**DIVISION 41**

**WATER QUALITY STANDARDS: BENEFICIAL USES, POLICIES, AND CRITERIA FOR OREGON**

**340-041-0033**

**Toxic Substances**

(1) Amendments to sections (1-5) and (7) of this rule (OAR 340-041-0033) and associated revisions to Tables 20, 33A, 33B, 33C, and 40 become effective on April 18, 2014. The amendments do not become applicable for purposes of ORS chapter 468B or the federal Clean Water Act, however, unless approved by EPA pursuant to 40 CFR 131.21 (4/27/2000).

(2) **Toxic Substances Narrative.** Toxic substances may not be introduced above natural background levels in waters of the state in amounts, concentrations, or combinations that may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare or aquatic life, wildlife, or other designated beneficial uses.

(3) **Aquatic Life Numeric Criteria**. Levels of toxic substances in waters of the state may not exceed the applicable aquatic life criteria listed in Table 30.

(4) **Human Health Numeric Criteria**. The criteria for waters of the state listed in Table 40 are established to protect Oregonians from potential adverse health effects associated with long-term exposure to toxic substances associated with consumption of fish, shellfish, and water.

(5) To establish permit or other regulatory limits for toxic substances for which criteria are not included in Table 30 or Table 40, the department may use the guidance values in Table 31, public health advisories, and other published scientific literature. The department may also require or conduct bio-assessment studies to monitor the toxicity to aquatic life of complex effluents, other suspected discharges, or chemical substances without numeric criteria.

(6) Establishing Site-Specific Background Pollutant Criteria: This provision is a performance based water quality standard that results in site-specific human health water quality criteria under the conditions and procedures specified in this rule section. It addresses existing permitted discharges of a pollutant removed from the same body of water. For waterbodies where a discharge does not increase the pollutant’s mass and does not increase the pollutant concentration by more than 3%, and where the water body meets a pollutant concentration associated with a risk level of 1x10-4, DEQ concludes that the pollutant concentration continues to protect human health.

(a) Definitions: For the purpose of this section (OAR 340-041-0033(6)):

(A) “Background pollutant concentration” means the ambient water body concentration immediately upstream of the discharge, regardless of whether those pollutants are natural or result from upstream human activity.

(B) An “intake pollutant” is the amount of a pollutant that is present in public waters (including groundwater) as provided in subsection (C), below, at the time it is withdrawn from such waters by the discharger or other facility supplying the discharger with intake water.

(C) “Same body of water”: An intake pollutant is considered to be from the “same body of water” as the discharge if the department finds that the intake pollutant would have reached the vicinity of the outfall point in the receiving water within a reasonable period had it not been removed by the permittee. This finding may be deemed established if:

(i) The background concentration of the pollutant in the receiving water (excluding any amount of the pollutant in the facility's discharge) is similar to that in the intake water;

(ii) There is a direct hydrological connection between the intake and discharge points; and

(I) The department may also consider other site-specific factors relevant to the transport and fate of the pollutant to make the finding in a particular case that a pollutant would or would not have reached the vicinity of the outfall point in the receiving water within a reasonable period had it not been removed by the permittee.

(II) An intake pollutant from groundwater may be considered to be from the “same body of water” if the department determines that the pollutant would have reached the vicinity of the outfall point in the receiving water within a reasonable period had it not been removed by the permittee, except that such a pollutant is not from the same body of water if the groundwater contains the pollutant partially or entirely due to past or present human activity, such as industrial, commercial, or municipal operations, disposal actions, or treatment processes.

(iii) Water quality characteristics (e.g., temperature, pH, hardness) are similar in the intake and receiving waters.

(b) Applicability

(A) Site-specific criteria may be established under this rule section only for carcinogenic pollutants.

(B) Site-specific criteria established under this rule section apply in the vicinity of the discharge for purposes of establishing permit limits for the specified permittee.

(C) The underlying waterbody criteria continue to apply for all other Clean Water Act programs.

(D) The site-specific background pollutant criterion will be effective upon department issuance of the permit for the specified permittee.

(E) Any site-specific criteria developed under this procedure will be re-evaluated upon permit renewal.

(c) A site-specific background pollutant criterion may be established where all of the following conditions are met:

(A) The discharger has a currently effective NPDES permit;

(B) The mass of the pollutant discharged to the receiving waterbody does not exceed the mass of the intake pollutant from the same body of water, as defined in section (6)(a)(C) above, and, therefore, does not increase the total mass load of the pollutant in the receiving water body;

(C) The discharger has not been assigned a TMDL wasteload allocation for the pollutant in question;

(D) The permittee uses any feasible pollutant reduction measures available and known to minimize the pollutant concentration in their discharge;

(E) The pollutant discharge has not been chemically or physically altered in a manner that causes adverse water quality impacts that would not occur if the intake pollutants were left in-stream; and,

(F) The timing and location of the pollutant discharge would not cause adverse water quality impacts that would not occur if the intake pollutant were left in-stream.

(d) The site-specific background pollutant criterion must be the most conservative of the following four values. The procedures deriving these values are described in the sections (6)(e) of this rule.

(A) The projected in-stream pollutant concentration resulting from the current discharge concentration and any feasible pollutant reduction measures under (c)(D) above, after mixing with the receiving stream.

(B) The projected in-stream pollutant concentration resulting from the portion of the current discharge concentration associated with the intake pollutant mass after mixing with the receiving stream. This analysis ensures that there will be no increase in the mass of the intake pollutant in the receiving water body as required by condition (c)(B) above.

(C) The projected in-stream pollutant concentration associated with a 3% increase above the background pollutant concentration as calculated:

(i) For the mainstem Willamette and Columbia Rivers, using 25% of the harmonic mean flow of the waterbody.

(ii) For all other waters, using 100% of the harmonic mean flow or similar critical flow value of the waterbody.

(D) A criterion concentration value representing a human health risk level of 1 ? 10-4. This value is calculated using EPA’s human health criteria derivation equation for carcinogens (EPA 2000), a risk level of 1 ? 10-4, and the same values for the remaining calculation variables that were used to derive the underlying human health criterion.

(e) Procedure to derive a site-specific human health water quality criterion to address a background pollutant:

(A) The department will develop a flow-weighted characterization of the relevant flows and pollutant concentrations of the receiving waterbody, effluent and all facility intake pollutant sources to determine the fate and transport of the pollutant mass.

(i) The pollutant mass in the effluent discharged to a receiving waterbody may not exceed the mass of the intake pollutant from the same body of water.

(ii) Where a facility discharges intake pollutants from multiple sources that originate from the receiving waterbody and from other waterbodies, the department will calculate the flow-weighted amount of each source of the pollutant in the characterization.

(iii) Where intake water for a facility is provided by a municipal water supply system and the supplier provides treatment of the raw water that removes an intake water pollutant, the concentration and mass of the intake water pollutant shall be determined at the point where the water enters the water supplier’s distribution system.

(B) Using the flow weighted characterization developed in Section (6)(e)(A), the department will calculate the in-stream pollutant concentration following mixing of the discharge into the receiving water. The resultant concentration will be used to determine the conditions in Section (6)(d)(A) and (B).

(C) Using the flow weighted characterization, the department will calculate the in-stream pollutant concentration based on an increase of 3% above background pollutant concentration. The resultant concentration will be used to determine the condition in Section (6)(d)(C).

(i) For the mainstem Willamette and Columbia Rivers, 25% of the harmonic mean flow of the waterbody will be used.

(ii) For all other waters, 100% of the harmonic mean flow or similar critical flow value of the waterbody will be used.

(D) The department will select the most conservative of the following values as the site-specific water quality criterion.

(i) The projected in-stream pollutant concentration described in Section 6(e)(B);

(ii) The in-stream pollutant concentration based on an increase of 3% above background described in Section (6)(e)(C); or

(iii) A water quality criterion based on a risk level of 1 x 10-4.

(f) Calculation of water quality based effluent limits based on a site-specific background pollutant criterion:

(A) For discharges to receiving waters with a site-specific background pollutant criterion, the department will use the site-specific criterion in the calculation of a numeric water quality based effluent limit.

(B) The department will compare the calculated water quality based effluent limits to any applicable aquatic toxicity or technology based effluent limits and select the most conservative for inclusion in the permit conditions.

(g) In addition to the water quality based effluent limits described in Section (6)(f), the department will calculate a mass-based limit where necessary to ensure that the condition described in Section (6)(c)(B) is met. Where mass-based limits are included, the permit shall specify how compliance with mass-based effluent limitations will be assessed.

(h) The permit shall include a provision requiring the department to consider the re-opening of the permit and re-evaluation of the site-specific background pollutant criterion if new information shows the discharger no longer meets the conditions described in subsections (6)(c) and (e).

(i) Public Notification Requirements.

(A) If the department proposes to grant a site-specific background pollutant criterion, it must provide public notice of the proposal and hold a public hearing. The public notice may be included in the public notification of a draft NPDES permit or other draft regulatory decision that would rely on the criterion and will also be published on the water quality standards website;

(B) The department will publish a list of all site-specific background pollutant criteria approved pursuant to this rule. A criterion will be added to this list within 30 days of its effective date. The list will identify: the permittee; the site-specific background pollutant criterion and the associated risk level; the waterbody to which the criterion applies; the allowable pollutant effluent limit; and how to obtain additional information about the criterion.

(7) Arsenic Reduction Policy: The inorganic arsenic criterion for the protection of human health from the combined consumption of organisms and drinking water is 2.1 micrograms per liter. While this criterion is protective of human health and more stringent than the federal maximum contaminant level (MCL) for arsenic in drinking water, which is 10 micrograms per liter, it nonetheless is based on a higher risk level than the Commission has used to establish other human health criteria. This higher risk level recognizes that much of the risk is due to naturally high levels of inorganic arsenic in Oregon’s waterbodies. In order to maintain the lowest human health risk from inorganic arsenic in drinking water, the Commission has determined that it is appropriate to adopt the following policy to limit the human contribution to that risk.

(a) The arsenic reduction policy established by this rule section does not become applicable for purposes of ORS chapter 468B or the federal Clean Water Act unless and until the numeric arsenic criteria established by this rule are approved by EPA pursuant to 40 CFR 131.21 (4/27/2000).

(b) It is the policy of the Commission that the addition of inorganic arsenic from new or existing anthropogenic sources to waters of the state within a surface water drinking water protection area be reduced the maximum amount feasible. The requirements of this rule section (OAR 340-041-0033(4**7**)) apply to sources that discharge to surface waters of the state with an ambient inorganic arsenic concentration equal to or lower than the applicable numeric inorganic arsenic criteria for the protection of human health.

(c) The following definitions apply to this section (OAR 340-041-0033(4**7**)):

(A) “Add inorganic arsenic” means to discharge a net mass of inorganic arsenic from a point source (the mass of inorganic arsenic discharged minus the mass of inorganic arsenic taken into the facility from a surface water source).

(B) A “surface water drinking water protection area,” for the purpose of this section, means an area delineated as such by DEQ under the source water assessment program of the federal Safe Drinking Water Act, 42 U.S.C. ¦ 300j 13. The areas are delineated for the purpose of protecting public or community drinking water supplies that use surface water sources. These delineations can be found at DEQ’s drinking water program website.

(C) “Potential to significantly increase inorganic arsenic concentrations in the public drinking water supply source water” means:

(i) to increase the concentration of inorganic arsenic in the receiving water for a discharge by 10 percent or more after mixing with the harmonic mean flow of the receiving water; or

(ii) as an alternative, if sufficient data are available, the discharge will increase the concentration of inorganic arsenic in the surface water intake water of a public water system by 0.021 micrograms per liter or more based on a mass balance calculation.

(d) Following the effective date of this rule, applications for an individual NPDES permit or permit renewal received from industrial dischargers located in a surface water drinking water protection area and identified by DEQ as likely to add inorganic arsenic to the receiving water must include sufficient data to enable DEQ to determine whether:

(A) The discharge in fact adds inorganic arsenic; and

(B) The discharge has the potential to significantly increase inorganic arsenic concentrations in the public drinking water supply source water.

(e) Where DEQ determines that both conditions in subsection (d) of this section (4**7**) are true, the industrial discharger must develop an inorganic arsenic reduction plan and propose all feasible measures to reduce its inorganic arsenic loading to the receiving water. The proposed plan, including proposed measures, monitoring and reporting requirements, and a schedule for those actions, will be described in the fact sheet and incorporated into the source’s NPDES permit after public comment and DEQ review and approval. In developing the plan, the source must:

(A) Identify how much it can minimize its inorganic arsenic discharge through pollution prevention measures, process changes, wastewater treatment, alternative water supply (for groundwater users) or other possible pollution prevention and/or control measures;

(B) Evaluate the costs, feasibility and environmental impacts of the potential inorganic arsenic reduction and control measures;

(C) Estimate the predicted reduction in inorganic arsenic and the reduced human health risk expected to result from the control measures;

(D) Propose specific inorganic arsenic reduction or control measures, if feasible, and an implementation schedule; and

(E) Propose monitoring and reporting requirements to document progress in plan implementation and the inorganic arsenic load reductions.

(f) In order to implement this section, DEQ will develop the following information and guidance within 120 days of the effective date of this rule and periodically update it as warranted by new information:

(A) A list of industrial sources or source categories, including industrial stormwater and sources covered by general permits, that are likely to add inorganic arsenic to surface waters of the State.

(i) For industrial sources or source categories permitted under a general permit that have been identified by DEQ as likely sources of inorganic arsenic, DEQ will evaluate options for reducing inorganic arsenic during permit renewal or evaluation of Stormwater Pollution Control Plans.

(B) Quantitation limits for monitoring inorganic arsenic concentrations.

(C) Information and guidance to assist sources in estimating, pursuant to subsection (e)(C) of this section, the reduced human health risk expected to result from inorganic arsenic control measures based on the most current EPA risk assessment.

(g) It is the policy of the Commission that landowners engaged in agricultural or development practices on land where pesticides, fertilizers, or soil amendments containing arsenic are currently being or have previously been applied, implement conservation practices to minimize the erosion and runoff of inorganic arsenic to waters of the State or to a location where such material could readily migrate into waters of the State.

[ED. NOTE: Tables referencing the toxics criteria are not included in rule text. Click here for a PDF copy of Table 30: Aquatic Life Water Quality Criteria for Toxic Pollutants. Click here for a PDF copy of Table 31: Aquatic Life Water Quality Guidance Values for Toxic Pollutants. Click here for a PDF copy of Table 40: Human Health Water Quality Criteria for Toxic Pollutants.]

Stat. Auth.: ORS 468.020, 468B.030, 468B.035 & 468B.048  
Stats. Implemented: ORS 468B.030, 468B.035 & 468B.048  
Hist.: DEQ 17-2003, f. & cert. ef. 12-9-03; DEQ 3-2004, f. & cert. ef. 5-28-04; DEQ 17-2010, f. & cert. ef. 12-21-10; DEQ 8-2011, f. & cert. ef. 6-30-11; DEQ 10-2011, f. & cert. ef. 7-13-11

**TABLE 30: Aquatic Life Water Quality Criteria for Toxic Pollutants**

*Effective April 18, 2014*

**Aquatic Life Criteria Summary**

The criteria for each compound listed in Table 30 must not be exceeded in waters of the state in order to protect aquatic life. The aquatic life criteria apply to waterbodies where fish and aquatic life is a designated beneficial use. All values are expressed as micrograms per liter (µg/L). Compounds are listed in alphabetical order with the corresponding information: the Chemical Abstract Service (CAS) number, whether there is a human health criterion for the pollutant (i.e. “y”= yes, “n” = no), and the associated aquatic life freshwater and saltwater acute and chronic criteria. Italicized pollutants are not identified as priority pollutants by EPA. Dashes in the table column indicate that there is no aquatic life criterion for that pollutant.

Unless otherwise noted in the table below, the acute criterion is the Criterion Maximum Concentration (CMC) applied as a one hour average concentration, and the chronic criterion is the Criterion Continuous Concentration (CCC) applied as a 96 hour (4 day) average concentration. The CMC and CCC criteria may not be exceeded more than once every three years. Footnote A, associated with eleven pesticide pollutants in Table 30, describes the exception to the frequency and duration of the toxics criteria stated in this paragraph.

| Table 30  **Aquatic Life Water Quality Criteria for Toxic Pollutants** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Pollutant** | **CAS Number** | | **Human Health Criterion** | **Freshwater**  **(*µg/L)*** | | **Saltwater**  ***(µg/L)*** | |
| **Acute Criterion (CMC)** | **Chronic Criterion (CCC)** | **Acute Criterion (CMC)** | **Chronic Criterion (CCC)** |
| 1 | Aldrin | 309002 | | y | 3 **A** | -- | 1.3 **A** | -- |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 2 | *Alkalinity* |  | | n | -- | 20,000 **B** | -- | -- |
| **B** *Criterion shown is the minimum (i.e. CCC in water may not be below this value in order to protect aquatic life).* | | | | | | | | |
| 3 | *Ammonia* | 7664417 | | n | *Criteria are pH, temperature, and salmonid or sensitive coldwater species dependent-- See document USEPA January 1985 (Fresh Water).***M** | | *Ammonia criteria for saltwater may depend on pH and temperature. Values for saltwater criteria (total ammonia) can be calculated from the tables specified in Ambient Water Quality Criteria for Ammonia (Saltwater)--1989 (EPA 440/5-88-004;*  [*http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm*](http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm)*)* | |
| **M** *See expanded endnote M equations at bottom of Table 30 to calculate freshwater ammonia criteria* | | | | | | | | |
| 4 | Arsenic | 7440382 | | y | 340 **C, D** | 150 **C, D** | 69 **C, D** | 36 **C, D** |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **D** *Criterion is applied as total inorganic arsenic (i.e. arsenic (III) + arsenic (V)).* | | | | | | | | |
| 5 | BHC Gamma (Lindane) | 58899 | | y | 0.95 | 0.08 **A** | 0.16 **A** | -- |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 6 | Cadmium | 7440439 | | n | *See* **E** | *See* **C,**  **F** | 40 **C** | 8.8 **C** |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **E** *The freshwater criterion for this metal is expressed as “total recoverable” and is a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote E at bottom of Table 30.*  **F** *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | | |
| 7 | Chlordane | 57749 | | y | 2.4**A** | 0.0043**A** | 0.09**A** | 0.004**A** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 8 | *Chloride* | 16887006 | | n | 860,000 | 230,000 | -- | -- |
| 9 | *Chlorine* | 7782505 | | n | 19 | 11 | 13 | 7.5 |
| 10 | *Chlorpyrifos* | 2921882 | | n | 0.083 | 0.041 | 0.011 | 0.0056 |
| 11 | Chromium III | 16065831 | | n | *See* **C,** **F** | *See* **C,** **F** | -- | -- |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **F** *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | | |
| 12 | Chromium VI | 18540299 | | n | 16 **C** | 11 **C** | 1100**C** | 50**C** |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.* | | | | | | | | |
| 13 | Copper | 7440508 | | y | *See* **E** | *See* **E** | 4.8 **C** | 3.1 **C** |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **E** *The freshwater criterion for this metal is expressed as “total recoverable” and is a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote E at bottom of Table 30.* | | | | | | | | |
| 14 | Cyanide | 57125 | | y | 22 **J** | 5.2 **J** | 1 **J** | 1 **J** |
| **J** *This criterion is expressed as µg free cyanide (CN)/L.* | | | | | | | | |
| 15 | DDT 4,4' | 50293 | | y | 1.1 **A , G** | 0.001 **A, G** | 0.13 **A, G** | 0.001 **A, G** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.*  **G** *This criterion applies to DDT and its metabolites (i.e. the total concentration of DDT and its metabolites should not exceed this value).* | | | | | | | | |
| 16 | *Demeton* | 8065483 | | n | -- | 0.1 | -- | 0.1 |
| 17 | Dieldrin | 60571 | | y | 0.24 | 0.056 | 0.71**A** | 0.0019**A** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 18 | Endosulfan | 115297 | | n | 0.22 **A , H** | 0.056 **A , H** | 0.034 **A , H** | 0.0087 **A, H** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.*  **H** *This value is based on* *the* *criterion published in Ambient Water Quality Criteria for Endosulfan (EPA 440/5-80-046) and should be applied as the sum of alpha- and beta-endosulfan.* | | | | | | | | |
| 19 | Endosulfan Alpha | 959988 | | y | 0.22 **A** | 0.056 **A** | 0.034 **A** | 0.0087 **A** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 20 | Endosulfan Beta | 33213659 | | y | 0.22 **A** | 0.056 **A** | 0.034 **A** | 0.0087 **A** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 21 | Endrin | 72208 | | y | 0.086 | 0.036 | 0.037 **A** | 0.0023 **A** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 22 | *Guthion* | 86500 | | n | -- | 0.01 | -- | 0.01 |
| 23 | Heptachlor | 76448 | | y | 0.52 **A** | 0.0038 **A** | 0.053 **A** | 0.0036 **A** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 24 | Heptachlor Epoxide | 1024573 | | y | 0.52 **A** | 0.0038 **A** | 0.053 **A** | 0.0036 **A** |
| ***A*** *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | | |
| 25 | *Iron (total)* | 7439896 | | n | -- | 1000 | -- | -- |
| 26 | Lead | 7439921 | | n | *See* **C , F** | *See* **C , F** | 210 **C** | 8.1 **C** |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **F** *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | | |
| 27 | *Malathion* | 121755 | | n | -- | 0.1 | -- | 0.1 |
| 28 | Mercury (total) | 7439976 | | n | 2.4 | 0.012 | 2.1 | 0.025 |
| 29 | *Methoxychlor* | 72435 | | y | -- | 0.03 | -- | 0.03 |
| 30 | *Mirex* | 2385855 | | n | -- | 0.001 | -- | 0.001 |
| 31 | Nickel | 7440020 | | y | *See* **C , F** | *See* **C , F** | 74 **C** | 8.2 **C** |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **F** *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | | |
| 32 | *Parathion* | | 56382 | n | 0.065 | 0.013 | -- | -- |
| 33 | Pentachlorophenol | | 87865 | y | *See* **H** | *See* **H** | 13 | 7.9 |
| **H** *Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC=(exp(1.005(pH)-4.869); CCC=exp(1.005(pH)-5.134).* | | | | | | | | |
| 34 | *Phosphorus Elemental* | 7723140 | | n | -- | -- | -- | 0.1 |
| 35 | Polychlorinated Biphenyls (PCBs) | NA | | y | 2 **K** | 0.014 **K** | 10 **K** | 0.03 **K** |
| **K** *This criterion applies to total PCBs (e.g.* determined as Aroclors or congeners) | | | | | | | | |
| 36 | Selenium | 7782492 | | y | *See* **C** , **L** | 4.6 **C** | 290 **C** | 71 **C** |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **L** *The CMC=(1/[(f1/CMC1)+(f2/CMC2)]µg/L) \* CF where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively,and CMC1 and CMC2 are 185.9 μg/L and 12.82 μg/L, respectively. See expanded endnote F for the Conversion Factor (CF) for selenium.* | | | | | | | | |
| 37 | Silver | 7440224 | | n | *See* **C** , **F** | 0.10 **C** | 1.9 **C** | -- |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **F** *The freshwater acute criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | | |
| 38 | *Sulfide Hydrogen Sulfide* | 7783064 | | n | -- | 2 | -- | 2 |
| 39 | Toxaphene | 8001352 | | y | 0.73 | 0.0002 | 0.21 | 0.0002 |
| 40 | *Tributyltin (TBT)* | 688733 | | n | 0.46 | 0.063 | 0.37 | 0.01 |
| 41 | Zinc | 7440666 | | y | *See* **C , F** | *See* **C , F** | 90 **C** | 81 **C** |
| **C** *Criterion is expressed in terms of “dissolved” concentrations in the water column.*  **F** *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | | |

**Expanded Endnotes A, E, F, M**

**Endnote A: Alternate Frequency and Duration for Certain Pesticides**

This criterion is based on EPA recommendations issued in 1980 that were derived using guidelines that differed from EPA's 1985 Guidelines which update minimum data requirements and derivation procedures. The CMC may not be exceeded at any time and the CCC may not be exceeded based on a 24-hour average. The CMC may be applied using a one hour averaging period not to be exceeded more than once every three years, if the CMC values given in Table 30 are divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

**Endnote E: Equations for Hardness-Dependent Freshwater Metals Criteria for Cadmium Acute and Copper Acute and Chronic Criteria**

The freshwater criterion for this metal is expressed as total recoverable with two significant figures, and is a function of hardness (mg/L) in the water column. Criteria values for hardness are calculated using the following formulas (CMC refers to the acute criterion; CCC refers to the chronic criterion):

**CMC** = (exp(mA\*[ln(hardness)] + bA))

**CCC** = (exp(mC\*[ln(hardness)] + bC))

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Chemical** | **mA** | **bA** | **mC** | **bC** |
| Cadmium | 1.128 | -3.828 | N/A | N/A |
| Copper | 0.9422 | -1.464 | 0.8545 | -1.465 |

**Endnote F: Equations for Hardness-Dependent Freshwater Metals Criteria and Conversion Factor Table**

The freshwater criterion for this metal is expressed as dissolved with two significant figures, and is a function of hardness (mg/L) in the water column. Criteria values for hardness are calculated using the following formulas (CMC refers to the acute criterion; CCC refers to the chronic criterion):

**CMC** = (exp(mA\*[ln(hardness)] + bA))\*CF

**CCC** = (exp(mC\*[ln(hardness)] + bC))\*CF

~~“~~CF~~”~~ is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Chemical** | **mA** | **bA** | **mC** | **bC** |
| Cadmium | N/A | N/A | 0.7409 | -4.719 |
| Chromium III | 0.8190 | 3.7256 | 0.8190 | 0.6848 |
| Lead | 1.273 | -1.460 | 1.273 | -4.705 |
| Nickel | 0.8460 | 2.255 | 0.8460 | 0.0584 |
| Silver | 1.72 | -6.59 | -- | -- |
| Zinc | 0.8473 | 0.884 | 0.8473 | 0.884 |

The conversion factors (CF) below must be used in the equations above for the hardness-dependent metals in order to convert total recoverable metals criteria to dissolved metals criteria. For metals that are not hardness-dependent (i.e. arsenic, chromium VI, selenium, and silver (chronic)), or are saltwater criteria, the criterion value associated with the metal in Table 30 already reflects a dissolved criterion based on its conversion factor below.

**Conversion Factor (CF) Table for Dissolved Metals**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Chemical** | **Freshwater** | | **Saltwater** | |
| **Acute** | **Chronic** | **Acute** | **Chronic** |
| Arsenic | 1.000 | 1.000 | 1.000 | 1.000 |
| Cadmium | N/A | 1.101672-[(ln hardness)(0.041838)] | 0.994 | 0.994 |
| Chromium III | 0.316 | 0.860 | -- | -- |
| Chromium VI | 0.982 | 0.962 | 0.993 | 0.993 |
| Copper | N/A | N/A | 0.83 | 0.83 |
| Lead | 1.46203-[(ln hardness)(0.145712)] | 1.46203-[(ln hardness)(0.145712)] | 0.951 | 0.951 |
| Nickel | 0.998 | 0.997 | 0.990 | 0.990 |
| Selenium | 0.996 | 0.922 | 0.998 | 0.998 |
| Silver | 0.85 | 0.85 | 0.85 | -- |
| Zinc | 0.978 | 0.986 | 0.946 | 0.946 |

**Endnote M: Equations for Freshwater Ammonia Calculations**

**Acute Criterion**

The 1-hour average concentration of un-ionized ammonia (mg/L NH3) may not exceed more often than once every three years on average, the numerical value given by:

CMCNH3 = 0.52/FT/FPH/2 where:

*FT = temperature adjustment factor*

*FPH = pH adjustment factor*

*TCAP = temperature cap*

FT = 10 0.03(20-TCAP); TCAP ≤ T ≤ 30˚ C

FT = 10 0.03(20-T); 0 ≤ T ≤ TCAP

FPH = 1 8≤ pH ≤ 9

FPH = 1 + 10 7.4-pH 6.5 ≤ pH ≤ 8

1.25

TCAP = 20 ˚C; Salmonids and other sensitive coldwater species present

TCAP = 25 ˚C; Salmonids and other sensitive coldwater species absent

**Chronic Criterion**

The 4-day average concentration of un-ionized ammonia (mg/L NH3) may not exceed more often than once every three years on average, the average numerical value given by:

CCCNH3 = 0.80/FT/FPH/RATIO

where FT and FPH are as above for acute criterion and:

RATIO = 16 *where* 7.7 ≤ pH ≤ 9

RATIO = 24 x 107.7 – pH *where* 6.5≤ pH ≤ 7.7

1 + 10 7.4 - pH

TCAP = 15 ˚C; Salmonids and other sensitive coldwater species present

TCAP = 20 ˚C; Salmonids and other sensitive coldwater species absent

**TABLE ~~Table~~ 31~~3C~~:Aquatic Life Water Quality Guidance Values for Toxic Pollutants**

*Effective April 18, 2014*

**~~WATER QUALITY GUIDANCE VALUES SUMMARY~~ Water Quality Guidance Values Summary A**

The concentration for each compound listed in Table 31~~3c~~ is a guidance value that can be used in application of Oregon’s ~~Narrative~~ Toxic~~s~~ Substances Narrative ~~Criteria~~ (340-041-0033(2~~1~~)) to waters of the state in order to protect aquatic life. All values are expressed as micrograms per liter (µg/L) except where noted. Compounds are listed in alphabetical order with the corresponding EPA number (from National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047), corresponding Chemical Abstract Service (CAS) number, aquatic life freshwater acute and chronic guidance values, and aquatic life saltwater acute and chronic guidance values.

| Table 31  **Aquatic Life Water Quality Guidance Values for Toxic Pollutants** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **EPA No.** | **Pollutant** | **CAS Number** | **Freshwater** | | **Saltwater** | |
| **Acute** | **Chronic** | **Acute** | **Chronic** |
| 56 | Acenaphthene | 83329 | 1,700 | 520 | 970 | 710 |
| 17 | Acrolein | 107028 | 68 | 21 | 55 |  |
| 18 | Acrylonitrile | 107131 | 7,550 | 2,600 |  |  |
| 1 | Antimony | 7440360 | 9,000 | 1,600 |  |  |
| ~~2~~ | ~~Arsenic~~ | ~~7440382~~ | ~~850~~ | ~~48~~ | ~~2,310~~ | ~~13~~ |
| 19 | Benzene | 71432 | 5,300 |  | 5,100 | 700 |
| 59 | Benzidine | 92875 | 2,500 |  |  |  |
| 3 | Beryllium | 7440417 | 130 | 5.3 |  |  |
| 19 B | BHC (Hexachlorocyclohexane-Technical) | 319868 | 100 |  | 0.34 |  |
| 21 | Carbon Tetrachloride | 56235 | 35,200 |  | 50,000 |  |
|  | Chlorinated Benzenes |  | 250 | 50 | 160 | 129 |
|  | Chlorinated naphthalenes |  | 1,600 |  | 7.5 |  |
|  | Chloroalkyl Ethers |  | 238,000 |  |  |  |
| 26 | Chloroform | 67663 | 28,900 | 1,240 |  |  |
| 45 | Chlorophenol 2- | 95578 | 4,380 | 2,000 |  |  |
|  | Chlorophenol 4- | 106489 |  |  | 29,700 |  |
| 52 | Methyl-4-chlorophenol 3- | 59507 | 30 |  |  |  |
| 5a | Chromium (III) | 16065831 |  |  | 10,300 |  |
| 109 | DDE 4,4'- | 72559 | 1,050 |  | 14 |  |
| 110 | DDD 4,4'- | 72548 | 0.06 |  | 3.6 |  |
|  | Diazinon | 333415 | 0.08 | 0.05 |  |  |
|  | Dichlorobenzenes |  | 1,120 | 763 | 1,970 |  |
| 29 | Dichloroethane 1,2- | 107062 | 118,000 | 20,000 | 113,000 |  |
|  | Dichloroethylenes |  | 11,600 |  | 224.000 |  |
| 46 | Dichlorophenol 2,4- | 120832 | 2,020 | 365 |  |  |
| 31 | Dichloropropane 1,2- | 78875 | 23,000 | 5,700 | 10,300 | 3,040 |
| 32 | Dichloropropene 1,3- | 542756 | 6,060 | 244 | 790 |  |
| 47 | Dimethylphenol 2,4- | 105679 | 2,120 |  |  |  |
|  | Dinitrotoluene |  | 330 | 230 | 590 | 370 |
| 16 | Dioxin (2,3,7,8-TCDD) | 1746016 | 0.01 | 38pg/L |  |  |
| 85 | Diphenylhydrazine 1,2- | 122667 | 270 |  |  |  |
| 33 | Ethylbenzene | 100414 | 32,000 |  | 430 |  |
| 86 | Fluoranthene | 206440 | 3,980 |  | 40 | 16 |
|  | Haloethers |  | 360 | 122 |  |  |
|  | Halomethanes |  | 11,000 |  | 12,000 | 6,400 |
| 89 | Hexachlorobutadiene | 87683 | 90 | 9.3 | 32 |  |
| 90 | Hexachlorocyclopentadiene | 77474 | 7 | 5.2 | 7 |  |
| 91 | Hexachloroethane | 67721 | 980 | 540 | 940 |  |
| 93 | Isophorone | 78591 | 117,000 |  | 12,900 |  |
| 94 | Naphthalene | 91203 | 2,300 | 620 | 2,350 |  |
| 95 | Nitrobenzene | 98953 | 27,000 |  | 6,680 |  |
|  | Nitrophenols |  | 230 | 150 | 4,850 |  |
| 26 B | Nitrosamines | 35576911 | 5,850 |  | 3,300,000 |  |
|  | Pentachlorinated ethanes |  | 7,240 | 1,100 | 390 | 281 |
| 54 | Phenol | 108952 | 10,200 | 2,560 | 5,800 |  |
|  | Phthalate esters |  | 940 | 3 | 2,944 | 3.4 |
|  | Polynuclear Aromatic Hydrocarbons |  |  |  | 300 |  |
|  | Tetrachlorinated Ethanes |  | 9,320 |  |  |  |
| 37 | Tetrachloroethane 1,1,2,2- | 79345 |  | 2,400 | 9,020 |  |
|  | Tetrachloroethanes |  | 9,320 |  |  |  |
| 38 | Tetrachloroethylene | 127184 | 5,280 | 840 | 10,200 | 450 |
|  | Tetrachlorophenol 2,3,5,6 |  |  |  |  | 440 |
| 12 | Thallium | 7440280 | 1,400 | 40 | 2,130 |  |
| 39 | Toluene | 108883 | 17,500 |  | 6,300 | 5,000 |
|  | Trichlorinated ethanes |  | 18,000 |  |  |  |
| 41 | Trichloroethane 1,1,1- | 71556 |  |  | 31,200 |  |
| 42 | Trichloroethane 1,1,2- | 79005 |  | 9,400 |  |  |
| 43 | Trichloroethylene | 79016 | 45,000 | 21,900 | 2,000 |  |
| 55 | Trichlorophenol 2,4,6- | 88062 |  | 970 |  |  |

The following chemicals/compounds/classes are of concern due to the potential for toxic effects to aquatic organisms; however, no guidance values are designated. If these compounds are identified in the waste stream, then a review of the scientific literature may be appropriate for deriving guidance values.

* Polybrominated diphenyl ethers (PBDE)
* Polybrominated biphenyls (PBB)
* Pharmaceuticals
* Personal care products
* Alkyl Phenols
* Other chemicals with Toxic effects

**Footnotes:**

A Values in Table 31~~3c~~ are applicable to all basins.

B This number was assigned to the list of non-priority pollutants in National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047).

**TABLE 40: Human Health Water Quality Criteria for Toxic Pollutants**

*Effective April 18, 2014*

**Human Health Criteria Summary**

The concentration for each pollutant listed in Table 40 was derived to protect Oregonians from potential adverse health impacts associated with long-term exposure to toxic substances associated with consumption of fish, shellfish, and water. The “organism only” criteria are established to protect fish and shellfish consumption and apply to waters of the state designated for fishing. The “water + organism” criteria are established to protect the consumption of drinking water, fish, and shellfish, and apply where both fishing and domestic water supply (public and private) are designated uses. All criteria are expressed as micrograms per liter (µg/L), unless otherwise noted. Pollutants are listed in alphabetical order. Additional information includes the Chemical Abstract Service (CAS) number, whether the criterion is based on carcinogenic effects (can cause cancer in humans), and whether there is an aquatic life criterion for the pollutant (i.e. “y”= yes, “n” = no). All the human health criteria were calculated using a fish consumption rate of 175 grams per day unless otherwise noted. A fish consumption rate of 175 grams per day is approximately equal to 23 8-ounce fish meals per month. For pollutants categorized as carcinogens, values represent a cancer risk of one additional case of cancer in one million people (i.e. 10-6), unless otherwise noted. All metals criteria are for total metal concentration, unless otherwise noted. Italicized pollutants represent non-priority pollutants. The human health criteria revisions established by OAR 340-041-0033 and shown in Table 40 do not become applicable for purposes of ORS chapter 468B or the federal Clean Water Act until approved by EPA pursuant to 40 CFR 131.21 (4/27/2000).

| Table 40  **Human Health Water Quality Criteria for Toxic Pollutants** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Pollutant** | **CAS Number** | **Carcinogen** | **Aquatic Life Criterion** | ***Human Health Criteria for the Consumption of:*** | |
| **Water + Organism (µg/L)** | **Organism Only (µg/L)** |
| 1 | Acenaphthene | 83329 | n | n | 95 | 99 |
| 2 | Acrolein | 107028 | n | n | 0.88 | 0.93 |
| 3 | Acrylonitrile | 107131 | y | n | 0.018 | 0.025 |
| 4 | Aldrin | 309002 | y | y | 0.0000050 | 0.0000050 |
| 5 | Anthracene | 120127 | n | n | 2900 | 4000 |
| 6 | Antimony | 7440360 | n | n | 5.1 | 64 |
| 7 | Arsenic (inorganic) **A** | 7440382 | y | ~~n~~ y | 2.1 | 2.1(freshwater)  1.0 (saltwater) |
|  | **A***The arsenic criteria are expressed as total inorganic arsenic. The “organism only” freshwater criterion is based on a risk level of approximately ~~of~~ 1 x 10-5, and the “water + organism” criterion is based on a risk level of 1 x 10-4.* | | | | | |
| 8 | Asbestos **B** | 1332214 | y | n | 7,000,000 fibers/L | -- |
|  | **B***Thehuman health risks from asbestos are primarily from drinking water, therefore no “organism only” criterion was developed. The “water + organism” criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | |
| 9 | *Barium***C** | 7440393 | n | n | 1000 | -- |
|  | **C** *The human health criterion for barium is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the 1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no “organism only” criterion was developed. The “water + organism” criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | |
| 10 | Benzene | 71432 | y | n | 0.44 | 1.4 |
| 11 | Benzidine | 92875 | y | n | 0.000018 | 0.000020 |
| 12 | Benz(a)anthracene | 56553 | y | n | 0.0013 | 0.0018 |
| 13 | Benzo(a)pyrene | 50328 | y | n | 0.0013 | 0.0018 |
| 14 | Benzo(b)fluoranthene 3,4 | 205992 | y | n | 0.0013 | 0.0018 |
| 15 | Benzo(k)fluoranthene | 207089 | y | n | 0.0013 | 0.0018 |
| 16 | BHC Alpha | 319846 | y | n | 0.00045 | 0.00049 |
| 17 | BHC Beta | 319857 | y | n | 0.0016 | 0.0017 |
| 18 | BHC Gamma (Lindane) | 58899 | n | y | 0.17 | 0.18 |
| 19 | Bromoform | 75252 | y | n | 3.3 | 14 |
| 20 | Butylbenzyl Phthalate | 85687 | n | n | 190 | 190 |
| 21 | Carbon Tetrachloride | 56235 | y | n | 0.10 | 0.16 |
| 22 | Chlordane | 57749 | y | y | 0.000081 | 0.000081 |
| 23 | Chlorobenzene | 108907 | n | n | 74 | 160 |
| 24 | Chlorodibromomethane | 124481 | y | n | 0.31 | 1.3 |
| 25 | Chloroethyl Ether bis 2 | 111444 | y | n | 0.020 | 0.053  [should reflect 2 significant digits] |
| 26 | Chloroform | 67663 | n | n | 260 | 1100 |
| 27 | Chloroisopropyl Ether bis 2 | 108601 | n | n | 1200 | 6500 |
| 28 | *Chloromethyl ether, bis* | 542881 | y | n | 0.000024 | 0.000029 |
| 29 | Chloronaphthalene 2 | 91587 | n | n | 150 | 160 |
| 30 | Chlorophenol 2 | 95578 | n | n | 14 | 15 |
| 31 | *Chlorophenoxy Herbicide (2,4,5,-TP)***D** | 93721 | n | n | 10 | -- |
|  | **D***TheChlorophenoxy Herbicide (2,4,5,-TP) criterion is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the 1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no “organism only” criterion was developed. The “water + organism” criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | |
| 32 | *Chlorophenoxy Herbicide (2,4-D)***E** | 94757 | n | n | 100 | -- |
|  | **E** *The Chlorophenoxy Herbicide (2,4-D) criterion is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the 1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no “organism only” criterion was developed. The “water + organism” criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | |
| 33 | Chrysene | 218019 | y | n | 0.0013 | 0.0018 |
| 34 | Copper**F** | 7440508 | n | y | 1300 | -- |
|  | **F***Human health risks from copper are primarily from drinking water, therefore no “organism only” criterion was developed. The “water + organism” criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | |
| 35 | Cyanide**G** | 57125 | n | y | 130 | 130 |
|  | **G***The cyanide criterion is expressed as total cyanide (CN)/L.* | | | | | |
| 36 | DDD 4,4' | 72548 | y | n | 0.000031 | 0.000031 |
| 37 | DDE 4,4' | 72559 | y | n | 0.000022 | 0.000022 |
| 38 | DDT 4,4' | 50293 | y | y | 0.000022 | 0.000022 |
| 39 | Dibenz(a,h)anthracene | 53703 | y | n | 0.0013 | 0.0018 |
| 40 | Dichlorobenzene(m) 1,3 | 541731 | n | n | 80 | 96 |
| 41 | Dichlorobenzene(o) 1,2 | 95501 | n | n | 110 | 130 |
| 42 | Dichlorobenzene(p) 1,4 | 106467 | n | n | 16 | 19 |
| 43 | Dichlorobenzidine 3,3' | 91941 | y | n | 0.0027 | 0.0028 |
| 44 | Dichlorobromomethane | 75274 | y | n | 0.42 | 1.7 |
| 45 | Dichloroethane 1,2 | 107062 | y | n | 0.35 | 3.7 |
| 46 | Dichloroethylene 1,1 | 75354 | n | n | 230 | 710 |
| 47 | Dichloroethylene trans 1,2 | 156605 | n | n | 120 | 1000 |
| 48 | Dichlorophenol 2,4 | 120832 | n | n | 23 | 29 |
| 49 | Dichloropropane 1,2 | 78875 | y | n | 0.38 | 1.5 |
| 50 | Dichloropropene 1,3 | 542756 | y | n | 0.30 | 2.1 |
| 51 | Dieldrin | 60571 | y | y | 0.0000053 | 0.0000054 |
| 52 | Diethyl Phthalate | 84662 | n | n | 3800 | 4400 |
| 53 | Dimethyl Phthalate | 131113 | n | n | 84000 | 110000 |
| 54 | Dimethylphenol 2,4 | 105679 | n | n | 76 | 85 |
| 55 | Di-n-butyl Phthalate | 84742 | n | n | 400 | 450 |
| 56 | Dinitrophenol 2,4 | 51285 | n | n | 62 | 530 |
| 57 | *Dinitrophenols* | 25550587 | n | n | 62 | 530 |
| 58 | Dinitrotoluene 2,4 | 121142 | y | n | 0.084 | 0.34 |
| 59 | Dioxin (2,3,7,8-TCDD) | 1746016 | y | n | 0.00000000051 | 0.00000000051 |
| 60 | Diphenylhydrazine 1,2 | 122667 | y | n | 0.014 | 0.020 |
| 61 | Endosulfan Alpha | 959988 | n | y | 8.5 | 8.9 |
| 62 | Endosulfan Beta | 33213659 | n | y | 8.5 | 8.9 |
| 63 | Endosulfan Sulfate | 1031078 | n | n | 8.5 | 8.9 |
| 64 | Endrin | 72208 | n | y | 0.024 | 0.024 |
| 65 | Endrin Aldehyde | 7421934 | n | n | 0.030 | 0.030 |
| 66 | Ethylbenzene | 100414 | n | n | 160 | 210 |
| 67 | Ethylhexyl Phthalate bis 2 | 117817 | y | n | 0.20 | 0.22 |
| 68 | Fluoranthene | 206440 | n | n | 14 | 14 |
| 69 | Fluorene | 86737 | n | n | 390 | 530 |
| 70 | Heptachlor | 76448 | y | y | 0.0000079 | 0.0000079 |
| 71 | Heptachlor Epoxide | 1024573 | y | y | 0.0000039 | 0.0000039 |
| 72 | Hexachlorobenzene | 118741 | y | n | 0.000029 | 0.000029 |
| 73 | Hexachlorobutadiene | 87683 | y | n | 0.36 | 1.8 |
| 74 | *Hexachlorocyclo-hexane-Technical* | 608731 | y | n | 0.0014 | 0.0015 |
| 75 | Hexachlorocyclopentadiene | 77474 | n | n | 30 | 110 |
| 76 | Hexachloroethane | 67721 | y | n | 0.29 | 0.33 |
| 77 | Indeno(1,2,3-cd)pyrene | 193395 | y | n | 0.0013 | 0.0018 |
| 78 | Isophorone | 78591 | y | n | 27 | 96 |
| 79 | *Manganese***H** | 7439965 | n | n | -- | 100 |
|  | **H***The “fish consumption only” criterion for manganese applies only to salt water and is for total manganese. This EPA recommended criterion predates the 1980 human health methodology and does not utilize the fish ingestion BCF calculation method or a fish consumption rate.* | | | | | |
| 80 | *Methoxychlor* **I** | 72435 | n | y | 100 | -- |
|  | **I** *The human health criterion for methoxychlor is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the1986 EPA Gold Book.* *Human health risks are primarily from drinking water, therefore no “organism only” criterion was developed. The “water + organism” criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | |
| 81 | Methyl Bromide | 74839 | n | n | 37 | 150 |
| 82 | Methyl-4,6-dinitrophenol 2 | 534521 | n | n | 9.2 | 28 |
| 83 | Methylene Chloride | 75092 | y | n | 4.3 | 59 |
| 84 | Methylmercury (mg/kg)**J** | 22967926 | n | n | -- | 0.040 mg/kg |
|  | **J***This value is expressed as the fish tissue concentration of methylmercury. Contaminated fish and shellfish is the primary human route of exposure to methylmercury* | | | | | |
| 85 | Nickel | 7440020 | n | ~~n~~ y | 140 | 170 |
| 86 | *Nitrates***K** | 14797558 | n | n | 10000 | -- |
|  | **K***The human health criterion for nitrates is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the 1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no “organism only” criterion was developed. The “water + organism” criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | |
| 87 | Nitrobenzene | 98953 | n | n | 14 | 69 |
| 88 | *Nitrosamines* | 35576911 | y | n | 0.00079 | 0.046 |
| 89 | *Nitrosodibutylamine, N* | 924163 | y | n | 0.0050 | 0.022 |
| 90 | *Nitrosodiethylamine, N* | 55185 | y | n | 0.00079 | 0.046 |
| 91 | Nitrosodimethylamine, N | 62759 | y | n | 0.00068 | 0.30 |
| 92 | Nitrosodi-n-propylamine, N | 621647 | y | n | 0.0046 | 0.051 |
| 93 | Nitrosodiphenylamine, N | 86306 | y | n | 0.55 | 0.60 |
| 94 | *Nitrosopyrrolidine, N* | 930552 | y | n | 0.016 | 3.4 |
| 95 | *Pentachlorobenzene* | 608935 | n | n | 0.15 | 0.15 |
| 96 | Pentachlorophenol | 87865 | y | y | 0.15 | 0.30 |
| 97 | Phenol | 108952 | n | n | 9400 | 86000 |
| 98 | Polychlorinated Biphenyls (PCBs)**L** | NA | y | y | 0.0000064 | 0.0000064 |
|  | **L***This criterion applies to total PCBs (e.g. determined as Aroclors or congeners).* | | | | | |
| 99 | Pyrene | 129000 | n | n | 290 | 400 |
| 100 | Selenium | 7782492 | n | ~~n~~ y | 120 | 420 |
| 101 | *Tetrachlorobenzene, 1,2,4,5-* | 95943 | n | n | 0.11 | 0.11 |
| 102 | Tetrachloroethane 1,1,2,2 | 79345 | y | n | 0.12 | 0.40 |
| 103 | Tetrachloroethylene | 127184 | y | n | 0.24 | 0.33 |
| 104 | Thallium | 7440280 | n | n | 0.043 | 0.047 |
| 105 | Toluene | 108883 | n | n | 720 | 1500 |
| 106 | Toxaphene | 8001352 | y | y | 0.000028 | 0.000028 |
| 107 | Trichlorobenzene 1,2,4 | 120821 | n | n | 6.4 | 7.0 |
| 108 | Trichloroethane 1,1,2 | 79005 | y | ~~y~~ n | 0.44 | 1.6 |
| 109 | Trichloroethylene | 79016 | y | n | 1.4 | 3.0 |
| 110 | Trichlorophenol 2,4,6 | 88062 | y | n | 0.23 | 0.24 |
| 111 | *Trichlorophenol, 2, 4, 5-* | 95954 | n | n | 330 | 360 |
| 112 | Vinyl Chloride | 75014 | y | n | 0.023 | 0.24 |
| 113 | Zinc | 7440666 | n | ~~n~~ y | 2100 | 2600 |

**~~TABLE 20~~**

***~~AQUATIC LIFE WATER QUALITY CRITERIA SUMMARY~~* ~~1~~**

~~The concentration for each compound listed in Table 20 is a criterion not to be exceeded in waters of the state in order to protect aquatic life. All values are expressed as micrograms per liter (µg/L) except where noted. Compounds are listed in alphabetical order with the corresponding designations as to whether EPA has identified it as a priority pollutant and a carcinogen, aquatic life freshwater acute and chronic criteria, aquatic life marine acute and chronic criteria. The acute criteria refer to the average concentration for one (1) hour and the chronic criteria refer to the average concentration for 96 hours (4 days), and that these criteria should not be exceeded more than once every three (3) years.~~

| ~~Compound Name (or Class)~~ | **~~Priority Pollutant~~** | **~~Concentration in Micrograms Per Liter~~**  **~~for Protection of Aquatic Life~~** | | | |
| --- | --- | --- | --- | --- | --- |
|  | |  | |
| **~~Fresh Acute Criteria~~** | **~~Fresh Chronic Criteria~~** | **~~Marine Acute Criteria~~** | **~~Marine Chronic Criteria~~** |
| ~~Acenapthene~~ | ~~Y~~ |  |  |  |  |
| ~~Acrolein~~ | ~~Y~~ |  |  |  |  |
| ~~Acrylonitrile~~ | ~~Y~~ |  |  |  |  |
| ~~Aldrin~~ | ~~Y~~ | ~~3~~ |  | ~~1.3~~ |  |
| ~~Alkalinity~~ | ~~N~~ |  | ~~20,000~~ |  |  |
| ~~Ammonia~~ | ~~N~~ | ~~CRITERIA ARE pH AND TEMPERATURE DEPENDENT—SEE DOCUMENT USEPA JANUARY 1985 (Fresh Water)~~  ~~CRITERIA ARE pH AND TEMPERATURE DEPENDENT—SEE DOCUMENT USEPA APRIL 1989 (Marine Water)~~ | | | |
| ~~Antimony~~ | ~~Y~~ |  |  |  |  |
| ~~Arsenic~~ | ~~Y~~ |  |  |  |  |
| ~~Arsenic (Pent)~~ | ~~Y~~ |  |  |  |  |
| ~~Arsenic (Tri)~~ | ~~Y~~ | ~~360~~ | ~~190~~ | ~~69~~ | ~~36~~ |
| ~~Asbestos~~ | ~~Y~~ |  |  |  |  |
| ~~Barium~~ | ~~N~~ |  |  |  |  |
| ~~Benzene~~ | ~~Y~~ |  |  |  |  |
| ~~Benzidine~~ | ~~Y~~ |  |  |  |  |
| ~~Beryllium~~ | ~~Y~~ |  |  |  |  |
| ~~BHC~~ | ~~Y~~ |  |  |  |  |
| ~~Cadmium~~ | ~~Y~~ | ~~3.9+~~ | ~~1.1+~~ | ~~43~~ | ~~9.3~~ |
| ~~Carbon Tetrachloride~~ | ~~Y~~ |  |  |  |  |
| ~~Chlordane~~ | ~~Y~~ | ~~2.4~~ | ~~0.0043~~ | ~~0.09~~ | ~~0.004~~ |
| ~~Chloride~~ | ~~N~~ | ~~860 mg/L~~ | ~~230 mg/L~~ |  |  |
| ~~Chlorinated Benzenes~~ | ~~Y~~ |  |  |  |  |
| ~~Chlorinated Naphthalenes~~ | ~~Y~~ |  |  |  |  |
| ~~Chlorine~~ | ~~N~~ | ~~19~~ | ~~11~~ | ~~13~~ | ~~7.5~~ |
| ~~Chloroalkyl Ethers~~ | ~~Y~~ |  |  |  |  |
| ~~Chloroethyl Ether (Bis-2)~~ | ~~Y~~ |  |  |  |  |
| ~~Chloroform~~ | ~~Y~~ |  |  |  |  |
| ~~Chloroisopropyl Ether (Bis-2)~~ | ~~Y~~ |  |  |  |  |
| ~~Chloromethyl Ether (Bis)~~ | ~~N~~ |  |  |  |  |
| ~~Chlorophenol 2~~ | ~~Y~~ |  |  |  |  |
| ~~Chlorophenol 4~~ | ~~N~~ |  |  |  |  |
| ~~Chlorophenoxy Herbicides (2,4,5,-Tp)~~ | ~~N~~ |  |  |  |  |
| ~~Chlorophenoxy Herbicides (2,4-D)~~ | ~~N~~ |  |  |  |  |
| ~~Chlorpyrifos~~ | ~~N~~ | ~~0.083~~ | ~~0.041~~ | ~~0.011~~ | ~~0.0056~~ |
| ~~Chloro-4 Methyl-3 Phenol~~ | ~~N~~ |  |  |  |  |
| ~~Chromium (Hex)~~ | ~~Y~~ | ~~16~~ | ~~11~~ | ~~1,100~~ | ~~50~~ |
| ~~Chromium (Tri)~~ | ~~N~~ | ~~1,700.+~~ | ~~210.+~~ |  |  |
| ~~Copper~~ | ~~Y~~ | ~~18.+~~ | ~~12.+~~ | ~~2.9~~ | ~~2.9~~ |
| ~~Cyanide~~ | ~~Y~~ | ~~22~~ | ~~5.2~~ | ~~1~~ | ~~1~~ |
| ~~DDT~~ | ~~Y~~ | ~~1.1~~ | ~~0.001~~ | ~~0.13~~ | ~~0.001~~ |
| ~~(TDE) DDT Metabolite~~ | ~~Y~~ |  |  |  |  |
| ~~(DDE) DDT Metabolite~~ | ~~Y~~ |  |  |  |  |
| ~~Demeton~~ | ~~Y~~ |  | ~~0.1~~ |  | ~~0.1~~ |
| ~~Dibutylphthalate~~ | ~~Y~~ |  |  |  |  |
| ~~Dichlorobenzenes~~ | ~~Y~~ |  |  |  |  |
| ~~Dichlorobenzidine~~ | ~~Y~~ |  |  |  |  |
| ~~Dichloroethane 1,2~~ | ~~Y~~ |  |  |  |  |
| ~~Dichloroethylenes~~ | ~~Y~~ |  |  |  |  |
| ~~Dichlorophenol 2,4~~ | ~~N~~ |  |  |  |  |
| ~~Dichloropropane~~ | ~~Y~~ |  |  |  |  |
| ~~Dichloropropene~~ | ~~Y~~ |  |  |  |  |
| ~~Dieldrin~~ | ~~Y~~ | ~~2.5~~ | ~~0.0019~~ | ~~0.71~~ | ~~0.0019~~ |
| ~~Diethylphthalate~~ | ~~Y~~ |  |  |  |  |
| ~~Dimethyl Phenol 2,4~~ | ~~Y~~ |  |  |  |  |
| ~~Dimethyl Phthalate~~ | ~~Y~~ |  |  |  |  |
| ~~Dinitrotoluene 2,4~~ | ~~N~~ |  |  |  |  |
| ~~Dinitrotoluene~~ | ~~Y~~ |  |  |  |  |
| ~~Dinitrotoluene~~ | ~~N~~ |  |  |  |  |
| ~~Dinitro-o-Cresol 2,4~~ | ~~Y~~ |  |  |  |  |
| ~~Dioxin (2,3,7,8-Tcdd)~~ | ~~Y~~ |  |  |  |  |
| ~~Diphenylhydrazine~~ | ~~Y~~ |  |  |  |  |
| ~~Diphenylhydrazine 1,2~~ | ~~Y~~ |  |  |  |  |
| ~~Di-2-Ethylhexyl Phthalate~~ | ~~Y~~ |  |  |  |  |
| ~~Endosulfan~~ | ~~Y~~ | ~~0.22~~ | ~~0.056~~ | ~~0.034~~ | ~~0.0087~~ |
| ~~Endrin~~ | ~~Y~~ | ~~0.18~~ | ~~0.0023~~ | ~~0.037~~ | ~~0.0023~~ |
| ~~Ethylbenzene~~ | ~~Y~~ |  |  |  |  |
| ~~Fluoranthene~~ | ~~Y~~ |  |  |  |  |
| ~~Guthion~~ | ~~N~~ |  | ~~0.01~~ |  | ~~0.01~~ |
| ~~Haloethers~~ | ~~Y~~ |  |  |  |  |
| ~~Halomethanes~~ | ~~Y~~ |  |  |  |  |
| ~~Heptachlor~~ | ~~Y~~ | ~~0.52~~ | ~~0.0038~~ | ~~0.053~~ | ~~0.0036~~ |
| ~~Hexachloroethane~~ | ~~N~~ |  |  |  |  |
| ~~Hexachlorobenzene~~ | ~~Y~~ |  |  |  |  |
| ~~Hexachlorobutadiene~~ | ~~Y~~ |  |  |  |  |
| ~~Hexachlorocyclohexane (Lindane)~~ | ~~Y~~ | ~~2~~ | ~~0.08~~ | ~~0.16~~ |  |
| ~~Hexachlorocyclohexane-Alpha~~ | ~~Y~~ |  |  |  |  |
| ~~Hexachlorocyclohexane-Beta~~ | ~~Y~~ |  |  |  |  |
| ~~Hexachlorocyclohexane-Gama~~ | ~~Y~~ |  |  |  |  |
| ~~Hexachlorocyclohexane-Technical~~ | ~~Y~~ |  |  |  |  |
| ~~Hexachlorocyclopentadiene~~ | ~~Y~~ |  |  |  |  |
| ~~Iron~~ | ~~N~~ |  | ~~1,000~~ |  |  |
| ~~Isophorone~~ | ~~Y~~ |  |  |  |  |
| ~~Lead~~ | ~~Y~~ | ~~82+~~ | ~~3.2+~~ | ~~140~~ | ~~5.6~~ |
| ~~Malathion~~ | ~~N~~ |  | ~~0.1~~ |  | ~~0.1~~ |
| ~~Manganese~~ | ~~N~~ |  |  |  |  |
| ~~Mercury~~ | ~~Y~~ | ~~2.4~~ | ~~0.012~~ | ~~2.1~~ | ~~0.025~~ |
| ~~Methoxychlor~~ | ~~N~~ |  | ~~0.03~~ |  | ~~0.03~~ |
| ~~Mirex~~ | ~~N~~ |  | ~~0.001~~ |  | ~~0.001~~ |
| ~~Monochlorobenzene~~ | ~~Y~~ |  |  |  |  |
| ~~Naphthalene~~ | ~~Y~~ |  |  |  |  |
| ~~Nickel~~ | ~~Y~~ | ~~1,400+~~ | ~~160+~~ | ~~75~~ | ~~8.3~~ |
| ~~Nitrates~~ | ~~N~~ |  |  |  |  |
| ~~Nitrobenzene~~ | ~~Y~~ |  |  |  |  |
| ~~Nitrophenols~~ | ~~Y~~ |  |  |  |  |
| ~~Nitrosamines~~ | ~~Y~~ |  |  |  |  |
| ~~Nitrosodibutylamine N~~ | ~~Y~~ |  |  |  |  |
| ~~Nitrosodiethylamine N~~ | ~~Y~~ |  |  |  |  |
| ~~Nitrosodimethylamine N~~ | ~~Y~~ |  |  |  |  |
| ~~Nitrosodiphenylamine N~~ | ~~Y~~ |  |  |  |  |
| ~~Nitrosopyrrolidine N~~ | ~~Y~~ |  |  |  |  |
| ~~Parathion~~ | ~~N~~ | ~~0.065~~ | ~~0.013~~ |  |  |
| ~~PCB's~~ | ~~Y~~ | ~~2~~ | ~~0.014~~ | ~~10~~ | ~~0.03~~ |
| ~~Pentachlorinated Ethanes~~ | ~~N~~ |  |  |  |  |
| ~~Pentachlorobenzene~~ | ~~N~~ |  |  |  |  |
| ~~Pentachlorophenol~~ | ~~Y~~ | ~~\*\*\*20~~ | ~~\*\*\*13~~ | ~~13~~ |  |
| ~~Phenol~~ | ~~Y~~ |  |  |  |  |
| ~~Phosphorus Elemental~~ | ~~N~~ |  |  |  | ~~0.1~~ |
| ~~Phthalate Esters~~ | ~~Y~~ |  |  |  |  |
| ~~Polynuclear Aromatic Hydrocarbons~~ | ~~Y~~ |  |  |  |  |
| ~~Selenium~~ | ~~Y~~ | ~~260~~ | ~~35~~ | ~~410~~ | ~~54~~ |
| ~~Silver~~ | ~~Y~~ | ~~4.1+~~ | ~~0.12~~ | ~~2.3~~ |  |
| ~~Sulfide Hydrogen Sulfide~~ | ~~N~~ |  | ~~2~~ |  | ~~2~~ |
| ~~Tetrachlorinated Ethanes~~ | ~~Y~~ |  |  |  |  |
| ~~Tetrachlorobenzene 1,2,4,5~~ | ~~Y~~ |  |  |  |  |
| ~~Tetrachloroethane 1,1,2,2~~ | ~~Y~~ |  |  |  |  |
| ~~Tetrachloroethanes~~ | ~~Y~~ |  |  |  |  |
| ~~Tetrachloroethylene~~ | ~~Y~~ |  |  |  |  |
| ~~Tetrachlorophenol 2,3,5,6~~ | ~~Y~~ |  |  |  |  |
| ~~Thallium~~ | ~~Y~~ |  |  |  |  |
| ~~Toluene~~ | ~~Y~~ |  |  |  |  |
| ~~Toxaphene~~ | ~~Y~~ | ~~0.73~~ | ~~0.0002~~ | ~~0.21~~ | ~~0.0002~~ |
| ~~Trichlorinated Ethanes~~ | ~~Y~~ |  |  |  |  |
| ~~Trichloroethane 1,1,1~~ | ~~Y~~ |  |  |  |  |
| ~~Trichloroethane 1,1,2~~ | ~~Y~~ |  |  |  |  |
| ~~Trichloroethylene~~ | ~~Y~~ |  |  |  |  |
| ~~Trichlorophenol 2,4,5~~ | ~~N~~ |  |  |  |  |
| ~~Trichlorophenol 2,4,6~~ | ~~Y~~ |  |  |  |  |
| ~~Vinyl Chloride~~ | ~~Y~~ |  |  |  |  |
| ~~Zinc~~ | ~~Y~~ | ~~120+~~ | ~~110+~~ | ~~95~~ | ~~86~~ |

**~~MEANING OF SYMBOLS:~~**

~~g = grams~~

~~mg = milligrams~~

~~+ = Hardness Dependent Criteria (100 mg/L used).~~

~~The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. Criteria values for hardness may be calculated from the following formulae (CMC refers to Acute Criteria; CCC refers to Chronic Criteria):~~

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **~~Chemical~~** | **~~m~~~~A~~** | **~~b~~~~A~~** | **~~m~~~~C~~** | **~~b~~~~C~~** |
| ~~Cadmium~~ | ~~1.128~~ | ~~-3.828~~ | ~~0.7852~~ | ~~-3.49~~ |
| ~~Chromium III~~ | ~~0.819~~ | ~~3.688~~ | ~~0.819~~ | ~~1.561~~ |
| ~~Copper~~ | ~~0.9422~~ | ~~-1.464~~ | ~~0.8545~~ | ~~-1.465~~ |
| ~~Lead~~ | ~~1.273~~ | ~~-1.46~~ | ~~1.273~~ | ~~-4.705~~ |
| ~~Nickel~~ | ~~0.846~~ | ~~3.3612~~ | ~~0.846~~ | ~~1.1645~~ |
| ~~Silver~~ | ~~1.72~~ | ~~-6.52~~ |  |  |
| ~~Zinc~~ | ~~0.8473~~ | ~~0.8604~~ | ~~0.8473~~ | ~~0.7614~~ |

~~CMC = (exp(m~~~~A~~~~\*[ln(hardness)] + b~~~~A~~~~))\*CF~~

~~CCC = (exp(m~~~~C~~~~\*[ln(hardness)] + b~~~~C~~~~))\*CF~~

~~ug = micrograms~~

~~\* = Insufficient data to develop criteria; value presented is the L.O.E.L – Lower Observed Effect Level.~~

~~ng = nanograms~~

~~pg = picograms~~

~~\*\*\* = pH Dependent Criteria (7.8 pH used).~~

~~Y = Yes~~

~~N = No~~

~~1 = Values in Table 20 are applicable to all basin~~

**~~TABLE 33A~~**

~~Note: The Environmental Quality Commission adopted the following criteria on May 20, 2004 to become effective February 15, 2005. However, EPA has not yet (as of June 2006) approved the criteria. Thus, Table 33A criteria may be used in NPDES permits, but not for the section 303(d) list of impaired waters.~~

***~~AQUATIC LIFE WATER QUALITY CRITERIA SUMMARY~~* ~~A~~**

~~The concentration for each compound listed in Table 33A is a criterion not to be exceeded in waters of the state in order to protect aquatic life. All values are expressed as micrograms per liter (µg/L) except where noted. Compounds are listed in alphabetical order with the corresponding EPA number (from National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047), the Chemical Abstract Service (CAS) number, aquatic life freshwater acute and chronic criteria, aquatic life saltwater acute and chronic criteria. The acute criteria refer to the average concentration for one (1) hour and the chronic criteria refer to the average concentration for 96 hours (4 days), and that these criteria should not be exceeded more than once every three (3) years.~~

| ~~EPA No.~~ | ~~Compound~~ | ~~CAS Number~~ |  | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ~~Freshwater~~ | | | | ~~Saltwater~~ | | | |
| ~~Acute (CMC)~~ | ~~Effective Date~~ | ~~Chronic (CCC)~~ | ~~Effective Date~~ | ~~Acute (CMC)~~ | ~~Effective Date~~ | ~~Chronic (CCC)~~ | ~~Effective Date~~ |
| ~~56~~ | ~~Acenaphthene~~ | ~~83329~~ |  |  |  |  |  |  |  |  |
| ~~57~~ | ~~Acenaphthylene~~ | ~~208968~~ |  |  |  |  |  |  |  |  |
| ~~17~~ | ~~Acrolein~~ | ~~107028~~ |  |  |  |  |  |  |  |  |
| ~~18~~ | ~~Acrylonitrile~~ | ~~107131~~ |  |  |  |  |  |  |  |  |
| ~~102~~ | ~~Aldrin~~ | ~~309002~~ | ~~3 O~~ | ~~X~~ |  |  | ~~1.3 O~~ | ~~X~~ |  |  |
| ~~1 N~~ | ~~Alkalinity~~ |  |  |  | ~~20,000 P~~ |  |  |  |  |  |
| ~~2 N~~ | ~~Aluminum (pH 6.5 - 9.0)~~ | ~~7429905~~ |  |  |  |  |  |  |  |  |
| ~~3 N~~ | ~~Ammonia~~ | ~~7664417~~ |  |  |  |  | ~~D~~ | ~~X~~ | ~~D~~ | ~~X~~ |
| ~~58~~ | ~~Anthracene~~ | ~~120127~~ |  |  |  |  |  |  |  |  |
| ~~1~~ | ~~Antimony~~ | ~~7440360~~ |  |  |  |  |  |  |  |  |
| ~~2~~ | ~~Arsenic~~ | ~~7440382~~ |  |  |  |  |  |  |  |  |
| ~~15~~ | ~~Asbestos~~ | ~~1332214~~ |  |  |  |  |  |  |  |  |
| ~~6 N~~ | ~~Barium~~ | ~~7440393~~ |  |  |  |  |  |  |  |  |
| ~~19~~ | ~~Benzene~~ | ~~71432~~ |  |  |  |  |  |  |  |  |
| ~~59~~ | ~~Benzidine~~ | ~~92875~~ |  |  |  |  |  |  |  |  |
| ~~60~~ | ~~Benzo(a)Anthracene~~ | ~~56553~~ |  |  |  |  |  |  |  |  |
| ~~61~~ | ~~Benzo(a)Pyrene~~ | ~~50328~~ |  |  |  |  |  |  |  |  |
| ~~62~~ | ~~Benzo(b)Fluoranthene~~ | ~~205992~~ |  |  |  |  |  |  |  |  |
| ~~63~~ | ~~Benzo(g,h,i)Perylene~~ | ~~191242~~ |  |  |  |  |  |  |  |  |
| ~~64~~ | ~~Benzo(k)Fluoranthene~~ | ~~207089~~ |  |  |  |  |  |  |  |  |
| ~~3~~ | ~~Beryllium~~ | ~~7440417~~ |  |  |  |  |  |  |  |  |
| ~~103~~ | ~~BHC alpha-~~ | ~~319846~~ |  |  |  |  |  |  |  |  |
| ~~104~~ | ~~BHC beta-~~ | ~~319857~~ |  |  |  |  |  |  |  |  |
| ~~106~~ | ~~BHC delta-~~ | ~~319868~~ |  |  |  |  |  |  |  |  |
| ~~105~~ | ~~BHC gamma- (Lindane)~~ | ~~58899~~ | ~~0.95~~ |  | ~~0.08~~ | ~~X~~ | ~~0.16 O~~ |  |  |  |
| ~~7 N~~ | ~~Boron~~ | ~~7440428~~ |  |  |  |  |  |  |  |  |
| ~~20~~ | ~~Bromoform~~ | ~~75252~~ |  |  |  |  |  |  |  |  |
| ~~69~~ | ~~Bromophenyl Phenyl Ether 4-~~ |  |  |  |  |  |  |  |  |  |
| ~~70~~ | ~~Butylbenzyl Phthalate~~ | ~~85687~~ |  |  |  |  |  |  |  |  |
| ~~4~~ | ~~Cadmium~~ | ~~7440439~~ |  |  |  |  |  |  |  |  |
| ~~21~~ | ~~Carbon Tetrachloride~~ | ~~56235~~ |  |  |  |  |  |  |  |  |
| ~~107~~ | ~~Chlordane~~ | ~~57749~~ | ~~2.4 O~~ | ~~X~~ | ~~0.0043 O~~ | ~~X~~ | ~~0.09 O~~ | ~~X~~ | ~~0.004 O~~ | ~~X~~ |
| ~~8 N~~ | ~~Chloride~~ | ~~16887006~~ | ~~860000~~ |  | ~~230000~~ |  |  |  |  |  |
| ~~9 N~~ | ~~Chlorine~~ | ~~7782505~~ | ~~19~~ | ~~X~~ | ~~11~~ | ~~X~~ | ~~13~~ | ~~X~~ | ~~7.5~~ | ~~X~~ |
| ~~22~~ | ~~Chlorobenzene~~ | ~~108907~~ |  |  |  |  |  |  |  |  |
| ~~23~~ | ~~Chlorodibromomethane~~ | ~~124481~~ |  |  |  |  |  |  |  |  |
| ~~24~~ | ~~Chloroethane~~ | ~~75003~~ |  |  |  |  |  |  |  |  |
| ~~65~~ | ~~ChloroethoxyMethane Bis2-~~ | ~~111911~~ |  |  |  |  |  |  |  |  |
| ~~66~~ | ~~ChloroethylEther Bis2-~~ | ~~111444~~ |  |  |  |  |  |  |  |  |
| ~~25~~ | ~~Chloroethylvinyl Ether 2-~~ | ~~110758~~ |  |  |  |  |  |  |  |  |
| ~~26~~ | ~~Chloroform~~ | ~~67663~~ |  |  |  |  |  |  |  |  |
| ~~67~~ | ~~ChloroisopropylEther Bis2-~~ | ~~108601~~ |  |  |  |  |  |  |  |  |
| ~~15 N~~ | ~~ChloromethylEther, Bis~~ | ~~542881~~ |  |  |  |  |  |  |  |  |
| ~~71~~ | ~~Chloronaphthalene 2-~~ | ~~91587~~ |  |  |  |  |  |  |  |  |
| ~~45~~ | ~~Chlorophenol 2-~~ | ~~95578~~ |  |  |  |  |  |  |  |  |
| ~~10 N~~ | ~~Chlorophenoxy Herbicide (2,4,5,-TP)~~ | ~~93721~~ |  |  |  |  |  |  |  |  |
| ~~11 N~~ | ~~Chlorophenoxy Herbicide (2,4-D)~~ | ~~94757~~ |  |  |  |  |  |  |  |  |
| ~~72~~ | ~~Chlorophenyl Phenyl Ether 4-~~ | ~~7005723~~ |  |  |  |  |  |  |  |  |
| ~~12 N~~ | ~~Chloropyrifos~~ | ~~2921882~~ | ~~0.083~~ | ~~X~~ | ~~0.041~~ | ~~X~~ | ~~0.011~~ | ~~X~~ | ~~0.0056~~ | ~~X~~ |
| ~~5a~~ | ~~Chromium (III)~~ |  |  |  |  |  |  |  |  |  |
| ~~5b~~ | ~~Chromium (VI)~~ | ~~18540299~~ |  |  |  |  |  |  |  |  |
| ~~73~~ | ~~Chrysene~~ | ~~218019~~ |  |  |  |  |  |  |  |  |
| ~~6~~ | ~~Copper~~ | ~~7440508~~ |  |  |  |  |  |  |  |  |
| ~~14~~ | ~~Cyanide~~ | ~~57125~~ | ~~22 S~~ | ~~X~~ | ~~5.2 S~~ | ~~X~~ | ~~1 S~~ | ~~X~~ | ~~1 S~~ | ~~X~~ |
| ~~108~~ | ~~DDT 4,4'-~~ | ~~50293~~ | ~~1.1 O,T~~ | ~~X~~ | ~~0.001 O,T~~ | ~~X~~ | ~~0.13 O,T~~ | ~~X~~ | ~~0.001 O,T~~ | ~~X~~ |
| ~~109~~ | ~~DDE 4,4'-~~ | ~~72559~~ |  |  |  |  |  |  |  |  |
| ~~110~~ | ~~DDD 4,4'-~~ | ~~72548~~ |  |  |  |  |  |  |  |  |
| ~~14 N~~ | ~~Demeton~~ | ~~8065483~~ |  |  | ~~0.1~~ | ~~X~~ |  |  | ~~0.1~~ | ~~X~~ |
| ~~74~~ | ~~Dibenzo(a,h)Anthracene~~ | ~~53703~~ |  |  |  |  |  |  |  |  |
| ~~75~~ | ~~Dichlorobenzene 1,2-~~ | ~~95501~~ |  |  |  |  |  |  |  |  |
| ~~76~~ | ~~Dichlorobenzene 1,3-~~ | ~~541731~~ |  |  |  |  |  |  |  |  |
| ~~77~~ | ~~Dichlorobenzene 1,4-~~ | ~~106467~~ |  |  |  |  |  |  |  |  |
| ~~78~~ | ~~Dichlorobenzidine 3,3'-~~ | ~~91941~~ |  |  |  |  |  |  |  |  |
| ~~27~~ | ~~Dichlorobromomethane~~ | ~~75274~~ |  |  |  |  |  |  |  |  |
| ~~28~~ | ~~Dichloroethane 1,1-~~ | ~~75343~~ |  |  |  |  |  |  |  |  |
| ~~29~~ | ~~Dichloroethane 1,2-~~ | ~~107062~~ |  |  |  |  |  |  |  |  |
| ~~30~~ | ~~Dichloroethylene 1,1-~~ | ~~75354~~ |  |  |  |  |  |  |  |  |
| ~~46~~ | ~~Dichlorophenol 2,4-~~ | ~~120832~~ |  |  |  |  |  |  |  |  |
| ~~31~~ | ~~Dichloropropane 1,2-~~ | ~~78875~~ |  |  |  |  |  |  |  |  |
| ~~32~~ | ~~Dichloropropene 1,3-~~ | ~~542756~~ |  |  |  |  |  |  |  |  |
| ~~111~~ | ~~Dieldrin~~ | ~~60571~~ | ~~0.24~~ |  |  |  | ~~0.71 O~~ | ~~X~~ | ~~0.0019 O~~ | ~~X~~ |
| ~~79~~ | ~~DiethylPhthalate~~ | ~~84662~~ |  |  |  |  |  |  |  |  |
| ~~47~~ | ~~Dimethylphenol 2,4-~~ | ~~105679~~ |  |  |  |  |  |  |  |  |
| ~~80~~ | ~~DimethylPhthalate~~ | ~~131113~~ |  |  |  |  |  |  |  |  |
| ~~81~~ | ~~Di-n-Butyl Phthalate~~ | ~~84742~~ |  |  |  |  |  |  |  |  |
| ~~49~~ | ~~Dinitrophenol 2,4-~~ | ~~51285~~ |  |  |  |  |  |  |  |  |
| ~~27 N~~ | ~~Dinitrophenols~~ | ~~25550587~~ |  |  |  |  |  |  |  |  |
| ~~82~~ | ~~Dinitrotoluene 2,4-~~ | ~~121142~~ |  |  |  |  |  |  |  |  |
| ~~83~~ | ~~Dinitrotoluene 2,6-~~ | ~~606202~~ |  |  |  |  |  |  |  |  |
| ~~84~~ | ~~Di-n-Octyl Phthalate~~ | ~~117840~~ |  |  |  |  |  |  |  |  |
| ~~16~~ | ~~Dioxin (2,3,7,8-TCDD)~~ | ~~1746016~~ |  |  |  |  |  |  |  |  |
| ~~85~~ | ~~Diphenylhydrazine 1,2-~~ | ~~122667~~ |  |  |  |  |  |  |  |  |
| ~~68~~ | ~~EthylhexylPhthalate Bis2-~~ | ~~117817~~ |  |  |  |  |  |  |  |  |
|  | ~~Endosulfan~~ |  | ~~0.22 I,P~~ | ~~X~~ | ~~0.056 I,P~~ | ~~X~~ | ~~0.034 I,P~~ | ~~X~~ | ~~0.0087 I,P~~ | ~~X~~ |
| ~~112~~ | ~~Endosulfan alpha-~~ | ~~959988~~ | ~~0.22 O~~ |  | ~~0.056 O~~ |  | ~~0.034 O~~ |  | ~~0.0087 O~~ |  |
| ~~113~~ | ~~Endosulfan beta-~~ | ~~33213659~~ | ~~0.22 O~~ |  | ~~0.056 O~~ |  | ~~0.034 O~~ |  | ~~0.0087 O~~ |  |
| ~~114~~ | ~~Endosulfan Sulfate~~ | ~~1031078~~ |  |  |  |  |  |  |  |  |
| ~~115~~ | ~~Endrin~~ | ~~72208~~ | ~~0.086~~ |  |  |  | ~~0.037 O~~ |  | ~~0.0023 O~~ |  |
| ~~116~~ | ~~Endrin Aldehyde~~ | ~~7421934~~ |  |  |  |  |  |  |  |  |
| ~~33~~ | ~~Ethylbenzene~~ | ~~100414~~ |  |  |  |  |  |  |  |  |
| ~~86~~ | ~~Fluoranthene~~ | ~~206440~~ |  |  |  |  |  |  |  |  |
| ~~87~~ | ~~Fluorene~~ | ~~86737~~ |  |  |  |  |  |  |  |  |
| ~~17 N~~ | ~~Guthion~~ | ~~86500~~ |  |  | ~~0.01~~ | ~~X~~ |  |  | ~~0.01~~ | ~~X~~ |
| ~~117~~ | ~~Heptachlor~~ | ~~76448~~ | ~~0.52 O~~ | ~~X~~ | ~~0.0038 O~~ | ~~X~~ | ~~0.053 O~~ | ~~X~~ | ~~0.0036 O~~ | ~~X~~ |
| ~~118~~ | ~~Heptachlor Epoxide~~ | ~~1024573~~ | ~~0.52 O~~ |  | ~~0.0038 O~~ |  | ~~0.053 O~~ |  | ~~0.0036 O~~ |  |
| ~~88~~ | ~~Hexachlorobenzene~~ | ~~118741~~ |  |  |  |  |  |  |  |  |
| ~~89~~ | ~~Hexachlorobutadiene~~ | ~~87683~~ |  |  |  |  |  |  |  |  |
| ~~91~~ | ~~Hexachloroethane~~ | ~~67721~~ |  |  |  |  |  |  |  |  |
| ~~19 N~~ | ~~Hexachlorocyclo-hexane-Technical~~ | ~~319868~~ |  |  |  |  |  |  |  |  |
| ~~90~~ | ~~Hexachlorocyclopentadiene~~ | ~~77474~~ |  |  |  |  |  |  |  |  |
| ~~92~~ | ~~Ideno1,2,3-(cd)Pyrene~~ | ~~193395~~ |  |  |  |  |  |  |  |  |
| ~~20 N~~ | ~~Iron~~ | ~~7439896~~ |  |  | ~~1,000~~ | ~~X~~ |  |  |  |  |
| ~~93~~ | ~~Isophorone~~ | ~~78591~~ |  |  |  |  |  |  |  |  |
| ~~7~~ | ~~Lead~~ | ~~7439921~~ |  |  |  |  |  |  |  |  |
| ~~21 N~~ | ~~Malathion~~ | ~~121755~~ |  |  | ~~0.1~~ | ~~X~~ |  |  | ~~0.1~~ | ~~X~~ |
| ~~22 N~~ | ~~Manganese~~ | ~~7439965~~ |  |  |  |  |  |  |  |  |
| ~~8a~~ | ~~Mercury~~ | ~~7439976~~ | ~~2.4~~ | ~~X~~ | ~~0.012~~ | ~~X~~ | ~~2.1~~ | ~~X~~ | ~~0.025~~ | ~~X~~ |
| ~~23 N~~ | ~~Methoxychlor~~ | ~~72435~~ |  |  | ~~0.03~~ | ~~X~~ |  |  | ~~0.03~~ | ~~X~~ |
| ~~34~~ | ~~Methyl Bromide~~ | ~~74839~~ |  |  |  |  |  |  |  |  |
| ~~35~~ | ~~Methyl Chloride~~ | ~~74873~~ |  |  |  |  |  |  |  |  |
| ~~48~~ | ~~Methyl-4,6-Dinitrophenol 2-~~ | ~~534521~~ |  |  |  |  |  |  |  |  |
| ~~52~~ | ~~Methyl-4-Chlorophenol 3-~~ | ~~59507~~ |  |  |  |  |  |  |  |  |
| ~~36~~ | ~~Methylene Chloride~~ | ~~75092~~ |  |  |  |  |  |  |  |  |
| ~~8b~~ | ~~Methylmercury~~ | ~~22967926~~ |  |  |  |  |  |  |  |  |
| ~~24 N~~ | ~~Mirex~~ | ~~2385855~~ |  |  | ~~0.001~~ | ~~X~~ |  |  | ~~0.001~~ | ~~X~~ |
| ~~94~~ | ~~Naphthalene~~ | ~~91203~~ |  |  |  |  |  |  |  |  |
| ~~9~~ | ~~Nickel~~ | ~~7440020~~ |  |  |  |  |  |  |  |  |
| ~~25 N~~ | ~~Nitrates~~ | ~~14797558~~ |  |  |  |  |  |  |  |  |
| ~~95~~ | ~~Nitrobenzene~~ | ~~98953~~ |  |  |  |  |  |  |  |  |
| ~~50~~ | ~~Nitrophenol 2-~~ | ~~88755~~ |  |  |  |  |  |  |  |  |
| ~~51~~ | ~~Nitrophenol 4-~~ | ~~100027~~ |  |  |  |  |  |  |  |  |
| ~~26 N~~ | ~~Nitrosamines~~ | ~~35576911~~ |  |  |  |  |  |  |  |  |
| ~~28 N~~ | ~~Nitrosodibutylamine,N~~ | ~~924163~~ |  |  |  |  |  |  |  |  |
| ~~29 N~~ | ~~Nitrosodiethylamine,N~~ | ~~55185~~ |  |  |  |  |  |  |  |  |
| ~~96~~ | ~~N-Nitrosodimethylamine~~ | ~~62759~~ |  |  |  |  |  |  |  |  |
| ~~98~~ | ~~N-Nitrosodiphenylamine~~ | ~~86306~~ |  |  |  |  |  |  |  |  |
| ~~30 N~~ | ~~Nitrosopyrrolidine,N~~ | ~~930552~~ |  |  |  |  |  |  |  |  |
| ~~97~~ | ~~N-Nitrosodi-n-Propylamine~~ | ~~621647~~ |  |  |  |  |  |  |  |  |
| ~~32 N~~ | ~~Oxygen, Dissolved~~ | ~~7782447~~ |  |  |  |  |  |  |  |  |
| ~~33 N~~ | ~~Parathion~~ | ~~56382~~ | ~~0.065~~ | ~~X~~ | ~~0.013~~ | ~~X~~ |  |  |  |  |
| ~~119~~ | ~~Polychlorinated Biphenyls PCBs:~~ | ~~1336363~~ | ~~2 U~~ | ~~X~~ | ~~0.014 U~~ | ~~X~~ | ~~10 U~~ | ~~X~~ | ~~0.03 U~~ | ~~X~~ |
| ~~34 N~~ | ~~Pentachlorobenzene~~ | ~~608935~~ |  |  |  |  |  |  |  |  |
| ~~53~~ | ~~Pentachlorophenol~~ | ~~87865~~ | ~~M~~ |  |  |  | ~~13~~ |  | ~~7.9~~ |  |
| ~~99~~ | ~~Phenanthrene~~ | ~~85018~~ |  |  |  |  |  |  |  |  |
| ~~54~~ | ~~Phenol~~ | ~~108952~~ |  |  |  |  |  |  |  |  |
| ~~36 N~~ | ~~Phosphorus Elemental~~ | ~~7723140~~ |  |  |  |  |  |  | ~~0.1~~ |  |
| ~~100~~ | ~~Pyrene~~ | ~~129000~~ |  |  |  |  |  |  |  |  |
| ~~10~~ | ~~Selenium~~ | ~~7782492~~ |  |  |  |  |  |  |  |  |
| ~~11~~ | ~~Silver~~ | ~~7440224~~ |  |  |  |  |  |  |  |  |
| ~~40 N~~ | ~~Sulfide-Hydrogen Sulfide~~ | ~~7783064~~ |  |  | ~~2~~ | ~~X~~ |  |  | ~~2~~ | ~~X~~ |
| ~~43 N~~ | ~~Tetrachlorobenzene,1,2,4,5~~ | ~~95943~~ |  |  |  |  |  |  |  |  |
| ~~37~~ | ~~Tetrachloroethane 1,1,2,2-~~ | ~~79345~~ |  |  |  |  |  |  |  |  |
| ~~38~~ | ~~Tetrachloroethylene~~ | ~~127184~~ |  |  |  |  |  |  |  |  |
| ~~12~~ | ~~Thallium~~ | ~~7440280~~ |  |  |  |  |  |  |  |  |
| ~~39~~ | ~~Toluene~~ | ~~108883~~ |  |  |  |  |  |  |  |  |
| ~~120~~ | ~~Toxaphene~~ | ~~8001352~~ | ~~0.73~~ | ~~X~~ | ~~0.0002~~ | ~~X~~ | ~~0.21~~ | ~~X~~ | ~~0.0002~~ | ~~X~~ |
| ~~40~~ | ~~Trans-Dichloroethylene 1,2-~~ | ~~156605~~ |  |  |  |  |  |  |  |  |
| ~~44 N~~ | ~~Tributyltin (TBT)~~ | ~~688733~~ |  |  |  |  |  |  |  |  |
| ~~101~~ | ~~Trichlorobenzene 1,2,4-~~ | ~~120821~~ |  |  |  |  |  |  |  |  |
| ~~41~~ | ~~Trichloroethane 1,1,1-~~ | ~~71556~~ |  |  |  |  |  |  |  |  |
| ~~42~~ | ~~Trichloroethane 1,1,2-~~ | ~~79005~~ |  |  |  |  |  |  |  |  |
| ~~43~~ | ~~Trichloroethylene~~ | ~~79016~~ |  |  |  |  |  |  |  |  |
| ~~45 N~~ | ~~Trichlorophenol 2,4,5~~ | ~~95954~~ |  |  |  |  |  |  |  |  |
| ~~55~~ | ~~Trichlorophenol 2,4,6-~~ | ~~88062~~ |  |  |  |  |  |  |  |  |
| ~~44~~ | ~~Vinyl Chloride~~ | ~~75014~~ |  |  |  |  |  |  |  |  |
| ~~13~~ | ~~Zinc~~ | ~~7440666~~ |  |  |  |  |  |  |  |  |

**~~Footnotes for Tables 33A and 33B:~~**

~~A Values in Table 20 are applicable to all basins.~~

~~C Ammonia criteria for freshwater may depend on pH, temperature, and the presence of salmonids or other fish with ammonia-sensitive early life stages. Values for freshwater criteria (of total ammonia nitrogen in mg N/L) can be calculated using the formulae specified in~~ *~~1999 Update of Ambient Water Quality Criteria for Ammonia~~* ~~(EPA-822-R-99-014; http://www.epa.gov/ost/standards/ammonia/99update.pdf):~~

~~Freshwater Acute:~~

~~salmonids present….CMC = ~~

~~salmonids not present…CMC=~~

~~Freshwater Chronic:~~

~~fish early life stages present~~

~~CCC =)~~

~~fish early life stages not present~~

~~CCC=~~

~~Note: these chronic criteria formulae would be applied to calculate the 30-day average concentration limit; in addition, the highest 4-day average within the 30-day period should not exceed 2.5 times the CCC.~~

~~D Ammonia criteria for saltwater may depend on pH and temperature. Values for saltwater criteria (total ammonia) can be calculated from the tables specified in~~ *~~Ambient Water Quality Criteria for Ammonia (Saltwater)--1989~~* ~~(EPA 440/5-88-004;~~ [~~http://www.epa.gov/ost/pc/ambientwqc/ammoniasalt1989.pdf~~](http://www.epa.gov/ost/pc/ambientwqc/ammoniasalt1989.pdf)~~).~~

~~E Freshwater and saltwater criteria for metals are expressed in terms of “dissolved” concentrations in the water column, except where otherwise noted (e.g. aluminum).~~

~~F The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. Criteria values for hardness may be calculated from the following formulae (CMC refers to Acute Criteria; CCC refers to Chronic Criteria):~~

~~CMC = (exp(m~~~~A~~~~\*[ln(hardness)] + b~~~~A~~~~))\*CF~~

~~CCC = (exp(m~~~~C~~~~\*[ln(hardness)] + b~~~~C~~~~))\*CF~~

~~where CF is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column.~~

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **~~Chemical~~** | **~~m~~~~A~~** | **~~b~~~~A~~** | **~~m~~~~C~~** | **~~b~~~~C~~** |
| ~~Cadmium~~ | ~~1.0166~~ | ~~-3.924~~ | ~~0.7409~~ | ~~-4.719~~ |
| ~~Chromium III~~ | ~~0.8190~~ | ~~3.7256~~ | ~~0.8190~~ | ~~0.6848~~ |
| ~~Copper~~ | ~~0.9422~~ | ~~-1.700~~ | ~~0.8545~~ | ~~-1.702~~ |
| ~~Lead~~ | ~~1.273~~ | ~~-1.460~~ | ~~1.273~~ | ~~-4.705~~ |
| ~~Nickel~~ | ~~0.8460~~ | ~~2.255~~ | ~~0.8460~~ | ~~0.0584~~ |
| ~~Silver~~ | ~~1.72~~ | ~~-6.59~~ |  |  |
| ~~Zinc~~ | ~~0.8473~~ | ~~0.884~~ | ~~0.8473~~ | ~~0.884~~ |

~~Conversion factors (CF) for dissolved metals (the values for total recoverable metals criteria were multiplied by the appropriate conversion factors shown below to calculate the dissolved metals criteria):~~

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **~~Chemical~~** | **~~Freshwater~~** | | **~~Saltwater~~** | |
| **~~Acute~~** | **~~Chronic~~** | **~~Acute~~** | **~~Chronic~~** |
| ~~Arsenic~~ | ~~1.000~~ | ~~1.000~~ | ~~1.000~~ | ~~1.000~~ |
| ~~Cadmium~~ | ~~1.136672-[(ln hardness)(0.041838)]~~ | ~~1.101672-[(ln hardness)(0.041838)]~~ | ~~0.994~~ | ~~0.994~~ |
| ~~Chromium III~~ | ~~0.316~~ | ~~0.860~~ | ~~--~~ | ~~--~~ |
| ~~Chromium VI~~ | ~~0.982~~ | ~~0.962~~ | ~~0.993~~ | ~~0.993~~ |
| ~~Copper~~ | ~~0.960~~ | ~~0.960~~ | ~~0.83~~ | ~~0.83~~ |
| ~~Lead~~ | ~~1.46203-[(ln hardness)(0.145712)]~~ | ~~1.46203-[(ln hardness)(0.145712)]~~ | ~~0.951~~ | ~~0.951~~ |
| ~~Nickel~~ | ~~0.998~~ | ~~0.997~~ | ~~0.990~~ | ~~0.990~~ |
| ~~Selenium~~ | ~~0.996~~ | ~~0.922~~ | ~~0.998~~ | ~~0.998~~ |
| ~~Silver~~ | ~~0.85~~ | ~~0.85~~ | ~~0.85~~ | ~~--~~ |
| ~~Zinc~~ | ~~0.978~~ | ~~0.986~~ | ~~0.946~~ | ~~0.946~~ |

~~I This value is based on criterion published in Ambient Water Quality Criteria for Endosulfan (EPA 440/5-80-046) and should be applied as the sum of alpha- and beta-endosulfan.~~

~~M Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC=(exp(1.005(pH)-4.869); CCC=exp(1.005(pH)-5.134).~~

~~N This number was assigned to the list of non-priority pollutants in National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047).~~

~~O This criterion is based on EPA recommendations issued in 1980 that were derived using guidelines that differed from EPA's 1985 Guidelines for minimum data requirements and derivation procedures. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.~~

~~P Criterion shown is the minimum (i.e. CCC in water should not be below this value in order to protect aquatic life).~~

~~Q Criterion is applied as total arsenic (i.e. arsenic (III) + arsenic (V)).~~

~~S This criterion is expressed as µg free cyanide (CN)/L.~~

~~T This criterion applies to DDT and its metabolites (i.e. the total concentration of DDT and its metabolites should not exceed this value).~~

~~U This criterion applies to total PCBs (e.g. the sum of all congener or all isomer or homolog or Arochlor analyses).~~

~~V 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 CMC1 and CMC2 are 185.9 μg/L and 12.82 μg/L, respectively.~~

~~W The acute and chronic criteria for aluminum are 750 μg/L and 87 μg/L, respectively. These values for aluminum are expressed in terms of “total recoverable” concentration of metal in the water column. The criterion applies at pH<6.6 and hardness<12 mg/L (as CaCO~~~~3~~~~).~~

~~X The effective date for the criterion in the column immediately to the left is 1991.~~

~~Y No criterion.~~

**~~TABLE 33B~~**

~~Note: The Environmental Quality Commission adopted the following criteria on May 20, 2004 to become effective on EPA approval. EPA has not yet (as of June 2006) approved these criteria. The Table 33B criteria may not be used until they are approved by EPA.~~

***~~AQUATIC LIFE WATER QUALITY CRITERIA SUMMARY~~* ~~A~~**

~~The concentration for each compound listed in Table 33A is a criterion not to be exceeded in waters of the state in order to protect aquatic life. All values are expressed as micrograms per liter (µg/L) except where noted. Compounds are listed in alphabetical order with the corresponding EPA number (from National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047), the Chemical Abstract Service (CAS) number, aquatic life freshwater acute and chronic criteria, aquatic life saltwater acute and chronic criteria. The acute criteria refer to the average concentration for one (1) hour and the chronic criteria refer to the average concentration for 96 hours (4 days), and that these criteria should not be exceeded more than once every three (3) years.~~

| ~~EPA No.~~ | ~~Compound~~ | ~~CAS Number~~ |  | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ~~Freshwater~~ | | | | ~~Saltwater~~ | | | |
| ~~Acute (CMC)~~ | ~~Effective Date~~ | ~~Chronic (CCC)~~ | ~~Effective Date~~ | ~~Acute (CMC)~~ | ~~Effective Date~~ | ~~Chronic (CCC)~~ | ~~Effective Date~~ |
| ~~2 N~~ | ~~Aluminum (pH 6.5 - 9.0)~~ | ~~7429905~~ | ~~W~~ |  | ~~W~~ |  |  |  |  |  |
| ~~3 N~~ | ~~Ammonia~~ | ~~7664417~~ | ~~C~~ |  | ~~C~~ |  |  |  |  |  |
| ~~2~~ | ~~Arsenic~~ | ~~7440382~~ |  |  |  |  |  |  |  |  |
| ~~15~~ | ~~Asbestos~~ | ~~1332214~~ |  |  |  |  |  |  |  |  |
| ~~19~~ | ~~Benzene~~ | ~~71432~~ |  |  |  |  |  |  |  |  |
| ~~3~~ | ~~Beryllium~~ | ~~7440417~~ |  |  |  |  |  |  |  |  |
| ~~105~~ | ~~BHC gamma- (Lindane)~~ | ~~58899~~ |  |  |  |  |  |  |  |  |
| ~~4~~ | ~~Cadmium~~ | ~~7440439~~ | ~~E,F~~ |  | ~~E,F~~ |  | ~~40 E~~ |  | ~~8.8 E~~ |  |
| ~~107~~ | ~~Chlordane~~ | ~~57749~~ |  |  |  |  |  |  |  |  |
|  | ~~CHLORINATED BENZENES~~ |  |  |  |  |  |  |  |  |  |
| ~~26~~ | ~~Chloroform~~ | ~~67663~~ |  |  |  |  |  |  |  |  |
| ~~67~~ | ~~ChloroisopropylEther Bis2-~~ | ~~108601~~ |  |  |  |  |  |  |  |  |
| ~~15 N~~ | ~~ChloromethylEther, Bis~~ | ~~542881~~ |  |  |  |  |  |  |  |  |
| ~~5a~~ | ~~Chromium (III)~~ |  | ~~E,F~~ |  | ~~E,F~~ |  |  |  |  |  |
| ~~5b~~ | ~~Chromium (VI)~~ | ~~18540299~~ | ~~16 E~~ |  | ~~11 E~~ |  |  |  |  |  |
| ~~6~~ | ~~Copper~~ | ~~7440508~~ | ~~E,F~~ |  | ~~E,F~~ |  | ~~4.8 E~~ |  | ~~3.1 E~~ |  |
| ~~108~~ | ~~DDT 4,4’-~~ | ~~50293~~ |  |  |  |  |  |  |  |  |
|  | ~~DIBUTYLPHTHALATE~~ |  |  |  |  |  |  |  |  |  |
|  | ~~DICHLOROBENZENES~~ |  |  |  |  |  |  |  |  |  |
|  | ~~DICHLOROBENZIDINE~~ |  |  |  |  |  |  |  |  |  |
|  | ~~DICHLOROETHYLENES~~ |  |  |  |  |  |  |  |  |  |
|  | ~~DICHLOROPROPENE~~ |  |  |  |  |  |  |  |  |  |
| ~~111~~ | ~~Dieldrin~~ | ~~60571~~ |  |  | ~~0.056~~ |  |  |  |  |  |
|  | ~~DINITROTOLUENE~~ |  |  |  |  |  |  |  |  |  |
|  | ~~DIPHENYLHYDRAZINE~~ |  |  |  |  |  |  |  |  |  |
| ~~115~~ | ~~Endrin~~ | ~~72208~~ |  |  | ~~0.036~~ |  |  |  |  |  |
| ~~86~~ | ~~Fluoranthene~~ | ~~206440~~ |  |  |  |  |  |  |  |  |
|  | ~~HALOMETHANES~~ |  |  |  |  |  |  |  |  |  |
| ~~20 N~~ | ~~Iron~~ | ~~7439896~~ |  |  |  |  |  |  |  |  |
| ~~7~~ | ~~Lead~~ | ~~7439921~~ | ~~E,F~~ |  | ~~E,F~~ |  | ~~210 E~~ |  | ~~8.1 E~~ |  |
| ~~22 N~~ | ~~Manganese~~ | ~~7439965~~ |  |  |  |  |  |  |  |  |
| ~~8a~~ | ~~Mercury~~ | ~~7439976~~ |  |  |  |  |  |  |  |  |
|  | ~~MONOCHLOROBENZENE~~ |  |  |  |  |  |  |  |  |  |
| ~~9~~ | ~~Nickel~~ | ~~7440020~~ | ~~E,F~~ |  | ~~E,F~~ |  | ~~74 E~~ |  | ~~8.2 E~~ |  |
| ~~53~~ | ~~Pentachlorophenol~~ | ~~87865~~ |  |  | ~~M~~ |  |  |  |  |  |
| ~~54~~ | ~~Phenol~~ | ~~108952~~ |  |  |  |  |  |  |  |  |
|  | ~~POLYNUCLEAR AROMATIC HYRDOCARBONS~~ |  |  |  |  |  |  |  |  |  |
| ~~10~~ | ~~Selenium~~ | ~~7782492~~ | ~~E,V~~ |  | ~~5 E~~ |  | ~~290 E~~ |  | ~~71 E~~ |  |
| ~~11~~ | ~~Silver~~ | ~~7440224~~ | ~~E,F,P~~ |  | ~~0.10 E~~ |  | ~~1.9 E,P~~ |  |  |  |
| ~~44 N~~ | ~~Tributyltin (TBT)~~ | ~~688733~~ | ~~0.46~~ |  | ~~0.063~~ |  | ~~0.37~~ |  | ~~0.01~~ |  |
| ~~41~~ | ~~Trichloroethane 1,1,1-~~ | ~~71556~~ |  |  |  |  |  |  |  |  |
| ~~55~~ | ~~Trichlorophenol 2,4,6-~~ | ~~88062~~ |  |  |  |  |  |  |  |  |
| ~~13~~ | ~~Zinc~~ | ~~7440666~~ | ~~E,F~~ |  | ~~E,F~~ |  | ~~90 E~~ |  | ~~81 E~~ |  |

**~~Footnotes for Tables 33A and 33B:~~**

~~A Values in Table 20 are applicable to all basins.~~

~~C Ammonia criteria for freshwater may depend on pH, temperature, and the presence of salmonids or other fish with ammonia-sensitive early life stages. Values for freshwater criteria (of total ammonia nitrogen in mg N/L) can be calculated using the formulae specified in~~ *~~1999 Update of Ambient Water Quality Criteria for Ammonia~~* ~~(EPA-822-R-99-014; http://www.epa.gov/ost/standards/ammonia/99update.pdf):~~

~~Freshwater Acute:~~

~~salmonids present….CMC = ~~

~~salmonids not present…CMC=~~

~~Freshwater Chronic:~~

~~fish early life stages present~~

~~CCC =)~~

~~fish early life stages not present~~

~~CCC=~~

~~Note: these chronic criteria formulae would be applied to calculate the 30-day average concentration limit; in addition, the highest 4-day average within the 30-day period should not exceed 2.5 times the CCC.~~

~~D Ammonia criteria for saltwater may depend on pH and temperature. Values for saltwater criteria (total ammonia) can be calculated from the tables specified in~~ *~~Ambient Water Quality Criteria for Ammonia (Saltwater)--1989~~* ~~(EPA 440/5-88-004;~~ [~~http://www.epa.gov/ost/pc/ambientwqc/ammoniasalt1989.pdf~~](http://www.epa.gov/ost/pc/ambientwqc/ammoniasalt1989.pdf)~~).~~

~~E Freshwater and saltwater criteria for metals are expressed in terms of “dissolved” concentrations in the water column, except where otherwise noted (e.g. aluminum).~~

~~F The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. Criteria values for hardness may be calculated from the following formulae (CMC refers to Acute Criteria; CCC refers to Chronic Criteria):~~

~~CMC = (exp(m~~~~A~~~~\*[ln(hardness)] + b~~~~A~~~~))\*CF~~

~~CCC = (exp(m~~~~C~~~~\*[ln(hardness)] + b~~~~C~~~~))\*CF~~

~~where CF is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column.~~

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **~~Chemical~~** | **~~m~~~~A~~** | **~~b~~~~A~~** | **~~m~~~~C~~** | **~~b~~~~C~~** |
| ~~Cadmium~~ | ~~1.0166~~ | ~~-3.924~~ | ~~0.7409~~ | ~~-4.719~~ |
| ~~Chromium III~~ | ~~0.8190~~ | ~~3.7256~~ | ~~0.8190~~ | ~~0.6848~~ |
| ~~Copper~~ | ~~0.9422~~ | ~~-1.700~~ | ~~0.8545~~ | ~~-1.702~~ |
| ~~Lead~~ | ~~1.273~~ | ~~-1.460~~ | ~~1.273~~ | ~~-4.705~~ |
| ~~Nickel~~ | ~~0.8460~~ | ~~2.255~~ | ~~0.8460~~ | ~~0.0584~~ |
| ~~Silver~~ | ~~1.72~~ | ~~-6.59~~ |  |  |
| ~~Zinc~~ | ~~0.8473~~ | ~~0.884~~ | ~~0.8473~~ | ~~0.884~~ |

~~Conversion factors (CF) for dissolved metals (the values for total recoverable metals criteria were multiplied by the appropriate conversion factors shown below to calculate the dissolved metals criteria):~~

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **~~Chemical~~** | **~~Freshwater~~** | | **~~Saltwater~~** | |
| **~~Acute~~** | **~~Chronic~~** | **~~Acute~~** | **~~Chronic~~** |
| ~~Arsenic~~ | ~~1.000~~ | ~~1.000~~ | ~~1.000~~ | ~~1.000~~ |
| ~~Cadmium~~ | ~~1.136672-[(ln hardness)(0.041838)]~~ | ~~1.101672-[(ln hardness)(0.041838)]~~ | ~~0.994~~ | ~~0.994~~ |
| ~~Chromium III~~ | ~~0.316~~ | ~~0.860~~ | ~~--~~ | ~~--~~ |
| ~~Chromium VI~~ | ~~0.982~~ | ~~0.962~~ | ~~0.993~~ | ~~0.993~~ |
| ~~Copper~~ | ~~0.960~~ | ~~0.960~~ | ~~0.83~~ | ~~0.83~~ |
| ~~Lead~~ | ~~1.46203-[(ln hardness)(0.145712)]~~ | ~~1.46203-[(ln hardness)(0.145712)]~~ | ~~0.951~~ | ~~0.951~~ |
| ~~Nickel~~ | ~~0.998~~ | ~~0.997~~ | ~~0.990~~ | ~~0.990~~ |
| ~~Selenium~~ | ~~0.996~~ | ~~0.922~~ | ~~0.998~~ | ~~0.998~~ |
| ~~Silver~~ | ~~0.85~~ | ~~0.85~~ | ~~0.85~~ | ~~--~~ |
| ~~Zinc~~ | ~~0.978~~ | ~~0.986~~ | ~~0.946~~ | ~~0.946~~ |

~~I This value is based on criterion published in Ambient Water Quality Criteria for Endosulfan (EPA 440/5-80-046) and should be applied as the sum of alpha- and beta-endosulfan.~~

~~M Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC=(exp(1.005(pH)-4.869); CCC=exp(1.005(pH)-5.134).~~

~~N This number was assigned to the list of non-priority pollutants in National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047).~~

~~O This criterion is based on EPA recommendations issued in 1980 that were derived using guidelines that differed from EPA's 1985 Guidelines for minimum data requirements and derivation procedures. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.~~

~~P Criterion shown is the minimum (i.e. CCC in water should not be below this value in order to protect aquatic life).~~

~~R Arsenic criterion refers to the inorganic form only.~~

~~S This criterion is expressed as µg free cyanide (CN)/L.~~

~~T This criterion applies to DDT and its metabolites (i.e. the total concentration of DDT and its metabolites should not exceed this value).~~

~~U This criterion applies to total PCBs (e.g. the sum of all congener or all isomer or homolog or Arochlor analyses).~~

~~V 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 CMC1 and CMC2 are 185.9 μg/L and 12.82 μg/L, respectively.~~

~~W The acute and chronic criteria for aluminum are 750 μg/L and 87 μg/L, respectively. These values for aluminum are expressed in terms of “total recoverable” concentration of metal in the water column. The criterion applies at pH<6.6 and hardness<12 mg/L (as CaCO~~~~3~~~~).~~

~~X The effective date for the criterion in the column immediately to the left is 1991.~~

~~Y No criterion.~~