



Focus on Developing Surface Water Cleanup Standards Under the Model Toxics Control Act

from Department of Ecology's Toxic Cleanup Program

Background

The Washington Department of Ecology (Ecology) adopted changes to the Model Toxics Control Act (MTCA) Cleanup Regulation, chapter 173-340 WAC, on February 12, 2001. These changes became effective on August 15, 2001. This document provides an overview of the requirements and procedures for developing surface water cleanup standards under this revised regulation.

What is a surface water cleanup standard?

A surface water cleanup standard consists of a concentration (cleanup level) that must be met at a specified location within the surface water (point of compliance). It also includes any additional regulatory requirements that may be specified in applicable state or federal laws.

What beneficial uses of surface water are cleanup levels based on?

Surface water cleanup levels must be set at a concentration that would allow the water to be used for those beneficial uses identified under the State's water quality laws (chapter 173-201A WAC). Beneficial uses include use for a domestic water supply, irrigation, fish and shellfish rearing, recreation (such as swimming and sport fishing), commerce and navigation, and wildlife habitat.

What options are available for establishing surface water cleanup levels?

The regulation provides three methods for establishing surface water cleanup levels – **Method A, Method B, and Method C**. Each of these methods and the criteria for their use are described below. See **Figures 1 through 4** for a visual depiction of the following discussion.

When may Method A be used to establish surface water cleanup levels and how is a Method A cleanup level established?

Method A may be used to establish surface water cleanup levels at routine sites and sites with relatively few hazardous substances.

Under Method A (see **Figure 2**), if concentrations have been established for a hazardous substance under applicable state or federal law, then the cleanup level is based on the most stringent of the following concentrations:

- **Concentrations established under applicable state and federal laws.** The cleanup level must be at least as stringent as each of the concentrations established under applicable state and federal laws.

- **Concentration based on drinking water beneficial uses, if surface water is classified as suitable for use as a domestic water supply.** If surface water is classified as suitable for use as a domestic water supply under state law (chapter 173-201A WAC), then the cleanup level must be at least as stringent as the potable ground water cleanup level established under WAC 173-340-720 to protect drinking water beneficial uses.

Otherwise, the Method A cleanup level is based on the natural background concentration or the practical quantitation limit (PQL), whichever is higher.

NOTE: Unlike for ground water and soil, the regulation does not provide a table of Method A cleanup levels for surface water.

NOTE: Surface water cleanup levels established under Method A must be protective of both human health (people eating fish and aquatic organisms) and the environment (fish and aquatic life). If an ambient water quality criterion has been established under applicable state and federal laws for human health protection, *but not for environmental protection*, then the Method A cleanup level established under WAC 173-340-730(2) may not be sufficiently protective of the environment and may need to be adjusted downward in accordance with WAC 173-340-730(1)(e).

When may Method B be used to establish surface water cleanup levels and how is a Method B cleanup level established?

Method B may be used to establish surface water cleanup levels at any site.

Method B is divided into two tiers: **Standard** and **Modified**. Under both standard and modified Method B (see **Figure 3**), the cleanup level is based on the most stringent of the following concentrations:

- **Concentrations established under applicable state and federal laws.** The cleanup level must be at least as stringent as the most stringent concentration established under applicable state and federal laws.
- **Concentrations that protect human health.** The cleanup level must be at least as stringent as the concentrations that protect human health.

For hazardous substances for which sufficiently protective, health-based concentrations have been established under applicable state and federal laws, the most stringent of those concentrations is used. A concentration established under applicable state and federal laws is sufficiently protective if the excess cancer risk does not exceed 1 in 100,000 (1×10^{-5}) and the hazard quotient does not exceed one (1). If the concentration is not sufficiently protective, then either the concentration must be adjusted downward in accordance with WAC 173-340-730(5)(b) or a protective concentration must be calculated using the equations provided in the regulation.

For hazardous substances for which health-based concentrations have not been established under applicable state and federal laws, a protective concentration must be calculated using the equations provided in the regulation.

Under standard Method B, protective concentrations are calculated using the standard equations and default assumptions provided in the regulation (**see Table 1**). These equations and default assumptions ensure that human consumption of fish and shellfish is safe.

Under modified Method B, specified default assumptions may be adjusted based on site-specific or chemical-specific data. The regulation describes which parameters may be adjusted and how they may be adjusted.

- **Concentrations that protect the environment.** The cleanup level must be at least as stringent as the concentrations that protect the environment.

For hazardous substances for which environmental effects-based concentrations have been established under applicable state and federal laws, the most stringent of those concentrations is used.

For hazardous substances for which environmental effects-based concentrations have not been established under applicable state and federal laws, a protective concentration must be established. Protective concentrations are defined as concentrations that do not result in adverse effects on the protection and propagation of fish, aquatic life and wildlife.

Whole effluent toxicity (WET) testing may be used to demonstrate that a concentration is protective of fish and aquatic life. Other methods may need to be used to demonstrate that a concentration is protective of wildlife, if this is a concern at the site.

- **Concentrations based on drinking water beneficial uses, if surface water is classified as suitable for use as a domestic water supply.** If surface water is classified as suitable for use as a domestic water supply under state law (chapter 173-201A WAC), then the cleanup level must be at least as stringent as the potable ground water cleanup level established under WAC 173-340-720 to protect drinking water beneficial uses.

When may Method C be used to establish surface water cleanup levels and how is a Method C cleanup level established?

Method C may be used to establish surface water cleanup levels at a site where it can be demonstrated that such levels comply with applicable state and federal laws, that all practicable methods of treatment have been used to minimize releases to the surface water, that institutional controls are in place, and that one or more of the following conditions exist:

- The Method A or B cleanup levels are below technically possible concentrations;
- The Method A or B cleanup levels are below area background concentrations; or
- The attainment of Method A or B cleanup levels has the potential for creating a significantly greater overall threat to human health or the environment than attainment of Method C cleanup levels.

Under Method C (see **Figure 4**), cleanup levels are established the same as under Method B, except that concentrations that are protective of human health are calculated using a less stringent target cancer risk for individual hazardous substances (1 in 100,000) and less stringent default exposure assumptions (see **Table 1**).

Are there any special considerations for establishing surface water cleanup levels for petroleum mixtures?

Yes. Cleanup levels must be established for the total petroleum hydrocarbon (TPH) mixture as a whole, as well as for individual hazardous substances (TPH components) within the mixture, such as benzene, ethylbenzene, toluene, and xylene.

Under Method A, cleanup levels for individual TPH components are established just like they would be for any other hazardous substance, as described above. For the TPH mixture as a whole, cleanup levels must be established based on the less stringent of the natural background and PQL concentrations because the regulation does not provide pre-calculated table values and there are no applicable state and federal standards.

Under Method B and Method C, cleanup levels for individual TPH components are established just like they would be for any other hazardous substance, as described above.

To establish site-specific TPH cleanup levels under Method B or C, the composition of the petroleum mixture in the surface water must be determined. Determining the composition requires the analysis of the surface water or the source of the petroleum contamination (the product itself or contaminated soil or ground water) for petroleum fractions and other toxic components likely to be present. See Table 830-1 for a list of contaminants to test for when establishing cleanup levels for petroleum mixtures. If the analysis is based on the source of the contamination, a water phase composition must be predicted using a fate and transport model under WAC 173-340-747, such as the 3-phase or 4-phase model.

The actual or predicted water composition is used in a risk assessment equation to calculate a cleanup level that takes into account the combined human health risk of the petroleum mixture. This equation is not specified in the regulation. However, an acceptable equation may be obtained from Ecology. This cleanup level may need to be adjusted downward to take into account the cleanup levels of the individual petroleum components.

As an alternative to calculating a site-specific TPH cleanup level, the regulation allows for the use of the applicable TPH ground water cleanup levels in Table 720-1. Use of these values would avoid the need to conduct fractionated petroleum analyses.

The cleanup levels for TPH and the TPH components must also be at least as stringent as concentrations that are protective of fish and aquatic life, as well as wildlife, just as for any other hazardous substance. Whole effluent toxicity (WET) testing may be used to demonstrate that a concentration is protective of fish and aquatic life. Other methods may need to be used to demonstrate that a concentration is protective of wildlife, if this is a concern at the site.

Are there any additional considerations when establishing surface water cleanup levels?

Yes. Surface water cleanup levels may need to be adjusted either downward or upward based on the following additional considerations:

- **Downward adjustment based on total site risk:** Surface water cleanup levels for individual hazardous substances may need to be adjusted downward to take into account the additive health effects resulting from exposure to multiple hazardous substances and/or multiple exposure pathways. The cleanup levels need only be adjusted if the hazard index exceeds 1 or the total excess cancer risk exceeds 1 in 100,000. This requirement does not apply when using Method A.
- **Downward adjustment to cleanup levels based on applicable state and federal laws:** Surface water cleanup levels based on applicable state and federal laws that exceed an excess cancer risk of 1 in 100,000 or a hazard index of 1 must be adjusted downward so that the total excess cancer risk does not exceed 1 in 100,000 and a hazard index of 1.
- **Downward adjustment based on nonaqueous phase limitation:** For organic hazardous substances and total petroleum hydrocarbons, the surface water cleanup level must not exceed a concentration that would result in nonaqueous phase liquid being present in or on the surface water.
- **Upward adjustment based on natural background and PQL:** Surface water cleanup levels for individual hazardous substances must not be set below the practical quantitation limit (PQL) or natural background concentration, whichever is higher.

May the department establish more stringent cleanup levels?

Yes. The department may establish cleanup levels that are more stringent than those required under the applicable method when the department determines, based upon a site-specific evaluation, that such levels are necessary to protect human health and the environment. The establishment of more stringent cleanup levels must comply with WAC 173-340-702 and 173-340-708.

Where in the surface water do the cleanup levels have to be met?

The "point of compliance" defines the point or points on a site where cleanup levels must be met. The term includes both "standard" and "conditional" points of compliance.

- **Standard point of compliance:** The standard point of compliance for surface water is defined as the point or points at which hazardous substances are released to surface waters of the state.
- **Conditional point of compliance:** For point source discharges (e.g., treatment plant discharges), a mixing zone (or "conditional point of compliance") may be used to demonstrate compliance only if Ecology has authorized the use of such a mixing zone under state water quality law, chapter 173-201A

WAC. The use of a mixing zone to demonstrate compliance is not allowed for ground water discharging to surface water.

What measurements are required to demonstrate compliance with surface water cleanup levels?

When surface water cleanup levels have been established at a site, the surface water must be sampled to demonstrate compliance with cleanup levels. In some cases, analysis of fish tissue, shellfish or other aquatic organisms and sediments may also need to be conducted to determine if the cleanup level is adequately addressing accumulation of contaminants. Multiple samples may need to be collected to take into account spatial and seasonal variability in the surface water quality. Statistical methods required under water quality law are to be used for analyzing the data. If no method exists, the appropriate statistical method for data analysis will be determined on a case-by-case basis.

For More Information / Special Accommodation Needs

If you would like more information on setting cleanup standards or cleaning up sites, please call us toll-free at **1-800-826-7716**, or contact your regional Washington State Department of Ecology office listed below. Information about site cleanup, including access to a variety of technical guidance documents, is also accessible through our Internet address: <http://www.ecy.wa.gov/programs/tcp/cleanup.html>.

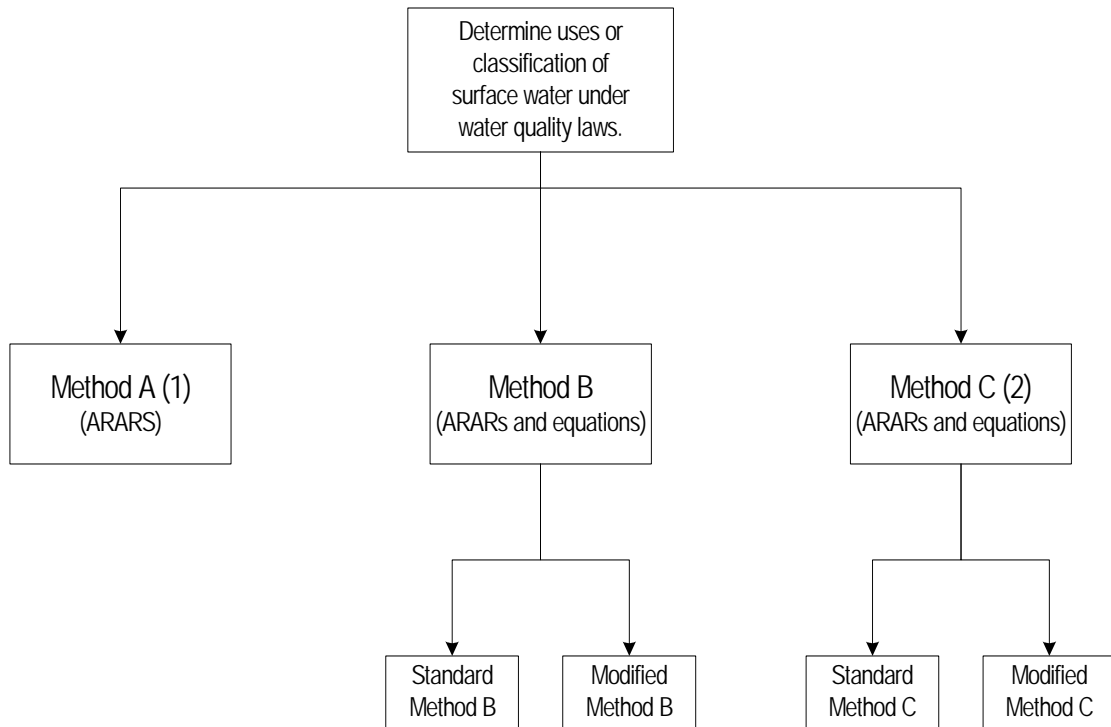
Regional Office	Phone / *TTY	Regions/Counties
Northwest	425/649-7000	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom
Southwest	360/407-6300	Southwestern Washington, Olympic Peninsula, Pierce, Thurston and Mason
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Figure 1: Options for Establishing Surface Water Cleanup Levels under WAC 173-340-730



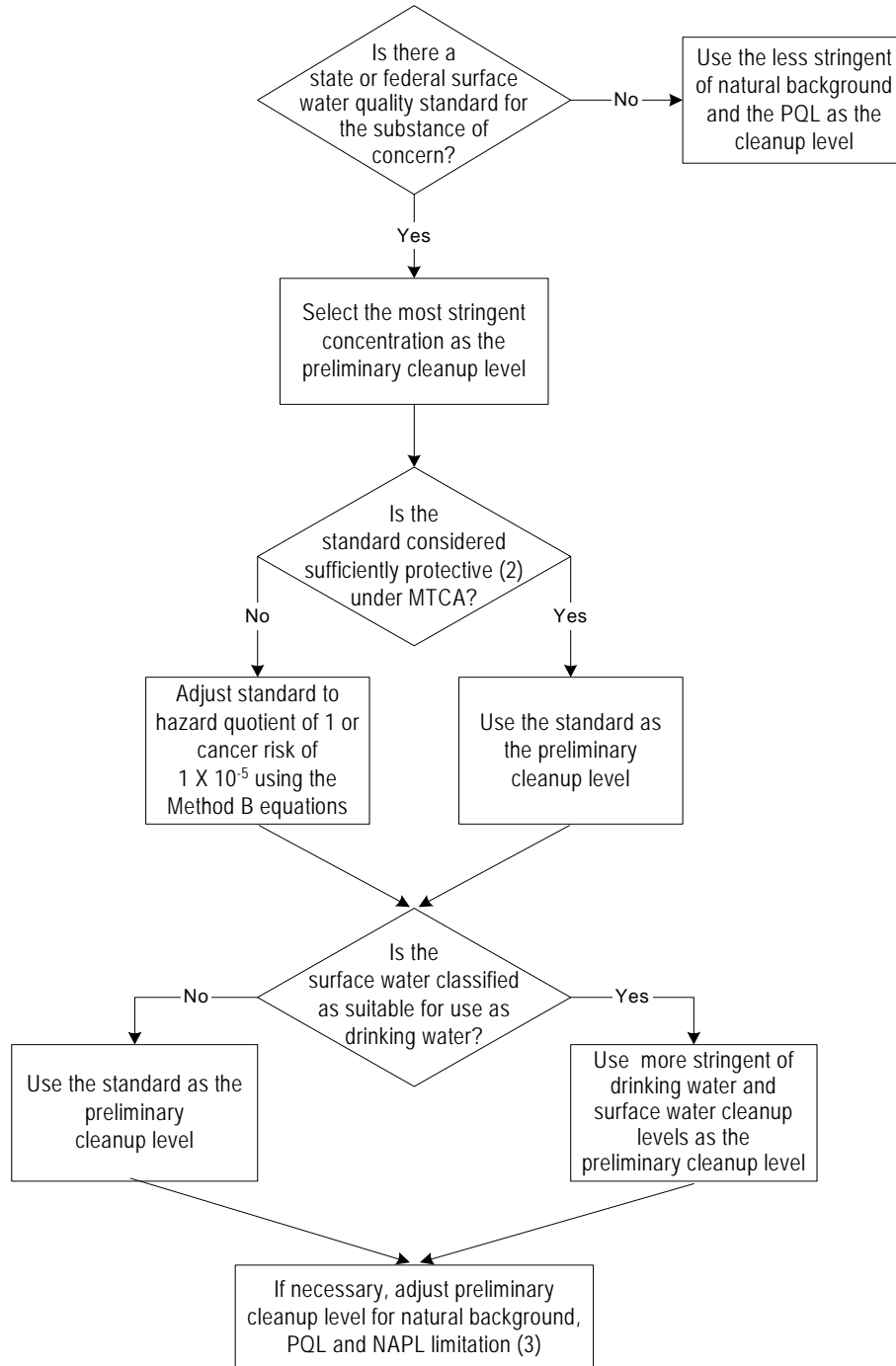
(1) Method A is only available at qualifying sites. See WAC 173-340-704.

(2) Method C is only available at qualifying sites. See WAC 173-340-706.

ARARs = Applicable and relevant and appropriate requirements. See WAC 173-340-710.

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Figure 2: Establishing Method A Surface Water Cleanup Levels under WAC 173-340-730(2)⁽¹⁾



NOTES

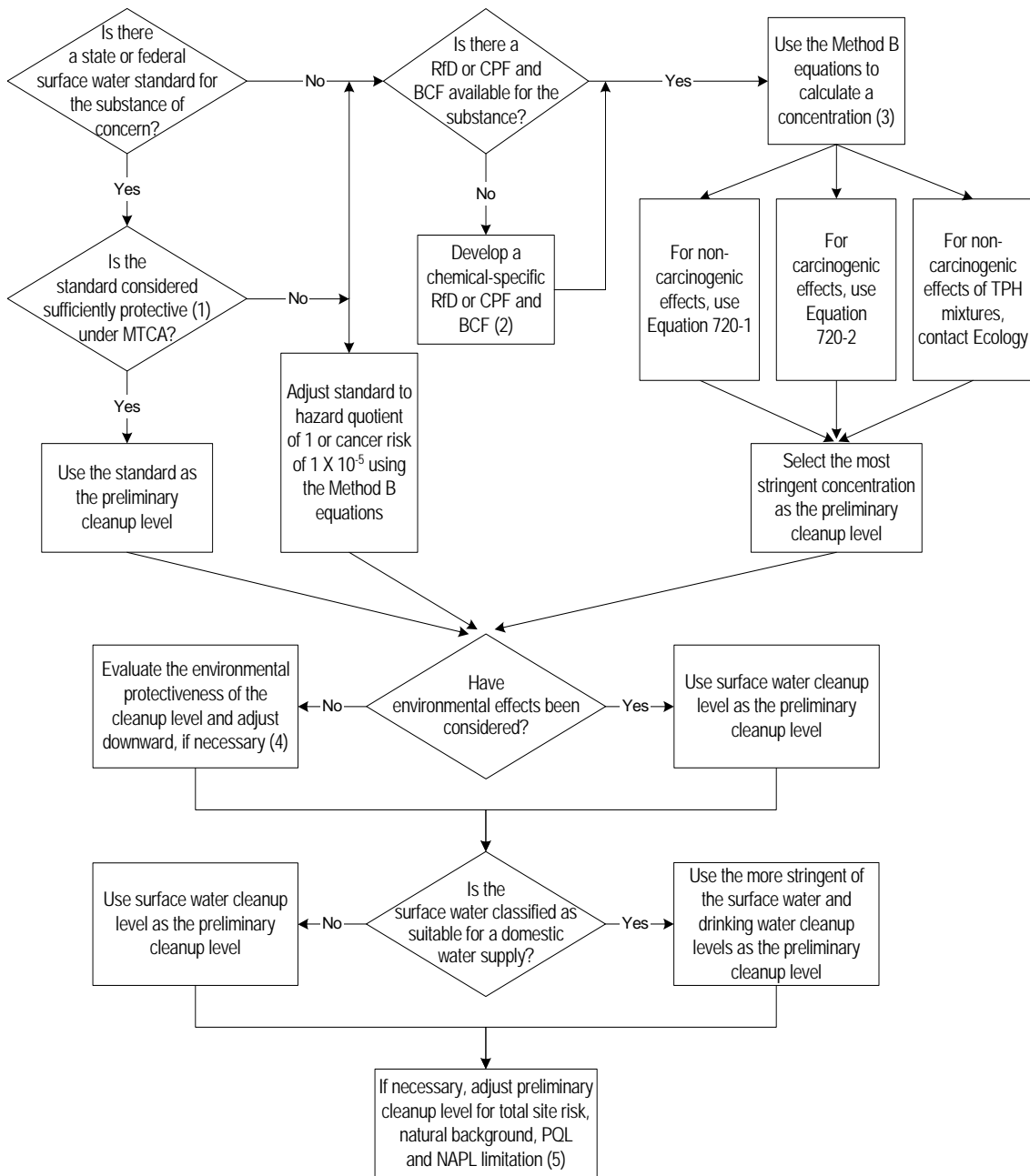
(1) Method A can only be used at qualifying sites. See WAC 173-340-704.

(2) The standard must be based on a hazard quotient of 1 or less or a cancer risk of 1×10^{-5} or less. See WAC 173-340-730(5)(b). The Method B equations may be used to check for acceptable risk.

(3) See WAC 173-340-730(5)

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Figure 3: Establishing Method B Surface Water Cleanup Levels under WAC 173-340-730(3)

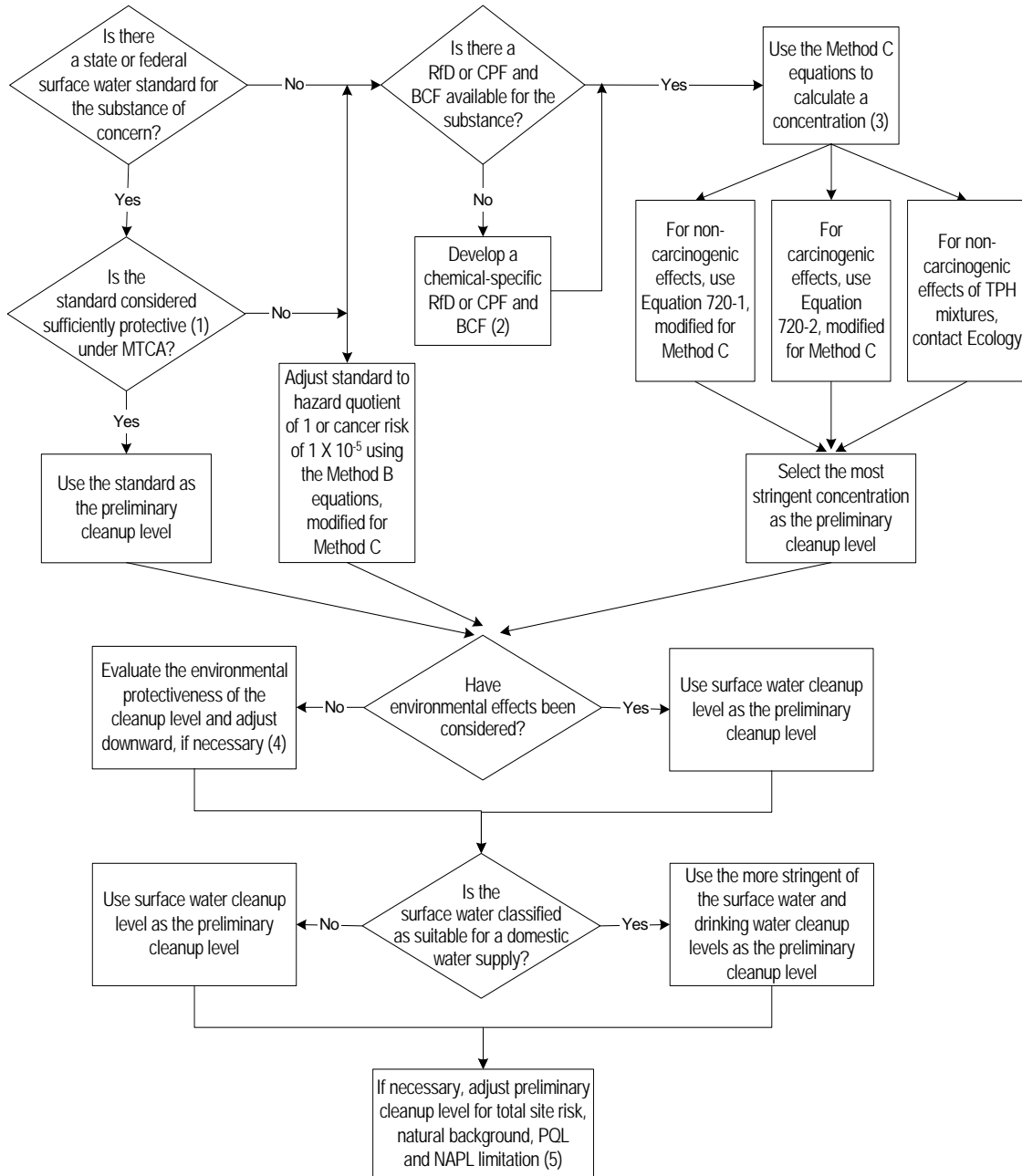


NOTES

- (1) The standard must be based on a hazard quotient of 1 or less or a cancer risk of 1×10^{-5} or less. See WAC 173-340-730(5)(b). The Method B equations may be used to check for acceptable risk.
- (2) Chemical-specific reference dose (RfD) or cancer potency factor (CPF) and bioconcentration factor (BCF) must be developed in consultation with Ecology, EPA, DOH and SAB. This process has been completed for RfDs for petroleum fractions and these values are available from Ecology.
- (3) Use equations with default values for Standard Method B. Selected default values may be changed under Modified Method B. See WAC 173-340-730(3)(c).
- (4) Whole effluent toxicity testing may be used to determine if the standard is protective of fish and aquatic life.
- (5) See WAC 173-340-730(5).

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Figure 4: Establishing Method C Surface Water Cleanup Levels under WAC 173-340-730(4)



NOTES

- (1) The standard must be based on a hazard quotient of 1 or less or a cancer risk of 1×10^{-5} or less. See WAC 173-340-730(5)(b). The Method B equations, modified for Method C, may be used to check for acceptable risk.
- (2) Chemical-specific reference dose (RfD) or cancer potency factor (CPF) and bioconcentration factor (BCF) must be developed in consultation with Ecology, EPA, DOH and SAB. This process has been completed for RfDs for petroleum fractions and these values are available from Ecology.
- (3) Use equations with default values for Standard Method C. Selected default values may be changed under Modified Method C. See WAC 173-340-730(4)(c).
- (4) Whole effluent toxicity testing may be used to determine if the standard is protective of fish and aquatic life.
- (5) See WAC 173-340-730(5).

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Table 1: Summary of Default Values for Surface Water Cleanup Level Equations under WAC 173-340-730

Factor	Method B ⁽¹⁾		Method C ⁽²⁾	
	Noncarcinogens	Carcinogens	Noncarcinogens	Carcinogens
Fish Consumption Rate (FCR)	54 grams/day	54 grams/day	54 grams/day	54 grams/day
Fish Diet Fraction (FDF) (Unitless)	0.5	0.5	0.2	0.2
Average Body Weight (ABW)	70 Kg	70 Kg	70 Kg	70 Kg
Exposure Duration (ED)	30 yrs	30 yrs	30 yrs	30 yrs
Averaging Time (AT)	30 yrs	75 yrs	30 yrs	75 yrs
Chemical-Specific Bioconcentration Factor (BCF)	See WAC 173-340-708(9)	See WAC 173-340-708(9)	See WAC 173-340-708(9)	See WAC 173-340-708(9)
Chemical-Specific Reference Dose (mg/kg-day)	See WAC 173-340-708(7)		See WAC 173-340-708(7)	
Chemical-Specific Cancer Potency Factor (kg-day/mg)		See WAC 173-340-708(8)		See WAC 173-340-708(8)
Noncarcinogenic Risk (Unitless)				
• Hazard Quotient (HQ)	1		1	
• Hazard Index (HI)	1		1	
Cancer Risk (Unitless)				
• Single Substance		1×10^{-6}		1×10^{-5}
• Total Risk		1×10^{-5}		1×10^{-5}

Footnotes:

- (1) For allowable modifications to these default values under Modified Method B, see WAC 173-340-730(3)(c).
- (2) For allowable modifications to these default values under Modified Method C, see WAC 173-340-730(4)(c).