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CALFED Water Quality Parameter Assessment Team Meeting Handout Packet

April 1, 1997
9:00 AM - 12:00 PM

State Water Resources Control Board
Hearing Room 102
901 P Street

D-034754

CALFED Water Quality Parameter Assessment Team Meeting
Handout Packet Contents

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Summary of Comments Received on the CALFED Water Quality Technical Program As of January 31, 1997

CALFED
BAY-DELTA
PROGRAM

Water Quality Parameter Assessment Team Meeting
Tuesday, April 1
9:00 - 12:00 AM
State Water Resources Control Board
Hearing Room 102
901 P Street, Sacramento

Purposes of meeting:

1) To discuss the adequacy of the EPA 303D impaired water body listings as the basis for focussing CALFED water quality actions.
2) To discuss the water quality parameter of concern targets and how these targets can be expanded into ranges for impact analysis.
3) To identify potential water quality models that are most applicable for impact analysis of the CALFED water quality parameters of concern.

Outcomes:

1) An understanding and general consensus on the adequacy of the EPA 303D listings including considerations that should be taken into account, and limitations on the use of data.
2) Preliminary potential methods for developing parameter ranges and team assignments for completion of range development.
3) Initial identification of water quality models that might be used for impact analysis. Assignments and schedule for a team paper on applicable water quality models for CALFED water quality parameters of concern including when they should and should not be used.

Agenda

9:00 AM	Welcome and introductions.
9:15 AM	Explanation of the EPA 303 D list including: • Geographic scope of listings for CALFED purposes • Explanation of what constitutes an impaired water body • Identification of CALFED parameters of concern included in the 303D list • Data that is used to underpin the listing • Work on-going to delist some parameters
9:45 AM	Group discussion on advantages and limitations of using current listings as basis for action prioritization and impact analysis.
10:30 AM	Break
10:45 AM	Discussion on how to develop appropriate parameter of concern target ranges for impact analysis. Team assignments to complete development of target ranges.
11:30 AM	Initial identification of water quality models that might be used for impact analysis including the models benefits, constraints and limitations. Topics covered will include a discussion of whether adequate data is available to use identified models. Assignments for production of water quality modeling briefing paper.
12:00 PM	Wrap-up and adjourn.

Attachment A
Impaired Waterbodies

D-034757

CALFED Water Quality Parameters of Concern

Metals	Pesticides/Organics	Other
Cadmium*	Carbofuran*	Ammonia*
Copper*	Chlordane*	Boron*
Mercury*	Chlorpyrifos*	Bromide
Selenium*	Diazinon*	Chloride
Zinc*	DDT*	Dissolved Oxygen*
	PCBs*	Nutrients (Nitrate)*
	Toxaphene*	Pathogens*
		pH*
		Salinity (EC_w)
		Salinity (TDS)*
		SAR:EC_w relationship
		Temperature*
		TOC
		Turbidity*
		Unknown Toxicity*

* Indicates inclusion in Clean Water Act Section 303(d) program

Clean Water Act Section 303(d) Listed Impaired Waterbodies Within the CALFED Problem Area

Waterbody	Regional Board	Parameters of Concern	Probable Sources
Delta			
Carquinez Strait	2	Metals	Municipal and Industrial Point Sources, Mining, Urban
Delta Waterways	5	Mercury Diazinon, Chlorpyrifos Group A Pesticides (Chlordane, Toxaphene) Unknown Toxicity DDT Dissolved Oxygen Salt	Mining Agriculture, Urban Agriculture Unknown Agriculture Municipal, Urban Agriculture
Lone Tree Creek	5	Ammonia, Salt, DO	Dairies
Marsh Creek	5	Mercury	Mining
Suisun Bay	2	Metals	Municipal and Industrial Point Sources, Mining, Urban
Suisun Marsh Wetlands	2	Metals Nutrients Salinity Dissolved Oxygen	Agriculture, Urban, Flow Regulation Agriculture, Urban, Flow Regulation Agriculture, Urban, Flow Regulation Agriculture, Urban, Flow Regulation

Note: These waterbodies represent CWA Section 303(d) impaired waterbodies within the CALFED problem area that are impaired due to the presence of one or more CALFED Water Quality parameters of concern.

Clean Water Act Section 303(d) Listed Impaired Waterbodies Within the CALFED Solution Area

Waterbody	Regional Board	Parameters of Concern	Probable Sources
Sacramento River Basin			
American River, Lower	5	Mercury Group A Pesticides (Chlordane) Unknown Toxicity	Mining Urban Unknown
Cache Creek	5	Mercury Unknown Toxicity	Mining Unknown
Colusa Drain	5	Pesticides (Carbofuran) Unknown Toxicity	Agriculture Unknown
Feather River, Lower	5	Mercury Diazinon, Chlorpyrifos Group A Pesticides (Toxaphene) Unknown Toxicity	Mining Agriculture, Urban Agriculture Unknown
Harley Gulch	5	Mercury	Mining
Humbug Creek	5	Copper, Mercury, Zinc Sedimentation	Mining Mining
Little Cow Creek	5	Copper, Zinc, Cadmium	Mining
Natomas East Main Drain	5	PCBs Diazinon, Chlorpyrifos	Industrial, Urban Agriculture, Urban
Sacramento River (Shasta Dam to Red Bluff)	5	Cadmium, Copper, Zinc Unknown Toxicity Temperature	Mining Unknown Dam
Sacramento River (Red Bluff to Delta)	5	Mercury Diazinon, Chlorpyrifos Carbofuran Unknown Toxicity	Mining Agriculture Agriculture Unknown
Sacramento Slough	5	Mercury Diazinon, Chlorpyrifos	Unknown Agriculture, Urban
Sulfur Creek	5	Mercury	Mining

Clean Water Act Section 303(d) Listed Impaired Waterbodies Within the CALFED Solution Area

Waterbody	Regional Board	Parameters of Concern	Probable Sources
San Joaquin River Basin			
Grasslands Marshes	5	Selenium TDS	Agriculture Agriculture
Merced River, Lower	5	Group A Pesticides (Toxaphene) DDT	Agriculture Agriculture
Mokelumne River, Lower	5	Copper, Zinc Dissolved Oxygen	Mining Dam
Mud Slough	5	Selenium TDS Boron Pesticides Unknown Toxicity	Agriculture Agriculture Agriculture Agriculture Agriculture
Orestimba Creek	5	Pesticides Unknown Toxicity	Agriculture Unknown
Panoche Creek	5	Mercury TDS Selenium	Mining Agriculture Agriculture
Salt Slough	5	Selenium TDS Mercury Pesticides Boron	Agriculture Agriculture Mining Agriculture Agriculture
San Carlos Creek	5	Mercury	Mining
San Joaquin River	5	Selenium Diazinon, Chlorpyrifos Unknown Toxicity Group A Pesticides (?) Salt, Boron	Agriculture Agriculture Unknown Agriculture Agriculture
Stanislaus River, Lower	5	Group A Pesticides (Endosulfan) DDT Unknown Toxicity	Agriculture Agriculture Unknown
Temple Creek	5	Ammonia	Dairies

Source: 1996 California 303(d) and TMDL Priority List

303D.XLS
CALFED solution area
3/31/97

D-034761

Clean Water Act Section 303(d) Listed Impaired Waterbodies Within the CALFED Solution Area

Waterbody	Regional Board	Parameters of Concern	Probable Sources
Tuolumne River, Lower	5	Group A Pesticides (Chlordane, Toxaphene) DDT Unknown Toxicity	Agriculture Agriculture Unknown
Turlock Irrigation District Lateral #5	5	Ammonia Pesticides Unknown Toxicity	Wastewater Discharge, Agriculture Agriculture Unknown
		Delta	
Carquinez Strait	2	Metals	Municipal and Industrial Point Sources, Mining, Urban
Delta Waterways	5	Mercury Diazinon, Chlorpyrifos Group A Pesticides (Chlordane, Toxaphene) Unknown Toxicity DDT Dissolved Oxygen Salt	Mining Agriculture, Urban Agriculture Unknown Agriculture Municipal, Urban Agriculture
Lone Tree Creek	5	Ammonia, Salt, DO	Dairies
Marsh Creek	5	Mercury	Mining
Suisun Bay	2	Metals	Municipal and Industrial Point Sources, Mining, Urban
Suisun Marsh Wetlands	2	Metals Nutrients Salinity Dissolved Oxygen	Agriculture, Urban, Flow Regulation Agriculture, Urban, Flow Regulation Agriculture, Urban, Flow Regulation Agriculture, Urban, Flow Regulation

Note: These waterbodies represent CWA Section 303(d) impaired waterbodies within the CALFED solution area that are impaired due to the presence of one or more CALFED Water Quality parameters of concern.

303D.XLS
CALFED solution area
3/31/97

Source: 1996 California 303(d) and TMDL Priority List

Clean Water Act Section 303(d) Listed Impaired Waterbodies Within the Bay Region that May Affect the CALFED Problem Area

Waterbody	Regional Board	Parameters of Concern	Probable Sources
Napa River	2	Pathogens Nutrients Turbidity	Urban Runoff, Agriculture Agriculture Agriculture, Urban Runoff
Petaluma River	2	Pathogens Nutrients Turbidity	Agriculture, Urban Runoff Agriculture, Urban Runoff Agriculture, Urban Runoff
Richardson Bay	2	Pathogens	Urban Runoff, Marinas
San Francisco Bay, Central	2	Metals	Municipal and Industrial Point Sources, Mining, Urban Runoff
San Francisco Bay, Lower	2	Metals	Municipal Point Sources, Urban Runoff
San Francisco Bay, South	2	Metals	Municipal Point Sources, Urban Runoff, Mining
San Pablo Bay	2	Metals	Municipal and Industrial Point Sources, Mining, Urban Runoff
Sonoma Creek	2	Nutrients, Pathogens, Turbidity	Agriculture, Urban Runoff, Construction

Note: These waterbodies represent CWA 303(d) impaired waterbodies within the Bay region that are impaired due to the presence of one or more CALFED Water Quality parameters of concern.

303D.XLS
Bay
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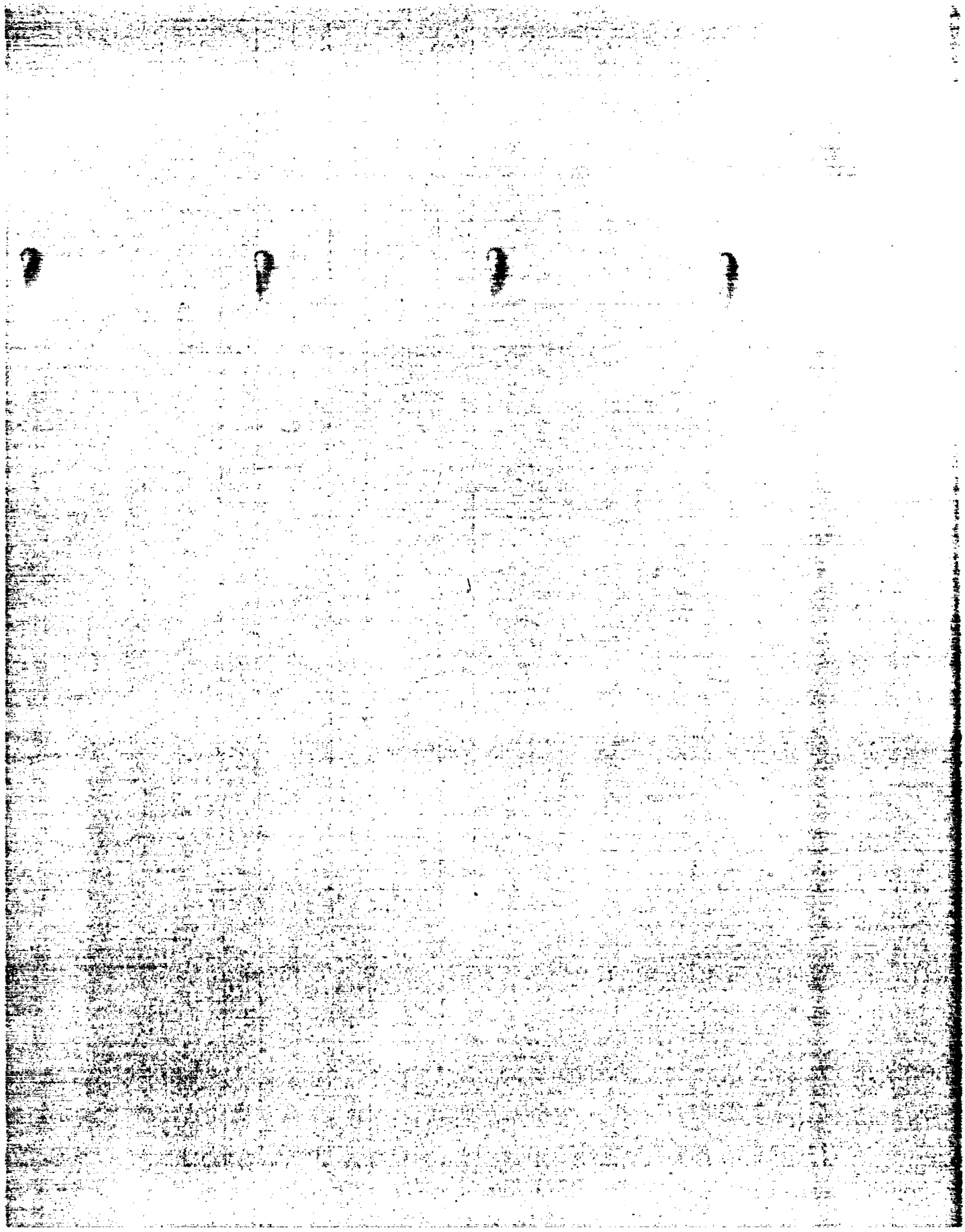
Clean Water Act Section 303(d) Listed Impaired Waterbodies
Above Dams Within the Sacramento River Basin that May Affect the CALFED Problem Area

Waterbody	Regional Board	Parameters of Concern	Probable Sources
Sacramento River Basin--Above Dams			
Berryessa Lake	5	Mercury	Mining
Clear Lake	5	Mercury Nutrients	Mining Unknown
Horse Creek	5	Copper, Cadmium, Zinc	Mining
Keswick Reservoir	5	Copper, Cadmium, Zinc	Mining
Little Backbone Creek	5	Copper, Cadmium, Zinc pH	Mining Mining
Shasta Lake	5	Copper, Cadmium, Zinc	Mining
Spring Creek	5	Copper, Cadmium, Zinc pH	Mining Mining
Town Creek	5	Copper, Cadmium, Zinc	Mining
West Squaw Creek	5	Copper, Cadmium, Zinc	Mining
Whiskeytown Reservoir	5	Pathogens	On-site Disposal Systems
Willow Creek	5	Copper, Zinc pH	Mining Mining

Note: These waterbodies represent CWA Section 303(d) impaired waterbodies above major dams within the Sacramento River Basin that are impaired due to the presence of one or more CALFED Water Quality parameters of concern.



Attachment B
Water Quality Actions and Target Water Quality Ranges

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CALFED Water Quality Action Mix by Basin

Sacramento River Basin Action Mix

Predominantly mine drainage actions with limited agricultural drainage actions and urban runoff actions (Sacramento and environs, Yuba City/Marysville).

Target Parameters for Mine Drainage Actions

Cadmium
Copper
Mercury
Zinc
Turbidity

Target Parameters for Agricultural Drainage Actions

Carbofuran
Chlorpyrifos
Diazinon
Toxaphene*

Target Parameters for Urban and Industrial Runoff Actions

Chlordane*
Chlorpyrifos
Diazinon
PCBs*

San Joaquin River Basin Action Mix

Predominantly agricultural drainage actions with limited mine drainage actions.

Target Parameters for Agricultural Drainage Actions

Ammonia
Boron
DDT*
Diazinon
Chlordane*
Chlorpyrifos
Salt
Selenium
TDS
Toxaphene*
Unknown Toxicity

Target Parameters for Mine Drainage Actions

Copper
Mercury
Zinc

Delta Basin Action Mix

Mix of agricultural, mining, urban runoff, and municipal and industrial wastewater actions.

Target Parameters for Agricultural Drainage Actions

Metals
Chlordane*
Chlorpyrifos
DDT*
Diazinon
Dissolved Oxygen
Nutrients
Salinity
Salt
Toxaphene*

Target Parameters for Mine Drainage Actions

Metals
Mercury

Target Parameters for Urban and Industrial Runoff Actions

Metals
Chlorpyrifos
Diazinon
Dissolved Oxygen
Nutrients
Salinity

Target Parameters for Municipal and Industrial Wastewater Actions

Metals
Dissolved Oxygen

* Chlordane, DDT, PCBs, and Toxaphene are banned in the United States and are no longer in use.

Draft Example of a Programmatic CALFED Water Quality Action

Action: Reduce copper concentrations in the Sacramento River above Hamilton City by remediation of abandoned and inactive mines.

Performance Target: Reduce copper loadings into the Sacramento River above Hamilton City from 30,000 lbs/year to 5,000 lbs/year.

Environmental Target: Copper concentrations in the Sacramento River at Hamilton City should meet Water Quality Control Plan requirements of 5μg/L.

Approaches:
Source control - cap tailings piles, remove tailings piles, divert water courses, seal mine portals, remove contaminated sediments, and similar measures.
Treatment - collection and treatment of drainage to remove copper.

Note: Less environmentally significant parameters (e.g. arsenic) of acid mine drainage would also be reduced through implementing this action.

Target Water Quality Values for CALFED Ecosystem Water Quality Parameters of Concern

Parameter of Concern	Sacramento River	San Joaquin River	Delta
Cadmium	River and tributaries from above State Hwy 32 bridge at Hamilton City: **0.22 µg/l** [a,c,d]		West of Antioch Bridge: **1.1 µg/l** (4 day average) [x] **3.9 µg/l** (1 hour average) [x]
Copper	River and tributaries from above State Hwy 32 bridge at Hamilton City: **5.6 µg/l** [a,c,d] Below Hamilton City: **10 µg/l** (no hardness connection) [a,d,f]		East of Antioch Bridge: **10 µg/l** (no hardness connection) [a,d,f] West of Antioch Bridge: **6.5 µg/l** (4 day average) [x] **9.2 µg/l** (1 hour average) [x]
Mercury			West of Antioch Bridge: **0.025 µg/l** (4 day average) [x] **2.4 µg/l** (1 hour average) [x]
Selenium			
Zinc	River and tributaries from above State Hwy 32 bridge at Hamilton City: **16 µg/l** [a,c,d] Below Hamilton City: **100 µg/l** (no hardness connection) [a,d,g]		East of Antioch Bridge: **100 µg/l** (no hardness connection) [a,d] West of Antioch Bridge: **106 µg/l** (4 day average) [x] **117 µg/l** (1 hour average) [x]

Target Water Quality Values for CALFED Ecosystem Water Quality Parameters of Concern

Parameter of Concern	Sacramento River	San Joaquin River	Delta
Carbofuran			
Chlordane			
Chlorpyrifos			
Diazinon			
DDT			
PCBs			
Toxaphene			

Target Water Quality Values for CALFED Ecosystem Water Quality Parameters of Concern

Parameter of Concern	Sacramento River	San Joaquin River	Delta
Ammonia			
Dissolved Oxygen	Keswick Dam to Hamilton City, June 1 to August 31: **9000 µg/l** [d,q] Below I Street Bridge: **7000 µg/l** [d]	Between Turner Cut and Stockton, September 1 through November 30: **6000 µg/l** [d]	All Delta Waters: **5000 µg/l** [d,r] West of Antioch Bridge: **7000 µg/l** (minimum) [d,x]
Salinity (EC_w)			
Salinity (TDS)			
Temperature	Keswick Dam to Hamilton City: **<56°F** [d,u] Hamilton City to I Street Bridge: **<68°F** [d,u] I Street Bridge to Freeport: **<68°F** [d,v] I Street Bridge to Freeport, January 1 through March 31: **<66°F** [d,w]	At Vernalis: **<68°F** [d,v]	West of Antioch Bridge: **<5°C** increase above for receiving water designated as cold or warm freshwater habitat. Alteration of temperature shall not adversely affect beneficial uses. [x]
Turbidity			

Target Water Quality Values for CALFED Ecosystem Water Quality Parameters of Concern

Parameter of Concern	Sacramento River	San Joaquin River	Delta
Unknown Toxicity			

[a] dissolved form

[c] The effects of these concentrations were measured by exposing test organisms to dissolved aqueous solutions of 40 mg/l hardness that had been filtered through a 0.45 micron membrane filter. Where deviations from 40 mg/l of water hardness occur, the objectives, in mg/l are determined by the following formulas:

$Cu = e^{(0.905)(\ln \text{hardness})} - 1.612 \times 10^{3}$

$Zn = e^{(0.830)(\ln \text{hardness})} - 0.289 \times 10^{3}$

$Cd = e^{(1.160)(\ln \text{hardness})} - 5.777 \times 10^{3}$

[d] Central Valley Regional Water Quality Control Plan

[f] Within the next year the State Water Resources Control Board or EPA will promulgate/adopt objectives which are hardness dependent. The adoption language is likely to contain a clause saying that the most stringent objective applies. Sometimes the 10 μg/l objectives will be more stringent and at other times the new rule will be more stringent.

[g] Similar to the objectives for copper, we expect the State Water Resources Control Board or EPA to promulgate new objectives within the next year which will be more stringent than current objectives.

[q] When natural conditions lower dissolved oxygen below this level, the concentration should be maintained at or above 95% of saturation.

[u] According to the basin plan, the temperature should not be elevated above 56°F in the reach from Keswick Dam to Hamilton City nor above 68°F in the reach from Hamilton City to I Street Bridge during periods when temperature increases will be detrimental to the fishery.

[v] According to the basin plan, the daily average water temperature should not be elevated by controllable factors above 68°F from the I Street Bridge to Freeport on the Sacramento River, and at Vernalis on the San Joaquin River between April 1 through June 30 and September 1 through November 30 in all water year types.

[w] According to the basin plan, the daily average water temperature should not be elevated by controllable factors above 66°F from I Street Bridge to Freeport on the Sacramento River between January 1 through March 31.

[x] San Francisco Regional Water Quality Control Board objectives at 100 mg/l hardness. Formulas for calculation objectives for varying hardness levels are as follows:

Target Water Quality Values for CALFED Ecosystem Water Quality Parameters of Concern

$Cd = e^{(0.7852H-3.490)}$ (4 day average)
$= e^{(1.128H-3.828)}$ (1 hour average)
$Cu = e^{(0.8545H-1.465)}$ (4 day average)
$= e^{(0.9422H-1.464)}$ (1 hour average)
$Zn = e^{(0.8473H+0.7614)}$ (4 day average)
$= e^{(0.8473H+0.8604)}$ (1 hour average)

Source: Central Valley Basin Plan. 1995.

III. WATER QUALITY OBJECTIVES

The Porter-Cologne Water Quality Control Act defines water quality objectives as "... the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area" [Water Code Section 13050(h)]. It also requires the Regional Water Board to establish water quality objectives, while acknowledging that it is possible for water quality to be changed to some degree without unreasonably affecting beneficial uses. In establishing water quality objectives, the Regional Water Board must consider, among other things, the following factors:

- Past, present, and probable future beneficial uses;
- Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
- Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area;
- Economic considerations;
- The need for developing housing within the region;
- The need to develop and use recycled water. (Water Code Section 13241)

The Federal Clean Water Act requires a state to submit for approval of the Administrator of the U.S Environmental Protection Agency *(USEPA)* all new or revised water quality standards which are established for surface and ocean waters. As noted earlier, California water quality standards consist of both beneficial uses (identified in Chapter II) and the water quality objectives based on those uses.

There are **seven important points** that apply to water quality objectives.

The **first point** is that water quality objectives can be revised through the basin plan amendment process. Objectives may apply region-wide or be specific to individual water bodies or parts of water bodies. Site-specific objectives may be developed whenever the Regional Water Board believes they are appropriate. As indicated previously, federal regulations call for each state to review its water quality standards at least every three years. These Triennial Reviews provide one opportunity to evaluate changing water quality objectives, because they begin with an identification of potential and actual water quality problems, i.e., beneficial use impairments. Since impairments may be associated with water quality objectives being exceeded, the Regional Water Board uses the results of the Triennial Review to implement actions to assess, remedy, monitor, or otherwise address the impairments, as appropriate, in order to achieve objectives and protect beneficial uses. If a problem is found to occur because, for example, a water quality objective is too weak to protect beneficial uses, the Basin Plan should be amended to make the objective more stringent. (Better enforcement of the water quality objectives or adoption of certain policies or redirection of staff and resources may also be proper responses to water quality problems. See the Implementation chapter for further discussion.)

Changes to the objectives can also occur because of new scientific information on the effects of water contaminants. A major source of information is the USEPA which develops data on the effects of chemical and other constituent concentrations on particular aquatic species and human health. Other information sources for data on protection of beneficial uses include the National Academy of Science which has published data on bioaccumulation and the Federal Food and Drug Administration which has issued criteria for unacceptable levels of chemicals in fish and shellfish used for human consumption. The Regional Water Board may make use of those and other state or federal agency information sources in assessing the need for new water quality objectives.

The **second point** is that achievement of the objectives depends on applying them to controllable water quality factors. *Controllable water quality factors* are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the State, that are subject to the authority of the State Water Board or the Regional Water Board, and that may be reasonably controlled. Controllable factors are not allowed to cause further degradation of water quality in instances where uncontrollable factors have already resulted in water quality objectives being exceeded. The Regional Water Board recognizes that man made changes that alter flow regimes can affect water quality and impact beneficial uses.

The **third point** is that objectives are to be achieved primarily through the adoption of waste discharge

requirements (including permits) and cleanup and abatement orders. When adopting requirements and ordering actions, the Regional Water Board considers the potential impact on beneficial uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives. It can then make a finding as to the beneficial uses to be protected within the area of influence of the discharge and establish waste discharge requirements to protect those uses and to meet water quality objectives. The objectives contained in this plan, and any State or Federally promulgated objectives applicable to the basins covered by the plan, are intended to govern the levels of constituents and characteristics in the main water mass unless otherwise designated. They may not apply at or in the immediate vicinity of effluent discharges, but at the edge of the *mixing zone* if areas of dilution or criteria for diffusion or dispersion are defined in the waste discharge specifications.

The **fourth point** is that the Regional Water Board recognizes that immediate compliance with water quality objectives adopted by the Regional Water Board or the State Water Board, or with water quality criteria adopted by the USEPA, may not be feasible in all circumstances. Where the Regional Water Board determines it is infeasible for a discharger to comply immediately with such objectives or criteria, compliance shall be achieved in the shortest practicable period of time (determined by the Regional Water Board), not to exceed ten years after the adoption of applicable objectives or criteria. This policy shall apply to water quality objectives and water quality criteria adopted after the effective date of this amendment to the Basin Plan [25 September 1995].

The **fifth point** is that in cases where water quality objectives are formulated to preserve historic conditions, there may be insufficient data to determine completely the temporal and hydrologic variability representative of historic water quality. When violations of such objectives occur, the Regional Water Board judges the reasonableness of achieving those objectives through regulation of the controllable factors in the areas of concern.

The **sixth point** is that the State Water Board adopts policies and plans for water quality control which can specify water quality objectives or affect their implementation. Chief among the State Water Board's policies for water quality control is State Water Board Resolution No. 68-16 (Statement of Policy with Respect to Maintaining High Quality of Waters in California). It requires that wherever the existing quality of surface or ground waters is better than the objectives established for those waters in a basin plan, the existing quality will be maintained unless as otherwise provided by Resolution No. 68-16 or any revisions thereto. This policy and others establish general objectives. The State Water Board's water quality control plans applicable to the Sacramento and San Joaquin River Basins are the Thermal Plan and Water Quality Control Plan for Salinity. The Thermal Plan and its water quality objectives are in the Appendix. The Water Quality Control Plan for Salinity water quality objectives are listed as Table III-5. The State Water Board's plans and policies that the Basin Plan must conform to are addressed in Chapter IV, Implementation.

The **seventh point** is that water quality objectives may be in numerical or narrative form. The enumerated milligram-per-liter (mg/l) limit for copper is an example of a numerical objective; the objective for color is an example of a narrative form.

Information on the application of water quality objectives is contained in the section, *Policy for Application of Water Quality Objectives*, in Chapter IV.

WATER QUALITY OBJECTIVES FOR INLAND SURFACE WATERS

The objectives below are presented by categories which, like the Beneficial Uses of Chapter II, were standardized for uniformity among the Regional Water Boards. The water quality objectives apply to all surface waters in the Sacramento and San Joaquin River Basins, including the Delta, or as noted. *(The legal boundary of the Delta is contained in Section 12220 of the Water Code and identified in Figure III-1.)* The numbers in parentheses following specific water bodies are keyed to Figure II-1.

Bacteria

In waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml.

For Folsom Lake (50), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period, shall not exceed a geometric mean of 100/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 200/100 ml.

Biostimulatory Substances

Water shall not contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses.

Chemical Constituents

Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. The chemical constituent objectives in Table III-1 apply to the water bodies specified. Metal objectives in the table are dissolved concentrations. Selenium, molybdenum, and boron objectives are total concentrations. Water quality objectives are also contained in the Water Quality Control Plan for Salinity, adopted by the State Water Board in May 1991.

At a minimum, water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Tables 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) and 64449-B (Secondary Maximum Contaminant Levels-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. At a minimum, water designated for use as domestic or municipal supply (MUN) shall not contain lead in excess of 0.015 mg/l. The Regional Water Board acknowledges that specific treatment requirements are imposed by state and federal drinking water regulations on the consumption of surface waters under specific circumstances. To protect all beneficial uses the Regional Water Board may apply limits more stringent than MCLs.

TABLE III-1
TRACE ELEMENT WATER QUALITY OBJECTIVES

CONSTITUENT	MAXIMUM CONCENTRATION[a] (mg/l)	APPLICABLE WATER BODIES
Arsenic	0.01	Sacramento River from Keswick Dam to the I Street Bridge at City of Sacramento (13, 30); American River from Folsom Dam to the Sacramento River (51); Folsom Lake (50); and the Sacramento-San Joaquin Delta.
Barium	0.1	As noted above for Arsenic.
Boron	2.0 (15 March through 15 September) 0.8 (monthly mean, 15 March through 15 September)	San Joaquin River, mouth of the Merced River to Vernalis
	2.6 (16 September through 14 March) 1.0 (monthly mean, 16 September through 14 March)	
	1.3 (monthly mean, critical year[b])	
	5.8[c] 2.0 (monthly mean, 15 March through 15 September)[c]	Salt Slough, Mud Slough (north), San Joaquin River from Sack Dam to the mouth of Merced River
Cadmium	0.00022[d]	Sacramento River and its tributaries above State Hwy 32 bridge at Hamilton City.
Copper	0.0056[d]	As noted above for Cadmium.
	0.01[c]	As noted above for Arsenic.[c]

D-034777

TABLE III-1 TRACE ELEMENT
WATER QUALITY OBJECTIVES
(Continued)

CONSTITUENT	MAXIMUM CONCENTRATION[a] (mg/l)	APPLICABLE WATER BODIES
Cyanide	0.01	As noted above for Arsenic.
Iron	0.3	As noted above for Arsenic.
Manganese	0.05	As noted above for Arsenic.
Molybdenum	0.015 0.010 (monthly mean)	San Joaquin River, mouth of the Merced River to Vernalis
	0.050[c] 0.019 (monthly mean)[c]	Salt Slough, Mud Slough (north), San Joaquin River from Sack Dam to the mouth of Merced River
Selenium	0.012 0.005 (4-day average)[f]	San Joaquin River, mouth of the Merced River to Vernalis
	0.020[f] 0.005 (4-day average)[f]	Salt Slough, Mud Slough (north), San Joaquin River from Sack Dam to the mouth of Merced River
	0.002 (monthly mean)	Any water supplies used for waterfowl habitat in the Grassland Water District, San Luis National Wildlife Refuge, and Los Banos State Wildlife Area.
Silver	0.01	As noted above for Arsenic.
Zinc	0.1[e]	As noted above for Arsenic.[e]
	0.016[d]	As noted above for Cadmium.

a Metal objectives in this table are dissolved concentrations. Selenium, molybdenum, and boron objectives are total concentrations.

b See Table IV-3.

c An alternate set of objectives is proposed to go into effect if the plan to use the San Luis Drain is implemented. The alternate set of objectives provide for better water quality in Salt Slough and the San Joaquin River, Sack Dam to the mouth of Mud Slough (north) and a longer compliance period for Mud Slough (north) and the San Joaquin River, mouth of Mud Slough (north) to mouth of the Merced River.

d The effects of these concentrations were measured by exposing test organisms to dissolved aqueous solutions of 40 mg/l hardness that had been filtered through a 0.45 micron membrane filter. Where deviations from 40 mg/l of water hardness occur, the objectives, in mg/l, shall be determined using the following formulas:

$$Cu = e^{(0.905)(\ln \text{hardness}) - 1.612} \times 10^{-3}$$

$$Zn = e^{(0.830)(\ln \text{hardness}) - 0.289} \times 10^{-3}$$

$$Cd = e^{(1.160)(\ln \text{hardness}) - 5.777} \times 10^{-3}$$

e Does not apply to Sacramento River above State Hwy. 32 bridge at Hamilton City. See relevant objectives (*) above.

f The Regional Water Board has not adopted these selenium concentrations. These selenium concentrations were promulgated by USEPA on 22 December 1992 after USEPA disapproved the Regional Water Board's selenium concentrations. (See 57 Fed.Reg. 60848, 60920.) The selenium concentrations promulgated by USEPA are currently in effect, and are provided in this table solely for reference.

Color

Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses.

Dissolved Oxygen

Within the legal boundaries of the Delta, the dissolved oxygen concentration shall not be reduced below:

7.0 mg/l in the Sacramento River (below the I Street Bridge) and in all Delta waters west of the Antioch Bridge; 6.0 mg/l in the San Joaquin River (between Turner Cut and Stockton, 1 September through 30 November); and 5.0 mg/l in all other Delta waters except for those bodies of water which are constructed for special purposes and from which fish have been excluded or where the fishery is not important as a beneficial use.

For surface water bodies outside the legal boundaries of the Delta, the monthly median of the mean daily dissolved oxygen *(DO)* concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75 percent of saturation. The dissolved oxygen concentrations shall not be reduced below the following minimum levels at any time:

Waters designated WARM 5.0 mg/l
Waters designated COLD 7.0 mg/l
Waters designated SPWN 7.0 mg/l

The more stringent objectives in Table III-2 apply to specific water bodies in the Sacramento and San Joaquin River Basins:

TABLE III-2
SPECIFIC DISSOLVED OXYGEN WATER QUALITY OBJECTIVES

AMOUNT	TIME	PLACE
9.0 mg/l*	1 June to 31 August	Sacramento River from Keswick Dam to Hamilton City (13)
8.0 mg/l	1 September to 31 May	Feather River from Fish Barrier Dam at Oroville to Honcut Creek (40)
8.0 mg/l	all year	Merced River from Cressy to New Exchequer Dam (78)
8.0 mg/l	15 October to 15 June	Tuolumne River from Waterford to La Grange (86)

* When natural conditions lower dissolved oxygen below this level, the concentrations shall be maintained at or above 95 percent of saturation.

Floating Material

Water shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses.

Oil and Grease

Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.

pH

The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses. In determining

compliance with the water quality objective for pH, appropriate averaging periods may be applied provided that beneficial uses will be fully protected.

For Goose Lake (2), pH shall be less than 9.5 and greater than 7.5 at all times.

Pesticides

- No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses.
- Discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses.
- Total identifiable persistent chlorinated hydrocarbon pesticides shall not be present in the water column at concentrations detectable within the accuracy of analytical methods approved by the Environmental Protection Agency or the Executive Officer.
- Pesticide concentrations shall not exceed those allowable by applicable antidegradation policies (see State Water Resources Control Board Resolution No. 68-16 and 40 C.F.R. Section 131.12.).
- Pesticide concentrations shall not exceed the lowest levels technically and economically achievable.
- Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the Maximum Contaminant Levels set forth in California Code of Regulations, Title 22, Division 4, Chapter 15.
- Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of thiobencarb in excess of 1.0 μg/l.

Where more than one objective may be applicable, the most stringent objective applies.

For the purposes of this objective, the term pesticide shall include: (1) any substance, or mixture of substances which is intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any pest, which may infest or be detrimental to vegetation, man, animals, or households, or be present in any agricultural or nonagricultural environment whatsoever, or (2) any spray adjuvant, or (3) any breakdown products of these materials that threaten beneficial uses. Note that discharges of "inert" ingredients included in pesticide formulations must comply with all applicable water quality objectives.

Radioactivity

Radionuclides shall not be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.

At a minimum, waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (MCL Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect.

Salinity

Electrical Conductivity and Total Dissolved Solids--Special Cases in the Sacramento and San Joaquin River Basins Other Than the Delta

The objectives for electrical conductivity and total dissolved solids in Table III-3 apply to the water bodies specified. To the extent of any conflict with the general Chemical Constituents water quality objectives, the more stringent shall apply.

Electrical Conductivity, Total Dissolved Solids, and Chloride--Delta Waters

The objectives for salinity (electrical conductivity, total dissolved solids, and chloride) which apply to the Delta are listed in Table III-5 at the chapter's end. See Figure III-2 for an explanation of the hydrologic year type classification system. The objectives in Table III-5 were adopted by the State Water Board in May 1991 in the Water Quality Control Plan for Salinity.

Table III-3

ELECTRICAL CONDUCTIVITY AND TOTAL DISSOLVED SOLIDS

PARAMETER	WATER QUALITY OBJECTIVES	APPLICABLE WATER BODIES
Electrical Conductivity (at 25°C)	Shall not exceed 230 micromhos/cm (50 percentile) or 235 micromhos/cm (90 percentile) at Knights Landing above Colusa Basin Drain; or 240 micromhos/cm (50 percentile) or 340 micromhos/cm (90 percentile) at I Street Bridge, based upon previous 10 years of record.	Sacramento River (13, 30)
	Shall not exceed 150 micromhos/cm (90 percentile) in well-mixed waters of the Feather River.	North Fork of the Feather River (33); Middle Fork of the Feather River from Little Last Chance Creek to Lake Oroville (36); Feather River from the Fish Barrier Dam at Oroville to Sacramento River (40)
	Shall not exceed 150 micromhos/cm from Friant Dam to Gravelly Ford (90 percentile).	San Joaquin River, Friant Dam to Mendota Pool (69)
Total Dissolved Solids	Shall not exceed 125 mg/l (90 percentile)	North Fork of the American River from the source to Folsom Lake (44); Middle Fork of the American River from the source to Folsom Lake (45); South Fork of the American River from the source to Folsom Lake (48, 49); American River from Folsom Dam to Sacramento River (51)
	Shall not exceed 100 mg/l (90 percentile)	Folsom Lake (50)
	Shall not exceed 1,300,000 tons	Goose Lake (2)

Sediment

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Settleable Material

Waters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.

Suspended Material

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

Tastes and Odors

Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.

Temperature

The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses.

Temperature objectives for COLD interstate waters, WARM interstate waters, and Enclosed Bays and Estuaries are as specified in the *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California* including any revisions. There are also temperature objectives for the Delta in the State Water Board's May 1991 *Water Quality Control Plan for Salinity.*

At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5°F above natural receiving water temperature. Temperature changes due to controllable factors shall be limited for the water bodies specified as described in Table III-4. To the extent of any conflict with the above, the more stringent objective applies.

In determining compliance with the water quality objectives for temperature, appropriate averaging periods may be applied provided that beneficial uses will be fully protected.

TABLE III-4
SPECIFIC TEMPERATURE OBJECTIVES

DATES	APPLICABLE WATER BODY
From 1 December to 15 March, the maximum temperature shall be 55°F. From 16 March to 15 April, the maximum temperature shall be 60°F. From 16 April to 15 May, the maximum temperature shall be 65°F. From 16 May to 15 October, the maximum temperature shall be 70°F. From 16 October to 15 November, the maximum temperature shall be 65°F. From 16 November to 30 November, the maximum temperature shall be 60°F.	Sacramento River from its source to Box Canyon Reservoir (9); Sacramento River from Box Canyon Dam to Shasta Lake (11)
The temperature in the epilimnion shall be less than or equal to 75°F or mean daily ambient air temperature, whichever is greater.	Lake Siskiyou (10)
The temperature shall not be elevated above 56°F in the reach from Keswick Dam to Hamilton City nor above 68°F in the reach from Hamilton City to the I Street Bridge during periods when temperature increases will be detrimental to the fishery.	Sacramento River from Shasta Dam to I Street Bridge (13, 30)

Toxicity

All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances. Compliance with this objective will be determined by analyses of indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests of appropriate duration or other methods as specified by the Regional Water Board.

The Regional Water Board will also consider all material and relevant information submitted by the discharger and other interested parties and numerical criteria and guidelines for toxic substances developed by the State Water Board, the California Office of Environmental Health Hazard Assessment, the California Department of Health Services, the U.S. Food and Drug Administration, the National Academy of Sciences, the U.S. Environmental Protection Agency, and other appropriate organizations to evaluate compliance with this objective.

The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors shall not be less than that for the same water body in areas unaffected by the waste discharge, or, when necessary, for other control water that is consistent with the requirements for "experimental water" as described in *Standard Methods for the Examination of Water and Wastewater*, latest edition. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour bioassay.

In addition, effluent limits based upon acute biotoxicity tests of effluents will be prescribed where appropriate; additional numerical receiving water quality objectives for specific toxicants will be established as sufficient data become available; and source control of toxic substances will be encouraged.

Turbidity

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits:

- Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTUs), increases shall not exceed 1 NTU.
- Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent.
- Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs.
- Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected.

Exceptions to the above limits will be considered when a dredging operation can cause an increase in turbidity. In those cases, an allowable zone of dilution within which turbidity in excess of the limits may be tolerated will be defined for the operation and prescribed in a discharge permit.

For Folsom Lake (50) and American River (Folsom Dam to Sacramento River) (51), except for periods of storm runoff, the turbidity shall be less than or equal 10 NTUs. To the extent of any conflict with the general turbidity objective, the more stringent applies.

For Delta waters, the general objectives for turbidity apply subject to the following: except for periods of storm runoff, the turbidity of Delta waters shall not exceed 50 NTUs in the waters of the Central Delta and 150 NTUs in other Delta waters. Exceptions to the Delta specific objectives will be considered when a dredging operation can cause an increase in turbidity. In this case, an allowable zone of dilution within which turbidity in excess of limits can be tolerated will be defined for the operation and prescribed in a discharge permit.

WATER QUALITY OBJECTIVES FOR GROUND WATERS

The following objectives apply to all ground waters of the Sacramento and San Joaquin River Basins, as the objectives are relevant to the protection of designated beneficial uses. These objectives do not require improvement over naturally occurring background concentrations. The ground water objectives contained in this plan are not required by the federal Clean Water Act.

Bacteria

In ground waters used for domestic or municipal supply (MUN) the most probable number of coliform organisms over any seven-day period shall be less than 2.2/100 ml.

Chemical Constituents

Ground waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.

At a minimum, ground waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B

(Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Tables 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) and 64449-B (Secondary Maximum Contaminant Levels-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. At a minimum, water designated for use as domestic or municipal supply (MUN) shall not contain lead in excess of 0.015 mg/l. To protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs.

Radioactivity

At a minimum, ground waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (MCL Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect.

Tastes and Odors

Ground waters shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

Toxicity

Ground waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life associated with designated beneficial use(s). This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances.

FIGURE III-1

BOUNDARY OF THE SACRAMENTO - SAN JOAQUIN DELTA

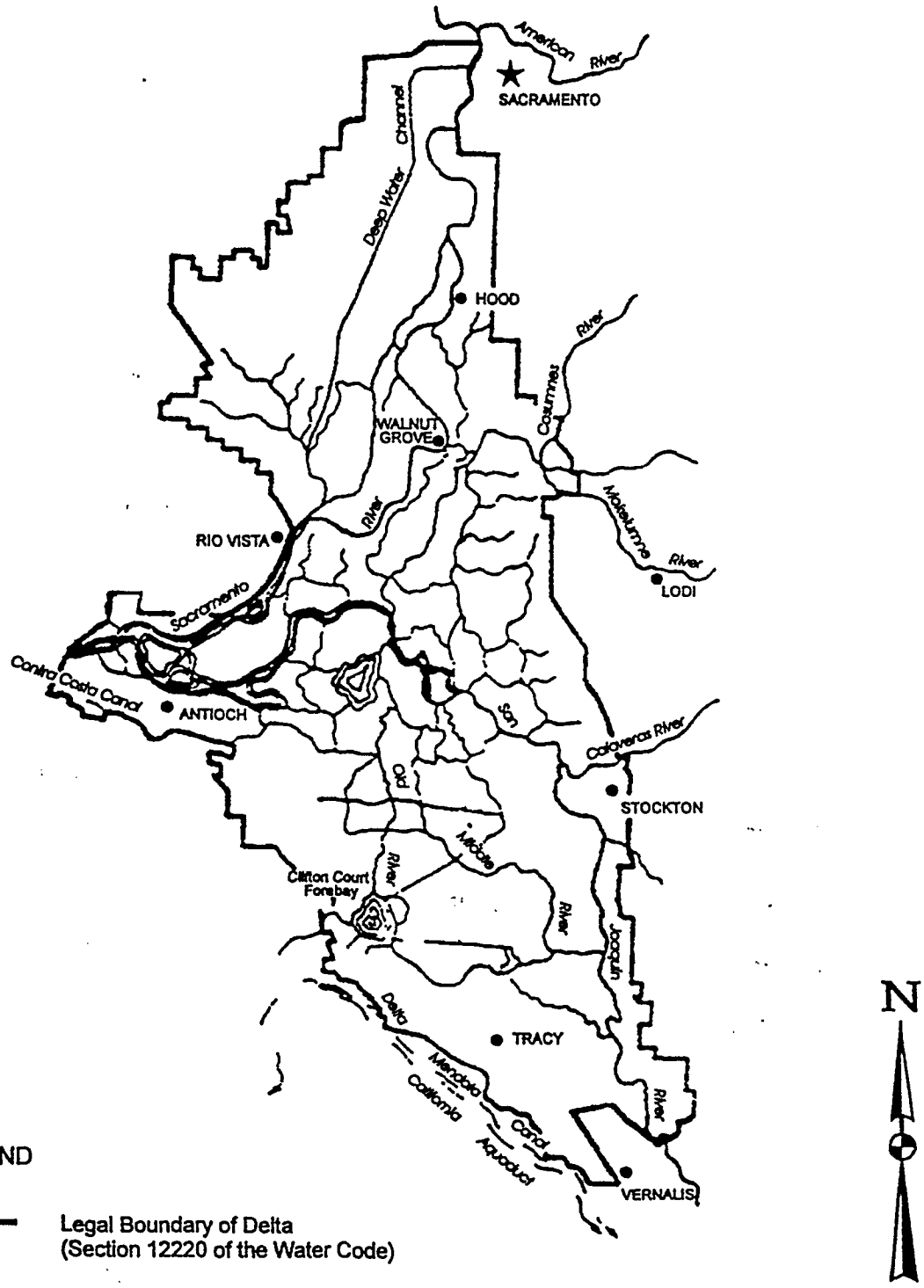


FIGURE III-2 *

Sacramento Valley

Water Year Hydrologic Classification

Year classification shall be determined by computation of the following equation:

INDEX = 0.4 * X + 0.3 * Y + 0.3 * Z

Where: X = Current years April - July
Sacramento Valley unimpaired runoff

Y = Current October - March
Sacramento Valley unimpaired runoff

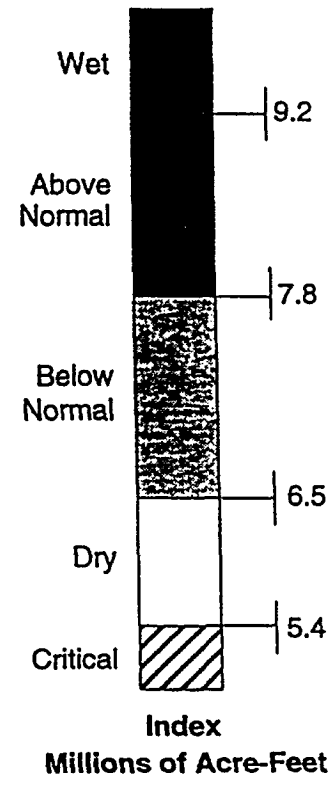
Z = Previous year's index [1]

The Sacramento Valley unimpaired runoff for the current water year (October 1 of the preceding calendar year through September 30 of the current calendar year) as published in California Department of Water Resources Bulletin 120 is a forecast of the sum of the following locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River at Smartville; American River, total inflow to Folsom Reservoir. Preliminary determinations of year classification shall be made in February, March, and April with final determination in May. These preliminary determinations shall be based on hydrologic conditions to date plus forecasts of future runoff assuming normal precipitation for the remainder of the water year.

Classification	Index Millions of Acre-Feet
Wet	Equal to or greater than 9.2
Above Normal	Greater than 7.8 and less than 9.2
Below Normal	Equal to or less than 7.8 and greater than 6.5
Dry	Equal to or less than 6.5 and greater than 5.4
Critical	Equal to or less than 5.4

YEAR TYPE [2]

All Years for All Objectives



[1] A cap of 10.0 MAF is put on the previous years index (X) to account for required flood control reservoir releases during wet years.

[2] The year type for the preceding water year will remain in effect until the initial forecast of unimpaired runoff for the current water year is available.

* Taken from the State Water Board's "Water Quality Control Plan For Salinity", May 1991, Figure 3-4

TABLE III-5*: WATER QUALITY OBJECTIVES

A) MUNICIPAL AND INDUSTRIAL USES

LOCATION	SAMPLING SITE NOs. (I-A/RKI)	PARAMETER	DESCRIPTION	INDEX TYPE	YEAR TYPE	DATES	VALUES
Contra Costa Canal at Pumping Plant #1	*C-5 CHCCC06*	*Chloride (Cl-)*	*Maximum mean daily, in mg/l*	*Not Applicable*	*All*	*Oct-Sep*	*250*
Contra Costa Canal at Pumping Plant #1	*C-5 CHCCC06*	*Chloride (Cl-)*	*Maximum mean daily 150 mg/l chloride for at least the number of days shown during the Calendar Year. Must be provided in intervals of not less than two weeks duration. (Percentage of Calendar Year shown in parenthesis).*	*Sacramento River 40-30-30*		*No. of days each Cal. Year < 150 mg/l Cl-*	
- or -					*W*	*240*	*(66%)*
San Joaquin River at Antioch Water Works Intake	*D-12(near) RSAN007*	*Chloride (Cl-)*		*Sacramento River 40-30-30*	*AN*	*190*	*(52%)*
					BN	*175*	*(48%)*
					D	*165*	*(45%)*
					C	*155*	*(42%)*
West Canal at mouth of Clifton Court Forebay	*C-9 CHWST0*	*Chloride (Cl-)*	*Maximum mean daily, in mg/l*	*Not Applicable*	*All*	*Oct-Sep*	*250*
Delta Mendota Canal at Tracy Pumping Plant	*DMC-1 CHDMC004*	*Chloride (Cl-)*	*Maximum mean daily, in mg/l*	*Not Applicable*	*All*	*Oct-Sep*	*250*
Cache Slough at City of Vallejo Intake [1]	*C-19 SLCCH16*	*Chloride (Cl-)*	*Maximum mean daily, in mg/l*	*Not Applicable*	*All*	*Oct-Sep*	*250*
-and/or-							
Barker Slough at North Bay Aqueduct Intake	*- SLBAR3*	*Chloride (Cl-)*	*Maximum mean daily, in mg/l*	*Not Applicable*	*All*	*Oct-Sep*	*250*

These pages superseded by SWRCB Water Quality Control Plan for SJ Bay/Sac SJ Delta

* Taken from the State Water Board's "Water Quality Control Plan For Salinity", May 1991

TABLE III-5* (cont.) : WATER QUALITY OBJECTIVES

B) AGRICULTURAL USES BY AREA

LOCATION	SAMPLING SITE NOs. (I-A/RKI)	PARAMETER	DESCRIPTION	INDEX TYPE	YEAR TYPE	DATES	VALUES
			1) WESTERN DELTA				
Sacramento River at Emmaton	*D-22 RSAC092*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily, in mmhos/cm (mmhos)*	*Sacramento River 40-30-30*		*0.45 EC April 1 to Date Shown*	*EC from Date Shown to Aug. 15 [2]*
					W	*Aug. 15*	*--*
					AN	*July 1*	*0.63*
					BN	*June 20*	*1.14*
					D	*June 15*	*1.67*
					C	*--*	*2.78*
San Joaquin River at Jersey Point	*D-15 RSAN018*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily, in mmhos*	*Sacramento River 40-30-30*		*0.45 EC April 1 to Date Shown*	*EC from Date Shown to Aug. 15 [2]*
					W	*Aug. 15*	*--*
					AN	*Aug. 15*	*--*
					BN	*June 20*	*0.74*
					D	*June 15*	*1.35*
					C	*--*	*2.20*
			2) INTERIOR DELTA				
South Fork Mokelumne River at Terminous	*C-13 RSMKL08*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily, in mmhos*	*Sacramento River 40-30-30*		*0.45 EC April 1 to Date Shown*	*EC from Date Shown to Aug. 15 [2]*
					W	*Aug. 15*	*--*
					AN	*Aug. 15*	*--*
					BN	*Aug. 15*	*--*
					D	*Aug. 15*	*--*
					C	*--*	*0.54*
San Joaquin River at San Andreas Landing	*C-4 RSAN032*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily, in mmhos*	*Sacramento River 40-30-30*		*0.45 EC April 1 to Date Shown*	*EC from Date Shown to Aug. 15 [2]*
					W	*Aug. 15*	*--*
					AN	*Aug. 15*	*--*
					BN	*Aug. 15*	*--*
					D	*Jun. 25*	*0.58*
					C	*--*	*0.87*

* Taken from the State Water Board's "Water Quality Control Plan For Salinity", May 1991

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TABLE III-5* (cont.): WATER QUALITY OBJECTIVES

B) AGRICULTURAL USES BY AREA

LOCATION	SAMPLING SITE NOs. (I-A/RKI)	PARAMETER	DESCRIPTION	INDEX TYPE	YEAR TYPE	DATES	VALUES
(To be implemented by 1996) [3]			**3) SOUTH DELTA**				
San Joaquin River at Airport Way Bridge, Vernalis	*C-10 RSAN112*	*Electrical Conductivity (EC)*	*Maximum 30-day running average of mean daily, in mmhos*	*Not Applicable*	*All*	*Apr 1-Aug 31*	*0.7*
						Sep 1-Mar 31	*1.0*
Old River near Middle River	*C-8 ROLD69*					*or*	
Old River at Tracy Road Bridge	*P-12 ROLD59*			*If a three-party contract has been implemented among DWR, USBR and the SDWA, that contract will be reviewed prior to implementation of the avove and, after also considering the needs of other beneficial uses, revisions will be made to the objectives and compliance/monitoring locations noted above, as appropriate.*			
San Joaquin River at Brandt Bridge [site]	*C-6 RSAN073*						
			4) EXPORT				
West Canal at mouth of Clifton Court Forebay -and- Delta Mendota Canal at Tracy Pumping Plant	*C-9 CHWST0 DMC-1 CHDMC004*	*Electrical Conductivity (EC)*	*Maximum monthly average of mean daily EC, in mmhos*	*Not Applicable*	*All*	*Oct-Sept*	*1.0*

* Taken from the State Water Board's "Water Quality Control Plan For Salinity", May 1991

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TABLE III-5* (cont.): WATER QUALITY OBJECTIVES

C) FISH AND WILDLIFE BY HABITAT/SPECIES

LOCATION	SAMPLING SITE NOs. (I-A/RKI)	PARAMETER	DESCRIPTION	INDEX TYPE	YEAR TYPE	DATES	VALUES
			CHINOOK SALMON				
DISSOLVED OXYGEN							
San Joaquin River between Turner Cut & Stockton	*RSAN050-RSAN061*	*Dissolved Oxygen (DO)*	*Minimum dissolved oxygen, in mg/l*	*Not Applicable*	*All*	*Sep 1-Nov 30*	*6.0*
TEMPERATURE							
Sacramento River at Freeport and	*RSAC155*	*Temperature*	*Narrative Objective*	*Not Applicable*	*All*	*"The daily average water temperature shall not be elevated by controllable factors above 68 deg. F from the I Street Bridge to Freeport on the Sacramento River, and at Vernalis on the San Joaquin River between April 1 through June 30 and September 1 through November 30 in all water year types." [4]*	
San Joaquin River at Airport Way Bridge, Vernalis	*C-10 RSAN112*	*Temperature*	*Narrative Objective*	*Not Applicable*	*All*		
Sacramento River at Freeport	*RSAC155*	*Temperature*	*Narrative Objective*	*Not Applicable*	*All*	*"The daily average water temperature shall not be elevated by controllable factors above 66 deg. F from the I street Bridge to Freeport on the Sacramento River between January 1 through March 31." [4]*	

* Taken from the State Water Board's "Water Quality Control Plan For Salinity", May 1991

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TABLE III-5* (cont.): WATER QUALITY OBJECTIVES

C) FISH AND WILDLIFE BY HABITAT/SPECIES

LOCATION	SAMPLING SITE NOs. (I-A/RKI)	PARAMETER	DESCRIPTION	INDEX TYPE	YEAR TYPE	DATES	VALUES
STRIPED BASS - SALINITY:1 ANTIOCH - SPAWNING							
Sacramento River at Chipps Island	*D-10 RSAC075*	*Delta outflow Index (DOI)*	*Average for the period not less than the value shown, in cfs.*	*Not Applicable*	*All*	*Apr 1-Apr 14*	*6,700*
San Joaquin River at Antioch Water Works Intake	*D-12 (near) RSAN007*	*Electrical Conductivity (EC)*	*14-day running average of mean daily for the period not more than value shown, in mmhos*	*Not Applicable*	*All*	*Apr 15-May 31 (or until spawning has ended)*	*1.5*
STRIPED BASS-SALINITY:2 ANTIOCH-SPAWNING-RELAXATION PROVISION							
San Joaquin River at Antioch Water Works Intake	*D-12 (near) RSAN007*	*Electrical Conductivity (EC)*	*14-day running average of mean daily EC in mmhos, not more than value shown corresponding to deficiencies in firm supplies declared by a set of water projects representative of the Sacramento River and San Joaquin River watersheds, for the period shown, or until spawning has ended. The specific representative projects and ammounts of deficiencies will be defined in subsequent phases of the proceedings.*	*Total Annual Imposed Deficiency (MAF)*		*Apr 1-May 31 EC in mmhos*	
						Dry	*Critical*
This relaxation provision replaces the above Antioch & Chipps Island standard whenever the projects impose deficiencies in firm supplies.				*0.0*		*1.5*	*1.5*
				0.5		*1.8*	*1.9*
				1.0		*1.8*	*2.5*
				1.5		*1.8*	*3.4*
				2.0 or more		*1.8*	*3.7*
				Linear interpolation is to be used to determine values between those shown.			
STRIPED BASS-SALINITY:3 PRISONERS POINT-SPAWNING							
San Joaquin River at: Prisoners Point	*D-29 RSAN038*	*Electrical Conductivity (EC)*	*14-day running average of mean daily for the period not more than value shown, in mmhos*	*Sacramento River 40-30-30*	*All*	*Apr 1-May 31 (or until spawning has ended)*	*0.44*

* Taken from the State Water Board's "Water Quality Control Plan For Salinity", May 1991

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TABLE III-5* (cont.): WATER QUALITY OBJECTIVES

C) FISH AND WILDLIFE BY HABITAT/SPECIES

LOCATION	SAMPLING SITE NOs. (I-A/RKI)	PARAMETER	DESCRIPTION	INDEX TYPE	YEAR TYPE	DATES	VALUES
STRIPED BASS-SALINITY: 4. PRISONERS POINT-SPAWNING-RELAXATION PROVISION							
When the relaxation provision for Antioch spawning protection is in effect:							
San Joaquin River at: Prisoners Point	*D-29 RSAN038*	*Electrical Conductivity (EC)*	*14-day running average of mean daily for the period not more than value shown, in mmhos*	*Sacramento River 40-30-30*	*D&C*	*Apr 1-May 31 (or until spawning has ended)*	*0.55*

FOOTNOTES:

[1] The Cache Slough objective to be effective only when water is being diverted from this location.

[2] When no date is shown, EC limit continues from April 1.

[3] South Delta Agriculture objectives will be implemented in stages: two interim stages and one final stage. The first interim stage will be implemented with the adoption of the WQCP, trhe second interim stage by 1994, and the final stage by 1996. Interim Stage 1 – 500 mg/l mean monthly TDS all year at Vernalis. Interim Stage 2 – (to be implemented no later than 1994) 0.7 mmhos/cm EC April 1 to August 31, 1.0 mmhos/cm EC September 1 to March 31, 30-day running average, at Vernalis and Brandt Bridge; with water quality monitored at three current interior stations – Mossdale, Old River, near Middle River and Tracy Road Bridge, and an additional interior monitoring station on Middle River at Howard Road Bridge. Final Stage – (to be implemented no later than 1996) 0.7 mmhos/cm EC April 1 to August 31, 1.0 mmhos/cm EC September 1 to March 31, 30-day running average, at Vernalis and Brandt Bridge on the San Joaquin River; with two interior stations at Old River Near Middle River and Old River at Tracy Road Bridge. Monitoring stations will be at Mossdale at head of Old River and Middle River at Howard Road Bridge.

OR

If a three-party contract has been implemented among DWR, USBR and the SDWA, that contract will be reviewed prior to implementation of the above and, after also considering the needs of other beneficial uses, revisions will be made to the objectives and compliance/monitoring locations noted above, as appropriate.

[4] Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the State, that are subject to the authority of the State Board, or the Regional Board, and that may be reasonably controlled. Based on the record in these proceedings, controlling temperature in the Delta utilizing reservoir releases does not appear to be reasonable, due to the distance of the Delta downstream of reservoirs and uncontrollable factors such as ambient air temperature, water temperatures in the reservoir releases, etc. For these reasons, the State Board considers reservoir releases to control water temperatures in the Delta a waste of water; therefore, the State Board will require a test of reasonableness before consideration of reservoir releases for such a purpose.

* Taken from the State Water Board's "Water Quality Control Plan For Salinity", May 1991

D—0347 92

Source: San Francisco Bay Basin Plan. 1995.

3 WATER QUALITY OBJECTIVES

INTRODUCTION

The overall goals of water quality regulation are to protect and maintain thriving aquatic ecosystems and the resources those systems provide to society and to accomplish these in an economically and socially sound manner. California's regulatory framework uses water quality objectives both to define appropriate levels of environmental quality and to control activities that can adversely affect aquatic systems.

WATER QUALITY OBJECTIVES

There are two types of objectives: narrative and numerical. Narrative objectives present general descriptions of water quality that must be attained through pollutant control measures and watershed management. They also serve as the basis for the development of detailed numerical objectives.

Historically, numerical objectives were developed primarily to limit the adverse effect of pollutants in the water column. Two decades of regulatory experience and extensive research in environmental science have demonstrated that beneficial uses are not fully protected unless pollutant levels in all parts of the aquatic system are also monitored and controlled. The Regional Board is actively working towards an integrated set of objectives, including numerical sediment objectives, that will ensure the protection of all current and potential beneficial uses.

Numerical objectives typically describe pollutant concentrations, physical/chemical conditions of the water itself, and the toxicity of the water to aquatic organisms. These objectives are designed to represent the maximum amount of pollutants that can remain in the water column without causing any adverse effect on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses (as described in Chapter 2).

The technical bases of the region's water quality objectives include extensive biological, chemical, and physical partitioning information reported in the scientific literature, national water quality criteria, studies conducted by other agencies, and information gained from local environmental and discharge monitoring (as described in Chapter 6). The Regional Board recognizes that limited information exists in some cases, making it difficult to establish definitive numerical objectives, but the Regional Board believes its conservative approach to setting objectives has been proper. In addition to the technical review, the overall feasibility of reaching objectives in terms of technological, institutional, economic, and administrative factors is considered at many different stages of objective derivation and implementation of the water quality control plan.

Together, the narrative and numerical objectives define the level of water quality that shall be maintained within the region. In instances where water quality is better than that prescribed by the objectives, the state Antidegradation Policy applies (State Board Resolution 68-16: Statement of Policy With Respect to Maintaining High Quality of Waters in California). This policy is aimed at protecting relatively uncontaminated aquatic systems where they exist and preventing further degradation.

When uncontrollable water quality factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives, the Regional Board will conduct a case-by-case analysis of the benefits and costs of preventing further degradation. In cases where this analysis indicates that beneficial uses will be adversely impacted by allowing further degradation, then the Regional Board will not allow controllable water quality factors to cause any further degradation of water quality. Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the state and that may be reasonably controlled.

QUICK INDEX PAGE

Water Quality Objectives for:

The Regional Board establishes and enforces waste discharge requirements for point and nonpoint source of pollutants at levels necessary to meet numerical and narrative water quality objectives. In setting waste discharge requirements, the Regional Board will consider, among other things, the potential impact on beneficial uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives.

In general, the objectives are intended to govern the concentration of pollutant constituents in the main water mass. The same objectives cannot be applied at or immediately adjacent to submerged effluent discharge structures. Zones of initial dilution within which higher concentrations can be tolerated will be allowed for such discharges.

For a submerged buoyant discharge, characteristic of most municipal and industrial wastes that are released from submerged 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.

Compliance with water quality objectives may be prohibitively expensive or technically impossible in some cases. The Regional Board will consider modification of specific water quality objectives as long as the discharger can demonstrate that the alternate objective will protect existing beneficial uses, is scientifically defensible, and is consistent with the state Antidegradation Policy. This exception clause properly indicates that the Regional Board will conservatively compare benefits and costs in these cases because of the difficulty in quantifying beneficial uses.

These water quality objectives are considered necessary to protect the present and potential beneficial uses described in Chapter 2 of this Plan and to protect existing high quality waters of the state. These objectives will be achieved primarily through establishing and enforcing waste discharge requirements and by implementing this water quality control plan.

OBJECTIVES FOR OCEAN WATERS

The provisions of the State Board's "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan) and "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan) and any revision to them will apply to ocean waters. These plans describe objectives and effluent limitations for ocean waters.

OBJECTIVES FOR SURFACE WATERS

The following objectives apply to all surface waters within the region, except the Pacific Ocean.

BACTERIA

Table 3-1 provides a summary of the bacterial water quality objectives and identifies the sources of those objectives. Table 3–2 summarizes U.S. EPA's water quality criteria for water contact recreation based on the frequency of use a particular area receives. These criteria will be used to differentiate between pollution sources or to supplement objectives for water contact recreation.

BIOACCUMULATION

Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.

BIOSTIMULATORY SUBSTANCES

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. Changes in chlorophyll a and associated phytoplankton communities follow complex dynamics that are sometimes associated with a discharge of biostimulatory substances. Irregular and extreme levels of chlorophyll a

or phytoplankton blooms may indicate exceedance of this objective and require investigation.

COLOR

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.

DISSOLVED OXYGEN

For all tidal waters, the following objectives shall apply:

In the Bay:

Downstream of Carquinez Bridge.....5.0 mg/l minimum

Upstream of Carquinez Bridge.....7.0 mg/l minimum

For nontidal waters, the following objectives shall apply:

Waters designated as:

Cold water habitat.....7.0 mg/l minimum

Warm water habitat.....5.0 mg/l minimum

The median dissolved oxygen concentration for any three consecutive months shall not be less than 80 percent of the dissolved oxygen content at saturation.

Dissolved oxygen is a general index of the state of the health of receiving waters. Although minimum concentrations of 5 mg/l and 7 mg/l are frequently used as objectives to protect fish life, higher concentrations are generally desirable to protect sensitive aquatic forms. In areas unaffected by waste discharges, a level of about 85 percent of oxygen saturation exists. A three-month median objective of 80 percent of oxygen saturation allows for some degradation from this level, but still requires a consistently high oxygen content in the receiving water.

FLOATING MATERIAL

Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses..

OIL AND GREASE

Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

POPULATION AND COMMUNITY ECOLOGY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce significant alterations in population or community ecology or receiving water biota. In addition, the health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

pH

The pH shall not be depressed below 6.5 nor raised above 8.5. This encompasses the pH range usually found in waters within the basin. Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH levels.

SALINITY

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.

SEDIMENT

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life.

SETTLEABLE MATERIAL

Waters shall not contain substances in concentrations that result in the deposition of material that cause nuisance or adversely affect beneficial uses.

SUSPENDED MATERIAL

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

SULFIDE

All water shall be free from dissolved sulfide concentrations above natural background levels. Sulfide occurs in Bay muds as a result of bacterial action on organic matter in an anaerobic environment.

Concentrations of only a few hundredths of a milligram per liter can cause a noticeable odor or be toxic to aquatic life. Violation of the sulfide objective will reflect violation of dissolved oxygen objectives as sulfides cannot exist to a significant degree in an oxygenated environment.

TASTES AND ODORS

Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.

TEMPERATURE

Temperature objectives for enclosed bays and estuaries are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California," including any revisions to the plan.

In addition, the following temperature objectives apply to surface waters:

- The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
- The temperature of any cold or warm freshwater habitat shall not be increased by more than 5°F (2.8°C) above natural receiving water temperature.

TOXICITY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species. There shall be no acute toxicity in ambient waters. Acute toxicity is defined as a median of less than 90 percent survival, or less than 70 percent survival, 10 percent of the time, of test organisms in a 96-hour static or continuous flow test.

There shall be no chronic toxicity in ambient waters. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, population abundance, community composition, or any other relevant measure of the health of an organism, population, or community. Chronic toxicity generally results from exposures to pollutants exceeding 96 hours. However, chronic toxicity may also be detected through short-term exposure of critical life stages of organisms.

As a minimum, compliance will be evaluated using the bioassay requirements contained in Chapter 4.

The health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

TURBIDITY

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.

UN-IONIZED AMMONIA

The discharge of wastes shall not cause receiving waters to contain concentrations of un-ionized ammonia in excess of the following limits (in mg/l as N):

Annual Median 0.025

Maximum, Central Bay (as depicted in Figure 2-5) and upstream 0.16

Maximum, Lower Bay (as depicted in Figures 2-6 and 2-7) 0.4

The intent of this objective is to protect against the chronic toxic effects of ammonia in the receiving waters. An ammonia objective is needed for the following reasons:

- Ammonia (specifically un-ionized ammonia) is a demonstrated toxicant. Ammonia is generally accepted as one of the principle toxicants in municipal waste discharges. Some industries also discharge significant quantities of ammonia.
- Exceptions to the effluent toxicity limitations in Chapter 4 of the Plan allow for the discharge of ammonia in toxic amounts. In most instances, ammonia will be diluted or degraded to a nontoxic state fairly rapidly. However, this does not occur in all cases, the South Bay being a notable example. The ammonia limit is recommended in order to preclude any build up of ammonia in the receiving water.

- A more stringent maximum objective is desirable for the northern reach of the Bay for the protection of the migratory corridor running through Central Bay, San Pablo Bay, and upstream reaches.

OBJECTIVES FOR SPECIFIC CHEMICAL CONSTITUENTS

Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. Water quality objectives for selected toxic pollutants developed in 1986 for surface waters are given in Tables 3-3 and 3-4.

The Regional Board intends to work towards the derivation of site-specific objectives for the Bay-Delta estuarine system. Site-specific objectives to be considered by the Regional Board shall be developed in accordance with the provisions of the federal Clean Water Act, the State Water Code, State Board water quality control plans, and this Plan. These site-specific objectives will take into consideration factors such as all available scientific information and monitoring data and the latest U.S. EPA guidance, and local environmental conditions and impacts caused by bioaccumulation. Copper, mercury, PCBs, and selenium will be the highest priorities in this effort. Pending the adoption of site-specific objectives, the objectives in Tables 3-3 and 3-4 apply throughout the region.

Based on the concerns raised in the Regional Monitoring Program, pilot fish contamination study, cooperative striped bass study, and other studies, water quality objectives for aromatic hydrocarbons are also needed.

The South Bay below the Dumbarton Bridge is a unique, water-quality-limited, hydrodynamic and biological environment that merits continued special attention by the Regional Board. Site-specific water quality objectives are absolutely necessary in this area for two reasons. First, its unique hydrodynamic environment dramatically affects the environmental fate of pollutants. Second, potentially costly nonpoint source pollution control measures must be implemented to attain any objectives for this area. The costs of those measures must be factored into economic impact considerations by the Regional Board in adopting any objectives for this area. Nowhere else in the region will nonpoint source economic considerations have such an impact on the attainability of objectives. Therefore, for this area, the objectives contained in Tables 3-3 and 3-4 will be considered guidance only, and should be used as part of the basis for site-specific objectives. Programs described in Chapter 4 will be used to develop site-specific objectives. Ambient conditions shall be maintained until site-specific objectives are developed.

CONSTITUENTS OF CONCERN FOR MUNICIPAL AND AGRICULTURAL WATER SUPPLIES

At a minimum, surface waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (SMCLs-Consumer Acceptance Limits) and 64449-B (SMCLs-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. Table 3-5 contains water quality objectives for municipal supply, including the MCLs contained in various sections of Title 22 as of the adoption of this plan.

At a minimum, surface waters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

RADIOACTIVITY

Radionuclides shall not be present in concentrations that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life. Waters designated for use as domestic or municipal supply shall not contain concentrations of radionuclides in excess of the limits specified in Table 4 of Section 64443 (Radioactivity) of Title 22 of the California Code of Regulations, which is incorporated by reference into this Plan. This incorporation is prospective, including future changes to the incorporated provisions as the changes take effect (see Table 3-5).

OBJECTIVES FOR GROUNDWATERS

Groundwater objectives consist primarily of narrative objectives combined with a limited number of numerical objectives. Additionally, the Regional Board will establish basin-

and/or site-specific numerical groundwater objectives as necessary. For example, the Regional Board has groundwater basin-specific objectives for the Alameda Creek watershed above Niles to include the Livermore-Amador Valley as shown in Table 3-7.

The maintenance of existing high quality of groundwater (i.e., "background") is the primary groundwater objective.

In addition, at a minimum, groundwaters shall not contain concentrations of bacteria, chemical constituents, radioactivity, or substances producing taste and odor in excess of the objectives described below unless naturally occurring background concentrations are greater.

BACTERIA

In groundwaters with a beneficial use of municipal and domestic supply, the median of the most probable number of coliform organisms over any seven-day period shall be less than 1.1 MPN/100 mL (based on multiple tube fermentation technique; equivalent test results based on other analytical techniques as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21 (f), revised June 10, 1992, are acceptable).

ORGANIC AND INORGANIC CHEMICAL CONSTITUENTS

All groundwaters shall be maintained free of organic and inorganic chemical constituents in concentrations that adversely affect beneficial uses. To evaluate compliance with water quality objectives, the Regional Board will consider all relevant and scientifically valid evidence, including relevant and scientifically valid numerical criteria and guidelines developed and/or published by other agencies and organizations (e.g.,U.S. EPA, the State Water Resources Control Board, California Department of Health Services, U.S. Food and Drug Administration, National Academy of Sciences, Cal/EPA Office of Environmental Health Hazard Assessment, U.S. Agency for Toxic Substances and Disease Registry, Cal/EPA Department of Toxic Substances Control, and other appropriate organizations.)

At a minimum, groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, and Table 64444-A (Organic Chemicals) of Section 64444. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

Groundwaters with a beneficial use of agricultural supply shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use. In determining compliance with this objective, the Regional Board will consider as evidence relevant and scientifically valid water quality goals from sources such as the Food and Agricultural Organizations of the United Nations; University of California Cooperative Extension, Committee of Experts; and McKee and Wolf's "Water Quality Criteria," as well as other relevant and scientifically valid evidence. At a minimum, groundwaters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

Groundwaters with a beneficial use of freshwater replenishment shall not contain concentrations of chemicals in amounts that will adversely affect the beneficial use of the receiving surface water.

Groundwaters with a beneficial use of industrial service supply or industrial process supply shall not contain pollutant levels that impair current or potential industrial uses.

To assist dischargers and other interested parties, the Central Valley Regional Board's staff has compiled many numerical water quality criteria from other appropriate agencies and organizations in its staff report, "A Compilation of Water Quality Goals." This staff report is updated regularly to reflect changes in these numerical criteria.

RADIOACTIVITY

At a minimum, groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

TASTE AND ODOR

Groundwaters designated for use as domestic or municipal supply (MUN) shall not contain taste- or odor-producing substances in concentrations that cause a nuisance or adversely affect beneficial uses. At a minimum, groundwaters designated for use as domestic or municipal supply shall not contain concentrations in excess of the secondary maximum contaminant levels (Secondary MCLs) specified in Tables 64449-A (Secondary MCLs-Consumer Acceptance Limits) and 64449-B (Secondary MCLs-Ranges) of Section 64449 of Title 22 of the California Code of Regulations, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

OBJECTIVES FOR THE DELTA AND SUISUN MARSH

The objectives contained in the State Board's "Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh" and any revisions thereto shall apply to the waters of the Sacramento-San Joaquin Delta and Suisun Marsh.

OBJECTIVES FOR ALAMEDA CREEK WATERSHED

The water quality objectives contained in Table 3-7 apply to the surface and groundwaters of the Alameda Creek watershed above Niles.

Wastewater discharges that cause the surface water limits in Table 3-7 to be exceeded may be allowed if they are part of an overall waterwastewater resource operational program developed by those agencies affected and approved by the Regional Board.

TABLE 3-1 WATER QUALITY OBJECTIVES FOR COLIFORM BACTERIA [a]

BENEFICIAL USE	FECAL COLIFORM (MPN /100ML)	TOTAL COLIFORM (MPN/100ML)
Water Contact Recreation	log mean < 200 90th percentile < 400	median < 240 no sample > 10,000
Shellfish Harvesting[b]	median < 14 90th percentile < 43	median < 70 90th percentile < 230[c]
Non-contact Water Recreation[d]	mean < 2000 90th percentile < 4000	
Municipal Supply: - Surface Water[e] - Groundwater	log mean < 20	log mean < 100 < 1.1[f]

NOTES:
a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
b. Source: National Shellfish Sanitation Program.
c. Based on a five-tube decimal dilution test or 300 MPN/100 ml when a three-tube decimal dilution test is used.
d. Source: Report of the Committee on Water Quality Criteria, National Technical Advisory Committee, 1968.
e. Source: DOHS recommendation.
f. Based on multiple tube fermentation technique; equivalent test results based on other analytical techniques, as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21(f), revised June 10, 1992, are acceptable.

TABLE 3-2 U.S. EPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION[1,2] (IN COLONIES PER 100 ML)

	FRESH WATER		SALT WATER
	ENTEROCOCCI	E. COLI	ENTEROCOCCI
Steady State (all areas)	33	126	35
Maximum at:			
- designated beach	61	235	104
- moderately used area	89	298	124
- lightly used area	108	406	276
- infrequently used area	151	576	500

NOTES:
1. The criteria were published in the Federal Register, Vol. 51, No. 45 / Friday, March 7, 1986 / 8012 - 8016. The Criteria are based on:
(a) Cabelli, V.J. 1983. Health Effects Criteria for Marine Recreational Waters. U.S. EPA, EPA 600/1-80-031, Cincinnati, Ohio, and
(b) Dufour, A.P. 1984. Health Effects Criteria for Fresh Recreational Waters. U.S. EPA, EPA 600/1-84-004, Cincinnati, Ohio.
2. The U.S. EPA criteria apply to water contact recreation only. The criteria provide for a level of protection based on the frequency of usage of a given water contact recreation area. The criteria may be employed in special studies within this region to differentiate between pollution sources or to supplement the current coliform objectives for water contact recreation.

TABLE 3-3 WATER QUALITY OBJECTIVES FOR TOXIC POLLUTANTS FOR SURFACE WATERS WITH SALINITIES GREATER THAN 5 PPT [a,b]

(ALL VALUES IN UG/L)

COMPOUND	4-DAY AVERAGE [c]	1-HR AVERAGE [c]	24-HR AVERAGED	INSTANTANEOUS MAXIMUM [d]
Arsenic	36.0	69.0		
Cadmium	9.3	43.0		
Chromium (VI)[e]	50.0	1100.0		
Copper		[f]		
Cyanide		5.0		
Lead	5.6	140.0		
Mercury	0.025	2.1		
Nickel[g]			7.1	140.0
Selenium				
Silver				2.3
Tributyltin[h]				
Zinc			58.0	170.0
PAHs[i]			15.0	

NOTES:

a. These objectives shall apply to all estuarine waters within the region, according to the salinity threshold, except for the South Bay below Dumbarton Bridge.

b. The values reported in this table are derived from the 1980 and 1984 U.S. EPA Ambient Water Quality Criteria for salt water and fresh water (unless otherwise specified) and were adopted by the Board in 1986. In 1992, the Regional Board adopted a more inclusive set of objectives reflecting more recent technical information; this set of objectives had been developed and adopted as part of the statewide Inland Surface Waters and Enclosed Bays and Estuaries Plan and was ruled invalid by a court decision in 1993. The U.S. EPA is expected to promulgate final water quality standards for California in late 1995. The national standards will then apply to all planning, monitoring, NPDES permitting, enforcement, and compliance programs conducted under the Clean Water Act within the state.

c. Source: U.S. EPA 1984.

d. Source: U.S. EPA 1980.

e. This objective may be met as total chromium.

f. The current U.S. EPA criterion is 2.9 ug/L. However, copper toxicity varies with the complexing capacity of specific receiving waters, and background concentrations in the Bay typically vary from 1 to 4 ug/L. The Regional Board conducted scientific studies on Bay waters between 1986 and 1992 and determined that 4.9 ug/l was a more appropriate value for a site-specific objective, given U.S. EPA's derivation method. U.S. EPA is reviewing that method as part of its national rulemaking for California water quality standards. A site-specific criterion for copper is urgently needed.

g. The current U.S. EPA criterion is 8.3 ug/l (4-day average).

h. Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations (<1 ppb). Based on technical information, a value of 0.005 ug/l (30-day average) would be protective of human health.

i. U.S. EPA water quality criteria indicate that 0.031 ug/l in both fresh water and salt water is protective of human health, based on setting the acceptable lifetime risk for cancer at the 10-6 risk level. PAHs are those compounds identified by EPA Method 610.

TABLE 3-4 WATER QUALITY OBJECTIVES FOR TOXIC POLLUTANTS FOR SURFACE WATERS WITH SALINITIES LESS THAN 5 PPT[a,b]

(ALL VALUES IN UG/L)

COMPOUND	4-DAY AVERAGE [c]	1-HR AVERAGE [c]	24-HR AVERAGE [d]	INSTANTANEOUS MAXIMUM [d]
Arsenic	190.0	360.0		
Cadmium	e	e		
Chromium (VI)[f]	11.0	16.0		
Copper[g]	6.5	9.2		
Cyanide	5.2	22.0		
Lead	h	h		
Mercury	0.025[i]	2.4		
Nickel	j	j	56.0	1100.0
Selenium				
Silver[k]				1.2
Tributyltin[l]				
Zinc	m	m	58.0	170.0
PAHs[n]				

NOTES:

a. These objectives shall apply to all estuarine and inland surface waters within the region where the salinity is less than 5 ppt, except for the South Bay below Dumbarton Bridge.

b. The values reported in this table are derived from the 1980 and 1984 U.S. EPA Ambient Water Quality Criteria for salt water and fresh water (unless otherwise specified) and were adopted by the Regional Board in 1986. In 1992, the Regional Board adopted a more inclusive set of objectives reflecting more recent technical information; this set of objectives had been developed and adopted as part of the statewide Inland Surface Waters and Enclosed Bays and Estuaries Plan and was ruled invalid by a court decision in 1993. The U.S. EPA is expected to promulgate final water quality standards for the California in late 1995. The national standards will then apply to all planning, monitoring, NPDES permitting, enforcement, and compliance programs conducted under the Clean Water Act within the state.

c. Source: U.S. EPA 1984.

d. Source: U.S. EPA 1980.

e. The objectives for cadmium and other noted metals are expressed by formulas where H = ln (hardness) as $CaCO_3$ in mg/l: The four-day average objective for cadmium is $e^{(0.7852\,H\,-\,3.490)}$. This is 1.1 µg/l at a hardness of 100 mg/l as $CaCO_3$. The one-hour average objective for cadmium is $e^{(1.128\,H\,-\,3.828)}$. This is 3.9 µg/l at a hardness of 100 mg/l as $CaCO_3$.

f. This limit may be met as total chromium.

g. The U.S. EPA water quality criteria for copper are hardness-dependent. The current objectives are equivalent to these criteria as calculated for 50 mg/l hardness as $CaCO_3$. The four-day average EPA criterion for copper is $e^{(0.8545H\,-\,1.465)}$; the one-hour average criterion is $e^{(0.9422H\,-\,1.464)}$.

h. The four-day average objective for lead is $e^{(1.273H\,-\,4.705)}$. This is 3.2 µg/l at at hardness of 100 mg/l as $CaCO_3$. The one-hour average objective for lead is $e^{(1.273H\,-\,1.460)}$. This is 81 µg/l at a hardness of 100 mg/l as $CaCO_3$.

i. The U.S. EPA Water Quality Criterion for mercury is 0.012 µg/l, which is below the level of detection of 0.025 µg/l. An objective of 0.012 µg/l is desirable, but attainment can only be determined at the level of detection.

j. The U.S. EPA criteria for nickel are hardness-dependent; the 4-day average criterion is $e^{(0.846\,ln\,H\,+\,1.164)}$, which is 158 µg/l at a hardness of 100 mg/l as $CaCO_3$. The 1-hour average is $e^{(0.846[ln\,H]\,+\,3.3612)}$, which is 1,419 µg/l at a hardness of 100 mg/l as $CaCO_3$.

k. The U.S. EPA water quality criterion for silver is hardness-dependent. This objective is equivalent to these criteria as calculated for 50 mg/l hardness as $CaCO_3$. The instantaneous maximum EPA criterion is $e^{(1.72[ln\,H]\,-\,6.52)}$.

l. Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations (<1 ppb). Based on technical information, values of 0.02 µg/l (4-day average), 0.04 µg/l (24-hour average), and 0.06 µg/l (instantaneous maximum) would be protective of aquatic life.

m. The U.S. EPA criteria for zinc are hardness-dependent: the 4-day average criterion is $e^{(0.8473[ln\,H]\,+\,0.7614)}$, which is 23 µg/l at a hardness of 100 mg/l as $CaCO_3$. The 1-hour average is $e^{(0.8473[ln\,H]\,+\,0.8604)}$, which is 21 µg/l at a hardness of 100 mg/l as $CaCO_3$.

n. U.S. EPA water quality criteria indicate that 0.031 µg/l in both fresh water and salt water is protective of human health, based on setting the acceptable lifetime risk for cancer at the 10^{-6} risk level. PAHs are those compounds identified by EPA Method 610.

TABLE 3-5 WATER QUALITY OBJECTIVES FOR MUNICIPAL SUPPLY

PARAMETER	OBJECTIVE (IN MG/L)
Physical:	
Color (units)[a]	15.0
Odor (number)[a]	3.0
Turbidity (NTU)[a]	5.0
pH[b]	6.5
TDS[c]	500.0
EC (mmhos/cm)[c]	0.9
Corrosivity	non-corrosive
Inorganic Parameters:	
Aluminum[d]	1.0[d] /0.2[a]
Antimony[d]	0.006
Arsenic[d]	0.05
Asbestos[d]	7 MFL[e]
Barium[d]	1.0
Beryllium[d]	0.004
Chloride[c]	250.0
Cadmium[d]	0.005
Chromium[d]	0.05
Copper[a]	1.0
Cyanide[d]	0.2
Fluoride[f]	0.8-1.7[g]
Iron[a]	0.3
Lead[b]	0.05
Manganese[a]	0.05
Mercury[d]	0.002
Nickel[d]	0.1
Nitrate (as NO_3)[d]	45.0
Nitrate + Nitrite (as N)[d]	10.0
Nitrite (as N)[d]	1.0
Selenium[d]	0.05
Silver[b]	0.05
Sulfate[c]	250.0
Thallium[d]	0.002
Zinc[a]	5.0
Organic Parameters:	
MBAS (Foaming agents)[a]	0.5
Oil and grease[b]	none
Phenols[b]	0.001
Trihalomethanes[b]	0.1
Chlorinated Hydrocarbons:	
Endrin[h]	0.002
Lindane[h]	0.0002
Methoxychlor[h]	0.04
Toxaphene[h]	0.003
2,3,7,8-TCDD (Dioxin)[h]	3×10^{-8}
2,4-D[h]	0.07
2,4,4-TP Silvex[h]	0.05
Synthetics:	
Alachlor[h]	0.002
Atrazine[h]	0.003
Bentazon[h]	0.018
Benzo(a)pyrene[h]	0.0002
Dalapon[h]	0.2
Dinoseb[h]	0.007
Diquat[h]	0.02
Endothall[h]	0.1

PARAMETER	OBJECTIVE (IN MG/L)
Benzene[h]	0.001
Carbon Tetrachloride[h]	0.0005
Carbofuran[h]	0.018
Chlordane[h]	0.0001
1,2-Dibromo-3 -chloropropane[h]	0.0002
1,2-Dichlorobenzene[h]	0.6
1,4-Dichlorobenzene[h]	0.005
1,1-Dichloroethane[h]	0.005
1,2-Dichloroethane[h]	0.0005
cis-1,2-Dichloroethlyene[h]	0.006
trans-1,2-Dichloroethylene[h]	0.01
1,1-Dichloroethylene[h]	0.006
Dichloromethane[h]	0.005
1,2-Dichloropropane[h]	0.005
1,3-Dichloropropene[h]	0.0005
Di (2-ethylhexyl) adipate[h]	0.4
Di(2-ethylhexyl) phthalate[h]	0.004
Ethylbenzene[h]	0.7
Ethylene dibromide[h]	0.00005
Glyphosate[h]	0.7
Heptachlor[h]	0.00001
Heptachlor epoxide[h]	0.00001
Hexachlorobenzene[h]	0.001
Hexachlorocyclopentadiene[h]	0.05
Molinate[h]	0.02
Monochlorobenzene[h]	0.07
Oxamyl[h]	0.2
Pentachlorophenol[h]	0.001
Picloram[h]	0.5
Polychlorinated Biphenyls[h]	0.0005
Simazine[h]	0.004
Styrene[h]	0.1
1,1,2,2-Tetrachloroethane[h]	0.001
Tetrachloroethylene[h]	0.005
Thiobencarb[h]	0.001
1,2,4-Trichlorobenzene[h]	0.07
1,1,1-Trichloroethane[h]	0.2
1,1,2-Trichloroethane[h]	0.005
Trichloroethylene[h]	0.005
Trichlorofluoromethane[h]	0.15
1,1,2-Trichloro-1,2,2-trifluoroethane[h]	1.2
Toluene[h]	0.15
Vinyl chloride[h]	0.0005
Xylenes (single or sum of isomers)[h]	1.75

PARAMETER	OBJECTIVE (IN pCi/l)
Radioactivity:	
Combined Radium-226 and Radium-228[i]	5
Gross Alpha Particle Activity[j]	15[j]
Tritium[i]	20,000
Strontium-90[i]	8
Gross Beta Particle Activity[j]	50
Uranium[i]	20

NOTES:

a. Secondary Maximum Contaminant Levels as specified in Table 64449-A of Section 64449, Title 22 of the California Code of Regulations, as of June 19, 1995.
b. Table III-2, 1986 Basin Plan.
c. Secondary Maximum Contaminant Levels as specified in Table 64449-B of Section 64449, Title 22 of the California Code of Regulations, as of June 19, 1995. (Levels indicated are "recommended" levels. Table 64449-B contains a complete list of upper and short-term ranges.)
d. Maximum Contaminant Levels as specified in Table 64431-A (Inorganic Chemicals) of Section 64431, Title 22 of the California Code of Regulations, as of June 19, 1995.
e. MFL = million fibers per liter; MCL for fibers exceeding 10 µm in length.
f. Flouride objectives depend on temperature.
g. A complete list of optimum and limiting concentrations is specified in Table 64431-B of Section 64431, Title 22 of the California Code of Regulations, as of June 19, 1995.
h. Maximum Contaminant Levels as specified in Table 64444-A (Organic Chemicals) of Section 64444, Title 22 of the California Code of Regulations, as of June 19, 1995.
i. Maximum Contaminant Levels as specified in Table 4 (Radioactivity) of Section 64443, Title 22 of the California Code of Regulations, as of December 22, 1988.
j. Includes Radium-226 but excludes Radon and Uranium.

TABLE 3-6 WATER QUALITY OBJECTIVES FOR AGRICULTURAL SUPPLY [a]

(IN MG/L)

PARAMETER	THRESHOLD	LIMIT	LIMIT FOR LIVESTOCK WATERING
Physical:			
pH	5.5-8.3	4.5-9.0	
TDS			10,000.0
EC (mmhos/cm)		0.2-3.0	
Inorganic Parameters:			
Aluminum	5.0	20.0	5.0
Arsenic	0.1	2.0	0.2
Beryllium	0.1	0.5	
Boron	0.5	2.0	5.0
Chloride	142.0	355.0	
Cadmium	0.01	0.5	0.05
Chromium	0.1	1.0	1.0
Cobalt	0.05	5.0	1.0
Copper	0.2	5.0	0.5
Fluoride	1.0	15.0	2.0
Iron	5.0	20.0	
Lead	5.0	10.0	0.1
Lithium		2.5[b]	
Manganese	0.2	10.0	
Molybdenum	0.01	0.05	0.5
Nickel	0.2	2.0	
$NO_3 + NO_2$ (as N)	5.0	30[c]	100.0
Selenium		0.02	0.05
Sodium adsorption ratio (adjusted)[d]	3.0	9.0	
Vanadium	0.1	1.0	0.1
Zinc	2.0	10.0	25

NOTES:

a. For an extensive discussion of water quality for agricultural puposes, see "A Compilation of Water Quality Goals," Central Valley Regional Water Quality Control Board, May 1993.

b. For citrus irrigation, maximum 0.075 mg/l.

c. For sensitive crops. Values are actually for NO_3-N + NH_4-N.

d. Adjusted SAR = [Na / (Ca+Mg) 1/2][1+(8.4-pHc)] where pHc is a calculated value based on total cations, 2 Ca + Mg+ CO_3 + HCO_3, in me/l. Exact calcuations of pHc can be found in "Guidelines for Interpretation of Water Quality for Agriculture" prepared by the Univ. of California Cooperative Extension.

TABLE 3-7 WATER QUALITY OBJECTIVES FOR THE ALAMEDA CREEK WATERSHED ABOVE NILES

SURFACE WATER QUALITY OBJECTIVES (ALAMEDA CREEK AND TRIBUTARIES)

TDS:	250 mg/l (90 day-arithmetic mean)
	360 mg/l (90 day-90th percentile)
	500 mg/l (daily maximum)
Chlorides:	60 mg/l (90 day-arithmetic mean)
	100 mg/l (90 day-90th percentile)
	250 mg/l (daily maximum)

GROUNDWATER QUALITY OBJECTIVES

(Concentration not to be exceeded more than 10 percent of the time during one year.)

Central Basin

TDS:	Ambient or 500 mg/l, whichever is lower
Nitrate (NO_3):	45 mg/l

Fringe Subbasins

TDS:	Ambient or 1000 mg/l, whichever is lower
Nitrate (NO_3):	45 mg/l

Upland and Highland Areas

California domestic water quality standards set forth in California Code of Regulations, Title 22, and current county standards.

Ambient water quality conditions at a proposed project area will be determined by Zone 7 of the Alameda County Flood Control and Water Conservation District at the time the project is proposed, with the cost borne by the project proponents. Ambient conditions apply to the water-bearing zone with the highest quality water.

Waters designated for use as domestic or municipal water supply shall not contain concentrations of chemicals in excess of natural concentrations or the limits specified in California Code of Regulations, Title 22, Chapter 15, particularly Tables 64431-A and 64431-B of Section 64431, Table 64444-A of Sectiion 64444, and Table 4 of Section 64443.

Target Water Quality Values for CALFED Urban Water Quality Parameters of Concern

Parameter of Concern	Delta
Bromide	<50 mg/l [a]
Nutrients (Nitrate)	10 mg/l [b]
Pathogens	See attached discussion and table [a]
Salinity(TDS)	500 mg/l [c]
TOC	<3mg/l [a]
Turbidity	0.5 or 1.0 NTU [b]

a California Urban Water Agencies. December 1996. Draft Bay Delta Drinking Water Quality Criteria.

b US EPA. 1995. Current MCL.

c US EPA. 1995. Secondary MCL.

4) Limiting TOC concentrations were not estimated because of the limited availability and robustness of the data illustrating the impact of TOC on bromate formation, in the presence of bromide. It should be recognized, however, that higher TOC concentrations translate to higher ozone dosages to meet a given disinfection criterion and thereby can result in higher bromate formation. This is empirically validated in reviewing bromate formed during settled water ozonation as opposed to raw water ozonation. When TOC concentrations typically are lower at a given facility, ozone dosages to achieve a given disinfection requirement are lower, and measured bromate concentrations are lower. Lower pH in settled water also helps reduce bromate concentrations.

The expert panel recognizes that there are variations in bromate production data and therefore looked for indications relating to threshold behavior. That is, evaluating source water bromide concentrations which result in a clear increase in bromate concentrations for a given set of ozonation conditions. Given some variation in the formation of bromate reported at lower source water bromide concentrations (< 50 µg/L), the expert panel took a position of plausible conservatism.

4.3 SUMMARY

Table 4.2 summarizes projected source water quality requirements for TOC and bromide, depending upon the technology applied. In reviewing the values presented in this table, it is evident that there are various water quality constraints for TOC and bromide depending upon the technology used and the level of microbiological inactivation required. As stated previously, which technology is implemented is agency-specific, and is dependent upon a host of constraints related to cost, permitting issues and residual disposal. In some instances, lowering the ozonation pH with acid may not be feasible as a result of the inability to transport and store the chemicals necessary. Lower pH could also have an impact on the structural integrity of concrete basins, such as flocculation basins, sedimentation basins, and ozone contactors. On the other hand, ozonating at a pH of 7.0 to 7.2 may be possible without acid feed if settled water ozonation can be implemented. Existing plant hydraulic conditions and site issues affect this alternative.

Source: California Urban Water Agencies. December 1996. Draft Bay Delta Drinking Water Quality Criteria.

TABLE 4.2

SUMMARY OF SOURCE WATER QUALITY CONSTRAINTS[1]

TREATMENT SCENARIO / DISINFECTION STRATEGY	MICROBIAL INACTIVATION REQUIRED					
	1 Log *Giardia* Inactivation		2 Log *Giardia* Inactivation		1 Log *Cryptosporidium* Inactivation	
	TOC (mg/L)	Bromide (µg/L)	TOC (mg/L)	Bromide (µg/L)	TOC (mg/L)	Bromide (µg/L)
Enhanced coagulation free chlorine/chloramines	<3.0 or <4.0	<200 or <50	<3.0	<100	N/A[2]	N/A[2]
Ozonation at pH 7.8 w/chloramines	N/E[4]	N/A[3]	N/E[4]	N/A[3]	N/E[4]	N/A[3]
Ozonation at pH 6.8 w/chloramines	N/E[4]	<150	N/E[4]	<50	N/E[4]	N/A[3]
Ozonation at pH 6.5 w/chloramines	N/E[4]	<200 to 250	N/E[4]	<100 to 150	N/E[4]	<50

Notes:
1. Source water quality constraints are based upon achieving 40 µg/L of TTHM, 30 µg/L of HAA5, and 5 µg/L of bromate using the treatment and disinfection conditions presented in Chapter 3.
2. N/A = Not achievable. At this time, it is considered that free chlorine can not inactivate *Cryptosporidium* at dosages practical in water treatment.
3. N/A = Not achievable. Bromide concentrations would have to be considerably less than 50 µg/L to achieve a bromate concentration of 5 µg/L. Data to determine the necessary bromide concentration relevant to this study were not available.
4. N/E = Not estimated. Limiting TOC concentrations were not estimated because of the limited availability and robustness of the data illustrating the impact of TOC on bromate formation, in the presence of bromide. It should be recognized, however, that higher TOC concentrations translate to higher ozone dosages to meet a given disinfection criterion and thereby can result in higher bromate formation.

The Panel is also aware of the significance of bromate in establishing limiting bromide levels in this evaluation. There are many factors that contribute to the uncertainty surrounding the projected numbers, including relatively few studies which have evaluated bromate formation in low bromide waters (< 50 µg/L), variations in treatment conditions which may reduce bromate formation (e.g., using both pre- and post-ozonation to reduce ozone dosages at any single location), and potentially lower CT values for ozone. It is the selected conservative (but plausible) level of 5 µg/L, however, that most keenly influences the analysis. The rationale for this level (i.e., advances in detection limit, the weight of the carcinogenic evidence, the precedence for THM and HAA5 limits in Stage 2 at half the Stage 1 levels) in this analysis may be modified by a variety of factors including:

- An allowance for disinfection - bromate trade-offs (this is the World Health Organization rationale for a 25 µg/L standard). This may be critical if an inactivation requirement for

Cryptosporidium emerges.

- A bromate versus brominated organic compound trade-off (i.e., addressing the difference between DBPs formed with ozone versus those formed with chlorine).
- Evidence of a cancer threshold for bromate (investigations underway).

On the other hand, there are other potential regulatory outcomes involving 1) the regulation of individual DBPs (rather than the groups of compounds represented by TTHM and HAA5) due to the potentially more severe health effects associated with brominated compounds, 2) the addition of other regulated HAAs (there are nine total) as analytical methods develop, and 3) the concerns over reproductive defects associated with DBPs, which may lower the regulatory levels and/or peak permissible concentrations (i.e., annual averaging may no longer be the basis for determining compliance).

Given this understanding, if flexibility were provided to all agencies to implement any of the technologies evaluated in this study to meet the potential future regulatory scenario, then it is projected that a TOC of < 3.0 mg/L and a bromide of < 50 µg/L in water diverted from the Delta would be necessary. The TOC value is constrained by the formation of total trihalomethanes when using of enhanced coagulation for TOC removal and free chlorine to inactivate *Giardia*. The bromide value is contrained by the formation of bromate when using ozone to inactivate *Cryptosporidium*.

Target Water Quality Values for CALFED Agricultural Water Quality Parameters of Concern

Parameter of Concern	Delta
Boron	< 0.7 mg/l[a]
Chloride	<4mg/l (surface irrigation)[a] <3me/l (sprinkle irrigation)[a]
Nutrients (Nitrate)	<5mg/l[a]
pH (Alkalinity)	<1.5me/l[a]
Salinity (EC_w)	<0.7dS/m or mmho/cm[a]
Salinity (TDS)	<450mg/l[a]
SAR	>0.7 EC_w - >5.0 EC_w [b]
Temperature	
Turbidity	

[a] Adapted from University of California Committee of Consultants (1974) and Ayers and Westcot (1985).

[b] SAR means sodium absorption ratio. At a given SAR, the infiltration rate increases as salinity EC_w increases. The following illustrates the relationship between SAR and Ec_w.

An SAR of 0-3 is associated with >0.7EC_w
An SAR of 3-6 is associated with >1.2EC_w
An SAR of 6-12 is associated with >1.9EC_w
An SAR of 12-20 is associated with >2.9EC_w
An SAR of 20-40 is associated with >5.0 EC_w

Table 2
Guidelines for Water Quality Ranges of Parameters for Irrigation

Parameters	Units	Water Quality for Irrigation[a] Degree of Restriction on Use			Drinking Water Standards[b] U.S. EPA			Basin Plan Water Quality Objectives - RWQCB[m]				
		None	Slight to Moderate	Severe	Primary MCL	Secondary MCL	MCL Goal	Central Valley	Tulare[l]	Ventura - Lan[n]	Santa Ana River[o]	Sac-San Joaquin
Salinity EC_w[b]	dS/m or mmho/cm	<0.7	0.7 - 3.0	>3.0				1.0[j]	1.0			1.0[r]
TDS	mg/l	<450	450-2000	>2000		500		125[j]	700	450-2000	700	
SAR[c]												
= 0 - 3	EC_w	>0.7	0.7 -0.2	<0.2								
= 3 - 6	EC_w	>1.2	1.2 - 0.3	<0.3								
= 6 - 12	EC_w	>1.9	1.9 - 0.5	<0.5								
= 12 - 20	EC_w	>2.9	2.9 - 1.3	<1.3								
= 20 - 40	EC_w	>5.0	5.0 - 2.9	<2.9								
Chloride[d,e]	µg/L					250,000		106,000[k]	175,000	100,000-355,000	175,000	
Surface irrigation	mg/L	<4	4-10	>10								
Sprinkle irrigation	me/L	<3	>3									
Boron	mg/L	<0.7	0.7 - 3.0	>3.0				0.7[k]	1.0	0.5 - 4.0	0.75	
Alkalinity ($CaCO_3$)[f]	me/L	<1.5	1.5 - 8.5	>8.5								
Turbidity	NTU				0.5 or 1.0						20%[p]	
Temperature	Deg F							55-70[k]			Varies[q]	
Nutrients												
Nitrate[g]	mg/L	<5	5 - 30	>30						10	10	

[a] Adapted from University of California Committee of Consultants (1974) and Ayers and Westcot (1985). The basic assumptions of the guidelines are discussed following these notes.

[b] EC_w means electrical conductivity of the irrigation water, reported in mmhos/cm or dS/m. TDS means total dissolved solids, reported in mg/l.

[c] SAR means sodium adsorption ratio. SAR is sometimes reported by the symbol RNa. See Ayers and Westcot* Figure 1 for the SAR calculation procedure. At a given SAR, infiltration rate increases as salinity EC_w increases. Evaluate the potential permeability problem by SAR and ECw in combination. Adapted from Rhoades* and Oster and Schroer*.

[d] For surface irrigation, most tree crops and woody plants are sensitive to sodium and chloride; use the values shown. Most annual crops are not sensitive; use the salinity tolerance in Ayers and Westcot* or equiv.

[e] For overhead sprinkle irrigation and low humidity (<30 percent), sodium and chloride greater than 70 or 100 mg/l, respectively, have resulted in excessive leaf adsorption and crop damage to sensitive crops, see Ayers and Westcot*.

[f] Overhead sprinkling only.

[g] NO_3 - N means nitrate nitrogen reported in terms of elemental nitrogen.

[k] J. B. Marshak, 1995. California Regional Water Quality Control Board, Central Valley Region. A Compilation of Water Quality Goals.

[j] Export value from multiple scenarios presented in Central Valley Basin Plan. Value varies with time of year, location, and water year type.

[l] Central Valley Basin Plan, Table III-3, assumes 90 percentile value.

[k] Central Valley Basin Plan, Table III-4.

[l] Tulare Basin Plan for mineral quality of irrigation water that may recharge to good quality ground waters.

[m] Water Quality Control Plan for the San Diego Basin, Table 3-1 cites criteria identified to "Water Quality for Irrigation" in this table.

[n] Water Quality Objectives Table 3-8 Beneficial Use Categories in Ventura Basin Plan.

[o] Water Quality Control Plan for Inland Surface Waters in Santa Ana River Basin.

[p] For the 0 - 50 NTU range a 20% increase is allowed.

[q] Cold waters increases < 5 deg F, Warm waters shall remain < 90 deg F June thru Oct and > 78 deg F the rest of the year. Lake temps shall not be raised more than 4 deg F.

[r] For export waters based on the 1991 Bay-Delta Plan.

Source: Water Quality Criteria for Agricultural Supply.

Attachment C
Comments

SUMMARY OF COMMENTS RECEIVED ON THE CALFED WATER QUALITY TECHNICAL PROGRAM

As of January 31, 1997

For additional information contact:
Rick Woodard (916)653-5422
or
Sarah Holmgren (916)921-3546

March 4, 1997

D-034813

Comments on CALFED Water Quality Program

Topic	Comment	Person	Date
Analytical Plan	Supplement this study plan with a timeline and budget.	Linda Mercurio *Mining Remedial Recovery Company*	11/27/96
Linkages	It is not clear how all the programs and reports mentioned on this page relate to one another. Nor is it clear from where and how (i.e., various ways) projects/studies or action items will be submitted to the WQTWG. How were and who originated the "studies currently planned as part of the Common Water Quality Program"?	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Modeling Approach	With regards to the modeling technical support team - it is important that any water quality models which are developed be thoroughly validated with real-life monitoring data.	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Process	I would caution that before the process gets too far down the road, due consideration be given to the development of a broader based approach to developing potential solutions to many problems of water quality in the Bay-Delta as opposed to the development of narrowly defined steps that may not be practical or achievable.	Walter Ward *Modesto Irrigation District*	11/26/96
Process	I think it would be helpful to have written guidelines for each homework assignment.	Jeanette Thomas	11/26/96
Process	To effectively design and implement remediation measures, it is necessary to identify and quantify sources of acid mine drainage (AMD). However, data and models alone will not improve the health of the Bay-Delta system. Perform mathematical modeling only as necessary or feasible. Moderate control measures including surface water diversions, waste rock covers, and anoxic limestone can be constructed without extensive modeling.	Linda Mercurio *Mining Remedial Recovery Company*	11/27/96
Process	Need to identify where the most technical knowledge is in a particular domain, and request that these people develop technical issues related to that domain.	Ted Roefs	12/4/96
Reference List	The San Joaquin Valley Drainage Program report should be used and added to our reference list.	Ted Roefs	12/4/96

Stakeholder Involvement	I recommend contacting additional representatives from active and inactive mining interests. The CALFED process could benefit significantly from additional expertise.	Linda Mercurio *Mining Remedial Recovery Company*	11/27/96
Stakeholder Involvement	Will input from mining experts be sought in the development and evaluation of proposed control measures for mine drainage remediation?	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Stakeholder Involvement	Ciba Crop Protection would like to be involved in this process, as one of our products, diazinon, is listed in your "Parameters of Concern".	Dennis Kelly *Ciba-Geigy Corporation*	12/4/96
Stakeholder Involvement	It is the District's understanding that only a very few members of the Agricultural Water Quality Workgroup were available to participate in the composite ranking process due to scheduling conflicts. Given the importance of full and complete input from this group and our concerns, the District requests this group be reconvened and their input obtained upon CALFED's completion of the changes delineated above.	David Orth *Westlands Water District*	12/6/96

Comments on CALFED Water Quality Parameters of Concern

Topic	Comment	Person	Date
Addition	Monocyclic aromatic hydrocarbons (MAHs) should be added based on Spies work with starry flounder and the Cooperative Striped Bass Study.	Phyllis Fox	9/22/96
Addition	Arsenic should be added. Arsenic water quality exceedences are reported in: Metals Implementation Project: Metals Monitoring of Central Valley Reservoir Releases: 1991-1992 (Goetzl and Stephenson, 1993). That report shows that 3 out of 4 samples collected from the upper Sacramento River at Dunsmuir and Delta and 2 out of 4 samples collected from the Pit River at Highway 299 and Bend exceeded the water quality objective of 5 µg/l. Frequent exceedences have also been reported in the lower watershed in the Coordinated Water Quality Monitoring Program.	Phyllis Fox	9/22/96
Addition	Simazine (also known by the trade name Princep) should be considered by the Ecosystem Water Quality Group as a parameter of concern. We understand Simazine was considered by the Group for inclusion because it is widely detected, but that it was dropped because detected concentrations are less than the LC 50's for aquatic species. While we understand and agree with the basic logic, we believe the Group's consideration is incomplete. Our concern is with the potential impact of Simazine on aquatic plants which are an integral part of the ecosystem and have, in many instances, declined significantly in and upstream of the Delta for undetermined reasons. While we understand this situation may not have been considered to date, we feel it warrants thorough evaluation and inclusion on the list until such time this can be scientifically ruled out.	David Orth *Westlands Water District*	12/6/96
Addition	Chlorine should be considered by the Ecosystem Water Quality group as a parameter of concern. We understand the Group may not have fully considered chlorine in its deliberations. Chlorine is acutely toxic to many aquatic organisms at very low concentrations and is widely used as a disinfectant in wastewater treatment processes. The District believes the Group should reconsider this matter.	David Orth *Westlands Water District*	12/6/96

Addition	The District believes bacteria and viruses should be reconsidered by the Group and left on the list until such time as they can be conclusively ruled out as a parameter of concern. Recent efforts by UCD to evaluate Delta smelt and the captive broodstock program for winter-run salmon at Bodega Marine Laboratory have experienced significant, in some cases near total, mortality as a result of various water-borne diseases in Delta and tributary waters.	David Orth *Westlands Water District*	12/6/96
Addition	We believe boat exhaust was not even considered by the Group. Given the byproducts of gasoline emission can be toxic and carcinogenic, this parameter should be added to the list until such time as detailed evaluation can eliminate it.	David Orth *Westlands Water District*	12/6/96
Carbofuran, Chlorpyrifos	Carbofuran is listed as an urban pesticide pollutant, whereas it is a restricted material and is not available to urban users. Chlorpyrifos, is available for domestic use. Please correct the documentation in question.	John Sanders *Dept. of Pesticide Regulation*	1/20/97
Process	I don't think each subteam used the same criteria for developing parameters of concern. Why are there no parameters of concern for salinity, chlorides, nutrients, and SAR for the San Joaquin and Sacramento rivers? They don't only cause problems for the Delta and the problems don't start in the Delta.	Jeanette Thomas	11/26/96
Process	My suggestion would be to look at the parameters in 2 groups: Basin Plan Parameters and Non-Basin Plan Parameters. This group could accept the basin plan parameters. A discussion should take place on those parameters included on this table, but not included in a basin plan and consensus reached on its inclusion for this table. Then this group needs to identify any areas which were not addressed (such as salinity for the San Joaquin River).	Jeanette Thomas	11/26/96
Process	The process needs to better integrate the parameters of concern from the 3 separate subgroups in such a way that does not allow a bias of a particular subgroup to outweigh the others input. I would suggest that the CALFED staff use information provided by the 3 subgroups and develop a standardized review of each item instead of attempting to develop a "top ten list". There is probably no equitable method of weighting the scores from each group, especially if individuals within each group ranked the list from a different direction, i.e. some with their group "hat" on and others "hatless".	Walter Ward *Modesto Irrigation District*	11/26/96

Process	We do not agree with the approach used to identify the Parameters of Concern.....A comprehensive process is now in place to both identify currently used pesticides associated with the surface water concerns and establish numeric targets, including water quality objectives, if appropriate. This is described in detail in the Management Agency Agreement between the DPR and the SWRCB. In our opinion, the draft listings of Parameters of Concern and Acceptable Ranges do not meet the standards of process or science that already exist for that purpose and are appropriate for these pesticides.	Bryan Stuart *DowElanco*	1/10/97

Comments on CALFED Water Quality Ranges

Topic	Comment	Person	Date
Title	Agree with changing title from "Acceptable Ranges" to "target".	Jeanette Thomas *Stockton East Water District*	11/26/96
Title	The District is happy to hear that the title of this table will be changed, because it would have serious concerns with the words "Acceptable Ranges".	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Title	Change the title to "Target Levels" or "Criteria and Guidelines".	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Title	CUWA recommends that CALFED not use the term "acceptable ranges" and suggests that "desirable targets" more adequately describes the values presented for each parameter of concern.	Byron Buck *CUWA*	12/4/96
Title	The title states "ranges", but the document frequently lists specific, singular, numerical values. In some instances such a value may be appropriate, such as a threshold water quality concentration for chronic or acute aquatic toxicology. In other instances, such as dissolved oxygen levels, a singular value may be desirable as a "target" although some lower value my be acceptable, e.g. dissolved oxygen levels of 6000 µg/l from Turner Cut to Stockton on the San Joaquin River is desirable but 4000 µg/l is acceptable (although not necessarily consistently attainable) for adult salmon passage.	David Orth *Westlands Water District*	12/6/96
General	I have concerns about using numerical parameters that are not in the basin plan. I need a better understanding of how these parameters will be used before I could consider accepting them.	Jeanette Thomas *Stockton East Water District*	11/26/96
General	I have concerns about using MCLs specified in Title 22 of the California Code of Regulations which apply to drinking water (after treatment in the case of surface water) for raw water parameters. I agree that the closer the raw water is to the MCL the easier it is to produce drinking water that meets these criteria. With treatment, water above these criteria can also be acceptable.	Jeanette Thomas *Stockton East Water District*	11/26/96

General	The Ag Sub-Team wanted the ag water parameters set for the most sensitive crop grown in the region. The ag parameters are for the Delta only. Ag parameters need to be detailed for San Joaquin and Sacramento rivers.	Jeanette Thomas *Stockton East Water District*	11/26/96
General	It is too early in the process and probably not the charge of CALFED to develop numeric standards. The outlined approach is too specific. At this point in the planning process it would be better to capture a broad range of parameters and not identify specific concentrations.	Walter Ward *Modesto Irrigation District*	11/26/96
General	The water quality parameters of concern should be refined into goal and objective statements, not "shall not exceed" language for specific parameters or ions.	Walter Ward *Modesto Irrigation District*	11/26/96
General	In addition, and perhaps more importantly, the water quality parameters will have to be measurable in order to weigh various alternatives against one another and must be practical and achievable in the field. Otherwise, the work is too detailed to be implemented and it will be very difficult to achieve concurrence with the group.	Walter Ward *Modesto Irrigation District*	11/26/96
General	Many of the values listed in the table are not legally adopted objectives and, as such, have not been deemed acceptable from a legal, scientific or policy perspective. The process of adopting legally enforceable objectives forces consideration of numerous factors, including but not limited to scientific validity and/or uncertainty, risk level, attainability and economic effect. First footnote in the table should clearly state which values are legally enforceable objectives and which are not. The footnote should also state that values which are not objectives should not be used to imply beneficial use impairment or adverse water quality impacts.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
General	CUWA also believes that all values in the table should be expressed as less than or equal to the subject number (except pH and DO).	Byron Buck *CUWA*	12/4/96
General	CALFED should adopt concentration-based water quality objectives instead of load-based objectives for salts, boron, and other constituents with the exception of the bioaccumulative constituents.	Manucher Alemi *San Joaquin Valley Drainage Implementation Program*	12/4/96
General	Under footnote x, a clarifying sentence, namely H = ln hardness should be added.	Carol Atkins *State Water Resources Control Board*	12/4/96

General	The District is concerned with the language in many of the footnotes linked to the "ranges" in the list. In many instances these footnotes state "shall not be greater than". This is an absolute term and does not express the flexibility of a "range". The District requests such absolute language be removed unless it only applies, and is so noted, to the lower limits of acceptable ranges to be determined.	David Orth *Westlands Water District*	12/6/96
General	We do not agree with the approach used to identify the Parameters of Concern or the search for Acceptable Ranges for different pesticides. The Regional Board Basin Plan expressly provides toxicity standards which eliminate some of the potential misinterpretations mentioned above.	Bryan Stuart *Dow Elanco*	1/10/97
General	After extensive comment and deliberation between several State agencies, a comprehensive process is now in place to both identify currently used pesticides associated with surface water concerns and establish numeric targets, including water quality objectives if appropriate. This is described in detail in the Management Agency Agreement between the DPR and the SWRCB.	Bryan Stuart *Dow Elanco*	1/10/97
General	In our opinion, the draft listings of Parameters of Concern and Acceptable Ranges do not meet the standards of process or science that already exist for that purpose and are appropriate for these pesticides. While this concern may not be applicable for potential sources of toxicity that lack a specific science based regulatory infrastructure or proprietary ownership by a registrant, it is an objections we feel compelled to reemphasize.	Bryan Stuart *Dow Elanco*	1/10/97
General	Acceptance of interim water quality standards, even those characterized as "targets", without a flexible mechanism to further assess and update such values creates final water quality criterion by default.	John Jachetta *Dow Elanco*	1/10/97
Hardness Equations	Footnote c is incorrect. Hardness concentrations in mg/l should read: $Cu = e^{(0.905)(\ln \text{hardness}) - 1.62} \times 10^{-3}$ $Zn = e^{(0.830)(\ln \text{hardness}) - 0.289} \times 10^{-3}$ $Cd = e^{(1.160)(\ln \text{hardness}) - 5.777} \times 10^{-3}$	Linda Mercurio *Mining Remedial Recovery Company*	11/27/96
Hardness Equations	Under footnote c, the hardness equations for cadmium, copper and zinc appear to be written incorrectly. Namely, the subtraction should occur in the superscript of the exponential and multiplication should be by 10 to the minus 3 power. The equations should read as follows: $Cu = e^{(0.905)(\ln \text{hardness} - 1.612)} \times 10^{-3}$ $Zn = e^{(0.830)(\ln \text{hardness} - 0.289)} \times 10^{-3}$ $Cd = e^{(1.160)(\ln \text{hardness} - 5.777)} \times 10^{-3}$	Carol Atkins *State Water Resources Control Board*	12/4/96

EPA values	The EPA criteria shown in the table are not legally enforceable in the Sacramento, San Joaquin or Delta at the present time. Such criteria are expected to be proposed in 1997 by EPA as part of the California Toxics Rule. Enforceable standards based on these EPA criteria will not be adopted in California until late 1997 or 1998.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
EPA values	It is not clear what "general EPA guidelines" means. The Federal Register (May 4, 1995) standards are applicable nationwide, while the Great Lakes criteria are currently only applicable to Great Lakes states. There, however, does not seem to be a reason why the recalculated criteria should not be considered for acceptable ranges.	Carol Atkins *State Water Resources Control Board*	12/4/96
Boron	For values on the San Joaquin River, see water quality objectives on page III-3.00 of the Basin Plan.	Chris Foe, Rudy Schnagel	11/21/96
Boron	What is the rationale for not using the boron objective in the CVRWQCB Basin Plan?	Carol Atkins *State Water Resources Control Board*	12/4/96
Bromide	There are a number of uncertainties in the estimate of the bromide concentration limit, which is assumed to correspond to a bromate concentration of 0.005 mg/l in the treated water. The relationship between bromate concentration in the treated water and bromide concentration in the source water is quite variable, even among different CUWA facilities using the same source water. There are also very little data at low bromide concentration.	Richard Denton *Contra Costa Water District*	1/14/97
Cadmium, Copper, Zinc	It is not clear where the ranges for cadmium - below Hamilton City, cadmium-San Joaquin River, cadmium-Delta, copper-San Joaquin River, and Zinc-San Joaquin River.	Carol Atkins *State Water Resources Control Board*	12/4/96
Chlordane	Basin Plan says no detectable chlorinated hydrocarbons in water. Please change.	Chris Foe, Rudy Schnagel	11/21/96
Chloride	State Board has salinity objectives for delta waters.	Chris Foe, Rudy Schnagel	11/21/96
Chloride	CUWA recommends that CALFED adopt a desirable target for chloride of a 10 year average of 55 mg/L and a monthly average of 110 mg/L. This will comply with the State Water Project (SWP) contract objective.	Byron Buck *CUWA*	12/4/96

Chlorpyrifos	CALFED should recognize that any Water Quality Acceptable Range for chlorpyrifos developed at this point in time is provisional and may need adjustment as the database is clarified.	John Jachetta *Dow Elanco*	1/10/97
Chlorpyrifos	Chlorpyrifos is subject to rapid dissipation in the aquatic environment. In the case of chlorpyrifos, the short half-life and sporadic pattern of detection in the Sacramento and San Joaquin Rivers may support an acute criterion; however, the establishment of interim chronic values, in the absence of freshwater data or exposure information is not supportable.	John Jachetta *Dow Elanco*	1/10/97
Chlorpyrifos	DowElanco ecotoxicologists, using a comprehensive database and stringent interpretation of USEPA Tier I guidance, have developed a chlorpyrifos FAV of 0.129 µg/L. We do believe that the development of water quality standards using the probabilistic approach outlined by the Aquatic Risk and Mitigation Dialogue Group is more consistent with current science and may be considered as an alternative goal for the CALFED Water Quality Team. Such an approach develops a more realistic risk assessment by looking at probable exposure in addition to potential effect. In addition, the development of a more proactive plan, such as that proposed by the Western Crop Protection Association for the Univ. of Calif. system Best Management Practice research, education, and outreach program may be a more productive use of CALFED resources. If, however, CALFED chooses to use a USEPA Tier I standard, we suggest that the 0.129 µg/l value be adopted as the interim WQAR for chlorpyrifos.	John Jachetta *Dow Elanco*	1/10/97
Chlorpyrifos	The CALFED Water Quality Team appears to have chosen the interim freshwater Water Quality Criteria developed by the CDFG to define the proposed acceptable ranges for chlorpyrifos. Although these guidelines provide a method for the determination of both acute and chronic criterion, DFG developed an interim chronic value only; this value was described as interim because of insufficient data. While the short half-life of chlorpyrifos (>90% degradation within 48 hours) and sporadic pattern of detection in the Sacramento and San Joaquin Rivers may support an acute criterion, the establishment of a chronic value, in the absence of exposure information, is not supportable.	John Jachetta *Dow Elanco*	1/10/97

Copper, Cadmium, Zinc	Adjust the acceptable ranges downstream of Hamilton City. Currently, the EPA guideline for these metals are applied to the delta, San Joaquin River, and Sacramento River downstream of Hamilton City, while CVRWQCP limits are applied upstream of Hamilton City. As a result, acceptable cadmium concentrations are an order of magnitude higher downstream of the Highway 32 bridge than upstream of the bridge. Should use a less arbitrary and more digital application of these standards to better reflect the beneficial uses of the bay-delta system.	Linda Mercurio *Mining Remedial Recovery Company*	11/27/96
DDT	Basin Plan says no detectable chlorinated hydrocarbons in water. Please change.	Chris Foe, Rudy Schnagel	11/21/96
Mercury	Consider use of the FDA action level of 1.0 mg/kg for mercury in fish tissue.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Pathogens	To balance disinfection requirements for controlling pathogens with the production of disinfection by-products, sources of pathogens should be located away from drinking water intakes. Desirable targets of less than 1 oocyst/100L for *Giardia* and *Cryptosporydium* in raw water supplies should be used by CALFED in evaluating actions.	Byron Buck *CUWA*	12/4/96
Pathogens	Due to the possibility of more stringent future regulations on both pathogens removal (especially Cryptosporidium) and disinfection by-products, urban water agencies might be required to turn to ozonation, and a source water concentration as low as 0.050 mg/l bromide might be required to meet these future regulations.	Richard Denton *Contra Costa Water District*	1/14/97
pH	There are objectives in the Basin Plan.	Chris Foe, Rudy Schnagel	11/21/96
Salinity	State Board has salinity objectives for delta waters. See agriculture and other uses in Basin Plan, Table III-5 for Sacramento and San Joaquin Rivers.	Chris Foe, Rudy Schnagel	11/21/96
Sediment Values	Consider use of ERMs or other sediment values in lieu of ERLs. If ERLs are shown, show a range consisting of ERL to ERM sediment values.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Selenium	Selenium Action Level for SFWQCB = 0.06 - 1.1 µg/l	Phyllis Fox	9/20/96

Selenium	The water quality objectives for North and South of the Merced River on the San Joaquin River are not final. They are subject to Office of Administrative Law (OAL) approval. Approval by the OAL is expected within the next few weeks.	Chris Foe, Rudy Schnagel	11/21/96
TDS	CUWA recommends that CALFED adopt a desirable target for TDS of a 10 year average of 220 mg/L and a monthly average of 440 mg/L. This will facilitate local wastewater reclamation and conjunctive use projects and comply with the SWP contract objective.	Byron Buck *CUWA*	12/4/96
Temperature	The document proposes a standard of < 56°F for the river reach from Keswick Dam to Hamilton City. The 1993 Winter Run Salmon Biological Opinion issued by NMFS for operation of the Central Valley Project contains temperature control criteria between Keswick and Red Bluff Diversion Dam--many miles upstream of Hamilton City. ..... Since 1992 it has been demonstrated time and again that it is impossible to consistently achieve, much less maintain < 56°F even at RBDD. ..... The proposed criteria is unattainable and should be deleted, and the 1993 Biological Opinion should be cited as the appropriate level of temperature control on the upper Sacramento River.	David Orth *Westlands Water District*	12/6/96
Temperature	Temperature standards farther downstream on the Sacramento River are even farther beyond the control of the state and federal water projects than that described above. Again, temperature in the lower river, such as I Street Bridge and Freeport are a function of climate and natural hydrology. Any temperature standards are completely beyond the ability of the projects to control or regulate and therefore arbitrary and capricious and should be eliminated in their entirety.	David Orth *Westlands Water District*	12/6/96
Temperature	For the San Joaquin River temperature standard at Vernalis we restate our comments above. The State Water Resources Control Board has determined in the past that it is unreasonable to try to control temperature in the lower San Joaquin River.	David Orth *Westlands Water District*	12/6/96
Temperature	The temperature differential standard for the area west of Antioch Bridge, providing for a maximum allowable differential of discharge waters of <5°C (11°F) may be inadequate. Several aquatic species, such as Delta and long fin smelt, are extremely sensitive to thermal shock as demonstrated in studies at UCD. The District recommends that an allowable differential be set at <3°C (5.4°F) to provide adequate protection of sensitive native species at critical life stages.	David Orth *Westlands Water District*	12/6/96

Toxaphene	Basin Plan says no detectable chlorinated hydrocarbons in water. Please change.	Chris Foe, Rudy Schnagel	11/21/96
Turbidity	CUWA recommends 50 NTU as a desirable target for turbidity to improve treatment reliability. Use of the maximum contaminant level of 0.5 or 1.0 NTU is not appropriate for raw water supplies.	Byron Buck *CUWA*	12/4/96

Comments on CALFED Water Quality Actions

Topic	Comment	Person	Date
Action Addition	An action for mining and urban specific to mercury should be added to the list.	Chris Foe	12/5/96
Action Addition	Add an action for sediment transport into major reservoirs. Look at ways to decrease sediment transport into reservoirs so that the longevity of the dam and reservoir is maintained.	Chris Foe	12/5/96
Action Addition	There needs to be a separate action that addresses mercury.	Frank G. Zalom *University of California, Davis*	12/8/96
Action Addition	There needs to be a separate action for pesticides and salt.	Frank G. Zalom *University of California, Davis*	12/8/96
Action Addition	Here is a suggested write-up for a pesticide action. The integrated pest management action should be included under this action. *Reduce surface water concentrations of pesticides that are present at levels that have reasonable potential to cause or contribute to adverse impacts to aquatic communities.* *Study steps:* 1. *Summarize existing data to establish water quality conditions in the Delta and principle tributaries.* 2. *Determine which pesticides are present at levels that need to be reduced.* 3. *Establish a program to develop and evaluate practices that can be implemented to reduce pesticide levels.* 4. *Establish a program to assure that appropriate practices are, in fact, implemented.* 5. *Establish a monitoring program to 1) evaluate the success of implemented management practices in reducing levels of pesticides of concern, and 2) determine whether other pesticides are present at levels that warrant attention.*	Frank G. Zalom *University of California, Davis*	12/8/96

Action Description	Reduce Urban Pollutant Loadings by Source Control. The description of this action refers only to urban stormwater runoff loadings, not urban loading in general. The title should be revised.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Action Description	Reduce Urban Pollutant by Better Planning of New Construction. Use of the words "better planning" presents that current efforts are deficient. The District suggests substituting the words "Implementation of Additional Control Measures for New Construction".	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Action Description	Reduce Urban Pollutant by Better Planning of New Construction. Information on the water quality benefit to be achieved through changes in control measures for new construction is lacking. Again, the prioritized list will be weakly supported.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Action Description	For pesticide reduction by source control, include the SWRCB in points #5, 6, and 7.	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Action Description	CUWA recommends that the action statement for Mine Drainage Remediation be rewritten as follows: "Reduce tributary and Delta heavy metals loadings by implementation of moderate onsite mine drainage remediation/control measures using relevant on-going and pending control programs as guides. Fund remediation through pollution-credit trading e.g., reduce loadings from mines in lieu of more costly, but less effective, wastewater treatment plant upgrades or other means".	Byron Buck *California Urban Water Agencies*	12/4/96
Action Description	CUWA recommends that the action statement for Undertake Toxicity Bioassay and Identification Testing be rewritten as follows: "Reduce pollutants adversely impacting aquatic resources by using toxicity test measurements to target point and non-point source control efforts".	Byron Buck *California Urban Water Agencies*	12/4/96

Action Description	We recommend that item 4 in the study steps be rewritten as follows: "Conduct toxicity identification/reduction evaluations (TI/REs) at those locations at which unacceptable toxicity is measured. Develop appropriate control programs based on TI/RE results".	Byron Buck *California Urban Water Agencies*	12/4/96
Action Description	We understand the need to provide more information on each of the Actions but we urge you to forge ahead with more detailed analysis of high priority actions.	Byron Buck *California Urban Water Agencies*	12/4/96
Action Description	The descriptions of proposed actions are in some cases vague, incomplete, inaccurate, overly broad and inclusive of multiple actions. This makes assessment and prioritization difficult at best and in many cases impossible. It is our understanding that CALFED is in the process of compiling more concise descriptions of proposed actions. It is the District's position that such descriptions, modified as delineated above should be completed and circulated to the committee for reevaluation of all rankings prior to finalization of this process.	David Orth *Westlands Water District*	12/6/96
Action Description	In "study step" #4, I would really like to see UC research and extension staff mentioned specifically as among the integrated pest management experts that should be consulted.	Frank G. Zalom *University of California, Davis*	12/8/96
Action Description	The mine remediation action should focus on abatement at abandoned mine sites. Following is a suggested rewrite of the action. *Reduce tributary and Delta heavy metals loadings by implementing moderate remediation measures at abandoned mine sites (i.e., sites that do not have responsible parties) that contribute significant loads to the Delta or cause significant impacts to aquatic resources associated with the Delta ecosystem (i.e., salmon, steelhead, striped bass). Pollution - credit trading should be used to facilitate remediation.*	Frank G. Zalom *University of California, Davis*	12/8/96
Action Description	Under Section D, Watershed Coordination, in your December 18, 1996 memorandum, item #4 should read "Implement recommendations" rather than "Utilize recommendations". CALFED should encourage active implementation of source reduction actions.	Richard Denton *Contra Costa Water District*	1/10/97

Action Description	Surface Drainage Source Control Agricultural Drainage. The introduction to this section suggests implementing Integrated Pest Management (IPM) "especially for parameters of concern." In fact, the three currently used pesticides listed as parameters of concern are often employed as IPM tools for pest control. A more accurate statement of the project objective would be to implement BMPs within an IPM strategy to mitigate concerns related to pesticide use, off-site transport and aquatic toxicity. These BMPs should not be focused on Parameters of Concern, rather they should target agronomic practices which lead to aquatic toxicity endpoint of concerns.	Bryan L. Stuart, Ph.D. *DowElanco*	1/10/97
Action Description	This section suggests that the project "should result in reduced pesticide loads applied to land." This would be true if implementation of an improved IPM approach eliminated unnecessary pesticide use (an outcome we would welcome). However, in some cases, the opposite may be true. In a highly targeted necessary application, a greater percentage of that application remains on the field rather than being lost by off-site transport into the aquatic environment.	Bryan L. Stuart, Ph.D. *DowElanco*	1/10/97
Action Descriptions	May of the action items need to be re-written in order to better define intent. It appears that several of the items could be consolidated into a single action item of a common concern. For example, action items 1 through 16 are all related to the agricultural drainage problem on the west side of the San Joaquin Valley.	Walter Ward *Modesto Irrigation District*	11/26/96
Action Descriptions	During the 11/20 meeting concerns arose while the agricultural water quality sub-team was ranking the action items. The ag group did suggest some revisions.	Jeanette Thomas	11/26/96
Action Modification	The linkage between the individual sub-groups water quality problem statements and objective statements seems to have broken down when compared to what has been compiled into the proposed 32 action items.	Walter Ward *Modesto Irrigation District*	11/26/96
Action Modification	Overall, the District feels the outcome of this effort is sufficiently important to warrant modifying the list, taking the extra steps described above and recirculating for additional review and reconsideration.	David Orth *Westlands Water District*	12/6/96
Action Prioritization	Source Control By Watershed Management. Prioritization of watershed management projects will be very subjective.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96

Action Prioritization	I want to emphasize the importance of keeping Action Items #31, 11, and 32 in the priority list. For the SWRCB, these are extremely critical actions which our budget cannot currently cover.	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Action Prioritization	The District is concerned with the emphasis on San Joaquin River and the general composition of the list of actions in the current form. We are also concerned with the "top ten" actions initially targeted for recommendation to CALFED.	David Orth *Westlands Water District*	12/6/96
Action Prioritization	Action item rankings can vary significantly by region. The listing should be restructured regionally as Sacramento Valley, in-Delta, east bay, north bay, south bay, San Joaquin Valley east side, and export area, in many instances	David Orth *Westlands Water District*	12/6/96
Action Prioritization	Prioritization as low, moderate, or high can be affected by the time frame in which an action is contemplated. The District recommends the list be restructured and recirculated with three prioritization time frames: 1-2 years, 3-5 years, 5-10 years, and 10-24 (year 2020) years.	David Orth *Westlands Water District*	12/6/96
Action Prioritization	The action list and prioritization does not explicitly address technical or financial feasibility or probability of success. These factors should be included in a reassessment of the list. The District suggests that technical feasibility and probability of success be ranked numerically, say 1-5, and financial feasibility include some degree of cost analysis leading to a unit cost for the action to enable comparison and feasibility assessment.	David Orth *Westlands Water District*	12/6/96
Approach	The action plans need to be conceptual in their framework and focus more upon "what to achieve" as opposed to "how to achieve" a desired goal as the plans are now formulated. I believe that too much emphasis is placed on agricultural drainage issues without identifying the broader concern which is to keep the dissolved salts out of the San Joaquin River in the first place. In general, it is runoff resulting from all types of land uses that contributes to the pollution of the Bay-Delta.	Walter Ward *Modesto Irrigation District*	11/26/96
Data Limitations	Pesticide Reduction by Land Fallowing. Due to data and information limitations, it is doubtful whether a prioritized list of land to be retired can be developed which will withstand critical review, especially where the findings are contentious. This seems to be overstepping the capability of current knowledge.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96

Data Limitations	Reduce Urban Pollutant Loadings by Source Control. Again, the summary and analysis of stormwater discharge data and associated receiving water data for all communities in the Central Valley is a very large effort. It may be necessary to select several programs with the best data, prepare estimates for those areas, and extrapolate the results through the valley.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Data Limitations	Reduce Urban Pollutant Loadings by Source Control. Information on the effectiveness of stormwater BMP's is lacing. Progressive programs are just now developing this information, in pieces.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Data Limitations	Reduce Urban Pollutant Loadings by Source Control. The prioritization of stormwater source control measures will be compromised by data limitations.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Data Limitations	Source Control By Watershed Management. Many watershed management programs are now in the developmental stage. Hard information from these programs regarding water quality and ecological resources will be rare. Information on control measures and effectiveness has typically not been developed yet.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Data Limitations	Undertake Toxicity Bioassay and Identification Testing. Little data using sound QA/QC procedures exists, and most of that will have been obtained in the past few years. Consequently, the significant data gaps will likely be very large.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Data Limitations	Undertake Toxicity Bioassay and Identification Testing. Great care will have to be taken in identifying appropriate methods for assessing toxicity in water, and especially in sediment.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96

Diazinon, Chlorpyrifos	Several folks suggested that holding agricultural drain waters and urban runoff would allow chlorpyrifos, diazinon, and other pesticides to degrade. While this is certainly true, I question whether it would necessarily reduce toxicity because the degradation byproducts themselves are often toxic. I suggest that toxicity of transformation of byproducts be added as an issue of concern for these actions.	Phyllis Fox	9/20/96
Integrated Pest Management (IPM)	Incentives other than financial (e.g. good stewardship) should be included in this action item.	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Mine Drainage Remediation	Mine Drainage Remediation--The description for this action implies that such remediation will be largely financed through pollutant trading, funded primarily by publicly owned treatment works (POTW). Such trading agreements are complex and have little or no track record. While trading may work in some instances, its role should be significantly de-emphasized in this document.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Mine Drainage Remediation	The data which is essential to the evaluation of control measures is very limited. Results from this analysis will be very approximate and may not be adequate for prioritization of control measures.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Mine Drainage Remediation	Data limitations will also hamper water quality modeling efforts. What models are proposed for use in this effort? Are they suitable for prediction of downstream changes in levels of trace metals?	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Mine Drainage Remediation	Despite the mention of pollutant trading in the description, the study steps do not refer to trading as a financing option. The District believes this position to be wise, and prefers that pollutant trading also be eliminated from the description.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96

Pesticide Reduction by Land Fallowing	This action also includes mineral salts and microbial agents.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Pesticide Reduction by Land Fallowing	Agricultural interests at the 11/20 meeting raised significant concerns regarding the description of this action. In addition, agricultural groups have raised these and similar concerns at public meetings during Phase I of the CALFED Program, as well as at the Bay-Delta Advisory Council meetings. Appropriate responses and modifications should be made to address those concerns.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Pesticide Reduction by Land Fallowing	Data on water quality, particularly for pesticides, in rivers and drainage waters is limited.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Pesticide Reduction by Land Fallowing	Once severe drainage problems have been defined, is available information adequate to identify such problems throughout the Central Valley?	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Pesticide Reduction by Land Fallowing	Study Step 5 refers to an assessment of toxic element and organic carbon reductions as a result of land fallowing. This appears to be an expansion of the scope of this item, which is aimed at pesticides, salts, and pathogens.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Pesticide Reduction by Source Control	This action must include the development of new alternative agricultural practices. Alternative practices involving the non-use of pesticides should be included in this item. So, include development, evaluation of success (in terms of pest control and water quality protection), and outreach of alternative agricultural practices designed to reduce offsite movement of pesticides. Inclusion of outreach is essential!! Furthermore, outreach must incorporate notification of growers, irrigators, pesticide advisors, applicators, etc. that there ARE pesticide-caused water quality problems.	Victor de Vlaming *State Water Resources Control Board*	12/2/96

Pesticide Reduction by Source Control	The action description and several of the Study Steps refer to reductions in salts and microbial agents, while the title refers only to pesticides.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Pesticide Reduction by Source Control	The scope of this study effort is enormous, given the magnitude and diversity of the agricultural practices, crop types, soil types, pesticide uses, and water management practices in the Central Valley. Is there enough existing information to undertake these steps?	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Pesticide Reduction by Source Control	Data limitations will again significantly limit the ability to evaluate various control measures. The results of this effort will be highly approximate.	Jerry Troyan *Sacramento Regional Wastewater Treatment Plant*	11/27/96
Process	I feel any comments on individual action items in the Draft Analytical Plan must wait until the revisions have been made and accepted by the Group.	Jeanette Thomas	11/26/96
Process	Source Control By Watershed Management. Identification of projects which will or will not need CALFED financial support will probably not be possible.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Process	Financial Incentives for Integrated Pest Management for Agriculture. In general, the District believes that the efforts proposed by the CALFED plan should be qualified appropriately based on known limitations regarding data and simplifying assumptions which will have to be made.	Jerry Troyan *Sacramento Region Wastewater Treatment Plant*	11/27/96
Source Control by Watershed Management	This action should be coordinated and integrated with source control of pesticides and financial incentives for IPM for agriculture.	Victor de Vlaming *State Water Resources Control Board*	12/2/96

Source Control by Watershed Management	Outreach must be a component of this action item. See my comments on outreach under source control for pesticides. Alternative practices have little or no potential for success unless interested and affected parties comprehend that current practices are resulting in water quality problems. At this time, affected parties do not have this comprehension.	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Storage of Agricultural Drainage	Disagree with drainage storage, pointing out that Kesterson was conceived for this purpose.	Ted Roefs	12/4/96
Toxicity	It is toxicity testing which has and will determine compliance with Regional Water Quality Control Board toxicity water quality standards. It is TIEs which have been and will be so successful in identifying the chemical causes of toxicity in toxic water quality samples.	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Toxicity	Toxicity tests are the only relatively rapid integrative measure of all directly acting toxic chemicals in a water sample. All other tests/measures are chemical specific (i.e., do not measure additivity). Toxicity tests are the only measure of aquatic organism response to water samples and the only means of measuring bioavailability of chemicals.	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Toxicity	It is imperative that this action item be a high priority so that improvements (or further degradation) in water quality due to actions taken be assessed.	Victor de Vlaming *State Water Resources Control Board*	12/2/96
Toxicity	Toxic testing should be focused on testing specific hypotheses. Also need to take into account available methodologies.	Ted Roefs	12/4/96

Comments on CALFED Water Quality Projects

Topic	Comment	Person	Date
Project Selection	Consider expanding the review process to include additional mine remediation projects. MRRC owns several inactive copper and zinc mines in the West Shasta Mining District.	Linda Mercurio *Mining Remedial Recovery Company*	11/27/96
Project Selection	The District urges CALFED to give high priority to programs that would reduce pollutant loads from agricultural drainage and wastewater discharges. This includes implementation of best management practices on pesticide applications such as the Integrated Pest Management (Action 11, 32B) to reduce the use of pesticide within the Sacramento-San Joaquin River watershed. Other drainage programs such as reconstructing subsurface drainage systems (Action 11) and improved land use management should also be accorded high priority. These projects need to be coordinated with efforts by EPA to set up source water protection assessment guidelines as part of the Safe Drinking Water Act Amendment of 1996.	Richard Denton *Contra Costa Water District*	1/10/97
Project Selection	The District also supports the pilot projects proposed by DWR's MWQI Program to explore different approaches to treat agricultural drainage on-site and to use real-time monitoring of Delta water quality to coordinate agricultural drainage discharges. Toxicity monitoring, including bioassays, should also be included in this monitoring program.	Richard Denton *Contra Costa Water District*	1/10/97
Project Selection	The emphasis should be on funding projects that take positive steps towards actually reducing contaminant loadings and improving water quality. Basic research studies (except for pilot studies) should be given lower priority.	Richard Denton *Contra Costa Water District*	1/10/97
Project Selection	Some proposed projects need to be reviewed to see if they create other environmental problems. For example, No. 5 in the category "Surface Drainage Source Control" of "High Priority Projects" in your December 18, 1996 memo proposes to store agricultural drainage in open surface reservoirs. This could be an attractive nuisance and expose wildlife, particularly waterfowl, to high concentration of selenium.	Richard Denton *Contra Costa Water District*	1/10/97

Projects	Consider funding pilot studies to evaluate new technologies.	Linda Mercurio *Mining Remedial Recovery Company*	11/27/96
Projects	3b This study step is not clearly written.	Linda Mercurio *Mining Remedial Recovery Company*	11/27/96
Watershed Projects	The Selenium Total Maximum Monthly Load for the San Joaquin River is not really a watershed program.	Joe Karkowski *USEPA*	12/31/96
Watershed Projects	The San Joaquin NAWQA Program is not really a watershed program because there is no stakeholder involvement.	Joe Karkowski *USEPA*	12/31/96
Watershed Projects	The Salinity Management Program for the San Joaquin River may not have begun yet.	Joe Karkowski *USEPA*	12/31/96