

COMPARISON OF PROPOSED CALIFORNIA TOXICS RULE CRITERIA TO CALFED WATER QUALITY VALUES^{1,2}
(Cadmium, Copper, Mercury, Selenium, Zinc, Chlordane, DDT, PCBs, Toxaphene)

PROPOSED CALIFORNIA TOXICS RULE CRITERIA		CALFED WATER QUALITY VALUES		
PARAMETER	CRITERIA	Sacramento River	San Joaquin River	Delta
CADMIUM	<p><u>Freshwater:</u> 2.2 µg/l (4-day average concentration chronic limit)^{2,a,b,c,d} 4.3 µg/l (short term concentration acute limit)^{1,a,b,c,d,e}</p> <p><u>Saltwater:</u> 9.3 µg/l (4-day average concentration chronic limit)^{2,b,c} 42 µg/l (short term concentration acute limit)^{1,b,c}</p> <p><u>Sacramento River above Hamilton City:</u> 0.22 µg/l (maximum)^{m,a,w}</p> <p><u>Human Health:</u> EPA is not promulgating human health criteria for this contaminant regarding consumption of water and organisms and organisms only.^y</p>	<p><u>Water:</u> River and Tributaries from above State Hwy 32 bridge at Hamilton City: 0.22 µg/l^{a,c,d}</p> <p>Below Hamilton City: 2.2 µg/l (4 day average)^{a,e} 4.3 µg/l (1 hour average)^{a,e}</p> <p><u>Sediment:</u>^z 5.0 ppm (dry weight)</p>	<p><u>Water:</u> 2.2 µg/l (4 day average)^{a,e} 4.3 µg/l (1 hour average)^{a,e}</p> <p><u>Sediment:</u>^z 5.0 ppm (dry weight)</p>	<p><u>Water:</u> East of Antioch Bridge: 2.2 µg/l (4 day average)^{a,e} 4.3 mg/l (1 hour average)^{a,e}</p> <p>West of Antioch Bridge: 1.1 µg/l (4 day average)^x 3.9 µg/l (1 hour average)^x</p> <p><u>Sediment:</u>^z 1.2 ppm (dry weight)</p>

C-036947

¹ Except for the shaded criteria and footnotes, the Proposed California Toxics Rule Criteria and footnotes in this table were taken verbatim from the Federal Register, Volume 62, Number 150, dated August 5, 1997. The shaded criteria are from the RWQCB Basin Plans. USEPA is not promulgating these site-specific criteria in the California Toxics Rule because they were previously approved by USEPA and remain in effect. These criteria are included in the table strictly for your ease of reference in comparing criteria.

² Revised November 6, 1997, based on USEPA review.

<p>COPPER</p>	<p><u>Freshwater:</u> 9.0 µg/l (4-day average concentration chronic limit)^{2,a,b,c,d} 13 µg/l (short term concentration acute limit)^{1,a,b,c,d,e}</p> <p><u>Saltwater:</u> 3.1 µg/l (4-day average concentration chronic limit)^{2,b,c} 4.8 µg/l (short term concentration acute limit)^{1,b,c}</p> <p>Sacramento River above Hamilton City: 5.6 µg/l (maximum)^{1,a,b,c}</p> <p><u>Human Health Criteria:</u> 1300 µg/l (water and organisms) No value(organisms only)</p>	<p><u>Water:</u> River and Tributaries from above State Hwy 32 bridge at Hamilton City: 5.6 µg/l ^{a,c,d}</p> <p>Below Hamilton City: 10 µg/l (no hardness connection) ^{a,d,f}</p> <p><u>Sediment:</u> ^z 70.0 ppm (dry weight)</p>	<p><u>Water:</u> 9.0 µg/l (4 day average) ^{a,c} 13 µg/l (1 hour average) ^{a,c}</p> <p><u>Sediment:</u> ^z 70.0 ppm (dry weight)</p>	<p><u>Water:</u> East of Antioch Bridge: 10 µg/l (no hardness connection) ^{a,d,f}</p> <p>West of Antioch Bridge: 6.5 µg/l (4 day average) ^x 9.2 µg/l (1 hour average) ^x</p> <p><u>Sediment:</u> ^z 34.0 ppm (dry weight)</p>
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PROPOSED CALIFORNIA TOXICS RULE CRITERIA		CALFED WATER QUALITY VALUES		
PARAMETER	CRITERIA	Sacramento River	San Joaquin River	Delta
MERCURY ^{II}	<p><u>Freshwater:</u> 0.77 µg/l (4-day average concentration chronic limit)^{2,b,c,d,p} 1.4 µg/l (short term concentration acute limit)^{1,b,c,d,p}</p> <p><u>Saltwater:</u> 0.94 µg/l (4-day average concentration chronic limit)^{2,b,c} 1.8 µg/l (short term concentration acute limit)^{1,b,c}</p> <p><u>Human Health:</u> 0.050 µg/l (water and organisms)^f 0.051 µg/l (organisms only)^f</p>	<p><u>Water:</u> 0.012 µg/l (4 day average)^{b,c} 2.1 µg/l (1 hour maximum)^{a,c}</p> <p><u>Sediment:</u>^z 0.15 ppm (dry weight)</p> <p><u>Tissue:</u>^{iy} 0.5 µg/gm (whole fish, wet weight)</p>	<p><u>Water:</u> 0.012 µg/l (4 day average)^{b,c} 2.1 µg/l (1 hour maximum)^{a,c}</p> <p><u>Sediment:</u>^z 0.15 ppm (dry weight)</p> <p><u>Tissue:</u>^{iy} 0.5 µg/gm (whole fish, wet weight)</p>	<p><u>Water:</u> East of Antioch Bridge: 0.012 µg/l (4 day average)^{b,c} 2.1 µg/l (1 hour maximum)^{a,c}</p> <p>West of Antioch Bridge: 0.025 µg/l (4 day average)^x 2.4 µg/l (1 hour average)^x</p> <p><u>Sediment:</u>^z 0.15 ppm (dry weight)</p> <p><u>Tissue:</u>^{iy} 0.5 µg/gm (whole fish, wet weight)</p>

PROPOSED CALIFORNIA TOXICS RULE CRITERIA		CALFED WATER QUALITY VALUES		
PARAMETER	CRITERIA	Sacramento River	San Joaquin River	Delta
SELENIUM	<p><u>Freshwater:</u> 5.0 µg/l (4-day average concentration chronic limit)^{2,h} No value(short term concentration acute limit)^{1,g}</p> <p><u>Saltwater:</u> 71 µg/l (4-day average concentration chronic limit)^{2,b,c} 290 µg/l (short term concentration acute limit)^{1,b,c}</p> <p><u>San Joaquin River (Mouth of Merced to Vernalis)</u>³ 5 µg/l (chronic) (4-day average)^g 12 µg/l (maximum)^{b,g} 5 µg/l (monthly mean)^g</p> <p><u>Grassland Water District, San Luis National Refuge, and Los Banos State Wildlife Refuge</u>⁴ 2 µg/l (monthly mean)^g</p> <p><u>Human Health:</u> EPA is not promulgating human health criteria for this contaminant regarding consumption of water and organisms and organisms only.^v</p>	<p><u>Water:</u> 20 µg/l (1 hour maximum)^{b,e} 5.0 µg/l (4 day average)^{b,e}</p> <p><u>Tissue:</u>^{aa} 4-12 ppm (fish, whole body, dry weight) 3-7 ppm (fish food items, food chain, dry weight)</p>	<p><u>Water:</u>^j South of Merced River: 20 µg/l (1 hour maximum)^{b,e} 5.0 µg/l (4 day average)^{b,e}</p> <p>North of Merced River: 12 µg/l (maximum)^{b,e} 5.0 µg/l (4 day average)^{b,e}</p> <p><u>Tissue:</u>^{aa} 4-12 ppm (fish, whole body, dry weight) 3-7 ppm (fish food items, food chain, dry weight)</p>	<p><u>Water:</u> East of Antioch Bridge: 20 µg/l (1 hour maximum)^{b,e} 5.0 µg/l (4 day average)^{b,e}</p> <p>West of Antioch Bridge: 20 µg/l (1 hour average)^{b,e} 5.0 µg/l (4 day average)^{b,e}</p> <p><u>Tissue:</u>^{aa} 4-12 ppm (fish, whole body, dry weight) 3-7 ppm (fish food items, food chain, dry weight)</p>

PROPOSED CALIFORNIA TOXICS RULE CRITERIA		CALFED WATER QUALITY VALUES		
PARAMETER	CRITERIA	Sacramento River	San Joaquin River	Delta
ZINC	<p><u>Freshwater:</u> 120 µg/l (4-day average concentration chronic limit)^{2,a,b,c} 120 µg/l (short term concentration acute limit)^{1,a,b,c}</p> <p><u>Saltwater:</u> 81 µg/l (4-day average concentration chronic limit)^{2,b,c} 90 µg/l (short term concentration acute limit)^{1,b,c}</p> <p>Sacramento River above Hamilton City: 16 µg/l (maximum)^{m,q,w}</p> <p><u>Human Health:</u> No value (water and organisms) No value (organisms only)</p>	<p><u>Water:</u> River and Tributaries from above State Hwy 32 bridge at Hamilton City: 16 µg/l^{a,c,d}</p> <p>Below Hamilton City: 100 µg/l (no hardness connection)^{a,d,g}</p> <p><u>Sediment:</u>^z 120.0 ppm (dry weight)</p>	<p><u>Water:</u> 120 µg/l (4 day average)^{a,e} 120 µg/l (1 hour average)^{a,e}</p> <p><u>Sediment:</u>^z 120.0 ppm (dry weight)</p>	<p><u>Water:</u> East of Antioch Bridge: 100 µg/l (no hardness connection)^{a,d}</p> <p>West of Antioch Bridge: 106 µg/l (4 day average)^x 117 µg/l (1 hour average)^x</p> <p><u>Sediment:</u>^z 150.0 ppm (dry weight)</p>
CHLORDANE	<p><u>Freshwater:</u> 0.0043 µg/l (4-day average concentration chronic limit)^{2,1} 2.4 µg/l (short term concentration acute limit)^{1,i}</p> <p><u>Saltwater:</u> 0.004 µg/l (4-day average concentration chronic limit)^{2,1} 0.09 µg/l (short term concentration acute limit)^{1,i}</p> <p><u>Human Health:</u> 0.00057 µg/l (water and organisms)^{f,j} 0.00059 µg/l (organisms only)^{f,j}</p>	<p><u>Water:</u> 2.4 µg/l (instantaneous max.)^e 0.0043 µg/l (4 day average, total pesticide)^e</p> <p><u>Sediment:</u>^z 7.1 ppm (dry weight)</p>	<p><u>Water:</u> 2.4 µg/l (instantaneous max.)^e 0.0043 µg/l (4 day average, total pesticide)^e</p> <p><u>Sediment:</u>^z 7.1 ppm (dry weight)</p>	<p><u>Water:</u> 2.4 µg/l (instantaneous max.)^e 0.0043 µg/l (4 day average, total pesticide)^e</p> <p><u>Sediment:</u>^z 7.1 ppm (dry weight)</p>

PROPOSED CALIFORNIA TOXICS RULE CRITERIA		CALFED WATER QUALITY VALUES		
PARAMETER	CRITERIA	Sacramento River	San Joaquin River	Delta
DDT	<p><u>Freshwater:</u> 0.001 µg/l (4-day average concentration chronic limit)^{2,i} 1.1 µg/l (short term concentration acute limit)^{1,i}</p> <p><u>Saltwater:</u> 0.001 µg/l (4-day average concentration chronic limit)^{2,i} 0.13 µg/l (short term concentration acute limit)^{1,i}</p> <p><u>Human Health:</u> 0.00059 µg/l (water and organisms)^{f,i} 0.00059 µg/l (organisms only)^{f,i}</p>	<p><u>Water:</u> 1.1 µg/l (instantaneous max., total pesticide) ° 0.001 µg/l (4 day average, total pesticide) °</p> <p><u>Tissue:</u>^y 1 µg/l (whole fish, wet weight)</p>	<p><u>Water:</u> 1.1 µg/l (instantaneous max., total pesticide) 0.001 µg/l (4 day average, total pesticide) °</p> <p><u>Tissue:</u>^{o,y} 1 µg/l (whole fish, wet weight)</p>	<p><u>Water:</u> East of Antioch Bridge: 1.1 µg/l (instantaneous max., total pesticide) ° 0.001 µg/l (4 day average, total pesticide) °</p> <p>West of Antioch Bridge: 1.1 µg/l (instantaneous maximum) 0.001 µg/l (24 hour average)</p> <p><u>Tissue:</u>^y 1 µg/l (whole fish, wet weight)</p>
PCBs	<p><u>Freshwater:</u> 0.014 µg/l (4-day average concentration chronic limit)^{2,i,k} No value (short term concentration acute limit)¹</p> <p><u>Saltwater:</u> 0.03 µg/l (4-day average concentration chronic limit)^{2,i,k} No value (short term concentration acute limit)¹</p> <p><u>Human Health:</u> 0.00017 µg/l (water and organisms)¹ 0.00017 µg/l (organisms only)¹</p>	<p><u>Water:</u> 0.014 µg/l (4 day average) ° (each of 7 congeners)</p> <p><u>Sediment:</u>^z 50 ppm (dry weight, total)</p> <p><u>Tissue:</u>^y 0.5 µg/l (whole fish, wet weight, total)</p>	<p><u>Water:</u> 0.014 µg/l (4 day average) ° (each of 7 congeners)</p> <p><u>Sediment:</u>^z 50 ppm (dry weight, total)</p> <p><u>Tissue:</u>^y 0.5 µg/l (whole fish, wet weight, total)</p>	<p><u>Water:</u> East of Antioch Bridge: 0.014 µg/l (4 day average) ° (each of 7 congeners)</p> <p>West of Antioch Bridge: 0.014 µg/l (24 hour average)</p> <p><u>Sediment:</u>^z 50 ppm (dry weight, total)</p> <p><u>Tissue:</u>^y 0.5 µg/l (whole fish, wet weight, total)</p>

PROPOSED CALIFORNIA TOXICS RULE CRITERIA		CALFED WATER QUALITY VALUES		
PARAMETER	CRITERIA	Sacramento River	San Joaquin River	Delta
TOXAPHENE	<p><u>Freshwater:</u> 0.0002 $\mu\text{g/l}$ (4-day average concentration chronic limit)² 0.73 $\mu\text{g/l}$ (short term concentration acute limit)¹</p> <p><u>Saltwater:</u> 0.0002 $\mu\text{g/l}$ (4-day average concentration chronic limit)² 0.21 $\mu\text{g/l}$ (short term concentration acute limit)¹</p> <p><u>Human Health:</u> 0.00073 $\mu\text{g/l}$ (water and organisms)^{fj} 0.00075 $\mu\text{g/l}$ (organisms only)^{fj}</p>	<p><u>Water:</u> 0.73 $\mu\text{g/l}$ (1 hour average) ^e 0.0002 $\mu\text{g/l}$ (4 day average) ^e</p> <p><u>Tissue:</u> ^y 0.1 $\mu\text{g/l}$ (whole fish, wet weight) (sum of 9 organochlorine insecticides)</p>	<p><u>Water:</u> 0.73 $\mu\text{g/l}$ (1 hour average) ^e 0.0002 $\mu\text{g/l}$ (4 day average) ^e</p> <p><u>Tissue:</u> ^y 0.1 $\mu\text{g/l}$ (whole fish, wet weight) (sum of 9 organochlorine insecticides)</p>	<p><u>Water:</u> East of Antioch Bridge: 0.73 $\mu\text{g/l}$ (1 hour average) ^e 0.0002 $\mu\text{g/l}$ (4 day average) ^e</p> <p>West of Antioch Bridge: 0.0002 $\mu\text{g/l}$ (4 day average) ^e</p> <p><u>Tissue:</u> ^y 0.1 $\mu\text{g/l}$ (whole fish, wet weight) (sum of 9 organochlorine insecticides)</p>

PROPOSED CALIFORNIA TOXICS RULE CRITERIA FOOTNOTES

¹ CMC- Criteria Maximum Concentration

² CCC - Criteria Continuous Concentration

^a These freshwater aquatic life criteria for metals are expressed as a function of total hardness (mg/l) in the water body. The equations are provided in matrix at paragraph (b)(2) of this section. Values displayed above in the matrix correspond to a total hardness of 100mg/l.

^b Criteria for these metals are expressed as a function of the water-effect ratio(WER). ~~See Summary of California Toxics Rule for definition of WER~~

^c These freshwater and saltwater criteria for metals are expressed in terms of the dissolved fraction of the metal in the water column. Criterion values were calculated by using EPA's Clean Water Act 304(a) guidance values (described in the total recoverable fraction) and then applying the conversion factors.

^d This criterion has been calculated pursuant to the 1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water, Office of Water, EPA-820-B-96-001. September 1996. See also Great Lakes Water Quality Initiative Criteria Documents for the Protection of Aquatic Life in Ambient Water, Office of Water, EPA-80-B-95-004, March 1995, available from the Water Resource Center, US EPA 401 M Street, SW, mail code RC 4100, Washington, DC 20460.

^e The State of California has adopted and EPA has approved site specific criteria for the Sacramento River and tributaries above Hamilton City; therefore, these proposed criteria do not apply to these waters.

^f These criteria have been revised to reflect the Agency q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of October 1, 1996. The fish tissue bioconcentration factor (BCF) from the 1980 documents was retained in each case.

^g The $CMC = 1/[(f1/CMC1) + (f2/CMC2)]$ where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate respectively, and $f1 + f2 = 1$. CMC1 and CMC2 are the CMCs for selenite and selenate, respectively, or 185.9 $\mu g/l$ and 12.83 $\mu g/l$, respectively. This criterion is in the total recoverable form. A criterion of 20 $\mu g/l$ was promulgated for specific waters in California in the NTR, as amended, and was promulgated in the total recoverable form. The specific waters to which the NTR criterion applies include: Water of the San Francisco Bay upstream to and including Suisun Bay and the Sacramento - San Joaquin Delta; and the Water of Salt Slough, Mud Slough (north) and the San Joaquin River, Sack Dam to the mouth of the Merced River.

Note: This rule does not supersede section 131.36 (the NTR, as amended), for this criterion. The criterion in this section applies to additional waters of the United States in the State of California by this rulemaking.

Note also: The State of California adopted and EPA approved a site specific criterion for the San Joaquin River, mouth of Merced to Vernalis; therefore, this criterion does not apply to these waters.

^h This criterion is in the total recoverable form. This criterion was promulgated for specific waters in California in the NTR, as amended, and was promulgated in the total recoverable form. The specific waters to which the NTR criterion applies include: Waters of the San Francisco Bay upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta; and waters of Salt Slough, Mud Slough (north) and the San Joaquin River, Sack Dam to Vernalis.

Note: This section does not supersede section 131.36 (the NTR, as amended), for this criterion. This criterion applies to additional waters of the United States in the State of California by this rulemaking.

Note also: The State of California adopted and EPA approved a site-specific criterion for the Grassland Water District, San Luis National Wildlife Refuge, and the Los Banos State Wildlife Refuge; therefore, this criterion does not apply to these waters.

ⁱThese aquatic life criteria for these compounds were issued in 1980 utilizing the 1980 Guidelines for criteria development. The acute values shown are final acute values (FAV) which by the 1980 Guidelines are instantaneous values as contrasted with a CMC which is a short-term average.

^jThese criteria are based on carcinogenicity of 10(-6) risk.

^kPCBs are a class of chemicals which include aroclors 1242, 1254, 1221, 1232, 1248, 1260, and 1016, and CAS numbers 53469219, 11097691, 11104282, 11141165, 12672296, 11096825, and 12674112, respectively. The aquatic life criteria apply to this set of chemicals. ~~SEE Summary of California Toxics Rule. See Summary of CTR for description of aquatic life criteria.~~

^lThis criterion applies to total PCBs or congener or isomer analyses.

~~^mEPA is making a finding that it is necessary to include *chronic criteria* for copper, cadmium and zinc for the Sacramento River and its tributaries above Hamilton City as part of the proposed statewide criteria in the California Toxics Rule.~~

~~ⁿMaximum with the understanding that the instantaneous maximum concentration may not exceed the objective more than once every three years.~~

~~^oThis chronic criterion applies to all water quality programs concerning the San Joaquin River, mouth of Merced River to Vernalis. The California Toxics Rule does not affect this *chronic* criterion as set forth in the National Toxics Rule and this previously federally promulgated chronic criterion remains in effect.~~

~~^pAquatic life criterion:~~

~~^qIn the dissolved form using hardness of 40 mg/l CaCO₃.~~

~~^rThese state-adopted site-specific acute criteria for copper, cadmium and zinc have been previously approved by the EPA and remain in effect.~~

~~^sThese state-adopted site-specific criteria have been previously approved by the EPA or promulgated in the National Toxics Rule and remain in effect.~~

~~^tThis state-adopted site-specific aquatic life selenium chronic criterion has been previously approved by the EPA and remains in effect.~~

~~^uEPA's criteria do not specify organic or inorganic mercury. CALFED Representative Numerical Standards, Criteria Objectives or Suggested Ranges are specifically inorganic mercury.~~

*Permit authorities should address these contaminants in NPDES permit actions using the State's existing narrative criteria for toxics.

~~These "maximum" criteria correspond to acute criteria in the proposed California Toxics Rule.~~

CALFED WATER QUALITY VALUES FOOTNOTES

^a dissolved form

^b total recoverable 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 shall be determined using the following formulas:

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

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

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

^d Central Valley Regional Water Quality Control Plan

^e General EPA 304(a) guideline

^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 objective 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.

^h The Central Valley Regional Water Quality Control Board expects to adopt an objective for carbofuran within the next year. The objective will probably be very similar to the performance goal.

ⁱ Water quality limited segments for mercury in fish tissue occur in the Sacramento River and Delta.

^j Water quality limited segments for selenium in the water column from Salt Slough to Vernalis on the San Joaquin River.

^k Lower Sacramento River is a water quality limited segment for carbofuran.

^l California Department of Fish and Game acute (1 hour) and chronic (4 day) hazard assessment criteria.

^m Sacramento River, San Joaquin River, and Delta water quality limited segments for chlorpyrifos.

ⁿ Sacramento River, San Joaquin River, and Delta water quality limited segments for diazinon.

^o San Joaquin River water quality limited segment for DDT in tissue.

^p Values are a function of pH, temperature, and designation of water body as cold or warm water beneficial use.

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

^r Except those water bodies which are constructed for special purposes and from which fish have been excluded or where the fishery is not important and a beneficial use.

^s Southern Delta around Stockton is a water quality limited segment for dissolved oxygen.

^t Bioassay results or other special studies demonstrate toxicity. Sacramento River, San Joaquin River, and Delta are water quality limited segments for "unknown toxicity".

^u 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 I Street Bridge during periods when temperature increases will be detrimental to the fishery.

^v The daily average water temperature shall 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 The daily average water temperature shall not be elevated by controllable factors above 66°F from the 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 calculating objectives for varying hardness levels are as follows:

$$\text{Cd} = e^{(0.7852H - 3.490)} \text{ (4 day average)}$$

$$= e^{(1.128H - 3.828)} \text{ (1 hour average)}$$

$$\text{Cu} = e^{(0.8545H - 1.465)} \text{ (4 day average)}$$

$$= e^{(0.9422H - 1.464)} \text{ (1 hour average)}$$

$$\text{Zn} = e^{(0.8473H + 0.7614)} \text{ (4 day average)}$$

$$= e^{(0.8473H + 0.8604)} \text{ (1 hour average)}$$

^y National Academy of Sciences (NAS)-National Academy of Engineering 1973

^z Effect range-low (ERLs) concentrations

^{aa} San Luis Drain Reuse, Technical Advisory Committee Selenium ecological risk guidelines

^{bb} 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 equivalent.

^{cc} SAR means sodium adsorption ratio. SAR is sometimes reported by the symbol RNa.

^{dd} For overhead sprinkle irrigation, and low humidity (< 30%), 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.

^{ee} EC_w means electrical conductivity of irrigation water, reported in mmho/cm or dS/m.

^{ff} At a given SAR, the infiltration rate increases as salinity EC_w increases. To evaluate a potential permeability problem examine SAR and EC_w together.

^{gg} Value arrived at in discussion with California Urban Water Agencies (CUWA)

^{hh} Bromide value is predicated on the assumption that the MCL for Bromate will be 5 µg/l.

ⁱⁱ U.S. EPA Secondary MCL. 1995.

^{jj} U.S. EPA Current MCL. 1995.

^{kk} U.S. EPA requires removal of 99.9 % of Giardia and 99.99% of viruses during water treatment.

^{ll} Target level based on the CUWA Expert Panel Report recommendations (Bay-Delta Water Quality Criteria, December 1996). Expert panel assumed future drinking water regulatory scenario for disinfection by-product (DBP) control and inactivation of Giardia and Cryptosporidium based on the proposed Stage 2 D/DBP Rule and Proposed Enhanced Surface Water Treatment Rule (ESWTR).

The bromide target level is constrained by the formation of bromate when using ozone to inactivate Cryptosporidium.

^{mmm} Nutrients are a critical reservoir management issue. Nutrient levels are a determining factor governing the growth of taste- and odor-producing algae in water storage reservoirs. SWP supplies are nitrogen-limited; however, phosphorous is present in great excess. This is a problem with respect to the growth of blue-green algae, which can fix their own nitrogen. Water quality impacts of nutrients are driven by reservoir management issues as opposed to human health effects; as a result, use of the MCL for nitrate (as N) of 10 mg/L is not appropriate.

ⁿⁿ Desirable target levels are based on likely future regulatory scenarios under the ESWTR that will base required levels of pathogen removal/inactivation treatment on pathogen density in source water. Future regulations may require additional log removal requirements for Cryptosporidium. Increasing treatment for removal of pathogens makes it more difficult to control the formation of DBPs. To balance disinfection requirements for controlling pathogens with the production of DBPs, selection of a Bay-Delta alternative should not result in degraded water quality necessitating increased removal requirements for pathogens.

^{oo} Target levels for TDS would allow compliance with the TDS objectives contained in Article 19 of the SWP Water Service Contract. The average TDS levels in SWP supplies over the last ten years have consistently exceeded the 220 mg/L (10-year average) SWP objective. The 10-year averaging period for the 220mg/L objective is too long to be sufficiently protective of source water quality. MWD staff are currently exploring the development of appropriate alternative TDS objectives for shorter time frames (i.e., 1 year and 6 month averages) and will forward that information to CALFED when available. The SWP TDS objective of 440mg/L (monthly average) is a problem for water resource management programs, especially in the months of April and September, and there is a real need to reduce peaks in TDS in SWP supplies. Consistently low TDS levels are

needed to minimize the following salinity-related impacts: Increased demand for Delta water supplies when such water is used to blend with other higher salinity water sources; Adverse impacts on water recycling and groundwater replenishment programs, which depend on Delta water supplies to meet local resource program salinity objectives. Failure to develop local resource programs may result in increased demand on Delta exports; Economic impacts on industrial, residential, and agricultural water users.

⁸⁹ Target level based on the CUWA Expert Panel report recommendations (Bay-Delta Drinking Water Quality Criteria, December 1996). Expert panel assumed future drinking water regulatory scenario for DBP control and inactivation of Giardia and Cryptosporidium based on the proposed Stage 2 D/DBP Rule and proposed ESWTR. The proposed D/DBP Rule requires increased levels of TOC removal as TOC concentrations in source waters increase. The recommended TOC target level is constrained by the formation of total trihalomethanes when using enhanced coagulation for TOC removal and free chlorine to inactivate Giardia.

⁹⁰ Reduced variability in turbidity is needed to improve treatment plant performance. When source water turbidity increases, water is more difficult and costly to treat. Also, increased turbidity reduces protection from pathogens because turbidity interferes with disinfection.