Regional Water Boards. This method was originally peer reviewed by the Los Angeles Regional Water Board 4 for the "Santa Monica Bay Beaches Bacteria TMDL"[29,30] and, more recently, in the Los Angeles River Watershed Bacteria TMDL[31]. The San

[27] U.S. EPA Peer Review email 10 21 2015 from Jeff Soller located in ECM 2118238

[28] U.S. EPA. 2011. Meeting Report for the Peer Review of U.S. EPA's Draft Recreational Water Quality Criteria (RWQC) Document. Submitted by Eastern Research Group. Final Meeting Report: November 1, 2011. [ECM No. 2327571]

[29] See California Regional Water Quality Control Board, Los Angeles Region, Resolution No. 02-004. January 24, 2002 located at:

Francisco Bay Regional Water Board has also recently peer reviewed the Reference Beach approach for the "Bacteria at San Pedro Creek and Pacifica State Beach TMDL"[32]. For the San Diego Regional Water Board, the Reference System approach was recently peer reviewed for a Basin Plan amendment to incorporate TMDLs for indicator bacteria[33] and earlier in their "Bacteria-Impaired Waters TMDL Project I for Beaches and Creeks" in 2005[34] in the San Diego Region. The natural sources exclusion approach was specifically included with the San Diego Regional Water Board's peer review in conjunction with the Basin Plan amendment in 2008 "to Incorporate Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources within the Context of a TMDL[35]. Therefore, due to these previous peer reviewed documents, no additional external peer review is necessary.

Policy provisions requiring site specific scientific review

The remaining provisions addressed below from the Bacteria Provisions deal more directly with expanding allowable policies statewide. These will usually require further site specific studies and scientific review at the time of local implementation. Therefore, these provisions should not require peer review as part of the current amendments.

High flow suspension of objectives for fresh waters

In 2003 the Los Angeles Regional Water Board proposed amendments (R03-010) for beneficial uses that allowed a High Flow Suspension of bacteria REC-1 beneficial use during periods of high rainfall events. It was set up for only engineered channels as specifically listed in the amendment. Subsequent studies performed additional recreational use assessments and

---

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

[30] See California Regional Water Quality Control Board, Los Angeles Region. Resolution No. 2002-022.. located at: http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

[31] See California Regional Water Quality Control Board, Los Angeles Region. 2010. Draft Staff Report for Proposed Amendment to the Water Quality Control Plan located at: http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_80_R10-007_td.shtml

[32] See California Bay Regional Water Quality Control Board, San Francisco Region. 2012. Bacteria in San Pedro Creek and at Pacifica State Beach Total Maximum Daily Load. Appendix D - Response to Comments (Includes Response to Peer Review Comments) located at: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/pacificabacteria/Appendix%20D%20-%20Response%20to%20Comments.pdf

[33] See California Regional Water Quality Control Board, San Diego Region. 2010. Technical Report for Revised Total Maximum Daily Loads for Indicator Bacteria Project I – Twenty Beaches and Creeks in the San Diego Region located at: http://www.waterboards.ca.gov/sandiego/water_issues/programs/tmdls/docs/bacteria/updates_022410/2010-0210_Final_TechRpt_AppendixA.pdf

[34] See California Regional Water Quality Control Board, San Diego Region. 2005. Bacteria-Impaired Waters TMDL Project I for Beaches and Creeks in the San Diego Region: Technical Draft. located at: http://www.waterboards.ca.gov/water_issues/programs/peer_review/docs/rb9_sandiego_indicatorbacteria/2005_reviewdocs.pdf

[35] See California Regional Water Quality Control Board, San Diego Region. 2008. Technical Report Appendix 3 located at: http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/docs/amendments/issue_7/070808_Update/App3_ResponsestoPeerReviewComments%20June08.pdf

reconfirmed the high flow suspension process in resolution (R14-011) "Retaining the Current Recreational Beneficial Use Designations of the Engineered Channels of the Los Angeles River Watershed" dated December 4, 2014[36]. Note this is for specifically studied and listed sections of the engineered river channels. The Bacteria Provisions are not supplying a scientific basis for this provision and as such will not require it to be peer reviewed at this time. It would require peer review at the time and place of implementation.

Averaging period to determine compliance

The use a six-week averaging period for determination of geometric mean and STV is based on an implementation strategy studied and employed by the Los Angeles Regional Water Quality Control Board. This is found in the Staff Report for revisions of several coastal bacteria TMDLs in the Los Angeles area[37]. The Los Angeles Regional Water Board Resolution R12-007 stated the following: "Implementation provisions for water contact recreation bacteria objectives do not preclude the calculation of a geometric mean over a period greater than 30 days, such as a seasonal geometric mean period. Use of a longer data period in the calculation of geometric means does not change any target or allocation in any TMDL and does not represent a need for significantly greater or smaller reductions in bacterial densities and will not require a greater or lesser implementation actions on the part of TMDL responsible parties."

Los Angeles Regional Water Board staff prepared a detailed technical document that analyzes and describes the specific necessity and rationale for the revision of these TMDLs and the revision to the Implementation Provisions for Water Contact Recreation Bacteria Objectives[38]. An external scientific peer review of the original Santa Monica Beaches TMDLs was completed to evaluate the scientific bases of the TMDLs. Additionally, five other bacteria TMDLs have been completed which followed the same approach. The Scientific portions of the subsequent revisions to the Beach Bacteria TMDLs were drawn from the original Santa Monica Beaches Bacteria TMDLs. As a result it has been determined by Senior Staff Counsel Frances L. McChesney of the State Water Board[39] that the scientific portions of the 2012 revised Beaches Bacteria TMDLs have already undergone external, scientific review. She also found that the remaining portions of the TMDLs, such as the implementation strategy, were not scientifically based, and therefore, not subject to peer review requirements of section 57004.

WQS Variance Provision

The State Water Board is proposing an amendment to the ISWEBE and Ocean Plan to identify WQS Variance provisions consistent with recently promulgated federal requirements. 40 Code of Federal Regulations section 131.14 allows states to adopt a WQS variance in accordance with specific provisions. The provisions note the applicability, requirements for submission to

---

[36] See California Regional Water Quality Control Board, Los Angeles Region. Resolution R14-011 located at: http://63.199.216.6/bpa/docs/R14-011_RB_RSL.pdf

[37] See Los Angeles Regional Water Board Resolution No. R12-007, located at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/90_New/Jan2013/Final%20Resolution_beaches%2007Jun12_signed.pdf

[38] See California Regional Water Quality Control Board, Los Angeles Region. Staff Report located at: http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/90_New/Jan2013/Final%20Beaches%20Reconsideration%20Staff%20Report%2007Jun12.pdf

[39] Los Angeles Regional Water Quality Control Board. 2012c. Letter from Frances L. McChesney to Renee Purdy: Peer Review for revision of beaches TMDLs for bacteria to amend implementing provisions for water contact recreation bacteria objectives. Dated August 20, 2012. ECM 2302202.

U.S. EPA, and how WQS variances are implemented within NPDES permits. Identifying the WQS Variance requirements outlined in 40 Code of Federal Regulations section 131.14 within the ISWEBE and Ocean Plan would achieve general consistency and allow Regional Water Boards another implementation tool.

In addition each specific use of the Variance Policy would be subject to public participation requirements applicable to the revision of a water quality standard, and is subject to U.S. Environmental Protection Agency U.S. EPA review and approval.

The Variance Policy within the ISWEBE and Ocean Plan provides the Water Boards identification of the process for obtaining a WQS variance consistent with 40 Code of Federal Regulations section 131.14. No peer review is considered for establishing the Variance Policy within the ISWEBE and Ocean Plans because each particular instance for applying the Variance Policy will require scientific peer review of technical methods employed or allowed at that time consistent with state and federal law.

Seasonal Suspension of REC-1 Beneficial Use

Seasonal conditions in some waterbodies may make the REC-1 beneficial uses unattainable for extended portions of the year. Seasonal conditions that may affect the REC-1 beneficial use may include frigid conditions in the mountains that result in frozen lakes, reservoirs, streams, or ponds, and very arid conditions during the summer in desert regions that result in extremely low flows.

A Seasonal Suspension for seasonal low flows or intermittent uses would require an Use Attainability Analysis, as a beneficial use is temporarily being suspended. A Use Attainability Analysis is a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological and economic factors as described in 40 Code of Federal Regulations section 131.10(g). The Use Attainability Analysis for Seasonal Suspension must be approved by the applicable Regional Water Board, the State Water Board and U.S. EPA. The Bacteria Provisions are not applying a scientific basis for this provision and as such this provision will not require to be peer reviewed at this time. It may require peer review at the time and place of implementation.

Limited REC-1 Beneficial Use Definition

The LREC-1 definition is used for those waters with recreational activities involving body contact with water, where full REC-1 use is limited by physical conditions such as very shallow water depth and restricted access, and as a result, ingestion of water is incidental and infrequent. The Los Angeles Regional Water Quality Control Board presently has waters with the beneficial use designation of LREC-1. This was actually implemented through the State Water Board Resolution 2005-0015 and Order WQO 2005-0004[40]. The Bacteria Provisions would create a statewide definition of the LREC-1 beneficial use based on these decisions. A science based Use Attainability Analysis would be required each time to determine if the LREC-1 use is appropriate and the REC-1 use is not attained at specific locations. Consequently, the Bacteria Provisions are not applying a scientific basis for this provision and as such this provision will not

[40] See the State Water Board Resolution 2005-0015 and Water Quality Order 2005-0004 located at: http://www.swrcb.ca.gov/board_decisions/adopted_orders/resolutions/res05.shtml

require to be peer reviewed at this time. It may require peer review at the time and place of implementation.

12 References

Abt Associates Inc. 2017. Economic Analysis of Proposed Water Quality Objectives for Pathogens in the State of California. June 2017.

American Society of Civil Engineers. 2014. Pathogens in Urban Stormwater Systems. Available at http://www.asce-pgh.org/Resources/EWRI/Pathogens%20Paper%20August%202014.pdf

Arid West Water Quality Research Project. 2007. Arid West Water Quality Research Project User's Guide.

California Department of Public Health. 1980. Uniform Guidelines for Sewage Disinfection.

California Regional Water Quality Control Board, Central Valley Region. 2014. Draft Staff Joaquin River Basins and the Water Quality Control Plan for the Tulare Lake Basin to add Policies for Variance from Surface Water Quality Standards for Point Source Dischargers, Variance Program for Salinity, and Exception from Implementation of Water Quality Objective for Salinity.

California Regional Water Quality Control Board, Central Valley Region. 2014. Resolutions No. R5-2014-0074. Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins and the Water Quality Control Plan for the Tulare Lake Basin to add Policies for Variances from Surface Water Quality Standards for Point Source Dischargers, Variance Program for Salinity, and Exception from Implementation of Water Quality Objective for Salinity.

California Regional Water Quality Control Board, Los Angeles Region. 2001. Staff Report for Proposed Amendment of the Water Quality Control Plan - Los Angeles Region to Revise Bacteria Objectives for Waters Designated for Contact Recreation. July 31, 2001. Pg. 8.

California Regional Water Quality Control Board, Los Angeles Region. 2002. Amendment of the Water Quality Control Plan for the Los Angeles Region to Incorporate Implementation Provisions for the Region's Bacteria Objectives and to Incorporate a Wet-Weather Total Maximum Daily Load for Bacteria at Santa Monica Bay Beaches. Resolution No. 2002-022.

California Regional Water Quality Control Board, Los Angeles Region. 2002. Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watershed of Los Angeles and Ventura Counties. Attachment A to Resolution No. 2002-022.

California Regional Water Quality Control Board, Los Angeles Region. 2003. Amendment of the Water Quality Control Plan for the Los Angeles Region to Suspend the Recreational Beneficial Uses in Engineered Channels during Unsafe Wet Weather Conditions. Resolution No. 2003-010.

California Regional Water Quality Control Board, Los Angeles Region. 2003. Draft Staff Report for Amendment to the Water Quality Control Plan for the Los Angeles Region to Suspend the

Recreational Beneficial Uses in Engineered Channels during Unsafe Wet Weather Conditions. May 15, 2003.

California Regional Water Quality Control Board, Los Angeles Region. 2005. Santa Monica Bay Beaches Wet-Weather Bacteria TMDL Implementation Plan Jurisdictional Groups 1 and 4.

California Regional Water Quality Control Board, Los Angeles Region. 2010. Draft Staff Report for Proposed Amendment to the Water Quality Control Plan – Los Angeles Region to Update the Bacteria Objectives for Freshwaters Designated for Water Contact Recreation by Removing the Fecal Coliform Objectives.

California Regional Water Quality Control Board, Los Angeles Region. 2012. Staff Report for Reconsideration of Certain Technical Matters of Santa Monica Bay Beaches Bacteria TMDLs; The Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL; and the Los Angeles Harbor Inner Cabrillo Beach and Main Ship Channel Bacteria TMDL. [ECM 2242674]http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/90_New/Jan2013/Final%20Beaches%20Reconsideration%20Staff%20Report%2007Jun12.pdf

California Regional Water Quality Control Board, Los Angeles Region. 2012. Letter from Frances L. McChesney to Renee Purdy: Peer Review for revision of beaches TMDLs for bacteria to amend implementing provisions for water contact recreation bacteria objectives. Dated August 20, 2012.

California Regional Water Quality Control Board, Los Angeles Region. 2014. Resolution R14-011. Retaining the Current Recreational Beneficial Use Designations of the Engineered Channels of the Los Angeles River Watershed. Available at http://63.199.216.6/bpa/docs/R14-011_RB_RSL.pdf

California Regional Water Quality Control Board, Los Angeles Region. 2015a Substitute Environmental Documents for the San Gabriel River, Estuary, and Tributaries Bacteria Total Maximum Daily Load. http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/111_new/SEDSGRBactTMDL.pdf

California Regional Water Quality Control Board, Los Angeles Region. 2015b Staff Report for Total Maximum Daily Loads for Indicator Bacteria in the San Gabriel River, Estuary and Tributaries. http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/111_new/Final_Staff_Report_SGR_9-03-15.pdf

California Regional Water Quality Control Board, San Diego Region. 2005. Bacteria-Impaired Waters TMDL Project I for Beaches and Creeks in the San Diego Region: Technical Draft. Available at: http://www.waterboards.ca.gov/water_issues/programs/peer_review/docs/rb9_sandiego_indicatorbacteria/2005_reviewdocs.pdf

California Regional Water Quality Control Board, San Diego Region. 2008. A Resolution Amending the Water Quality Control Plan for the San Diego Basin to Incorporate

Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources with the Context of a Total Maximum Daily Load. Resolution No. R9-2008-0028.

California Regional Water Quality Control Board, San Diego Region. 2008. Technical Report for an Amendment to the Water Quality Control Plan for the San Diego Basin to Incorporate Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources with the Context of a Total Maximum Daily Load. May 14, 2008. Pgs. 29-30.

California Regional Water Quality Control Board, San Diego Region. 2008. Technical Report for Total Maximum Daily Loads for Indicator Bacteria Baby Beach in Dana Point Harbor and Shelter Island Shoreline Park in San Diego Bay. Pg. 84.

California Regional Water Quality Control Board, San Diego Region. 2010. Technical Report for Revised Total Maximum Daily Loads for Indicator Bacteria Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek). http://www.waterboards.ca.gov/sandiego/water_issues/programs/tmdls/docs/bacteria/updates_022610/2010-0210_Final_Technical_Report.pdf

California Regional Water Quality Control Board, San Francisco Region. 2010. Proposed Basin Plan Amendment and Final Staff Report for Bacteria Objectives for Marine and Estuarine Waters Designated for the Contact Recreation in the San Francisco Bay Region. http://www.waterboards.ca.gov/sanfranciscobay/board_info/agendas/2010/April/BPA/Appendix_C.pdf

California Regional Water Quality Control Board, San Francisco Region. 2010. Resolution No. R2-2010-0066 Amending the Water Quality Control Plan for the San Francisco Bay region to establish bacteria objective for waters designated for contract recreation in marine and estuarine waters of the San Francisco Bay Region.

California Regional Water Quality Control Board, San Francisco Region. 2012. Bacteria in San Pedro Creek and at Pacifica State Beach Total Maximum Daily Load (TMDL). Appendix D - Response to Comments (Includes Response to Peer Review Comments).

California Regional Water Quality Control Board, San Francisco Region. 2015. Contract with SFEI for Reference Beach Identification.

California Regional Water Quality Control Board, San Francisco Region. 2016. Appendix E: Peer Review Comment Letters Received on Proposed Basin Plan Amendment for a Total Maximum Daily Load for Bacteria in San Francisco Bay Beaches. Dated February 29, 2016.

California Regional Water Quality Control Board, San Francisco Region. 2016. Appendix C: Staff Report for Proposed Basin Plan Amendment for a Total Maximum Daily Load for Bacteria in San Francisco Bay Beaches.

California Regional Water Quality Control Board, Santa Anna Region. 2012. Resolution Approving Amendments to the Basin Plan Pertaining to Bacteria Quality Objectives and Implementation Strategies, Recreation Beneficial Uses, the Addition and Deletion of Certain

Waters Listed in the Basin Plan and Designation of Appropriate Beneficial Uses, and Other Minor Modifications. Available at: http://www.waterboards.ca.gov/santaana/board_decisions/adopted_orders/orders/2012/12_001_Resolution_Approving_Amendments_to_the_BP.pdf.

Cohen, J., Darling, R., Dichter, G., Dobrovolny, L., Esmon, P., Garfield, L., Greenberg, N., & McGee, C. 2001. South Yuba River Enterococci Studies. Prepared for South Yuba River Citizens League, October 2001.

Martorano, Nick. SWRCB. 2016a. Email Communication regarding Exceedances from Two Different Bacteria Illness Rates.

Martorano, Nick. SWRCB. 2016b. Email Communication regarding Exceedances from Two Different Bacteria Illness Rates for Region 6.

Munakata, N., Kuo, J., Tang, C.-C., Horvath, R.W., and Leong, L.Y.C. 2007. Results of a National Survey of POTWS using UV Disinfection. Proceedings of the Water Environment Federation, WEFTEC 2007: Session 111 through Session 120, pp. 9030-9032(3).

Soller, Jeff, U.S. EPA. 2005. Email Communication regarding USEPA Peer Review of the 2012 Recreational Water Quality Criteria.

Southern California Coastal Water Research Project (SCCWRP). 2015. Wet and Dry Weather Beach Epidemiology Studies. Available at: http://www.sccwrp.org/ResearchAreas/BeachWaterQuality/CaliforniaEpidemiologicalStudies.aspx

SCCWRP. 2001. Evaluation of Microbial Source Tracking Methods using Mixed Fecal Sources in Aqueous Test Samples. Available at: http://www.sccwrp.org/ResearchAreas/BeachWaterQuality/EvaluationOfMicrobialSourceTrackingMethods.aspx

SCCWRP. 2005. Alpha-Testing of Rapid Microbiological Methods for Measuring Recreational Water Quality. Available at: http://www.sccwrp.org/ResearchAreas/BeachWaterQuality/AlphaTestingOfRapidMethods.aspx[[

SCCWRP. 2006. Side-by-Side Beta Testing of Rapid Methods Available at: http://www.sccwrp.org/ResearchAreas/BeachWaterQuality/SideBySideBetaTestingOfRapidMethods.aspx

SCCWRP. 2012. State-of-the-Science: Fecal Source Identification and Associated Risk Assessment Tools. Available at: http://www.sccwrp.org/Meetings/Workshops/SourceIdentificationWorkshop.aspx

SWRCB. 1968. Statement of Policy with Respect to Maintaining High Quality of Waters in California, Resolution No. 68-16.

SWRCB. 2005. In the Matter of Own Motion Review of Failure to Modify Recreational Use Standards for Ballona Creek by the California Regional Water Quality Control Board, Los Angeles Region. Order WQO 2005-0004.

SWRCB. 2005. Amendment to Water Quality Control plan for the Los Angeles Region to Remove the Potential REC-1 Beneficial Use Associated with the Swimmable Goal – as Expressed in the Federal Clean Water Act Section 101(a)(2) for Ballona Creek, "Replace the Potential REC-1 Beneficial use for "Ballona Creek to Estuary" with Existing Limited REC-1 Use, and Add Bacteria Objectives to Protect the new Limited REC-1 Use. Resolution No. 2005-0015.

SWRCB. 2006. Substitute Environmental Document for Total Residual Chlorine and Chlorine-Produced Oxidants Policy of California.
http://www.swrcb.ca.gov/water_issues/programs/state_implementation_policy/docs/rvsd_cl_sed_063006_accept.pdf

SWRCB. 2008. Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits. Resolution No. 2008.-0025.

SWRCB. 2012. Water Quality Control Plan, Ocean Waters of California.

SWRCB. 2013. Fact Sheet, Phase II Small Municipal Separate Storm Sewer system (Small MS4) General Permit.

SWRCB. 2013. Fact Sheet, Storm Water Management in California.

SWRCB. 2015. Total Maximum Daily Load Program website.
http://www.swrcb.ca.gov/water_issues/programs/tmdl/background.shtml

SWRCB. 2015. Informational Document, Public Scoping Meeting for Proposed Statewide Water Contact Plans for Inland Surface Waters, Enclosed Bays and Estuaries and the Ocean Waters of California.

SWRCB. 2015. Final Staff Report Including the Final Substitute Environmental Documentation Adopted May 6, 2015 addressing Desalination Facility Intakes, Brine Discharges, and the Incorporation of Other Non-Substantive Changes.
http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/rs2015_0033_sr_apx.pdf

SWRCB. 2015. Final Staff Report Including the Substitute Environmental Documentation for Amendment to the Water Quality Control Plan for the Ocean Waters of California to Control Trash and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries.
http://www.waterboards.ca.gov/water_issues/programs/trash_control/docs/01_final_sed.pdf

SWRCB. 2017 February 22, 2017 Executive Director's Report Available at:
http://www.waterboards.ca.gov/board_info/exec_dir_rpts/2017/edrpt022217.pdf
U.S. EPA. 1986. Ambient Water Quality Criteria for Bacteria – 1986. Office of Water. EPA 440/5-84-002.

U.S. EPA. 1991. Technical Support Document for Water Quality Based Toxics Control. EPA 505/2-90-001.

U.S. EPA. 1996. NPDES Permit Writers' Manual. EPA 833-B-96-003. Available at: http://www.epa.gov/npdes/pubs/owm0243.pdf .

U.S EPA. 2001. The National Costs of the Total Maximum Daily Load Program (Draft Report). EPA 841-D-01-003.

U.S. EPA. 2003. Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Ambient Water. Federal Register 68 (139): pp. 43271-43283. July 21, 2003. Online at: https://www.gpo.gov/fdsys/pkg/FR-2003-07-21/html/03-18155.htm .

U.S. EPA. 2004a. Water Quality Standards for Coastal and Great Lakes Recreational Waters; Final Rule. Federal Register, 40 C.F.R. Part 131, Tuesday, November 16, 2004.

U.S. EPA. 2004b. External Peer Review of EPA Analysis of Epidemiological Data From EPA Bacteriological Studies. Available in the public record for the BEACH Act rule, Docket ID No. OW-2004-0010.

U.S. EPA August 16, 2005. Guidelines Establishing Test Procedures For The Analysis Of Pollutants; Analytical Methods For Biological Pollutants In Wastewater And Sewage Sludge; Proposed Rule: Federal Register 70(157): pp. 48255-48268.

U.S. EPA. 2007. Water Quality Standards Academy, Module 15 Variances.

U.S. EPA. 2007. Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Wastewater and Sewage Sludge; Final Rule.

U.S. EPA. 2011. Meeting Report for the Peer Review of EPA's Draft Recreational Water Quality Criteria (RWQC) Document. Submitted by Eastern Research Group. Final Meeting Report: November 1, 2011.

U.S. EPA. 2012. Recreational Water Quality Criteria.

U.S. EPA. 2016. Water Quality Standards; Establishment of Revised Numeric Criteria for Selenium for the San Francisco Bay and Delta, State of California – Proposed Rule. Federal Register 81 (136): pp. 46030- 46042. July, 15, 2016. Online at: https://www.federalregister.gov/d/2016-16266/p-146.

Wade, T.J., N. Pai, J.N.S. Eisenberg , and J.M. Colford, Jr. 2003. Do U.S. Environmental Protection Agency Water Quality Guidelines for Recreational Waters Prevent Gastrointestinal Illness? A systematic review and meta-analysis. Environmental Health Perspectives, 111: 1102-1109.

The Water Institute. 2015. The Surfer Health Study: Microbial Water Quality Measurements Supporting a Combined Wet Weather Surfer Epidemiology and QMRA Study in San Diego, CA.

Available at:
http://ftp.sccwrp.org/pub/download/DOCUMENTS/ConferencePresentations/WaterInstituteConf_May2015_Steele.pdf

Appendix A. Abbreviations and Definitions

List of Abbreviations Used in the Staff Report

ASBS	Areas of Special Biological Significance
Bacteria Provisions	Part 3 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Bacteria Provisions and a Water Quality Standards Variance Policy; and Amendment to the Water Quality Control Plan for Ocean Waters of California—Bacteria Provisions and a Water Quality Standards Variance Policy
Basin Plan(s)	Water Quality Control Plan(s) for the Regional Basin(s)
Beach Safety	Beach Bathing Water Quality Standards and Public Notification Program
BMP	Best Management Practice
BMPs	Best Management Practices
Cal. Code Regs.	California Code of Regulations
CalEPA	California Environmental Protection Agency
CalTrans	State of California Department of Transportation
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
C.F.R.	Unites States Code of Federal Regulations
Clean Water Act	The Federal Water Pollution Control Act Amendments of 1972, as amended (33 U.S.C. section 1251 et. seq.)
Compliance Schedule Policy	Compliance Schedules in National Pollutant Discharge Elimination System Permits
DDW	State Water Board – Division of Drinking Water
DELTA	Sacramento–San Joaquin River Delta
E. coli	Escherichia coli
EIR	Environmental Impact Report
ESA	Endangered Species Act
FIB	Fecal Indicator Bacteria
GI	Gastrointestinal Illness
GM	Geometric Mean
HSC	Health and Safety Code
ISWEBE	Inland Surface Waters, Enclosed Bays & Estuaries
NEEAR	National Epidemiological and Environmental Assessment of Recreational Water
NGI	NEEAR – GI Illness
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
Ocean Farming	Mariculture industry
Ocean Plan	Water Quality Control Plan for Ocean Waters of California
POTWs	Publicly Owned Treatment Works
Pub. Resources Code	Public Resources Code
recreators	primary contact recreators
Regional Water Board	Regional Water Quality Control Board
SCCWRP	Southern California Coastal Water Research Project

SED	Substitute Environmental Documentation
SIP	Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California
State Water Board	State Water Resources Control Board
STV	Statistical Threshold Value
Title 17	California Code of Regulations, Title 17, section 7958
Title 22	California Code of Regulations, Title 22, Chapter 3
TMDL	Total Maximum Daily Load
Toxicity Provisions	Proposed Part 4 Toxicity Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California
Trash Amendments	Amendment to the Ocean Plan and Part I Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California
UAA	Use Attainability Analysis
U.S. EPA	United States Environmental Protection Agency
UV	Ultraviolet Light
Wat. Code	California Water Code
Wetlands Policy	Water Quality Control Policy for Wetland Area Protection and Dredge or Fill Permitting
WQS	Water Quality Standard

Scientific Unit Abbreviations Used in the Staff Report

cfu	colony forming units (comparable to Most Probably Number)
lbs/day	Pounds per day
mL	Milliliters
MPN	Most Probable Number (comparable to colony forming units)
ppm	parts per million
ppth	part per thousand
µg/m^3	micrograms per cubic meter
µPa	micropascals

Beneficial Use Abbreviations Used in the Staff Report

REC-1	Water Contact Recreation
LREC-1	Limited Water Contact Recreation

Definitions

BASIN PLAN: Water quality control plan consists of a designation or establishment for the waters within a specified area of all of the following: (1) Beneficial uses to be protected, (2)

Water quality objectives, (3) A program of implementation needed for achieving water quality objectives.

ENCLOSED BAYS are indentations along the coast which enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. This definition includes but is not limited to: Humboldt Bay, Bodega Harbor, Tomales Bay, Drakes Estero, San Francisco Bay, Morro Bay, Los Angeles Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay.

ESTUARIES AND COASTAL LAGOONS are waters at the mouths of streams that serve as mixing zones for fresh and ocean waters during a major portion of the year. Mouths of streams that are temporarily separated from the ocean by sandbars shall be considered as estuaries. Estuarine waters will generally be considered to extend from a bay or the open ocean to the upstream limit of tidal action but may be considered to extend seaward if significant mixing of fresh and salt water occurs in the open coastal waters. The waters described by this definition include but are not limited to the Sacramento-San Joaquin Delta as defined by Section 12220 of the California Water Code, Suisun Bay, Carquinez Strait downstream to Carquinez Bridge, and appropriate areas of the Smith, Klamath, Mad, Eel, Noyo, and Russian Rivers.

GEOMETRIC MEAN: In mathematics, the geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers by using the product of their values (as opposed to the arithmetic mean which uses their sum). The geometric mean is defined as the *n*th root of the product of *n* numbers.

INITIAL DILUTION: The process which results in the rapid and irreversible turbulent mixing of wastewater with ocean water around the point of discharge. For a submerged buoyant discharge characteristic of most municipal and industrial wastes that are released from the submarine outfalls, the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing. Initial dilution in this case is completed when the diluting wastewater ceases to rise in the water column and first begins to spread horizontally. For shallow water submerged discharges, surface discharges, and nonbuoyant discharges, characteristic of cooling water wastes and some individual discharges, turbulent mixing results primarily from the momentum of discharge. Initial dilution, in these cases, is considered to be completed when the momentum induced velocity of the discharge ceases to produce significant mixing of the waste, or the diluting plume reaches a fixed distance from the discharge to be specified by the Regional Board, whichever results in the lower estimate for initial dilution.

INITIAL DILUTION ZONES: The Initial Dilution Zone of wastewater outfalls shall be excluded from designation as kelp beds" for purposes of bacterial standards, and Regional Water Boards should recommend extension of such exclusion zone where warranted to the State Water Board (for consideration under Chapter III. J. of the Ocean Plan). Adventitious assemblages of kelp plants on waste discharge structures (e.g., outfall pipes and diffusers) do not constitute kelp beds for purposes of bacterial standards.

KELP BED: For purposes of the bacteriological standards of this plan, are significant aggregations of marine algae of the genera Macrocystis and Nereocystis. Kelp beds include the total foliage canopy of Macrocystis and Nereocystis plants throughout the water column.

OCEAN WATERS are the territorial marine waters of the State as defined by California law to the extent these waters are outside of ENCLOSED BAYS, ESTUARIES AND COASTAL LAGOONS. If a discharge outside the territorial waters of the State could affect the quality of the waters of the State, the discharge may be regulated to assure no violation of the Ocean Plan will occur in ocean waters.

REFERENCE SYSTEM: A reference system is an area and associate monitoring point that is not impacted by human activities that potentially affect bacteria densities in the receiving water body.

STATE WATER QUALITY PROTECTION AREAS: These are nonterrestrial marine or estuarine areas designated to protect marine species or biological communities from an undesirable alteration in natural water quality. All Areas of Special Biological Significance (ASBS) that were previously designated by the State Water Board in Resolutions 74-28, 74-32, and 75-61 are now also classified as a subset of State Water Quality Protection Areas and require special protections afforded by this Plan.

USE ATTAINABILITY ANALYSIS: A Use Attainability Analysis is a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological, and economic factors as described in 40 C.F.R. Part 131.10(g).

WQS VARIANCE: A water quality standards variance is a time-limited designated use and criterion for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable condition during the term of the WQS variance.

Appendix B. Existing Bacteria TMDLs

Bacteria TMDLs developed due to REC-1 impairments (as of November of 2016

Region	Name of TMDL	Status/ State Water Board Resolution No.	Pollutant
1	Russian River Pathogen Indicator Bacteria TMDL	In development	Indicator Bacteria
2	Richardson Bay Pathogens TMDL	Resolution No. 2009-0063	Pathogens
2	Napa River Pathogen TMDL	Water Board Resolution No. R2-2006-0079	Pathogens
2	San Pedro Creek and Pacifica State Beach Bacteria TMDL	Resolution No. 2013-0007	Bacteria
2	Sonoma Creek Pathogens TMDL	Resolution No. R2-2006-0042	Pathogens
2	Tomales Bay Pathogen TMDL	Resolution No. R2-2005-0046	Pathogens
2	San Francisco Bay Beaches Bacteria TMDL	In development	Bacteria
3	Aptos/Valencia Creek Pathogen TMDL	Resolution No. 2010-0038	Pathogens
3	Arroyo de la Cruz Fecal Indicator Bacteria TMDL	Certified by Executive Officer	Indicator Bacteria
3	Cholame Creek Fecal Indicator Bacteria TMDL	Certified by Executive Officer	Indicator Bacteria
3	Corralitos Creek Pathogen TMDL	Resolution No. 2011-0019	Pathogens
3	Morro Bay Pathogen TMDL	Resolution No. 2003-0060	Pathogens
3	Pajaro River Fecal Coliform TMDL	Resolution No. 2010-0015	Fecal Coliform
3	Lower Salinas River Fecal Coliform TMDL	Resolution No. 2011-0040	Fecal Coliform
3	Lower San Antonio Fecal Indicator Bacteria TMDL	Certified by Executive Officer	Indicator Bacteria
3	San Lorenzo Creek (Monterey County) Fecal Indicator Bacteria TMDL	Certified by Executive Officer	Indicator Bacteria
3	San Lorenzo River Watershed Pathogen TMDL	Resolution No. 2011-0010	Pathogens
3	San Luis Obispo Creek Pathogen TMDL	Resolution No. 2005-0037	Pathogens
3	Santa Maria Watershed TMDL - Fecal Indicator Bacteria	Resolution No. 2012-0055	Pathogens
3	Soquel Lagoon Pathogen TMDL	Resolution No. 2010-0031	Pathogens
3	Tularcitos Fecal Indicator Bacteria TMDL	Certified by Executive Officer	Indicator Bacteria
3	Watsonville Slough Pathogen	Resolution No. 2006-0067	Pathogens

	TMDL		
4	Santa Clara River Bacteria TMDL	Resolution No. 2011-0048	Bacteria
4	Los Angeles River Bacteria TMDL	Resolution No. 2011-0056	Bacteria
4	Harbor Beaches of Ventura County (Kiddie Beach and Hobie Beach) Bacteria TMDL	Resolution No. 2008-0072	Bacteria
4	TMDL for Bacterial Indicator Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel.	Resolution No. 2006 - 0092	Bacteria Indicator Densities
4	Santa Monica Bay Beaches Bacteria TMDL (Dry Weather Only)	Resolution No. 2002- 0149	Bacteria
4	Santa Monica Bay Beaches Bacteria TMDL (Wet Weather)	Resolution No. 2003 - 0022	Bacteria
4	Marina del Rey Back Basins Bacteria TMDL	Resolution No. 2003 - 0072	Bacteria
4	Los Angeles Harbor Bacteria TMDL	Resolution No. 2004- 0071	Bacteria
4	Malibu Creek Bacteria TMDL	Resolution No. 2005-0072	Bacteria
4	McGrath Beach Coliform TMDL	Cease & Desist Order	Coliform
4	Avalon Bay Bacteria TMDL	Cease & Desist Order	Bacteria
4	Long Beach City Beaches and Los Angeles River Estuary Total Maximum Daily Loads for Indicator Bacteria	U.S. EPA Established	Indicator Bacteria
4	San Gabriel River Coliform	Resolution No. 2015-005	Bacteria
5	Stockton Urban Waterbodies Pathogen TMDL	Implemented through MS_4 permit	Pathogens
6	None Found		
7	New River Pathogen TMDL	Resolution No. 2002 - 0042	Pathogens
7	Coachella Valley Stormwater Channel Bacterial Indicators TMDL	Resolution No. 2011-0030	Bacteria Indicators
8	Knickerbocker Creek Bacterial Indicators	In Development	Bacteria Indicators
8	Incorporate Bacterial Indicator TMDLs for Middle Santa Ana River Watershed Waterbodies		Bacteria Indicators
8	Bacterial Indicator TMDLs for Canyon Lake	Other Action	Bacteria Indicators
8	TMDL for Fecal Coliform in Newport Bay.		Fecal Coliform
9	Revised TMDL for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)	Resolution No. 2010-0064	Indicator Bacteria

9	Bacteria Impaired Waters TMDL for San Diego Bay and Dana Point Harbor Shorelines	Resolution No. 2009-0053	Bacteria

Appendix C. Calculations of Illness Rates

Region 1's more stringent Limits

E. coli is ~ 90% of Fecal Coliform (based on number used by Ocean Plan staff – M. Gjerde)

Therefore Region 1's Fecal coliform limit of 50 is equal to a *E. coli* limit of 45

Mean *E. coli* density $= \text{antilog}_{10}\left(\frac{\text{illness rate/1000 people} + 11.74}{9.40}\right)$

$= \text{antilog}_{10}\left(\frac{\mathbf{4} + 11.74}{9.40}\right)$ back calculated using excel (3.77 rounded to 4)

$= \text{antilog}_{10}\left(\frac{15.74}{9.40}\right)$

$= \text{antilog}_{10}(1.65)$

$= 10^{(1.65)}$

$= 45$

- Therefore Region 1's illness rate is 4 illness /1,000 people versus the 8 illness/1,000 people that is currently proposed.

- Region 1's illness rate is 2 times more stringent then the proposed illness rate

Region 5's Lake Folsom more stringent Limits

E. coli is ~ 90% of Fecal Coliform (based on number used by Ocean Plan staff – M. Gjerde)

Therefore Region 5's Fecal coliform limit of 100 is equal to a *E. coli* limit of 90

Mean *E. coli* density $= \text{antilog}_{10}\left(\frac{\text{illness rate/1000 people} + 11.74}{9.40}\right)$

$= \text{antilog}_{10}\left(\frac{\mathbf{6.63} + 11.74}{9.40}\right)$ back calculated using excel

$= \text{antilog}_{10}\left(\frac{18.37}{9.40}\right)$

$= \text{antilog}_{10}(1.95)$

$= 10^{(1.95)}$

$= 90$

- Therefore Region 5's illness rate is 6.63 illness /1,000 people versus the 8 illness/1,000 people that is currently proposed.

- Region 5's illness rate is 20 % more stringent then the proposed illness rate

Region 6's more stringent Limits

E. coli is ~ 90% of Fecal Coliform (based on number used by Ocean Plan staff – M. Gjerde)

Therefore Region 6's fecal coliform limit of 20 is equal to a *E. coli* limit of 18

Mean *E. coli* density $= \text{antilog}_{10}\left(\frac{\text{illness rate/1000 people} + 11.74}{9.40}\right)$

$= \text{antilog}_{10}\left(\frac{\mathbf{.1} + 11.74}{9.40}\right)$ back calculated using excel

$= \text{antilog}_{10}\left(\frac{11.84}{9.40}\right)$

$= \text{antilog}_{10}(1.26)$

$= 10^{(1.26)}$

$= 18.18$ or 18

- Therefore Region 6's illness rate is .1 illness /1,000 people or 1 illness / 10,000 people versus the 8 illness/1,000 people that is currently proposed.

- Region 6's illness rate is 80 times more stringent then the proposed illness rate