Calculating Human Health Criteria Part 2: Key Risk Management Decisions

What Key Risk Management Decisions Were Made?

Variable	Description of the Variable and the State Decision
Fish Consumption Rate (FCR)	Determining a fish consumption rate to apply to the human health criteria equations require making several risk management decisions, such as: •What target population should protections be based on (general population vs. highly-exposed populations)? •What statistic should be used to represent the target population (average vs. median vs. some other percentile)?
	State Decision: Use 175 grams per day, which is representative of average fish and shellfish consumption rates, from all sources, for highly exposed populations on Puget Sound. Oregon's updated human health criteria use this same value, which is endorsed by the Environmental Protection Agency and several tribes.
Risk Level (RL)	Neither science nor legal and regulatory language help guide the choice of risk levels. The Environmental Protection Agency gave each state a choice in assigning an additional cancer risk level to use in the human health criteria equations. Generally, states have chosen either one-in-one hundred thousand (10^{-5}) or one-in-one million (10^{-6}). These are all theoretical risk levels that would add a minimal additional risk to the overall risk of cancer after a lifetime of daily exposures to a pollutant. The American Cancer Society estimates that the lifetime risk in the United States is approximately one-in-two for males and one-in-three for females (http://www.cancer.org/cancer/cancerbasics/lifetime-probability-of-developing-or-dying-from-cancer).
	State Decision: Continue to use the cancer risk level of one-in-one million (10^{-6}) that is currently specified in Washington's surface water quality standards and approved by the Environmental Protection Agency.
Relative Source Contribution (RSC)	Selection of a relative source contribution requires knowledge of exposures to a chemical that could occur outside of surface water pathways (e.g. exposure to chemicals in food consumed other than local fish/shellfish, or exposure to a chemical from air deposition).
	A state must consider whether to develop stricter water quality criteria to account for chemical exposures that occur outside of the controls available through state water quality standards (and the Clean Water Act), even though control of these sources are outside of the jurisdiction of the Clean Water Act. **State Decision: Use a relative source contribution of 1, which means that 100% of the assumed chemical exposure is assumed to come from sources under Clean Water Act regulation. Given the very limited ability to control sources outside the jurisdiction of the Clean Water Act, we think this is a prudent decision.**

How did Ecology Calculate Human Health Criteria?

The math:

Put all the chemicals (except for arsenic, asbestos, and copper that are based on drinking water standards) through the human health criteria equations for marine and fresh waters.

Use science, science policy, or risk management-based values assigned to each variable

If toxicity factors are available for both cancer and non-cancer effects, criteria for both types of effects are calculated and the most stringent criteria value is used as the proposed value.

4 Equations to Calculate Human Health Criteria

	Freshwater Criteria (Consumption of Organisms **and** Water)	Marine Criteria (Consumption of Organisms **Only**)
Criteria for Carcinogens	$\frac{RL \times BW}{CSF \times [(FCR \times BCF) + DI]}$	$\frac{RL \times BW}{CSF \times FCR \times BCF}$
Criteria for Non-Carcinogens	$\frac{RfD \times RSC \times BW}{(FCR \times BCF) + DI}$	$\frac{RfD \times RSC \times BW}{FCR \times BCF}$