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The CTE shall be applicable only over the range of water quality parameters equivalent to the mean plus or minus two standard deviations using the entire freshwater chronic toxicity data base and the water quality parameter transformation employed in subd. 1. Additional information may be used to modify those ranges.

13. If, for a commercially, recreationally or ecologically important species, the SMCI is lower than the calculated CCI, then that SMCI is used as the CCI instead of the calculated one.

(b) Table 4 contains the chronic toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1). Table 4A contains the water quality parameter ranges calculated in par. (a) 1.

(5) ACUTE-CHRONIC RATIOS. (a) The acute-chronic ratio is used to estimate the chronic toxicity of a substance to fish or other aquatic species when the database of sub. (1) (a) is not satisfied.

(b) The acute-chronic ratio for a species equals the acute concentration from data considered under s. NR 105.05 (1) divided by the chronic concentration from data calculated under sub. (1), subject to the following conditions:

1. If the acute toxicity of a substance is related to any water quality parameter, the acute-chronic ratio shall be based on acute and chronic toxicity data obtained from organisms exposed to test water with similar, if not identical, values of those water quality parameters. Preference under this paragraph shall be given to data from acute and chronic tests done by the same author or reference in order to increase the likelihood of comparable test conditions.

2. If the acute and chronic toxicity data indicate that the acute-chronic ratio varies with changes in the values of the water quality parameters, the acute-chronic ratio used at specified values of the water quality parameters shall be based on the ratios at values closest to that specified.

(c) A chronic toxicity criterion shall be calculated for a substance under this subsection only if at least one acute-chronic ratio is available for a freshwater vertebrate and a freshwater invertebrate, and if at least one is a relatively sensitive freshwater species on an acute toxicity basis.

(d) If the acute toxicity of a substance is unrelated to water quality parameters, the acute-chronic ratio may be derived from any acute and chronic test on a species regardless of the similarity in values of those parameters. Preference under this paragraph shall be given to data from acute and chronic tests done by the same author or reference in order to increase the likelihood of comparable test conditions.

(e) The geometric mean acute-chronic ratio is calculated for each species using the available acute-chronic ratios for that species. That mean ratio shall be called the species mean acute-chronic ratio (SMACR).

(f) For a given substance, if the SMACR appears to increase or decrease as the species mean acute values (SMAV) calculated for that substance using the procedure described in s. NR 105.05 increase, the final acute-chronic ratio (FACR) shall be equal to the final acute value.

(g) For a given substance, if no trend is apparent regarding changes in SMACRs and SMAVs, the FACR shall be equal to the geometric mean of all freshwater SMACRs available for that substance.

(h) For a given substance, the chronic toxicity criterion (CTC) shall be equal to the final acute value (FAV) divided by the final acute-chronic ratio (FACR).

(i) Chronic toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using acute-chronic ratios are listed in Table 5 for substances with acute toxicity unrelated to water quality parameters and in Table 6 for substances with acute toxicity related to water quality parameters. Equations listed in Table 6 are applicable over the same range of water quality parameters as contained in Table 2A.

Table 1
Acute Toxicity Criteria for Substances
With Toxicity Unrelated to Water Quality
(in ug/L except where indicated)

| Substance | Great Lakes | Cold Water | Warm Water Sportfish | All Other Fish and Aquatic Life Subcategories |
|----------------|-------------|------------|-------------------------|---|
| Arsenic (+3)* | 363.8 | 363.8 | 363.8 | 363.8 |
| Chromium (+6)* | 14.2 | 14.2 | 14.2 | 14.2 |
| Mercury (+2)* | 1.53 | 1.53 | 1.53 | 1.53 |
| Selenium (+4)* | 58 | 58 | 58 | 58 |
| Cyanide, free | 22.4 | 22.4 | 46.2 | 46.2 |
| Chlorine* | 18.4 | 18.4 | 18.4 | 18.4 |
| Aldrin | 1.94 | 1.94 | 2.16 | 2.16 |
| Gamma - BHC | 1.32 | 1.32 | 3.80 | 3.80 |
| Chlordane | 1.06 | 1.06 | 1.06 | 1.06 |
| Dieldrin | 1.33 | 1.33 | 2.10 | 2.10 |
| 4,4' - DDT | 0.43 | 0.43 | 0.43 | 0.43 |
| Endosulfan | 0.169 | 0.169 | 0.471 | 0.471 |
| Endrin | 0.101 | 0.101 | 0.158 | 0.158 |
| Heptachlor | 0.396 | 0.396 | 0.396 | 0.396 |
| Toxaphene | 0.61 | 0.81 | 0.61 | 0.81 |
| Parathion | 0.08 | 0.08 | 0.08 | 0.08 |

Note: * - Criterion listed is applicable to the "total recoverable" form except for chlorine which is applicable to the "total residual" form.

Table 2
Acute Toxicity Criteria for Substances
With Toxicity Related to Water Quality
(all in ug/L)

Water Quality Parameter: Hardness (in ppm as CaCog)

| Substance | ATC = $e^{(V \ln(\text{hardness}) + \ln \text{ACI})}$ | | ATC at Various Hardness (ppm) Levels | | |
|------------------------------------|---|---------|---|-------|-------|
| | V | ln ACI | 50 | 100 | 200 |
| Total Recoverable Cadmium: | | | | | |
| Great Lakes | 1.128 | -3.828 | 1.79 | 3.92 | 8.57 |
| Cold Water | 1.128 | -3.828 | 1.79 | 3.92 | 8.57 |
| Warm Water Sportfish | 1.128 | -1.8291 | 13.25 | 28.95 | 63.27 |
| All Others | 1.128 | -1.8291 | 13.25 | 28.95 | 63.27 |
| Total Recoverable Chromium (+): | | | | | |
| Great Lakes | 0.819 | 3.7627 | 1061 | 1871 | 3301 |
| Cold Water | 0.819 | 3.7627 | 1061 | 1871 | 3301 |
| Warm Water Sportfish | 0.819 | 3.7627 | 1061 | 1871 | 3301 |
| All Others | 0.819 | 3.7627 | 1061 | 1871 | 3301 |

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| <u>Substance</u> | <u>V</u> | <u>ln ACI</u> | <u>50</u> | <u>100</u> | <u>200</u> |
|----------------------------------|----------|---------------|-----------|------------|------------|
| Total Recoverable Copper: | | | | | |
| Great Lakes | 0.9422 | -1.531 | 8.63 | 16.58 | 31.85 |
| Cold Water | 0.9422 | -1.531 | 8.63 | 16.58 | 31.85 |
| Warm Water Sportfish | 0.9422 | -1.531 | 8.63 | 16.58 | 31.85 |
| All Others | 0.9422 | -1.531 | 8.63 | 16.58 | 31.85 |
| Total Recoverable Lead: | | | | | |
| Great Lakes | 1.273 | -0.7321 | 69.96 | 169.1 | 408.6 |
| Cold Water | 1.273 | -0.7321 | 69.96 | 169.1 | 408.6 |
| Warm Water Sportfish | 1.273 | -0.7321 | 69.96 | 169.1 | 408.6 |
| All Others | 1.273 | -0.7321 | 69.96 | 169.1 | 408.6 |
| Total Recoverable Nickel: | | | | | |
| Great Lakes | 0.846 | 3.0865 | 599.5 | 1078 | 1937 |
| Cold Water | 0.846 | 3.0865 | 599.5 | 1078 | 1937 |
| Warm Water Sportfish | 0.846 | 3.0865 | 599.5 | 1078 | 1937 |
| All Others | 0.846 | 3.0865 | 599.5 | 1078 | 1937 |
| Total Recoverable Silver: | | | | | |
| Great Lakes | 1.169 | -4.6949 | 0.885 | 1.99 | 4.48 |
| Cold Water | 1.169 | -4.6949 | 0.885 | 1.99 | 4.48 |
| Warm Water Sportfish | 1.169 | -4.6949 | 0.885 | 1.99 | 4.48 |
| All Others | 1.169 | -4.6949 | 0.885 | 1.99 | 4.48 |
| Total Recoverable Zinc: | | | | | |
| Great Lakes | 0.8473 | 0.7352 | 57.39 | 103.3 | 185.8 |
| Cold Water | 0.8473 | 0.8236 | 62.69 | 112.8 | 202.9 |
| Warm Water Sportfish | 0.8473 | 0.7352 | 57.39 | 103.3 | 185.8 |
| All Others | 0.8473 | 0.8236 | 62.69 | 112.8 | 202.9 |

Water Quality Parameter: pH

| <u>ATC = e^{(V (pH) + ln ACI)}</u> | <u>ATC at Various pH (s.u.) Levels</u> | | | | |
|--|--|--------------|-----------|------------|------------|
| | <u>V</u> | <u>lnACI</u> | <u>50</u> | <u>100</u> | <u>200</u> |
| Pentachlorophenol: | | | | | |
| Great Lakes | 1.005 | -4.7033 | 6.23 | 23.00 | 62.8 |
| Cold Water | 1.005 | -4.7033 | 6.23 | 23.00 | 62.8 |
| Warm Water Sportfish | 1.005 | -4.7033 | 6.23 | 23.00 | 62.8 |
| All Others | 1.005 | -4.7033 | 6.23 | 23.00 | 62.8 |

Table 2A
Water Quality Parameter Ranges for Substances
With Acute Toxicity Related to Water Quality

| <u>Substance</u> | <u>Parameter</u> | <u>Applicable Range</u> |
|-------------------|------------------|-------------------------|
| Cadmium | Hardness (ppm) | 6 - 368 |
| Chromium (+ 3) | Hardness (ppm) | 12 - 319 |
| Copper | Hardness (ppm) | 14 - 448 |
| Lead | Hardness (ppm) | 8 - 487 |
| Nickel | Hardness (ppm) | 12 - 274 |
| Silver | Hardness (ppm) | 15 - 260 |
| Zinc | Hardness (ppm) | 10 - 364 |
| Pentachlorophenol | pH (s.u.) | 6.5 - 8.8 |

Table 3
Chronic Toxicity Criteria for Substances
With Toxicity Unrelated to Water Quality
(all in ug/L)

| <u>Substance</u> | <u>Great Lakes</u> | <u>Cold Water</u> | <u>Warm Water Sportfish</u> | <u>All Other Fish and Aquatic Life Subcategories</u> |
|------------------|--------------------|-------------------|-----------------------------|--|
|------------------|--------------------|-------------------|-----------------------------|--|

(Reserved)

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Table 4
Chronic Toxicity Criteria for Substances
With Toxicity Unrelated to Water Quality
(all in ug/L)

Water Quality Parameter: Hardness (in ppm as CaCO₃)

| Substance | CTC = $e^{(V \ln(\text{hardness}) + \ln \text{CCI})}$ | | CTC at Various Hardness (ppm) Levels | | |
|-----------|---|-----|---|-----|-----|
| | V | CCI | 50 | 100 | 200 |
| | (Reserved) | | | | |

Table 4A
Water Quality Parameter Ranges for Substances
With Chronic Toxicity Related to Water Quality

| Substance | Parameter | Applicable Range |
|-----------|------------|------------------|
| | (Reserved) | |

Table 5
Chronic Toxicity Criteria
Using Acute-Chronic Ratios for Substances
With Toxicity Unrelated to Water Quality
(all in ug/L)

| Substance | Great Lakes | Cold Water | Warm Water Sportfish | All Other Fish and Aquatic Life Subcategories |
|----------------|-------------|------------|-------------------------|---|
| Arsenic (+3)* | 153 | 153 | 153 | 153 |
| Chromium (+6)* | 9.74 | 9.74 | 9.74 | 9.74 |
| Selenium (+4)* | 7.07 | 7.07 | 7.07 | 7.07 |
| Cyanide, free | 4.96 | 4.96 | 4.96 | 4.96 |
| Chlorine* | 7.06 | 7.06 | 7.06 | 7.06 |
| Gamma - BHC | 0.335 | 0.335 | 0.877 | 0.877 |
| Chlordane | 0.188 | 0.188 | 0.188 | 0.188 |
| Endosulfan | 0.115 | 0.115 | 0.321 | 0.321 |
| Toxaphene | 0.01 | 0.01 | 0.01 | 0.01 |
| Parathion | 0.0141 | 0.0141 | 0.0141 | 0.0141 |

Note: * - Criterion listed is applicable to the "total recoverable" form except for chlorine which is applicable to the "total residual" form.

Table 6
Chronic Toxicity Criteria
Using Acute-Chronic Ratios for Substances
With Toxicity Related to Water Quality
(all in ug/L)

Water Quality Parameter: Hardness (in ppm as CaCO₃)

| Substance | CTC = $e^{(V \ln(\text{hardness}) + \ln \text{CCI})}$ | | CTC at Various Hardness (ppm) Levels | | |
|----------------------------------|---|---------|---|-------|-------|
| | V | ln CCI | 50 | 100 | 200 |
| Total Recoverable Cadmium: | | | | | |
| Great Lakes | 1.128 | -5.9473 | 0.216 | 0.471 | 1.03 |
| Cold Water | 1.128 | -5.9473 | 0.216 | 0.471 | 1.03 |
| Warm Water Sportfish | 1.128 | -5.9473 | 0.216 | 0.471 | 1.03 |
| All Others | 1.128 | -5.9473 | 0.216 | 0.471 | 1.03 |
| Total Recoverable Chromium (+3): | | | | | |
| Great Lakes | 0.819 | 0.2184 | 30.60 | 54.60 | 95.37 |
| Cold Water | 0.819 | 0.2184 | 30.60 | 54.60 | 95.37 |
| Warm Water Sportfish | 0.819 | 0.2184 | 30.60 | 54.60 | 95.37 |
| All Others | 0.819 | 0.2184 | 30.60 | 54.60 | 95.37 |

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| Substance | V | ln CCI | 50 | 100 | 200 |
|---------------------------|--------|---------|-------|-------|-------|
| Total Recoverable Copper: | | | | | |
| Great Lakes | 0.9422 | -1.8956 | 5.99 | 11.51 | 22.12 |
| Cold Water | 0.9422 | -1.8956 | 5.99 | 11.51 | 22.12 |
| Warm Water Sportfish | 0.9422 | -1.8956 | 5.99 | 11.51 | 22.12 |
| All Others | 0.9422 | -1.8956 | 5.99 | 11.51 | 22.12 |
| Total Recoverable Lead: | | | | | |
| Great Lakes | 1.273 | -3.5511 | 4.17 | 10.09 | 24.38 |
| Cold Water | 1.273 | -3.5511 | 4.17 | 10.09 | 24.38 |
| Warm Water Sportfish | 1.273 | -3.5511 | 4.17 | 10.09 | 24.38 |
| All Others | 1.273 | -3.5511 | 4.17 | 10.09 | 24.38 |
| Total Recoverable Nickel: | | | | | |
| Great Lakes | 0.846 | 0.2956 | 36.79 | 66.13 | 118.9 |
| Cold Water | 0.846 | 0.2956 | 36.79 | 66.13 | 118.9 |
| Warm Water Sportfish | 0.846 | 0.2956 | 36.79 | 66.13 | 118.9 |
| All Others | 0.846 | 0.2956 | 36.79 | 66.13 | 118.9 |
| Total Recoverable Silver: | | | | | |
| Great Lakes | 1.169 | -4.6949 | 0.885 | 1.99 | 4.48 |
| Cold Water | 1.169 | -4.6949 | 0.885 | 1.99 | 4.48 |
| Warm Water Sportfish | 1.169 | -4.6949 | 0.885 | 1.99 | 4.48 |
| All Others | 1.169 | -4.6949 | 0.885 | 1.99 | 4.48 |
| Total Recoverable Zinc: | | | | | |
| Great Lakes | 0.8473 | 0.0019 | 27.57 | 49.59 | 89.23 |
| Cold Water | 0.8473 | 0.0019 | 27.57 | 49.59 | 89.23 |
| Warm Water Sportfish | 0.8473 | 0.0019 | 27.57 | 49.59 | 89.23 |
| All Others | 0.8473 | 0.0019 | 27.57 | 49.59 | 89.23 |

Water Quality Parameter: pH

| Substance | CTC = $e^{(V(\text{pH}) + \ln \text{CCI})}$ | | CTC at Various pH (s.u.) Levels | | |
|----------------------|---|---------|------------------------------------|-------|------|
| | V | ln CCI | 6.5 | 7.8 | 8.8 |
| Pentachlorophenol: | | | | | |
| Great Lakes | 1.005 | -4.9779 | 4.73 | 17.48 | 47.8 |
| Cold Water | 1.005 | -4.9779 | 4.73 | 17.48 | 47.8 |
| Warm Water Sportfish | 1.005 | -4.9779 | 4.73 | 17.48 | 47.8 |
| All Others | 1.005 | -4.9779 | 4.73 | 17.48 | 47.8 |

History: Cr. Register, February, 1989, No. 398, eff. 3-1-89.

NR 105.07 Wild and domestic animal criterion. (1) The wild and domestic animal criterion is the concentration of a substance which if not exceeded protects Wisconsin's wild and domestic animals from adverse effects resulting from ingestion of surface waters of the state and from ingestion of aquatic organisms taken from surface waters of the state.

(a) For any substance not shown in Table 7, the wild and domestic animal criterion (WDAC) is the lowest species wild and domestic animal value (WDAV) calculated pursuant to sub. (2).

(b) Table 7 contains the wild and domestic animal criteria calculated according to the procedures of this chapter.

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Table 7
Wild and Domestic Animal Criteria

| Substance | Criteria (all in ng/L) |
|---------------------------|------------------------|
| DDT & Metabolites | 0.015 |
| Mercury | 2.0 |
| Polychlorinated Biphenyls | 3.0 |

(2) (a) The species wild and domestic animal value shall be calculated as follows using information available from scientifically acceptable studies of animal species exposed repeatedly to the substance via oral routes including gavage:

$$WDAV = \frac{NOAEL \times Wt_A \times SSF}{W_A + [F_A \times BAF]}$$

Where: WDAV = Wild and domestic animal value in milligrams per liter (mg/L).

NOAEL = No observed adverse effect level in milligrams of substance per kilogram of body weight per day (mg/kg-d) as derived from mammalian or avian studies or as specified in subs. (3) to (5).

Wt_A = Average weight in kilograms (kg) of the test animals.

W_A = Average daily volume of water in liters consumed per day (L/d) by the test animals or as specified in sub. (6).

SSF = An uncertainty factor ranging between 0.01 and 1 to account for differences in species sensitivity.

F_A = Average daily amount of food consumed by the test animals in kilograms (kg/d) or as specified in sub. (6).

BAF = Aquatic life bioaccumulation factor with units of liter per kilogram (L/kg) as derived in s. NR 105.10.

(b) The selection of the species sensitivity factor (SSF) shall be based on the available toxicological data base and available physicochemical and toxicokinetic properties of the substance in question.

(c) A species WDAV is calculated as the geometric mean of the WDAVs if more than one WDAV is available for a species.

(3) In those cases in which a no observed adverse effect level (NOAEL) is available from studies of mammalian or avian species exposed repeatedly to the substance via oral routes including gavage, but is available in units other than mg/kg-d as specified in sub. (2), the following procedures shall be used to express the NOAEL prior to calculating the wild and domestic animal value:

(a) If the NOAEL is given in milligrams of toxicant per liter of water consumed (mg/L), the NOAEL shall be multiplied by the daily average