

TECHNICAL MEMORANDUM
Evaluation of Drinking Water Quality Goals

TO: California Urban Water Agencies Central Valley Drinking Water Program Work Group
FROM: Bonny Starr, Starr Consulting and Holly Grover, CVRWQCB
DATE: October 1, 2007
SUBJECT: Final Technical Memorandum No. 4 –Review California Regional Water Board Basin Plans and Policies

The objective of this task was to determine if any of the nine Regional Water Boards have adopted, or are planning to adopt, numerical or narrative objectives for the constituents of concern listed in **Table 1** and to better understand how the drinking water beneficial use is designated in each Region. A review of each of the Water Quality Control Plans (Basin Plans) prepared by the nine Regional Water Boards was conducted, as well as a review of the respective websites, and used to develop this summary. Direct contact was also made with Regional Board staff at seven of the boards.

Table 1
Constituents of Concern to Drinking Water

Constituent Class	Specific Constituents
Disinfection Byproduct Precursors	Total organic carbon, dissolved organic carbon, bromide
Dissolved Minerals	Total dissolved solids (TDS), conductivity (EC), bromide, and chloride
Nutrients	Nitrogen species (total, total Kjeldahl, organic, nitrate, nitrite, ammonia) Phosphorus species (total, dissolved)
Pathogens and Indicator Organisms	<i>Giardia</i> , <i>Cryptosporidium</i> , total coliform, fecal coliform, <i>Enterococcus</i> , <i>E. coli</i>

NUMERICAL/NARRATIVE OBJECTIVES –

Each of the Basin Plans was reviewed to determine if numerical or narrative water quality objectives have been established, or are in development, for each of the constituents listed in **Table 1**. **Table 2** provides a summary of objectives found for each of the nine Regional Boards.

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Table 2
Summary of Existing Water Quality Objectives for the Regional Water Boards

	Region 1 – North Coast	Region 2 – San Francisco Bay	Region 3 – Central Coast	Region 4 – Los Angeles	Region 5 – Central Valley	Region 6 - Lahontan	Region 7 – Colorado River Basin	Region 8 – Santa Ana	Region 9 – San Diego
Disinfection byproduct precursors (TOC, DOC, bromide)	None Directly for TOC, DOC or bromide (May be indirectly impacted by other objectives such as color) <i>Santa Ana Regional Board may be adding TOC objective for Reach 3 of the Santa Ana River. This objective is planned for Fiscal Year 2008/2009 and will focus on the possible components of organic matter related to wastewater discharges as it relates to groundwater recharge.</i>								
Dissolved Minerals (TDS, EC, bromide, and chloride)	MUN: Site-specific objective (selected water bodies only) for TDS and EC	MUN: TDS=500 mg/L, EC=900 mmhos/cm, chloride=250 mg/L (2 nd MCLs) Controllable water quality factors shall not increase the total dissolved solids or salinity of waters of the state so as to adversely affect beneficial uses, particularly fish migration and estuarine habitat.	Controllable water quality factors shall not increase the total dissolved solids or salinity of waters of the state so as to adversely affect beneficial uses, particularly fish migration and estuarine habitat. There are also specific objectives for TDS and chloride in surface waters and groundwaters by sub-basin and sub-area.	MUN: TDS=500 mg/L, chloride=250 mg/L (2 nd MCLs) There are site-specific objective for TDS and chloride for selected inland waters, both surface water and groundwater	Site-specific objective for EC and chloride. TDS in Folsom Lake 90 th percentile <100 mg/L. TDS in Folsom Lake tributaries and American River from Folsom Dam to the Sacramento River 90 th percentile <125 mg/L. EC: Sacramento R. at Knights Landing 50 th percentile <230 mmhos/cm and 90 th percentile <235, Sacramento R. at I Street 50 th percentile <240 and 90 th percentile <290, Feather R. 90 th percentile <150, San Joaquin R. between Friant Dam and Mendota Pool 90 th percentile <150. Chloride: 250 mg/L for selected MUN	MUN: TDS=500 mg/L, EC=900 mmhos/cm, chloride=250 mg/L (2 nd MCLs) Also, site-specific water quality objectives for TDS and EC	Discharges are not allowed to increase the receiving water concentrations unless there is no adverse impact to affected beneficial uses. TDS water quality objectives for specific reaches.	MUN: TDS =1,000 mg/L, chloride=500 mg/L There are also site-specific objective for TDS and chloride for selected inland waters, both surface water and groundwater.	For municipal supplies a range of TDS=500 – 1,000 mg/L is recommended and a range for chloride of 250 – 500 mg/L, but many variances have been approved for various water sources due to the naturally high levels of minerals in the groundwaters and surface waters.

Table 2 Cont'd
Summary of Existing Water Quality Objectives for the Regional Water Boards

	Region 1 – North Coast	Region 2 – San Francisco Bay	Region 3 – Central Coast	Region 4 – Los Angeles	Region 5 – Central Valley	Region 6 - Lahontan	Region 7 – Colorado River Basin	Region 8 – Santa Ana	Region 9 – San Diego
<p>Nutrients- Nitrogen species (total nitrogen, total kjeldahl nitrogen, organic, nitrate, nitrite, ammonia)</p> <p>Phosphorus species (total phosphorus and dissolved phosphorus)</p>	<p>MUN: Nitrate N- as NO₃ at 45 mg/L</p> <p>Ammonia shall be temperature and pH dependent for surface water</p> <p>Discharge shall not contain biostimulatory substances (N, P) that promote aquatic organism growth that is a nuisance or affects beneficial uses.</p>	<p>MUN: Nitrate(as NO₃) =45.0 mg/L, Nitrate+Nitrite (as N)=10mg/L, Nitrite (as N)=1.0mg/L</p> <p>Un-ionized NH₃ Annual median = 0.025 mg/L Central Bay max = 0.16 mg/L Lower Bay max = 0.4 mg/L</p> <p>Ammonia shall be temperature and pH dependent for surface water</p> <p>Discharge shall not contain biostimulatory substances (N, P) that promote aquatic organism growth that is a nuisance or affects beneficial uses.</p>	<p>MUN: Nitrate(as NO₃) =45.0 mg/L</p> <p>Ammonia shall be temperature and pH dependent for surface water</p> <p>Groundwater – specific standards for nitrogen for selected sub-basins.</p> <p>Discharge shall not contain biostimulatory substances (N, P) that promote aquatic organism growth that is a nuisance or affects beneficial uses.</p>	<p>MUN: Nitrate(as NO₃) = 45.0 mg/L Nitrate+Nitrite (as N) = 10 mg/L Nitrite (as N) = 1.0 mg/L Nitrogen = 10 mg/L</p> <p>Ammonia shall be temperature and pH dependent for surface water</p> <p>Discharge shall not contain biostimulatory substances (N, P) that promote aquatic organism growth that is a nuisance or affects beneficial uses.</p> <p>There are some site-specific objectives for nitrogen in inland waters.</p>	<p>MUN: Nitrate(as NO₃) = 45.0 mg/L Nitrate+Nitrite (as N) = 10 mg/L Nitrite (as N) = 1.0 mg/L Nitrogen = 10 mg/L</p> <p>Tulare Lake Basin NH₃ ammonia shall not exceed 0.025 mg/L in receiving waters.</p> <p>Discharge shall not contain biostimulatory substances (N, P) that promote aquatic organism growth that is a nuisance or affects beneficial uses.</p>	<p>MUN: Nitrate(as NO₃) = 45.0 mg/L Nitrate+Nitrite (as N) = 10 mg/L Nitrite (as N) = 1.0 mg/L Nitrogen = 10 mg/L</p> <p>Site specific objectives for Total N, nitrate, TKN, P, and PO₄</p> <p>Ammonia shall be temperature and pH dependent for surface water</p> <p>Discharge shall not contain biostimulatory substances (N, P) that promote aquatic organism growth that is a nuisance or affects beneficial uses.</p> <p>Owens River HU and Pine Creek = NH₃ not to exceed 0.01 mg/L as NH₃ N = 0.50 mg/L (average), 0.8. mg/L (90th %) TP = 0.06 mg/L (average), 0.10 mg/L (90th %)</p>	<p>MUN: Nitrate(as N) = 10.0 mg/L</p> <p>Discharge shall not contain biostimulatory substances (N, P) that promote aquatic organism growth that is a nuisance or affects beneficial uses.</p>	<p>Nitrate(as NO₃) = 45.0 mg/L</p> <p>Site-specific objectives for Total Inorganic Nitrogen (TIN).</p> <p>There are also site-specific objectives for nitrate for selected groundwater basins.</p> <p>Ammonia shall be temperature and pH dependent for surface water, site specific objectives for the Santa Ana River.</p>	<p>MUN: Nitrate(as NO₃) = 45.0 mg/L, Nitrate + Nitrite (asN) = 10 mg/L, Nitrite (as N) = 1.0 mg/L, Nitrogen = 10 mg/L, Un-ionized NH₃ Annual median = 0.025 mg/L</p> <p>Total P <0.05 mg/L in stream entering standing body of water, <0.025 mg/L in standing body of water, and <0.1 mg/L in all other flowing streams. Total N levels shall be based on actual N:P ratio (10:1 can be used as a standard). These shall not be exceeded more than 10% of the time. (This is an older objective to prevent oxygen depletion by algae)</p> <p>Discharge shall not contain biostimulatory substances (N, P) that promote aquatic organism growth that is a nuisance or affects beneficial uses.</p>

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Pathogens and indicator organisms (<i>Giardia</i> , <i>Crypto</i> , total coliform, fecal coliform, <i>Enterococcus</i> , <i>E. coli</i>)	<p>Surface waters - REC-1: Fecal coliform median concentration, based on a minimum of not less than five samples for any 30-day period: <50mpn/100 ml, nor shall more than ten percent of total samples during any 30-day period exceed 400mpn/100 ml.</p> <p>Groundwaters - MUN: Median total coliform should be less than 1.1 MPN/100 mL or absent over a 7 day period.</p> <p>There is also a standard for Shellfish in surface waters.</p>	<p>Surface waters - MUN: (based on DHS recom.) Fecal-geometric mean: <20mpn/100mL Total-geometric mean: <100mpn/100mL (This has limited application in the region since there are few MUN supplies and is not believed to be utilized. This may be removed in the near future)</p> <p>Groundwaters - MUN: Median total coliform should be less than 1.1 MPN/100 mL, or absent over a 7 day period.</p> <p>There are also standards for REC 1, REC 2 and Shellfish in surface waters.</p>	<p>Surface waters - REC-1: Fecal coliform median concentration, based on a minimum of not less than five samples for any 30-day period: <200mpn/100 ml, nor shall more than ten percent of total samples during any 30-day period exceed 400mpn/100 ml.</p> <p>Groundwaters - MUN: Median total coliform should be less than 2.2 MPN/100 mL, over a 7 day period.</p> <p>There are also standards for REC 2 and shellfish in surface waters.</p> <p>The Regional Board is considering a MUN designation for the ocean.</p>	<p>Surface waters - REC-1: Fecal coliform median concentration, based on a minimum of not less than five samples for any 30-day period: <200mpn/100 ml, nor shall more than ten percent of total samples during any 30-day period exceed 400mpn/100 ml.</p> <p>Groundwaters - MUN: Median total coliform should be less than 1.1 MPN/100 mL over a 7 day period.</p> <p>There are also standards for REC 2 and shellfish in surface waters.</p>	<p>Surface waters - REC-1: Fecal coliform = not less than 5 samples for any 30-day period shall not exceed a geometric mean of 200/100 mL, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 400/100 mL.</p> <p>Folsom Lake fecal coliform = not less than 5 samples for any 30-day period, shall not exceed a geometric mean of 100/100 mL, not shall more than 10% of the total number of samples taken during any 30-day period exceed 200/100 mL.</p> <p>Groundwaters - MUN: Median total coliform should be less than 2.2 MPN/100 mL, over a 7 day period.</p>	<p>Surface waters - REC-1: Fecal coliform = not less than 5 samples for any 30-day period shall not exceed a log mean of 20/100 ml, nor shall more than 10% of all samples collected during any 30-day period exceed 40/100 ml. However, a log mean concentration exceeding 20/100 ml for any 30-day period shall indicate violation of this objective even if fewer than five samples were collected.</p> <p>Also, some site-specific objectives.</p> <p>Groundwaters – MUN: Median total coliform should be less than 1.1 MPN/100 mL over a 7 day period.</p>	<p>Surface waters – REC-1: <i>E. coli</i> = not less than 5 samples for any 30-day period shall not exceed a geometric mean of 126/100 mL, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 400/100 mL.</p> <p>There is a site specific max objective for the Colorado River, based on REC 1, of 235 mpn/100mL.</p> <p>There are alternate levels for fecal coliform and <i>Enterococcus</i>. There are also standards REC 2.</p> <p>Groundwaters – MUN: Median total coliform should be less than 1.1 MPN/100 mL or absent over a 7 day period.</p>	<p>Surface waters – MUN: Total coliform: less than 100 organisms/100 mL (This is an older objective and currently no discharges are impacted)</p> <p>Groundwaters - MUN: Median total coliform should be less than 2.2 MPN/100 mL, over a 7 day period.</p> <p>There are also standards for REC 1, REC 2, and shellfish in surface waters.</p>	<p>Surface waters - REC-1: <i>E. coli</i> = not less than 5 samples for any 30-day period shall not exceed a geometric mean of 126/100 mL, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 235-576/100 mL.</p> <p>There are site specific objectives for <i>E. coli</i> and <i>Enterococcus</i> for San Diego Bay.</p> <p>There are alternate levels for fecal coliform and <i>Enterococcus</i>. There are also standards for REC 2 and shellfish in surface waters.</p>

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SOURCES OF DRINKING WATER POLICY AND TRIBUTARY BENEFICIAL USE DESIGNATIONS

The purpose of this subsection is to investigate how each Regional Board designates the municipal and domestic (MUN) beneficial use in waters within the jurisdiction of each Region by applying the Sources of Drinking Water Policy (State Water Resources Control Board Resolution 88-63) and the tributary beneficial use designations.

The Sources of Drinking Water Policy was adopted by the State Water Resources Control Board (State Board) in May 1988. It states:

“All surface and ground waters of the state are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Boards with the exception of:

1. Surface and ground waters where:

- a. The total dissolved solids (TDS) exceed 3,000 mg/L (5,000 uS/cm, electrical conductivity) and it is not reasonably expected by Regional Boards to supply a public water system, or
- b. There is contamination, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or economically achievable treatment practices, or
- c. The water source does not provide sufficient water to supply a single well capable of producing an average sustained yield of 200 gallons per day.

2. Surface water where:

- a. The waters is in systems designed or modified to collect or treat municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff, provided that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards; or,
- b. The waters is in systems designed or modified for the primary purpose of conveying or holding agricultural drain waters, provided that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards.

3. Groundwater where:

The aquifer is regulated as a geothermal energy producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations, Section 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR, 261.3.”

If a Regional Board finds that one of these exceptions applies to a water, and the use is not existing or achievable, they can remove the municipal and domestic supply beneficial use designation through a Basin Plan amendment. The amendment requires

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approval by the State Board, the State Office of Administrative Law (OAL), and the United State Environmental Protection Agency (USEPA).

In addition, each Region Board provides a summary of the major waterbodies in its jurisdiction in their Basin Plan. This summary is then used to present the beneficial uses that have been designated as either existing or potential. The Regional Boards also provide a statement on how smaller tributaries or unspecified waters are to be designated.

Region 1 – North Coast

The North Coast Regional Board has determined that inland surface waters and groundwater that meet the criteria mandated by the Sources of Drinking Water Policy are designated MUN. Coastal waters, such as the ocean, bays, and saline wetlands are not shown as existing or potential MUN uses.

The beneficial uses of any specifically identified water body generally apply to all its tributaries, therefore beneficial uses are designated for all water bodies.

Region 2 – San Francisco Bay

The San Francisco Bay Regional Board has determined that inland surface waters and groundwater that meet the criteria mandated by the Sources of Drinking Water Policy are designated MUN. In the 2004 Triennial Review of the Basin Plan, the Regional Board identified a task to update the beneficial uses for waters that were not specifically identified in the Basin Plan and this work is on-going.

The beneficial uses of any specifically identified water body generally apply to all its tributaries.

Region 3 – Central Coast

The Central Coast Regional Board has determined that inland surface waters and ground water (except the Soda Lake sub-basin) that meet the criteria mandated by the Sources of Drinking Water Policy are designated MUN. Coastal waters, such as the ocean, bays, and saline wetlands are excluded from existing or potential MUN uses. The Regional Board is currently re-evaluating whether coastal waters should be considered as potentially MUN use.

Surface water bodies within the Region that do not have beneficial uses specifically designated for them in the Basin Plan are assigned the following designations: MUN and protection of both recreation and aquatic life.

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Region 4 – Los Angeles

Currently, the Los Angeles Regional Board uses the Sources of Drinking Water Policy to show all inland surface waters and groundwaters as potentially suitable if not already specifically identified as an existing beneficial use. The Regional Board plans to use the Sources of Drinking Water Policy as well as their own Regional Board Policy 89-03 (an adoption of State Board Policy 88-63) to implement a detailed review of the criteria and identify waters that will be exempted from the MUN designation. This will be followed up with a Basin Plan amendment.

Possible de-designation of waterbodies listed as “potential MUN” will require a waterbody specific Use Attainability Analysis (UAA) to determine whether at least one of the six conditions for de-designation outlined in 40 CFR 131.10(g) is met, as well as an evaluation of whether the waterbody meets any of the allowable exceptions outlined in the State Sources of Drinking Water Policy (State Water Resources Control Board Resolution #88-63).

Alternatives to MUN de-designation have been identified by the Regional Board and include: 1) creating a beneficial use subcategory for these waterbodies, 2) adopting water quality standard variances for discharges to these waterbodies, 3) developing a policy to protect waterbodies designated as Potential MUN using Title 22 standards, rather than California Toxics Rule human health criteria for consumption of water and organisms, if appropriate, or 4) others. Currently the Regional Board has determined to use a targeted approach by implementing variances on a case-by-case determination. The Board will monitor this approach and revise the plan if necessary based on its application.

Most of the inland surface waters in the Region have beneficial uses specifically designated for them. Those waters not specifically listed (generally smaller tributaries) are designated with the same beneficial uses as the streams, lakes, or reservoirs to which they are tributary. This is commonly referred to as the “tributary rule”

The Regional Board has determined that the Basin Plan needs to first clarify the applicability of the tributary rule in cases such as those where the “tributary” is an underground storm drain or translating marine criteria to freshwater streams. Second, the similar rule of thumb for groundwater should be made clearer by specifying which upgradient groundwater areas are included (e.g., hydraulically connected, water bearing aquifers, perched groundwater, etc.).

Region 5 – Central Valley

The Central Valley Regional Board uses the Sources of Drinking Water Policy to assign the MUN use designation to water bodies that do not have beneficial uses specifically identified in the Basin Plan beneficial use tables, in accordance with the provisions of Resolution 88-63. The tributary statement also separately assigns MUN designation to water bodies not listed in the Basin Plan.

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According to the Basin Plan “tributary rule”, the beneficial uses of any specifically identified waterbody generally apply to its tributary streams, with some exceptions. Exceptions were based on UAA (see description later) and promulgated as a Basin Plan amendment.

Region 6 – Lahontan

The 1975 beneficial use designations were based on knowledge of the existing and potential water uses, with emphasis on the former. Lakes, streams, and groundwaters may have potential beneficial uses established because the water has been identified as a potential source of drinking water based on the quality and quantity available, in accordance with the Sources of Drinking Water Policy. All sources of water are designated MUN unless specifically exempted by the Regional Board through adoption of a Basin Plan amendment after consideration of substantial evidence, see the UAA description later, to exempt such waters.

Unless otherwise specified, beneficial uses also apply to all tributaries of surface waters identified in the Basin Plan (i.e., specific surface waters which are not listed have the same beneficial uses as the streams, lakes, wetlands, or reservoirs to which they are tributary). Note that nondegradation policies would supersede in the instances where the tributary is of higher quality than its receiving water.

Region 7 – Colorado River Basin

The Colorado River Basin Regional Board has determined that inland surface waters and groundwater that meet the criteria mandated by the Sources of Drinking Water Policy are designated MUN.

There is no specific reference to un-named or non-specified tributaries in the Basin Plan and how beneficial uses shall be designated.

Region 8 – Santa Ana

To implement the Sources of Drinking Water Policy, the Santa Ana Regional Board revised the table of Beneficial Uses in the 1983 Basin Plan, adding the MUN designation for certain waterbodies and specifically excepting others that were already excepted prior to the Drinking Water Policy development (RWQCB Resolution No. 89-42).

The Basin Plan attempts to include all significant surface streams and bodies of water, as well as the significant groundwater basins and sub-basins which are recognized as water supply sources or which are receiving waters. Specific waters which are not listed have the same beneficial uses as the streams, lakes or reservoirs to which they are tributary or the groundwater basins or sub-basin to which they are tributary or overlie.

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The Basin Plan will be updated in the next Triennial Review to specifically include the tributary rule.

Region 9 – San Diego

Currently, the San Diego Regional Board uses the Sources of Drinking Water Policy to show inland surface waters, including imported waters that are impounded, and groundwaters as potentially suitable if not already specifically identified as an existing beneficial use. The Regional Board adopted their own Regional Board Policy 89-33 (an adoption of State Board Policy 88-63) to formalize the designation as well as clarify sources which had been previously excepted from the MUN designation.

Those waters not specifically listed in the Basin Plan, generally smaller tributaries, are designated with the same beneficial uses as the streams, lakes, or reservoirs to which they are tributary.

USE ATTAINABILITY ANALYSIS PROCESS

A State must conduct a Use Attainability Analysis (UAA), as described in Section 131.3(g) of the Clean Water Act (CWA), whenever the State designates or has designated uses that do not include the uses specified in section 101(a)(2) of the CWA. Section 101 (a)(2) of the CWA includes the designated uses fish, shellfish, wildlife, and recreation. This section does not include drinking water (MUN), therefore any designations associated with MUN must have a UAA completed.

A UAA is a rigorous scientific assessment regarding the use's attainability, including the definition of existing uses, evaluation of the appropriateness of existing and potential uses, and examination of the waterbody including physical, chemical, biological, and economic factors. Uses can be changed if attainment would result in substantial and widespread economic and social benefit. Uses cannot be removed if they are existing or can be attained through application of required effluent limits for point sources or best management practices for nonpoint sources. There are six removal factors that can be used to demonstrate that the designated use is not feasible, as follows:

1. Naturally occurring pollutant concentrations prevent the attainment of the use; or
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
3. Human caused conditions or sources 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
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; or

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5. Physical conditions related 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
6. Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

Each Regional Board has the ability to independently apply the UAA process for water bodies designated with the MUN beneficial use.

Region 1 – North Coast

No information was found on if and how the North Coast Regional Board conducts and implements UAAs.

Region 2 – San Francisco Bay

No information was found on if and how the San Francisco Bay Regional Board conducts and implements UAAs.

Region 3 – Central Coast

De-designate the Municipal and Domestic Supply (MUN) Beneficial Use for a portion of San Luis Obispo Creek.

This project is in the California Environmental Quality Act (CEQA) scoping phase, with a draft UAA due out August 2007. The de-designation will remove an existing designated use, MUN, from San Luis Obispo Creek from the City of San Luis Obispo Water Reclamation Facility effluent discharge point downstream to the estuary because this use is not being attained. Staff will propose the de-designation for Regional Board adoption at a public meeting next year.

As mentioned previously, the CWA allows the State to remove a designated use if it can be demonstrated that attaining the designated use is not feasible because of one of six conditions. Staff assessed conditions 1, 2 and 3 to see if it was feasible for the Creek to attain the MUN use.

Condition 3 considers whether human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied. Staff's assessment of Condition 3 considered water quality data to determine if human sources of pollution prevent the attainment of the use and the feasibility of remedies to address human sources of pollution to allow for the attainment of the use. Currently, human sources of nitrate could be remedied with current technology to meet existing water quality however, there are no current treatment methods nor applicable water quality objective to form the basis for effluent limits for other wastewater constituents of concern, which includes pathogens and emerging contaminants. Thus, human sources of other wastewater constituents of concern prevent the attainment of the MUN use at the present time.

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Region 4 – Los Angeles

In the Los Angeles Region Basin Plan, it is stated that site specific objectives can only be developed if a UAA is completed, for waters where the aquatic life and recreation beneficial uses are in question. UAAs are also used when de-designating the MUN beneficial use.

The Regional Board has conducted one UAA to de-designate MUN use of a small portion of the West Coast Groundwater Basin (that portion underlying a Chevron Facility and Terminal Island). This was also used to successfully create a new subcategory of limited contact recreation (LREC).

Region 5 – Central Valley

Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins to De-designate Four Beneficial Uses for Old Alamo Creek, Final Staff Report April 2005

This amendment de-designates MUN as well as various fisheries as beneficial uses for Old Alamo Creek. Downstream from Vacaville Wastewater Treatment Plant outfall, available nitrate and total dissolved solids (TDS) data demonstrate that the creek has not been of sufficient quality to be a municipal or domestic supply. In addition, a combination of hydrologic modifications and the resulting ephemeral, intermittent or low flows prevents MUN from being attained.

Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins to Determine Certain Beneficial Uses Are Not Applicable in and Establish Water Quality Objectives for Sulphur Creek, Public Review Staff Report, October 2006

Staff are not aware of any direct municipal and domestic supply use of water from Sulphur Creek since 1975. Water in Sulphur Creek exceeds federal and state drinking water standards for TDS and electrical conductivity (EC).

Natural sources of mercury and TDS cause Sulphur Creek water to be unsuitable for drinking. Sulphur Creek would have to be treated to remove mercury and TDS to fully attain the MUN beneficial use. Fully attaining the MUN beneficial use is not feasible due to the cost of treating Sulphur Creek to meet drinking water standards.

Region 6 – Lahontan

Removal of a use designation requires a UAA using USEPA methodology, to show that the use does not occur and cannot reasonably be attained.

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Removal of MUN Beneficial Use Designation from Surface Waters of Owens Lake, Inyo County, April 2005

This staff report summarizes information and data on hydrology and water quality at Owens Lake. It concludes that the MUN use is not an existing use of the affected surface waters, and cannot feasibly be attained through permit conditions, use of Best Management Practices, or treatment such as desalination. Due to water quality and water quantity considerations, removal of the MUN use from surface waters of Owens Lake is justified under criteria in the federal Water Quality Standards Regulation (40CFR 131.10 (g)) and California's Sources of Drinking Water Policy (State Board Resolution 88-63).

This amendment would allow the Lahontan Regional Board to consider granting an exemption from the Basin Plan's region-wide prohibition against industrial waste discharges to surface waters for a mining waste discharge to the Owens Lake brine pool. The absence of a MUN use designation will also change the applicability of certain existing state and federal water quality standards, and the applicability of the Proposition 65 prohibition against discharges of toxic substances, to surface waters of Owens Lake. This could affect Regional Board permitting and enforcement activities for other discharges to surface waters on the lakebed.

Region 7 – Colorado River Basin

No information was found on if and how the Colorado River Basin Regional Board conducts and implements UAAs.

Region 8 – Santa Ana

UAAs are used by the Santa Ana Regional Board for both removal of a use designation and creation of a new use subcategory, using USEPA methodology. Removal needs to show that the use does not occur and cannot reasonably be attained. Justification of a new use subcategory must be provided and show how beneficial uses will continue to be protected.

Region 9 – San Diego

Removal of a use designation requires a UAA using USEPA methodology, to show that the use does not occur and cannot reasonably be attained.

VARIANCE POLICIES

The State Water Resources Control Board developed the State Implementation Policy (SIP) in 2000 for all non-ocean surface waters with a goal of establishing a standard approach for permitting discharges of toxics so there is statewide consistency in achieving water quality standards. Dischargers are allowed to apply to the Regional Boards for case-by-case exceptions either from provisions of the SIP or from water

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quality criteria or objectives. The exceptions must be short-term (less than five years), non-permanent, cannot compromise beneficial uses, serve the public interest, and meet all California Environmental Quality Act (CEQA) requirements.

A discharger would apply to the Regional Board for the exception, or variance. The application for the variance must include justification based on UAA factors (see discussion later). In addition, for variances from water quality criteria or objectives, more data is required and USEPA approval is required since it would be considered a new or revised standard. Additional information includes:

- The site-specific conditions in question including, but not limited to, monitoring data of the receiving water;
- The infeasibility of using other provisions of the SIP or other control measures to address the site-specific conditions;
- Justification for the length of the proposed exception;
- Where the exception will likely result in the temporary downgrade of beneficial uses, justifications consistent with any of the section 131.10(g) factors (See II. (e) above);
- Any progress the discharger will make toward attaining water quality standards;
- For aquatic life criteria, any impact on any threatened or endangered species or designated critical habitat under the federal ESA; and
- Notice in the Federal Register is necessary for amendments to CTR criteria before USEPA will promulgate.

Region 1 – North Coast

No information was found on how the North Coast Regional Board issues Variance Policies.

Region 2 – San Francisco Bay

No information was found on how the San Francisco Bay Regional Board issues Variance Policies.

Region 3 – Central Coast

The Central Coast Regional Board does allow for the issuance of Variance Policies if the exception does not compromise protection of the water for the beneficial uses and the public interest is served. When exceptions are made based on the MUN designation, a public hearing is required as well as the State Board and USEPA approval.

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Region 4 – Los Angeles

The Los Angeles Regional Board does allow for the issuance of Variance Policies. The Regional Board is currently considering development of a “categorical” variance policy to outline conditions required to grant variances.

The Regional Board adopted the Variance Provision for Groundwater Mineral Quality Objectives for Coastal Groundwaters in March 2006. The Regional Board determined that rather than de-designating the MUN beneficial use for these groundwaters, they would issue a variance policy for the mineral quality objectives, i.e. total dissolved solids. They determined that de-designation of the groundwater supplies would not be appropriate since the need for local water supplies can be critical, there is the possibility of shortage of imported water supply, and that minerals can be feasibly treated for drinking water use. The Board determined that it would be better to preserve the beneficial use and grant a five year, one-time renewable, variance provision.

Region 5 – Central Valley

The Central Valley Regional Board requires that a UAA is completed, identifying one of the six criteria for designation removal (see UAA section below for more details). This is then forwarded to the State Board for review and approval with a recommendation from the Regional Board.

Region 6 – Lahontan

No information was found on how the Lahontan Regional Board issues Variance Policies.

Region 7 – Colorado River Basin

No information was found on how the Colorado River Basin Regional Board issues Variance Policies.

Region 8 – Santa Ana

No information was found on how the Santa Ana Regional Board issues Variance Policies.

Region 9 – San Diego

No information was found on how the San Diego Regional Board issues Variance Policies.

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TOTAL MAXIMUM DAILY LOAD (TMDL) PROCESSES

Once a water is identified by the State as not meeting or not expected to meet water quality standards, criteria or objectives it is placed on the CWA Section 303 (d) list as impaired. States are then required to develop TMDLs to address the pollutants causing the impairment. A TMDL defines how much of a pollutant a waterbody can tolerate and still meet water quality standards. TMDLs must contain a problem statement, numeric targets, source analysis, linkage analysis, allocations, margin of safety, an implementation plan, and monitoring/re-evaluation. Numeric targets are interpretations of the numerical water quality objectives that are used to calculate the load allocations. TMDLs are first adopted by the Regional Boards. They are then approved by the State Board and then by the USEPA. Upon approval by the USEPA, the Regional Board will develop a Basin Plan Amendment to add the TMDL to the Basin Plan.

The status of TMDL development for the constituents listed in **Table 1** were reviewed, to identify if drinking water quality was a factor in establishing the TMDL and the basis for determining the concentration and load of a constituent that is protective of drinking water quality.

Region 1 – North Coast

Currently, the North Coast Regional Board has not passed any TMDLs related to the constituents of interest but has developed a list of future TMDLs for these constituents based on the 303 (d) listing. **Table 3** below provides a summary of the water sources, constituents and status of the TMDL development.

Table 3
Upcoming TMDLs for the North Coast Regional Board

Water	Impairment	Status	Beneficial Use
Americano Creek	Nutrients	Not Yet Begun	Fisheries
Big Sulphur Creek	EC	Not Yet Begun	De-List Expected
Butte Valley	Nutrients	Not Yet Begun	Unknown
Estero Americano	Nutrients	Not Yet Begun	Fisheries
Klamath River Watershed (Including Tributaries)	Nutrients	In Development	Fisheries/Aquatic Life
Laguna de Santa Rosa	Nutrients	Completed, Not Yet Adopted	Fisheries
Stemple Creek	Nutrients	Completed, Not Yet Adopted	REC2 and Fisheries
Russian River	Pathogens	In Development	REC1 and REC2
Santa Rosa Creek	Pathogens	In Development	REC1 and REC2

Of note is the linkage analysis expected for the MUN use on the Klamath River Watershed Nutrient TMDL. This analysis is on-going, but because of the presence of blue-green algae (cyanobacteria) in the upper watershed reservoirs, and the associated potential for toxicity impacts to MUN and REC1 beneficial uses, there will be a linkage

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analysis and possibly the development of response parameters related to algae/toxin presence and levels. There is no expected analysis for other MUN impacts such as taste and odor and filter operations.

Region 2 – San Francisco Bay

Of note is a document that the Regional Board developed to assist with the development of upcoming nutrient TMDLs, the “Conceptual Approach for Developing Nutrient TMDLs for San Francisco Bay Area Waterbodies” dated June 2003. This document provides an outline for what a TMDL must include as well as technical supporting information to develop the site-specific TMDLs.

The San Francisco Bay Regional Board has adopted three pathogen TMDLs. All three were based on the body contact recreation (REC 1) beneficial use.

Napa River Pathogen TMDL, Adopted by the Regional Board in November 2006

The numeric water quality targets listed in **Table 4** are derived from water quality objectives for coliform bacteria in contact recreational waters, and from USEPA’s bacteriological criteria.

Table 4
TMDL Water Quality Targets^a for the Napa River

<p><i>E. coli</i> density: Geometric mean < 126 CFU/100 mL^b ; 90th percentile < 409 CFU/100 mL^c</p> <p>Fecal coliform density^d: Geometric mean < 200 CFU/100 mL^b ; 90th percentile < 400 CFU/100 mL^c</p> <p>Total coliform density^d: Median < 240 CFU/100 mL^b ; no sample to exceed 10,000 CFU/100 mL</p> <p>Zero discharge of untreated or inadequately treated human waste</p> <p>^a <u>These targets are applicable year-round.</u></p> <p>^b <u>Based on a minimum of five consecutive samples collected at approximately equal intervals over a 30-day period.</u></p> <p>^c <u>No more than 10 percent of total samples during any 30-day period may exceed this number.</u></p> <p>^d <u>The numeric targets for total coliform and fecal coliform shall sunset and shall no longer be effective upon the replacement of the total and fecal coliform water quality objectives in the Basin Plan with <i>E. coli</i>-based water quality objectives for contact recreation.</u></p>
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Sonoma Creek Pathogens TMDL, Adopted by the Regional Board in June 2006

Numeric water quality targets were developed as follows:

1. Geometric mean *E. coli* density of 126 CFU/100 mL;
2. 90th percentile *E. coli* density of 320 CFU/100 mL; and
3. Zero discharge of untreated or inadequately treated human waste to Sonoma Creek and its tributaries or to groundwater with direct through flow to these surface waters.

The first two targets are based on USEPA guidance (U.S. EPA; 1986, 2002,2003) and on the Basin Plan’s fecal coliform-based water quality objectives. These targets were developed assuming that *E. coli* are a subset of the fecal coliform group of bacteria, that

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E. coli typically constitute from 80 percent to more than 90 percent of fecal coliforms in fecally contaminated ambient water samples (Noble et al., 2000). Assuming the conservative 80 percent conversion factor, a geometric mean of 126 CFU/100 mL *E. coli* is equivalent to approximately 158 CFU/100 mL fecal coliform, lower than the Basin Plan water quality objective of 200 CFU/100 mL fecal coliform. Similarly, a 90th percentile value of 320 CFU/100mL *E. coli* is approximately equivalent to 400 CFU/100 mL fecal coliform, Thus these targets are at least as protective as existing fecal coliform-based water quality objectives. In addition, these targets were considered more protective than existing water quality objectives because USEPA has determined that *E. coli* densities are more strongly correlated to human illness than fecal coliform densities.

Tomales Bay Pathogens TMDL, Adopted by the Regional Board in September 2005

The numeric water quality targets (desired future conditions for the Bay and its tributaries) proposed for this TMDL are shown in **Table 5**. The targets also include a shellfish harvesting closure target of <30 days per year and a zero discharge of human waste for the Bay and all its tributaries.

Table 5
Numeric Targets for Fecal Coliform for Tomales Bay and its Tributaries ^b

Water Body	Fecal Coliform
Tomales Bay (SHEL Water Quality Objective) ^c	Median <14 MPN ^a /100 mL
	90 th percentile <43 MPN/100 mL
Tomales Bay Tributaries ^c	Log mean <200 MPN/100mL
	90 th percentile <400 MPN/100mL

- a. Most Probable Number (MPN) is a statistical representation of the standard coliform test results.⁴
- b. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
- c. All samples should be collected at the knee-high depth.

The first target is the fecal coliform water quality objective as contained in the Basin Plan. The Basin Plan also lists a total coliform objective to protect the beneficial use of shellfish harvesting. Fecal coliform is proposed as a target and not total coliform because fecal coliform is a better indicator of fecal contamination and its use as an indicator is consistent with how DHS regulates the shellfish growing industry.

In addition to the finalized TMDLs above, there are several water sources for which TMDLs are currently being developed, as shown in **Table 6** below.

Table 6
Upcoming TMDLs for the San Francisco Bay Regional Board

Water	Constituent	Controlling Beneficial Use	Status
Richardson Bay	Pathogens	REC 1	In Development
Pacific Beach/ San Pedro Creek	Pathogens	REC 2	In Development
Napa River	Nutrients	REC 1	In Development
Sonoma Creek	Nutrients	REC 1	In Development

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Region 3 – Central Coast

There are numerous TMDLs completed for the constituents of interest by Central Coast Regional Board. However, these are generally not focused on the MUN beneficial use designation.

Pajaro River Nitrate TMDL, Approved by USEPA in October 2006

Pajaro River and Llagas Creek exhibit consistent nitrate violations, which demonstrates that the MUN beneficial use is impaired. As such, the TMDL for Pajaro River and Llagas Creek is set at a maximum concentration for nitrate of 10 mg/l-N in receiving water to protect the MUN beneficial use. Load allocations of 10 mg/l-N are assigned to each source, including background and all watershed land uses (e.g., cropland and rangeland). Staff determined that the primary source of nitrates is croplands.

San Luis Obispo Creek Nitrate-Nitrogen TMDL, Approved by USEPA in January 2007

The entire main stem of the Creek is designated to support MUN beneficial use. Data collected by staff clearly indicate that nitrate-N levels in the Creek exceed the 10 mg/L-N threshold. The numeric target used to calculate the TMDL is a nitrate-N target of 10 mg/L-N.

San Luis Obispo Creek Pathogen TMDL, Approved by USEPA in September 2005

The creek is listed as a MUN beneficial use designation. However, there is no target water quality objective for pathogens associated with MUN use, only REC-1 and no contact recreation (REC-2). The numeric target for the development of this TMDL is based on existing water quality objectives for the protection of water contact recreation. The numeric target is:

- Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 MPN per 100mL,
- Nor shall more than ten percent of total samples during any 30-day period exceed 400 MPN per 100mL.

The value of 200 MPN/100mL is used to develop the TMDL and allocations in the sections that follow.

Los Osos Creek, Warden Creek, and Warden Lake Wetland Nutrient TMDL, Approved by USEPA in March 2005

The nitrate TMDL for the Warden Creek branch of Los Osos Creek is set at a maximum concentration for nitrate of 10 mg/l-N in receiving water to protect the MUN beneficial use. The allocations, which include background levels, are also equal to the numeric

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targets. Expressing the TMDL as a nitrate concentration equal to the water quality objective provides a direct measure of the nitrate levels in the watershed to compare with water quality objectives and provides a measurable target for sources to monitor and with which to comply. Requiring the responsible parties for nitrate loading to reduce nitrate discharges to the numeric target of 10 mg/L-N establishes a direct link between the TMDL target and sources.

Morro Bay (including Chorro and Los Osos Creeks) Pathogen TMDL, Approved by USEPA in January 2004

Most of the creeks that are tributary to Morro Bay are designated MUN, however, Morro Bay itself is not designated MUN. Based on applicable regulations this TMDL will focus on achieving the DHS' standards of fecal coliform concentrations for shellfish growing areas in the Bay because they are the most conservative and are the most protective of the beneficial use of shellfishing. The Basin Plan's total coliform standards will not be used because 1) fecal coliform standards are more stringent and therefore more protective of water quality, and 2) total coliform standards in the Basin Plan are not currently used to manage the shellfish growing areas by DHS.

Numeric targets for fecal coliform in Morro Bay (not designated MUN) based on regulations that DHS follows:

- Geometric Mean = 14 MPN/100 mL_a
- Maximum = 43 MPN/100 mL_b

a: Based on the geometric mean of monthly sampling evaluated over an annual and triennial basis

b: No more than 10% of total samples may exceed this number when evaluated over an annual and triennial basis

Source: United States Department of Health and Human Services Food and Drug Administration's National Shellfish Sanitation Program 1990

Numeric targets for fecal coliform in the tributaries to Morro Bay (Creeks and Seeps designated MUN), based on Basin Plan regulations:

- Geometric Mean = 200 MPN/100 mL_a
- Maximum = 400 MPN/100 mL_b

a: Geometric mean of not less than five samples over a period of 30 days

b: Not more than 10% of total samples during a period of 30 days exceed

Source: Regional Water Quality Control Board, Basin Plan 1994

San Lorenzo River Watershed Nitrate TMDL, Approved by USEPA in January 2003

A taste and odor problem is affecting the MUN beneficial use. The target for the San Lorenzo River Watershed is 1.5 mg/l as nitrogen. This level would reduce the nitrate threat and represent a 30 percent reduction in total nitrate loading by the year 2020. This reduction equates to a nitrate level that occurred prior to the late 1970's before taste and odor became a significant problem in the City water supply.

In addition to the finalized TMDLs above, there are several water sources for which TMDLs are currently being developed, as shown in **Table 7** below.

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Table 7
Upcoming TMDLs for the Central Coast Regional Board

Water	Constituent	Controlling Beneficial Use	Status
Watsonville Slough	Pathogens	REC 1	OAL Approved
Aptos/Valencia Creek	Pathogens	REC 1	Postponed Until February 2008
Corralitos Creek	Pathogens	REC 1	In Development
San Lorenzo River Watershed	Pathogens	REC 1	Postponed Until February 2008
Soquel Lagoon	Pathogens	REC 1	Postponed Until February 2008
Pajaro River	Fecal Coliform	REC 1	In Development
Salinas River	Fecal Coliform	REC 1	In Development
Santa Maria and Oso Flaco	Fecal Coliform	REC 1	In Development
Santa Maria and Oso Flaco	Nitrate	MUN (nitrate only)	In Development
Chorro Creek	Nutrients	Fisheries and Aquatic Life	Regional Board Approved
Salinas River	Nutrients	MUN (nitrate only)	Postponed

Region 4 – Los Angeles

There are two TMDLs completed for the constituents of interest by the Los Angeles Regional Board. However, these are generally not focused on the MUN beneficial use designation.

Calleguas Creek Nitrogen Compounds and Related Effects TMDL, Approved by USEPA in June 2003

The Regional Board's goal in establishing this TMDL is to maintain the warm water fish and wildlife habitat (WARM, WILD) and groundwater recharge (GWR) beneficial uses of Calleguas Creek as established in the Basin Plan. Additionally, ammonia is known to cause toxicity to aquatic organisms. The aquatic life objectives are the targets used in the development of the TMDL for ammonia. There are numeric targets for ammonia as well as nitrate and nitrite (for MUN beneficial use of groundwater) based on Basin Plan water quality objective.

Malibu Creek Bacteria TMDL, Approved by USEPA in January 2006

Elevated bacterial indicator densities caused impairment of the REC-1 beneficial use at Malibu Creek, Lagoon, and adjacent beach. The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine and fresh water to protect the water contact recreation use, as outlined in the Basin Plan. The fresh water

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objectives are based on fecal coliform and *E. coli* and include both geometric mean limits and single sample limits.

Implementation of the above bacteria objectives and the associated TMDL numeric targets is achieved using a 'reference system/antidegradation approach'. This approach means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within Santa Monica Bay, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing bacteriological water quality.

In addition to the finalized TMDLs above, there are several water sources for which TMDLs are currently being developed, as shown in **Table 8** below.

Table 8
Upcoming TMDLs for the Los Angeles Regional Board

Water	Constituent	Controlling Beneficial Use	Status
Ballona Creek, Ballona Estuary, and Sepulveda Channel	Bacteria	REC 1	Approved by State Board
Malibu Creek	Nutrients	Aquatic Life	Public Draft
Machado Lake	Nutrients	Aquatic Life, REC 1	In Development
Calleguas Creek	TDS	Groundwater Recharge	In Development

Region 5 – Central Valley

Limited TMDLs for the constituents of interest have been completed by Central Valley Regional Board. However, two TMDLs are currently being developed.

San Joaquin River at Vernalis Salt and Boron TMDL – Approved by USEPA in February 2007

Salinity problems have been a consistent problem in the Lower San Joaquin River (LSJR), including exceedance of the salinity water quality objectives. This TMDL covers the San Joaquin River, from the Mendota Dam to the Airport Way Bridge, near Vernalis. The numeric targets are the existing numeric water quality objectives for salinity and boron in the LSJR near Vernalis. The LSJR near Vernalis is the most upstream location where salinity water quality objectives have been established. The salinity and boron objectives include numeric water quality objectives for the irrigation season (April 1 to August 31) and non-irrigation season (September 1- March 31).

The numeric targets in the TMDL are the existing water quality objectives for salt and boron for LSJR near Vernalis: salinity (EC) in irrigation season, 700 µS/cm, and in non-irrigation season, 1,000 µS/cm (expressed as a maximum 30 day running average)

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Boron in irrigation season, 0.80 mg/L, and in non-irrigation season, 1.0 mg/L (expressed as a monthly mean).

It was determined that the increases in salinity and boron are primarily due to reservoir development on the east side tributaries, the use of poorer quality, higher salinity, imported Delta water in lieu of San Joaquin River water on west side agricultural lands, and drainage from upslope saline soils on the west side of the San Joaquin Valley. It was also confirmed that point source discharges to surface waters only contribute a small fraction of the total salt and boron loads in the San Joaquin River.

The boron and salt control program includes load allocations for point and non-point sources. The point sources will be addressed by incorporating the new targets into updated waste discharge requirements. The non-point sources will be addressed either through a new waiver program for salinity management, the use of the existing agricultural waiver program, or through waste discharge requirements. The Regional Board will allow for the use of dilution flow credits as well as supply credits for those dischargers using imported water. The Regional Board also plans to work with the U.S. Bureau of Reclamation, who operates the Delta Mendota Canal, to develop a salt reduction program to reduce salinity in imported water.

San Joaquin River Upstream Vernalis Salt and Boron TMDL – In Development

This is the second phase of the salinity control program on the LSJR. This project will expand the salt and boron TMDL at Vernalis upstream. The first task is to define water quality objectives for this upstream reach of the LSJR. The most significant beneficial uses impacted by salts are drinking water and irrigation supply. There are currently three options for water quality objectives.

Salinity Option 1: “Existing” Narrative Drinking Water

- Year-round objective of 1,600 $\mu\text{S}/\text{cm}$ (This is the upper level MCL for domestic drinking water supplies)

Salinity Option 2: “Full Protection”

- 700 $\mu\text{S}/\text{cm}$ from 1 April to 31 August when agriculture is most sensitive beneficial use
- 900 $\mu\text{S}/\text{cm}$ from 1 September to 31 March when municipal water supply is most sensitive beneficial use (This is the recommended level MCL for domestic drinking water supplies)

Salinity Option 3: “Export Limit”

- Year-round objective of 1,000 $\mu\text{S}/\text{cm}$ (This is numeric standard for Delta waters at intakes to California Aqueduct and Delta-Mendota Canal)

Once water quality objectives are defined, then the Regional Board must conduct a loading capacity study to determine load allocations. This will include a base load assessment as well as an assessment of imported water salt loading.

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Stockton Deepwater Ship Channel DO TMDL - Approved by USEPA in February 2007

The San Joaquin River experiences regular periods of low dissolved oxygen (DO) concentrations in the first few miles of the Stockton Deep Water Ship Channel (DWSC) downstream from the City of Stockton. There are three main factors contributing low DO levels: loads of oxygen demanding substances entering the channel from upstream, the geometry of the channel (that has been deepened significantly over natural conditions to accommodate shipping) and reduced flow resulting from water management in the San Joaquin River basin.

Discharge of all oxygen demanding substances and their precursors (i.e., nutrients) are prohibited if flow in the DWSC is less than 3,000 cfs unless the discharge is regulated by a waiver of waste discharge requirements, individual or general waste discharge requirements, or NPDES permits that implement the TMDL. Modeling studies supported by CALFED's Ecosystem Restoration Program are underway to evaluate algae production in the San Joaquin River, as it is related to oxygen demand in the river and Delta.

The TMDL also identified additional studies needed to better understand the sources of oxygen demanding substances and their linkage to the DO impairment in the DWSC. One of the three studies listed is the need to identify and quantify the mechanisms, sources of nutrients, and environmental variables that control the creation of algae in the watershed and its transformation before entering the DWSC. Numerous watershed stakeholders have proposed and received approval from the California Bay-Delta Authority (CBDA) for a three-year monitoring and analysis program of the upstream sources of oxygen demanding substances and their precursors. The study, as proposed, should provide much of the information required to identify and quantify sources and transformation of oxygen demanding substances in the watershed. Two other studies have been started by CBDA to develop multi-dimensional water quality models of the DWSC. This information could be used to better define nutrients issues as they relate to drinking water quality in the Delta.

Clear Lake Nutrient TMDL – Adopted by the Regional Board in June 2006

Studies indicate that excess phosphorus contributes to the occurrence of nuisance blooms of blue-green algae in Clear Lake. Most sources of phosphorus to Clear Lake are sediment driven and include erosion from agricultural and urban areas, instream channel erosion, timber harvesting, runoff from roads, construction, gravel mining, wildfires, control burns, off highway vehicle (OHV) use, and dredging and filling. Fertilizer use (both urban and rural) and sewer and septic overflows may also contribute phosphorus to the lake.

An extensive data set exists for Clear Lake, which includes a 30-year plus record of water quality observations. Based on this data, a water quality model was used to generate a water quality target, estimate existing phosphorus loads, and calculate the

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load reductions necessary to reach the target. Chlorophyll was chosen as the target constituent because it is the best measurement of nuisance algae blooms. The model simulated chlorophyll concentrations during years of nuisance algae blooms as well as years when algae blooms were not excessive. Based on the results of the model, it was determined that chlorophyll concentrations may reach up to 73 µg/L without the presence of nuisance algae blooms. Therefore the numeric target for this TMDL was set at a chlorophyll concentration of 73 µg/L.

The model was used to calculate the phosphorus load reduction necessary to achieve a chlorophyll concentration of 73 µg/L or less in Clear Lake. It was estimated that reducing phosphorus loading from the watershed by 40 percent would result in compliance with the chlorophyll target. The phosphorus load reductions were allocated to the responsible parties within the watershed.

Stockton Urban Sloughs Dissolved Oxygen and Pathogens TMDL – In Development

This TMDL is still in development, but numerical targets will likely be set for the REC-1 beneficial use.

Region 6 – Lahontan

There is one TMDL completed for the constituents of interest by the Lahontan Regional Board. Also, there is a draft TMDL which is substantially developed.

Indian Creek Reservoir Phosphorus TMDL, Approved by the USEPA in July 2002 and Supplement to Technical Staff Report for the Nutrient Criteria Development

During development of the Indian Creek Reservoir phosphorus TMDL, the USEPA proposed numerical nutrient criteria for surface waters of “aggregate ecoregions” within California and Nevada. The USEPA directed states to adopt these criteria or to develop their own scientifically defensible nutrient criteria for surface waters by 2004. The recommended USEPA criteria for total phosphorus in the “Mountainous West” ecoregion (Ecoregion II) including the Sierra Nevada are 10.00 µg/L for rivers and streams and 8.75 µg/L for lakes and reservoirs, expressed as annual medians.

The Ecoregion II “rivers and streams” number is more stringent than the current water quality objective for the reservoir (40 µg/L – based on historical achievement when it was receiving treated wastewater discharge); the Ecoregion II “lakes and reservoirs” number is more stringent than the long-term TMDL numerical target for Indian Creek Reservoir (20 µg/L), to be achieved by 2024. The numerical target was set to protect the REC2 and fisheries beneficial uses. The long-term numerical target is based on literature and studies that show lakes with this level typically display mesotrophic conditions, not eutrophic. This is also the same as the water quality objective for many of the surrounding water bodies. There is an interim numerical target of 40 µg/L, to be achieved by 2013. The Regional Board will assess the reservoir at that time to

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determine if the levels are sufficient to support the beneficial uses and may consider revising the numerical target.

In addition to the finalized TMDLs above, there is a TMDL currently being developed for nutrients in Crowley Reservoir. This source has several designated beneficial uses, including MUN, REC 1, and aquatic life, and the aquatic life use will drive the TMDL. The strategy for this source water is to implement Best Management Practices and then re-assess the achievement of the water quality objectives.

Bridgeport Reservoir Nutrient TMDL, In Development

Bridgeport Reservoir was listed in 1994 as impaired for nutrients, sediment, and siltation in accordance with Section 303(d) of the CWA. The nutrient impairment focuses on the fisheries beneficial use. The MUN beneficial use designation applies to Bridgeport Reservoir and its tributaries, as well as other uses. Water quality standards for Bridgeport Reservoir include narrative and numeric standards established in the Basin Plan. In addition, specific numeric water quality objectives for the East Walker River just upstream of Bridgeport Reservoir include an average and 90th percentile for TDS (145/160 mg/L), chloride (4/8 mg/L), percent sodium (30/35 percent), total nitrogen (0.5/0.8 mg/L), and total phosphorus (0.06/0.1 mg/L).

Region 7 – Colorado River Basin

There is one TMDL completed for the constituents of interest by the Colorado River Basin Regional Board. There are also two TMDLs for bacteria that are substantially developed. These do not focus on the MUN beneficial use designation.

New River Pathogen TMDL – Approved by USEPA in August 2002

The New River headwaters start about 12 to 16 miles south of Calexico in the Mexicali Valley, Mexico. The bacterial concentrations in the New River exceed the water quality objectives established to protect mainly the REC 1 and REC 2 beneficial uses of the New River. This TMDL's in-stream numeric water quality targets are shown in **Table 9**.

Table 9
Numeric Water Quality Targets for New River

Indicator Parameters	30-day Geometric Mean^a	Maximum
Fecal Coliform	200 MPN/100 ml ^b	^c
<i>E. coli</i>	126 MPN/100 ml	400 MPN/100 ml
<i>Enterococci</i>	33 MPN/100 ml	100 MPN/100 ml

a. Based on a minimum of no less than 5 samples equally spaced over a 30-day period.

b. Most Probable Number.

c. No more than 10% of total samples during any 30-day period shall exceed 400 MPN/100 ml.

Coachella Valley Storm Water Channel Bacteria TMDL – In Development

Coachella Valley Stormwater Channel (CVSC) is on the 303(d) list for impairment by pathogens of unknown sources. This listing applies to the 17-mile length of the CVSC

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from Indio to the Salton Sea. This violation impairs the REC 1 and REC 2 beneficial uses. TMDL numeric targets derived from the Basin Plan's water quality objectives have been established for *E. coli* as a log mean of 126 MPN/100 ml (based on a minimum of not less than five samples during a 30-day period), or 400 MPN/100 ml for a single sample.

Palo Verde Outfall Drain Bacteria TMDL – In Development

Excess delivery of bacteria to Palo Verde Outfall Drain, which lies in both Riverside and Imperial Counties, has resulted in degraded conditions that impairs designated beneficial uses, including REC 1 and REC 2. The following are the in-stream numeric water quality targets, as a 30-day geometric mean maximum, for this TMDL:

- Fecal Coliform - 200 MPN/100 ml_p
 - *E. Coli* - 126 MPN/100 ml, 400 MPN/100 ml
 - *Enterococci* - 33 MPN/100 ml, 100 MPN/100 ml
- a. No more than 10% of total samples during any 30-day period shall exceed 400 MPN/100 ml.

In addition to the final and draft TMDLs above, TMDLs are currently being developed for nutrients for both the Salton Sea and the New River.

Region 8 – Santa Ana

There are two TMDLs completed for the constituents of interest by the Santa Ana Regional Board. Also, two have been adopted by the Regional Board and more are in development.

Lake Elsinore and Canyon Lake Nutrient TMDL –Approved by USEPA in December 2004

Lake Elsinore and Canyon Lake are not achieving water quality objectives due to excessive nutrients, specifically nitrogen and phosphorus. The Santa Ana Regional Board sets nutrient objectives either by selecting a reference state for a water body when beneficial uses were not impaired, which requires significant historical data, or by using literature searches of similar situations. Lake Elsinore has two beneficial uses, aquatic life and recreation, and has a water quality objective for total inorganic nitrogen (TIN) of 1.5 mg/L. This objective is based on the historical average in the lake prior to 1975. It is uncertain if this objective will protect the current uses and operation of the lake. Canyon Lake has four beneficial uses, MUN, agriculture, aquatic life, and recreation. This is also a water quality objective for TIN, set at 8 mg/L based on the MUN use. Levels of TIN this high can cause low dissolved oxygen in the lake resulting in significant levels of iron and manganese which cause treatment problems.

The Regional Board decided to set the same numerical targets both total nitrogen and total phosphorus in both lakes in the TMDL, using Lake Elsinore as the controlling lake. The annual average total nitrogen numeric target is 0.75 mg/L and the annual average total phosphorus numeric target is 0.1 mg/L. These targets must be met by 2020. In

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addition to the numeric targets set, there is also required monitoring for response parameters, specifically chlorophyll and dissolved oxygen. These have reference thresholds that if met are expected to result in attainment of beneficial uses. Chlorophyll levels are targeted for 40 µg/L by 2015 and 25 µg/L by 2020. Dissolved oxygen levels are targeted for 5 mg/L as a depth average by 2015 and 5 mg/L at one meter above lake bottom by 2020. As these conditions are achieved, the effectiveness of the measures will be assessed and targets will be revised if necessary.

Newport Bay/San Diego Creek Watershed Nutrient TMDL –Approved by USEPA in 1998

Nutrient loading to the Bay, particularly from the San Diego Creek watershed, contributes to seasonal algal blooms which create a recreational and aesthetic nuisance. These algal blooms may also adversely affect wildlife. The TMDL distributes the portions of the waterbody's assimilative capacity to various pollution sources so that the waterbody achieves its water quality standards. Total annual nitrogen loading for the Newport Bay Watershed (divided into summer and winter loads) and San Diego Creek, Reach 2 were set as well as total annual phosphorus loading for the Newport Bay Watershed.

The Regional Board supports the trading of pollutant allocations among sources where appropriate. Trading can take place between point/point, point/nonpoint, and nonpoint/nonpoint pollutant sources. Optimizing alternative point and nonpoint control strategies through allocation tradeoffs may be a cost effective way to achieve pollution reduction benefits.

Big Bear Lake Nutrient TMDL – Regional Board Adopted in April 2006

Big Bear Lake is moderately eutrophic. During the summer months, deeper water during the summer months may exhibit severe oxygen deficits. Nutrient enrichment has resulted in the growth of rooted aquatic plants, which has impaired the fishing, boating, and swimming uses of the lake. Big Bear Lake has numerous beneficial uses but the ones that have been identified as impacted are aquatic life (fisheries) and recreation. Site-specific water quality objectives have been set for phosphorus (150 µg/L), total inorganic nitrogen (150 µg/L), and dissolved oxygen (>5 mg/L). These were developed based on ambient conditions in the 1970s and have been determined by the Regional Board to be insufficiently protective.

A TMDL for dry hydrological conditions has been developed, using historical data and a site-specific model. Since there was inadequate data for the wet and average conditions, additional TMDLs will be developed in the future. The causal numerical target is for phosphorus, since it is the primary limiting nutrient in Big Bear Lake. The total phosphorus concentration annual average shall be no greater than 35 µg/L and must be attained no later than 2015 for dry hydrological conditions (2020 for all other times). The annual average shall be determined by the following methodology: the nutrient data from both the photic composite and discrete bottom samples are averaged

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by station number and month; a calendar year average is obtained for each sampling location by averaging the average of each month; and finally, the separate annual averages for each location are averaged to determine the lake-wide average.

In addition to the numeric target for phosphorus, there are also response numeric targets set for chlorophyll a (<14 µg/L), macrophyte coverage (30 – 40 percent of total area), and nuisance aquatic vascular plant species (95 percent eradication).

The TMDL implementation is focused on reducing the internal lake load from the sediment and macrophyte components, not dischargers. The TMDL also includes an extensive monitoring program of the watershed and the lake as well as development and implementation of a lake-wide management plan for nutrients.

Middle Santa Ana River Watershed Bacteria TMDL – Regional Board Adopted

Middle Santa Ana River Watershed waterbodies were listed on the Section 303 (d) list of impaired waters due to violations of REC 1 fecal coliform bacteria objectives. Recognizing that, in the future, *E. coli* may be incorporated into the Basin Plan as new bacterial water quality objectives for REC 1, alternative numeric targets for *E. coli* are also specified. These numeric targets are specified as follows:

- Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples per 30 day period, and not more than 10 percent of the samples exceed 400 organisms/100 mL for any 30–day period.
- *E. coli*: log mean less than 126 organisms/100 mL based on five or more samples per 30–day period, and not more than 10 percent of the samples exceed 235 organisms/100mL for any 30 day period.

In addition to the adopted TMDLs above, TMDLs are currently being developed for nutrients in the Big Bear Lake Tributaries as well as for bacteria in Canyon Lake.

Region 9 – San Diego

There is one TMDL completed for the constituents of interest by the San Diego Regional Board.

Rainbow Creek Total Nitrogen and Total Phosphorus TMDL – Approved by USEPA in March 2006

Nitrate concentrations in Rainbow Creek exceed the water quality objective for MUN and total nitrogen and total phosphorus concentrations exceed the water quality objective for biostimulatory substances (as presented in **Table 2**), and threaten to unreasonably impair the water quality necessary for the fisheries beneficial uses of Rainbow Creek. Excessive nutrient levels in Rainbow Creek promote the growth of algae in localized areas, creating a nuisance condition that unreasonably interferes with aesthetics and REC 1 and REC 2 and threatens to impair fisheries beneficial uses.

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Runoff from agriculture, nursery, and residential land uses contribute to increased pollutant nutrients in Rainbow Creek as a result of storm water runoff, irrigation return flows, and ground water contributions to the creek.

The numeric targets for nutrients are intended to achieve the numeric water quality objective for nitrates for MUN and ultimately the narrative water quality objective for stimulation of algal and emergent plant growth by nutrients. Water quality objectives are established for nitrates, total nitrogen, and total phosphorus to meet drinking water standards in the short-term, and to reduce existing periodic algal blooms and prevent future eutrophic conditions.

Lacking a quantitative method, ratios of nitrogen to phosphorus (N:P) concentrations are used to indicate which nutrient is limiting. Allan (1995) states that it has been shown that nitrogen and phosphorus occur in algal tissue in a remarkably consistent mole ratio of 16N:1P and that the N:P ratio indicates which nutrient is likely to be the limiting factor in algal growth. For example, ratios higher than the natural ratio of 16:1 indicate a surplus supply of nitrogen and suggest that the availability of phosphorus is more likely to limit algal growth. Conversely, ratios below 16:1 indicate a nitrogen limitation (Allan 1995). Allan (1995) states that joint limitation by both nutrients is likely where N:P ratios are between 10:1 and 20:1. Primarily, phosphorus appears to be the limiting nutrient during the spring and summer; however, there are occurrences where nitrogen or both may be limiting. Therefore, targets for both nitrogen and phosphorus are appropriate to provide greater assurance that eutrophic conditions and excessive algal growth are prevented, and beneficial uses are protected. **Table 10** presents the numeric targets.

Table 10
Numeric Targets for Nutrients

Constituent or Factor	TMDL Targets
NITRATE, As N	10 mg N/L
TOTAL NITROGEN	1.0 mg N/L
TOTAL PHOSPHORUS	0.1 mg P/L

The numeric target for nitrates, based on the water quality objective for MUN, is set at 10 mg N/L to ensure that these surface waters are protected as drinking water sources and to assure compliance with the numeric water quality objective at all times. The targets for total nitrogen and total phosphorus are water quality objectives set forth in the Basin Plan. These are long standing objectives that are intended to prevent nuisance algae and emergent plant growth in flowing waters that may result in dissolved oxygen depletion. The water quality objectives are 1.0 mg N/L and 0.1 mg P/L, respectively, and are not to be exceeded more than 10 percent of the time. These targets are established as final endpoints and are to be implemented by incremental load reductions over time.

In addition to the finalized TMDLs above, there are several water sources for which TMDLs are currently being developed, as shown in **Table 11** below.

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Table 11
Upcoming TMDLs for the San Diego Regional Board

Water	Constituent	Controlling Beneficial Use	Status
Beaches and Creeks in the San Diego Region	Bacteria	REC 1 and Shellfish	In Development
Tecolote Creek	Bacteria	REC 1 and Shellfish	In Development

NUTRIENT CRITERIA

The USEPA developed the National Nutrient Criteria Development Program to assist states in developing regional nutrient criteria. It should be noted that the State Water Resources Control Board is working with the USEPA to develop an official plan for nutrient criteria development in California. In the interim, most regional boards have determined to use the TMDL process to address nutrient issues on a case-by-case basis.

Region 1 – North Coast

In the 2004 Triennial Review of the Basin Plan, the North Coast Regional Board indicated that they would be considering site-specific objectives for nutrients.

Region 2 – San Francisco Bay

No information was obtained on the current nutrient criteria program status.

Region 3 – Central Coast

The Central Coast Regional Board began participation in the National Program in 2001 and started developing region wide criteria. It was determined that the TMDL program would be used as the starting point for developing and implementing water quality objectives.

Region 4 – Los Angeles

The Los Angeles Regional Board began participation in the National Program in 2001. It was expected that region wide criteria would be ready by 2003, but this deadline was not met. Participation in the program is still on-going.

Region 5 – Central Valley

No information was obtained on the current nutrient criteria program status.

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Region 6 – Lahontan

For several hydrologic units, including the Susanville Hydrologic Unit, Eagle Drainage Hydrologic Area, Lake Tahoe, and Little Truckee River, the Lahontan Regional Board has set site-specific objectives. These were developed in conjunction with the USEPA using the USEPA Regional Nutrient Criteria Guidance document. This includes constituents such as algae and plankton growth, biological indicators, chlorophyll-a, pH, clarity, and biostimulatory substances (including nitrogen and phosphorus).

In the 2003 Triennial Review of the Basin Plan the Lahontan Regional Board prioritized development of narrative biocriteria for Sierra Nevada streams as well as new objectives region-wide for nutrients and related parameters for surface waters.

Region 7 – Colorado River Basin

No information was obtained on the current nutrient criteria program status.

Region 8 – Santa Ana

The 2006 Triennial Review of the Basin Plan provided a recommendation to develop/revise nutrient objectives for region, focusing on 303 (d) - listed waters, including Newport Bay, San Diego Creek, Lake Elsinore, Canyon Lake, Big Bear Lake and its tributaries. This may also include reviewing the ammonia objective for specific water bodies based on 1999 USEPA national criteria.

Region 9 – San Diego

No information was obtained on the current nutrient criteria program status.

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REFERENCES:

Region 1 – North Coast

Water Quality Control Plan for the North Coast Region, September 2006
<http://www.waterboards.ca.gov/northcoast/programs/basinplan/basin.html>
<http://www.waterboards.ca.gov/northcoast/programs/tmdl/Status.html>
Matt St. John, personal communication 8/27/07 – (707) 570-3762

Region 2 – San Francisco Bay

Water Quality Control Plan for the San Francisco Bay Basin
<http://www.waterboards.ca.gov/sanfranciscobay/basinplan.htm>
<http://www.waterboards.ca.gov/sanfranciscobay/tmdlmain.htm>
Thomas Mumley (510) 622-2395
Naomi Seger

Region 3 – Central Coast

Water Quality Control Plan for the Central Coast Basin
<http://www.swrcb.ca.gov/rwqcb3/BasinPlan/Index.htm>
<http://www.swrcb.ca.gov/rwqcb3/TMDL/303dandTMDLprojects.htm>
Lisa Horowitz McCann, personal communication 13 Dec 2006

Region 4 – Los Angeles

Water Quality Control Plan for the Los Angeles Region
http://www.waterboards.ca.gov/losangeles/html/meetings/tmdl/Basin_plan/basin_plan.html
<http://www.waterboards.ca.gov/losangeles/html/meetings/tmdl/tmdl.html>
Renee DeShazo (213) 576-6783

Region 5 – Central Valley

Water Quality Control Plan for the Sacramento River and San Joaquin River Basins
http://www.waterboards.ca.gov/centralvalley/available_documents/index.html#anchor616381
<http://www.waterboards.ca.gov/centralvalley/programs/tmdl/index.htm>
Betty Yee

Region 6 - Lahontan

Water Quality Control Plan for the Lahontan Region, North and South Basins
http://www.waterboards.ca.gov/lahontan/BPlan/BPlan_Index.htm
http://www.waterboards.ca.gov/lahontan/TMDL/TMDL_Index.htm
Judith Unsicker (530) 542-5462

Region 7 – Colorado River Basin

Water Quality Control Plan for the Colorado River Basin – Region 7
<http://www.waterboards.ca.gov/coloradoriver/documents/RB7Plan.pdf>
<http://www.waterboards.ca.gov/coloradoriver/tmdl.html>
Liann Chavez (760) 776-8945

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Region 8 – Santa Ana

Water Quality Control Plan Santa Ana River Basin, 1995

http://www.waterboards.ca.gov/santaana/html/basin_plan.html

<http://www.waterboards.ca.gov/santaana/html/tmdls.html>

Mark Adelson, personal communication 8/27/07 – (951) 782-3234

Region 9 – San Diego

Water Quality Control Plan for the San Diego Basin (9)

<http://www.waterboards.ca.gov/sandiego/programs/basinplan.html>

<http://www.waterboards.ca.gov/sandiego/tmdls/tmdl.html>

Julie Chan, (858) 627-3926 personal communication on 21 Nov 06

Linda Pardy (848) 627-3932 personal communication on 23 Aug 07

State Water Resources Control Board; Source of Drinking Water Policy (88-63)

Water Pollution Control Act (Clean Water Act)