Concise Explanatory Statement
Chapter 173-201A WAC Aquatic Life Toxics Critiera

Summary of Rulemaking and Response to Comments

Washington State Department of Ecology
Olympia, Washington

August 2024, Publication 24-10-032

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Contact Information

Water Quality Program
P.O. Box 47600
Olympia, WA 98504-7600
Phone: 360-407-6600
Website: Washington State Department of Ecology[1]

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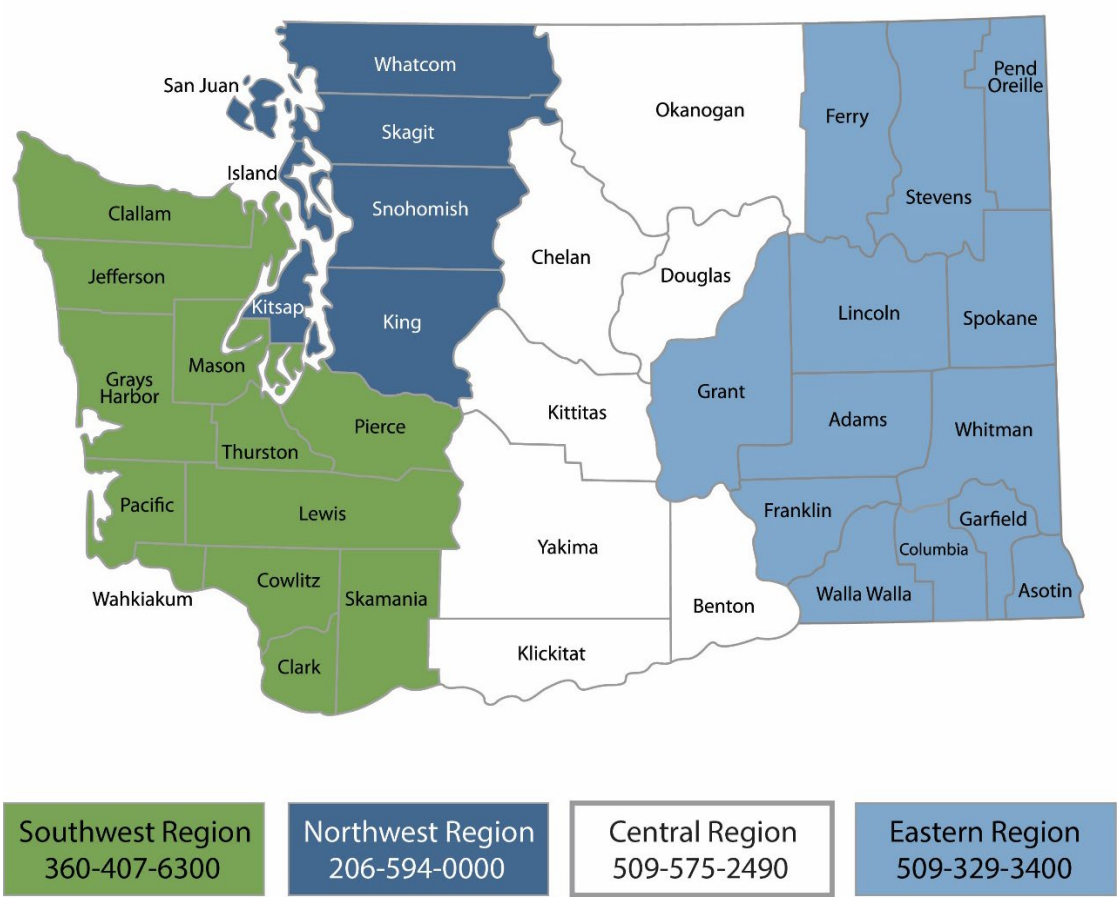
Department of Ecology's Regional Offices

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

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Chapter 173-201A WAC
Aquatic Life Toxics Criteria

Water Quality Program
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DEPARTMENT OF
ECOLOGY
State of Washington

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Acronyms and Abbreviations

µg/L	micrograms per liter
ACR	Acute to chronic ratio
BiOp	Biological opinion
BLM	Biotic ligand model
CaCO3	Calcium carbonate
CCC	Criterion continuous concentration
CFR	Code of Federal Regulations
CMC	Criterion maximum concentration
CWA	Clean Water Act
DOC	Dissolved organic carbon
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAV	Final acute value
GMAV	Genus mean acute value
LAA	Likely to adversely affect
LC50	Lethal Concentration 50
LOER	Lowest observed effect residue
mg/L	milligrams per liter
MLR	Multiple linear regression model
NLAA	Not likely to adversely affect
NMFS	National Marine Fisheries Service
TOC	Total organic carbon
USFWS	United States Fish and Wildlife Services
WAC	Washington Administrative Code

Introduction

The purpose of a Concise Explanatory Statement is to:

- Meet the Administrative Procedure Act (APA) requirements for agencies to prepare a Concise Explanatory Statement (RCW 34.05.325).
- Provide reasons for adopting the rule.
- Describe any differences between the proposed rule and the adopted rule.
- Provide Ecology's response to public comments.

This Concise Explanatory Statement provides information on The Washington State Department of Ecology's (Ecology) rule adoption for:

Title:	Water Quality Standards for Surface Waters of the State of Washington
WAC Chapter(s):	173-201A
Adopted date:	August 14, 2024
Effective date:	September 14, 2024

To see more information related to this rulemaking or other Ecology rulemakings please visit our website: https://ecology.wa.gov/About-us/How-we-operate/Laws-rules-rulemaking.

Reasons for Adopting the Rule

This rulemaking is focused on aquatic life toxics criteria to refine and provide additional water quality protection for organisms that live in water (173-201A-240 Washington Administrative Code [WAC]). These criteria are designed to protect aquatic life (fish, plants, and invertebrates) from the effects of toxic chemicals in the water. Examples of toxic chemicals include lead, mercury, cadmium, and other harmful chemicals. Above certain amounts, toxic chemicals in the water can harm aquatic life through either short-term (acute) effects, such as immediate reductions in survival, and long-term (chronic) effects, such as changes in growth, reproduction, and survival. In this way, criteria are set to prevent both short and long-term consequences of toxic chemicals.

We submitted freshwater and marine aquatic life criteria for 26 toxic chemicals in 1988 and Environmental Protection Agency (EPA) approved those criteria in 1988. EPA determined that additional aquatic life criteria were needed to comply with Clean Water Act (CWA) Section 303(c)(2)(B) and promulgated aquatic life criteria for Washington in the 1992 National Toxics Rule for acute and chronic freshwater and marine arsenic and selenium criteria, chronic marine copper criteria, and chronic marine cyanide criteria. Following EPA's promulgation of the 1992 National Toxics Rule, we submitted updates to toxic chemicals in 1993, 1998, and 2007, leading to Washington's withdrawal from the National Toxics Rule. Washington's last update to aquatic life criteria for toxic chemicals was in 2007.

Since Ecology's last major update of aquatic life toxics criteria in 1992, new information and scientific research has become available about the effects of toxic chemicals on aquatic life, and with it legal and public motivations to revise criteria.

Under Section 303(c) of the CWA and federal implementing regulations at 40 Code of Federal Regulations (CFR) § 131.4, states and authorized Tribes have the primary responsibility for reviewing, establishing, and revising water quality standards. Water quality standards consist primarily of the designated uses of a waterbody or waterbody segment, the water quality criteria that protect those designated uses, and an antidegradation policy to protect high quality waters.

EPA has compiled a list of nationally recommended water quality criteria for the protection of aquatic life and human health in surface waters. These criteria are published pursuant to Section 304(a) of the CWA and provide guidance for states and Tribes to establish water quality standards and provide the foundation for controlling the release of pollutants and identifying impaired waters. The state water quality standards are federally approved by EPA and describe the level of protection for Waters of the State.

Washington state law gives Ecology authority and responsibility to protect the quality of Washington waters and implement federal Clean Water Act programs. This authority and responsibility, with regard to water quality standards, can be found in the Revised Code of Washington (RCW) Water Pollution Control Act: RCW 90.48.030, RCW 90.48.035, and RCW 90.48.260(1).

Differences Between the Proposed Rule and Adopted Rule

RCW 34.05.325(6)(a)(ii) requires Ecology to describe the differences between the text of the proposed rule as published in the Washington State Register and the text of the rule as adopted, other than editing changes, stating the reasons for the differences.

There are some differences between the proposed rule filed on February 15, 2024, and the adopted rule filed on August 14, 2024. Ecology made these changes for all or some of the following reasons:

- In response to comments we received.
- To ensure clarity and consistency.
- To meet the intent of the authorizing statute.

The following content describes the changes and Ecology's reasons for making them. Where a change was made solely for editing or clarification purposes, we did not include it in this section. We included a summary table (Table 1) showing differences between proposed criteria and adopted criteria, followed by a summary explanation of rule language or criteria derivation changes.

Table 1 Difference between proposed criteria and final adopted criteria for toxic substances included in this rulemaking

Criteria	Proposed Criteria (µg/L)	Adopted Criteria (µg/L)
Aluminum freshwater acute	**Default values** West: 510 East: 820	**Default values** Western cordillera: 288 Marine west coast forest: 630 Cold desert: 1400
Aluminum freshwater chronic	**Default values** West: 270 East: 480	**Default values** Western cordillera: 180 Marine west coast forest: 302 Cold desert: 720
Arsenic saltwater acute	27	No changes to existing criteria
Arsenic saltwater chronic	12	No changes to existing criteria
Chromium III freshwater acute	570 (hardness of 100 mg/L)	470 (hardness of 100 mg/L)
Chromium III freshwater chronic	74 (hardness of 100 mg/L)	61 (hardness of 100 mg/L)

Criteria	Proposed Criteria (µg/L)	Adopted Criteria (µg/L)
Chromium VI freshwater chronic	4.5	6.6
Copper freshwater acute	**Default values** West: 2.0 East: 2.5	**Default values** Western cordillera: 1.4 Marine west coast forest: 2.4 Cold desert: 4.8
Copper freshwater chronic	**Default values** West: 1.6 East: 1.8	**Default values** Western cordillera: 1.2 Marine west coast forest: 1.8 Cold desert: 3.2
Methoxychlor (freshwater and saltwater chronic)	0.3	0.03
Nickel freshwater acute	34 (hardness of 100 mg/L)	58 (hardness of 100 mg/L)
Nickel freshwater chronic	5.6 (hardness of 100 mg/L)	11 (hardness of 100 mg/L)
Silver freshwater acute	0.52 (hardness of 100 mg/L)	0.44 (hardness of 100 mg/L)
Silver freshwater chronic	0.21 (hardness of 100 mg/L)	0.17 (hardness of 100 mg/L)
Silver saltwater acute	2.2	2.3
Silver saltwater chronic	0.87	0.91
Zinc freshwater acute	57 (hardness of 100 mg/L)	68 (hardness of 100 mg/L)
Zinc freshwater chronic	39 (hardness of 100 mg/L)	24 (hardness of 100 mg/L)
6PPD-quinone freshwater acute	0.008	0.012
Cyanide freshwater acute	12	8.2
Cyanide freshwater chronic	2.7	1.9
Pentachlorophenol freshwater acute	9.4 (pH of 7.8)	11 (pH of 7.8)
Pentachlorophenol freshwater chronic	4.7 (pH of 7.8)	5.4 (pH of 7.8)

Invasive Species

We have decided to include invasive species into the criteria derivation if they have established resident populations in North America. This decision is based on EPA's comment that invasive species should be included in criteria derivations because they can serve as a surrogate for native species in North America. The reincorporation of invasive species into criteria derivations has resulted in slight changes to the proposed criteria. We have detailed specific changes to criteria in the sections below.

6PPD-quinone

We integrated methods used in EPA's 6PPD-quinone screening level calculations that utilize time-weighted average median lethal concentrations (LC50s) and incorporated additional scientific studies released since the rule proposal, resulting in an increase (i.e., less stringent) in the 6PPD-quinone criterion. We also removed a previously included zebrafish study from the derivation because it does not serve as a surrogate for resident North American aquatic species.

Aluminum and Copper

We changed the geographical representation of default criteria for freshwater aluminum and copper (acute and chronic) criteria from eastern and western Washington to EPA level II ecoregions. Level II ecoregions represent three geographic areas in Washington State: western cordillera, marine west coast forest, and cold desert. This better represents the geographical features that contribute to water quality conditions. Our dataset has limited geospatial representation in some EPA level III ecoregions, and we were unable to develop default criteria at a finer scale.

Aluminum

We added a footnote to the freshwater aluminum multiple linear regression (MLR)-based criteria indicating the criteria are based on total recoverable aluminum. We further noted that analytical methods that measure the bioavailable fraction in ambient waters may be utilized when allowed by state and federal regulations (e.g., utilizing a less aggressive initial acid digestion, such as to a pH of approximately 4 or lower). The bioavailable fraction method more accurately reflects toxicity under natural instream conditions.

Arsenic

We changed the saltwater arsenic criteria (acute and chronic) from state-specific criteria to EPA national recommendations for aquatic life. The EPA's recommendations are less stringent than the saltwater arsenic criteria that was proposed during the rule proposal. During the rule proposal, we mistakenly used the 1st percentile of the genus sensitivity distribution for the saltwater arsenic criteria. Our rule strategy indicates that the 1st percentile should only be used when there is a jeopardy determination in another Region 10 state. While the Swinomish Tribe Biological Evaluation suggests effects from the saltwater arsenic criteria, we believe the data used in the analysis is out of date and that more recent data will significantly lower the magnitude of effects described. We encourage EPA and the Services to reevaluate saltwater

arsenic criteria when able. We did not find any new marine arsenic studies that would effectively lower the arsenic criteria using EPA 1985 guidance.

Chromium III

We changed the proposed freshwater chromium III (acute and chronic) from EPA national recommended values to more stringent state-specific criteria.

Our rule strategy includes evaluating new scientific studies when a Region 10 state received a "likely to adversely affect" ESA determination for a similarly listed species in Washington, which occurred for bull trout in Oregon. Two new toxicity studies have been incorporated into the freshwater acute chromium III criterion, leading to lower (i.e., more stringent) criterion compared to EPA recommendations. This subsequently led to a lower freshwater chronic chromium III criterion because the chronic criterion is based on an acute-to-chronic ratio (ACR). A chronic criterion dependent upon an ACR uses the final acute value to derive the criterion. Thus, the chronic criterion is directly linked to any changes to the acute criterion.

Chromium VI

We removed some toxicity studies used in the proposed rule that did not meet data qualifications. This resulted in an increase freshwater chronic chromium VI criterion compared to the rule proposal.

Cyanide

The incorporation of new scientific studies and recalculation of toxicity values to the free cyanide form led to a decrease (i.e., more stringent) in the criterion. This subsequently led to a decrease in the freshwater chronic cyanide criterion because the chronic criterion is based on an acute-to-chronic ratio (ACR). A chronic criterion dependent upon an ACR uses the final acute value to derive the criterion. Thus, the chronic criterion is directly linked to any changes to the acute criterion.

Methoxychlor

We incorrectly reported EPA recommended criteria as 0.3 micrograms per liter (µ/L) for methoxychlor chronic criteria (freshwater and saltwater) in our proposed rule language. EPA recommends 0.03 µg/L. The number was incorrectly reported in the draft rule language, but correctly reported in the Technical Support Document. We have made the correction in our final rule language.

Nickel

We incorporated new scientific studies into the freshwater acute and chronic nickel criteria that were suggested during the public comment period as well as the reincorporation of invasive species studies that were previously removed. The addition of new chronic studies allowed for the chronic nickel criterion to be calculated using the eight-family approach rather than the acute-to-chronic ratio approach used in the rule proposal. The result is an increase (i.e., less stringent) in the acute and chronic criteria for nickel.

Pentachlorophenol

The freshwater acute pentachlorophenol criterion was recalculated using GMAVs ranked 2-5, in accordance EPA 1985 derivation guidelines for aquatic life criteria when there are greater than 59 GMAVs. This led to an increase (i.e., less stringent) in the freshwater acute pentachlorophenol criterion. This subsequently led to a reduced freshwater chronic pentachlorophenol criterion because the chronic criterion is based on an acute-to-chronic ratio (ACR). A chronic criterion dependent upon an ACR uses the final acute value to derive the criterion. Thus, the chronic criterion is directly linked to any changes to the acute criterion.

Silver

We removed scientific studies that did not meet data qualifications from the derivation of the freshwater acute silver criterion, resulting in a decrease (i.e., more stringent) in the criterion. This subsequently led to a lower freshwater chronic silver criterion because the chronic criterion is based on an acute-to-chronic ratio (ACR). A chronic criterion dependent upon an ACR uses the final acute value to derive the criterion. Thus, the chronic criterion is directly linked to any changes to the acute criterion.

We added a new scientific study to the saltwater acute derivation, resulting in an increase (i.e., less stringent) in the criterion. This subsequently led to a higher saltwater chronic silver criterion because the chronic criterion is based on an ACR. A chronic criterion dependent upon an ACR uses the final acute value to derive the criterion. Thus, the chronic criterion is directly linked to any changes to the acute criterion.

Zinc

We added scientific studies to the freshwater acute zinc criterion that met data qualifications, resulting in an increase in the criterion (i.e., less stringent). The freshwater acute zinc criterion was also recalculated using genus mean acute values (GMAVs) ranked 2-5, in accordance EPA 1985 derivation guidelines for aquatic life criteria when there are greater than 59 GMAVs.

The addition of new chronic studies allowed for the chronic nickel criterion to be calculated using the eight-family approach rather than the acute-to-chronic ratio approach used in the rule proposal. The incorporation of new scientific studies into the freshwater chronic zinc criterion led to a decrease (i.e., more stringent) in the criterion.

List of Commenters and Response to Comments

Organization of comments and responses

We accepted comments on the proposed rule from February 15, 2024, to May 7, 2024 (extended from April 17, 2024). During this 83-day comment period, we accepted comments by mail, through our online comment form, and verbally at two public hearings that were held via webinar.

We received 50 comment submissions on this rulemaking. Some of the comment submissions covered multiple topics. Comments and responses are grouped together and organized by topic. We summarized comments when appropriate and responded to comments below each comment or summarized comments. Commenters who provided a comment related to each topic below are listed after each comment. You can see the original comments we received on our online public comments website.[2] Comments are available through this page until two years after the rule adoption date.

We grouped comments together by the following topics:

1. General comments
    1.1. Support for rulemaking
    1.2. Protection of designated uses and endangered species
2. Comments on rulemaking process
    2.1. General comments on rulemaking process
    2.2. Rule purpose
    2.3. Sources cited
    2.4. Methods and models to derive criteria
    2.5. Preliminary Regulatory Analyses
3. Comments on the Technical Support Document
    3.1. General Comments on the Technical Support Document
    3.2. Corrections and clarifications
4. Implementation
    4.1. Comments on Rule Implementation Plan
    4.2. Assessment
    4.3. Irrigation concerns
    4.4. Permit monitoring and compliance
    4.5. Impacts to cleanup work
5. Comments on specific toxic chemicals
    5.1. 6PPD-quinone
    5.2. Acrolein
    5.3. Aluminum
    5.4. Arsenic
    5.5. Cadmium
    5.6. Carbaryl

[2] https://wq.ecology.commentinput.com/comment/extra?id=apZ8BGx2sQ

5.7. Chromium III
5.8. Chromium VI
5.9. Copper
5.10. Cyanide
5.11. Diazinon
5.12. Dieldrin
5.13. Endrin
5.14. gamma-BHC
5.15. Guthion
5.16. Lead
5.17. Malathion
5.18. Mercury
5.19. Methoxychlor
5.20. Nickel
5.21. Nonylphenol
5.22. Pentachlorophenol
5.23. PFOA and PFOS
5.24. Selenium
5.25. Silver
5.26. Tributyltin
5.27. Zinc
5.28. Human health criteria footnotes

6. Comments on toxic chemicals not included in proposed rule

List of commenters

Commenters are listed in Table 2 below in alphabetical order by individual's last name or by affiliation. Comment topics are identified by the section and comment number as they are listed in the following section, Comments and Ecology Responses. Under the column Comment Topic, comment codes are grouped by comment subtopics.

Table 2 List of commenters and comment topic code

Submitted By	Comment Topic
Alkylphenols & Ethoxylates Research Council (Barbara Losey)	5.21.B, 5.21.C, 5.21.D, 5.21.E
Aluminum Association (Andrew Smith)	4.2.A 5.3.A, 5.3.F
Association of Washington Business (Erin Herlihy)	2.1.C, 2.1.E, 2.1.F 2.2.A, 2.3.E 2.3.F, 2.3.G, 2.3.H, 2.3.I, 2.3.J 2.4.D, 2.4.E, 2.4.F, 2.4.G, 2.4.H

Submitted By	Comment Topic
Association of Washington Business (Erin Herlihy, continued from above)	4.1.A, 4.4.H 5.1.H 5.2.B 5.3.D, 5.3.E 5.5.B 5.9.H, 5.9.M 5.20.B 5.23.D 5.24.B 5.25.B 5.27.B
Byrne, Jim	5.1.C
Center for Biological Diversity (Hannah Connor)	1.2.G 2.3.K, 2.3.P 5.5.C 5.10.A 6.17.A
Copper Development Association (William Adams)	2.3.O 3.1.E 5.9.A, 5.9.I, 5.9.J, 5.9.K, 5.9.L
Cooperative Research and Development Agreement (CRADA) Industry Partners (Ellie Middleton)	2.1.H 2.3.N
Davies, Paul	5.1.F
East Columbia Basin Irrigation District (Jamie Balliet)	5.2.C 5.9.C
Friends of the Issaquah Salmon Hatchery (Larry Franks)	5.1.A
Glaskova, Lena	6.18.A
International Lead Association (Jasim Chowdhury)	5.16.A, 5.16.B
International Zinc Association (Adam Ryan)	2.1.G 5.9.F 5.27.C

Submitted By	Comment Topic
Jamestown S'Klallam Tribe (Alex Scagliotti)	1.1.A 5.1.A,, 5.1.B 5.23.B 6.13.D 6.14.D 6.15.E
Kenefick, Andrew	5.1.A, 5.1.B, 5.1.D, 5.1.N
Kennewick Irrigation District (Seth Defoe)	4.3.A 5.2.B 5.9.B
King County (Kamuron Gurol)	2.1.D 2.3.M 5.1.U 5.9.A 5.23.C 5.28.D 6.15.F
Lake Sammamish Kokanee Work Group (Alison Agness)	5.1.A, 5.1.B
Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Salmon Recovery Council (Mary Ramirez)	5.1.A
Moe, Eric	5.23.E
Naches-Selah Irrigation District (Justin Harter)	4.3.A 5.9.B, 5.9.D
NiPERA Inc (Ellie Middleton)	5.20.C, 5.20.D, 5.20.E, 5.20.J
Northwest Environmental Advocates (Nina Bell)	1.2.A, 1.2.B, 1.2.C 2.1.B 2.2.D. 2.2.E 2.3.A, 2.3.B, 2.3.C, 2.3.D 3.1.A, 3.1.B, 3.1.C, 3.1.D 5.1.A 5.11.A 5.12.A

Submitted By	Comment Topic
Northwest Environmental Advocates (Nina Bell, continued from above)	5.13.A 5.14.A 5.15.A 5.17.A 5.18.A 5.19.A 5.19.B 5.2.A 5.20.A 5.21.A 5.22.A 5.23.A 5.24.A 5.25.A 5.26.A 5.27.A 5.3.C 5.4.A 5.5.A 5.6.A 5.7.A 5.8.A 5.9.E 6.1.A 6.3.A 6.4.A 6.5.A 6.7.A 6.8.A 6.9.A 6.10.A 6.11.A 6.12.A 6.13.A 6.14.E

Submitted By	Comment Topic
Northwest Environmental Advocates (Nina Bell, continued from above)	6.15.A 6.16.A 6.17.B 6.19.A 6.2.A 6.20.A 6.22.A 6.23.A 6.24.A 6.25.A
Northwest Indian Fisheries Commission (Justin Parker)	1.1.A 3.1.F 5.1.A, 5.1.B 5.23.B 5.28.A 6.13.B 6.14.A 6.15.B
Port Gamble S'Klallam Tribe (Josh Carter)	1.1.A 2.1.I 5.1.A 5.23.A, 5.23.B 5.28.B 5.28.C 6.13.E 6.14.B 6.15.C
Port of Tacoma (Mindi Kellar)	5.1.V
Puget Soundkeeper (Emily Gonzalez)	1.1.B 5.1.A, 5.1.E
Puyallup Tribe (Char Naylor)	2.3.L 5.28.A 6.13.C, 6.15.B
Quincy-Columbia Basin Irrigation District (Roger Sonnichsen)	4.3.C

Submitted By	Comment Topic
Roza Irrigation District (Roza)	4.3.A 5.2.B 5.9.B, 5.9.D
Roza-Sunnyside Board of Joint Control (RSBOJC)	4.3.A 5.2.B 5.9.B, 5.9.D
Snohomish Basin Salmon Recovery Technical Committee (Norah Kates)	5.1.A
Snohomish County (Steve Britsch)	2.4.A, 2.4.B 4.4.A, 4.4.B, 4.4.C, 4.4.D, 4.4.E, 4.4.F, 4.4.G 5.3.B
South Columbia Basin Irrigation District (John O'Callaghan)	4.3.E
Spokane Riverkeeper (Katelyn Scott)	1.1.A 2.1.A 5.1.A, 5.1.B 5.23.A
Squaxin Island Tribe (Erica Marbet)	1.1.A 5.1.A 5.23.A, 5.23.B 5.28.A 6.14.C 6.15.D
Sunnyside Valley Irrigation District (SVID)	4.3.A 5.2.B 5.9.B, 5.9.D
Suquamish Indian Tribe of the Port Madison Reservation (Denice Taylor)	1.1.A, 1.2.C 4.1.B 4.4.I 5.1.A 5.23.B 6.13.B 6.14.A 6.15.B

Submitted By	Comment Topic
Tabayoyon, Paul	6.6.B
U.S. Department of Energy Richland Operations Office (Alex Teimouri)	1.2.D, 1.2.E, 1.2.H 2.2.B, 2.2.F, 2.2.G 2.4.C 4.5.A 5.8.B, 5.8.C
U.S. EPA (Lindsay Guzzo)	1.2.F 2.1.J 2.2.C 3.1.G, 3.1.H, 3.1.I, 3.1.J, 3.1.K, 3.1.L, 3.1.M 3.2.A, 3.2.B, , 3.2.C, 3.2.D, 3.2.E, 3.2.F, 3.2.G, 3.2.H, 3.2.I, 3.2.J, 3.2.K, 3.2.L, 3.2.M, 3.2.N, 3.2.O, 3.2.P, 3.2.Q, 3.2.R, 3.2.S, 3.2.T, 3.2.U, 3.2.V, 3.2.W, 3.2.X, 3.2.Y, 3.2.Z, 3.2.AA, 3.2.BB 5.1.B, 5.1.I, 5.1.M 5.5.D, 5.5.E 5.9.G 5.10.B, 5.10.C 5.20.F, 5.20.G, 5.20.H, 5.20.I 5.24.C 5.27.D, 5.27.E, 5.27.F, 5.27.G 6.17.C
U.S. Tire Manufacturers Association (Stephanie Schlea)	5.1.J, 5.1.O, 5.1.P, 5.1.Q
Vlad, Daniel	6.6.A
WA Department of Fish and Wildlife (Rae Eaton)	5.1.T 5.23.A 6.21.A 6.22.B

Submitted By	Comment Topic
Washington Association of Sewer & Water Districts (Judi Gladstone)	5.3.G 5.4.B
Washington Council of Trout Unlimited (Andrew Kenefick)	5.1.A, 5.1.B, 5.1.D, 5.1.N
Washington State Department of Transportation (Elsa Pond)	1.1.A
Washington State Water Resources Association (John Stuhlmiller)	4.3.D
Washington Stormwater Center (Jenifer McIntyre)	5.1.G, 5.1.K, 5.1.L, 5.1.R, 5.1.S
Wenatchee Reclamation District (Waylon Marshall)	4.3.B

Comments and Ecology responses

1. General Comments

1.1. Support for rulemaking

1.1.A Comment summary – Commenters support Ecology updating the aquatic life toxics criteria, including updating the approach to update all criteria in a single rulemaking.

- Jamestown S'Klallam Tribe
- Northwest Indian Fisheries Commission
- Port Gamble S'Klallam Tribe
- Spokane Riverkeeper
- Squaxin Island Tribe
- Suquamish Indian Tribe of the Port Madison Reservation
- Washington State Department of Transportation

1.1.B Comment Summary – Commenters support Ecology updating aquatic life criteria but state that Ecology needs to update criteria on a more frequent basis.

- Puget Soundkeeper

1.2.C Comment Summary – Where ESA concerns exist and there has been a likely to adversely affect or jeopardy determination for state species, the Tribe strongly supports adoption of more protective criteria, based on new data or a more conservative derivation process that will ensure greater overall protection of all aquatic species including susceptible populations of endangered species.

- Suquamish Indian Tribe of the Port Madison Reservation

Response to 1.1.A, 1.1.B, and 1.1.C

Thank you for your support. We intend to update the aquatic life toxics criteria on a more regular basis as needed. The triennial review process is an excellent platform to suggest future rulemakings for Washington.

1.2. Protection of designated uses and endangered species

1.2.A Comment Summary – Ecology's process is explicitly not intended to ensure that designated uses are protected but, rather, that none of its criteria are held up through ESA consultation. In taking this approach, Ecology ensures that it will ignore species with dwindling populations in Washington State, subjecting them to further pressures, while waiting for the species to be formally recognized as on the brink of extinction before acting to protect them. This is not only poor policy, but it is contrary to the requirements of the CWA and contrary to the best interests of the species and the public.

- Northwest Environmental Advocates

Response to 1.2.A

The EPA's 1985 guidelines for aquatic life criteria derivation are designed to protect aquatic life. Attributing the listing status of an endangered or threatened species based solely on water quality criteria is not appropriate, given the other factors at play such as hydropower modifications, hydrological changes, habitat degradation, and invasive species, to name a few. The EPA's national recommendations for aquatic life are assumed to be protective of aquatic life under the Clean Water Act. We support using the best available scientific studies to derive protective aquatic life criteria for the state of Washington, and in some instances, deriving higher protection levels for some chemical criteria demonstrated to be needed through the Endangered Species Act consultation process.

1.2.B Comment Summary – It is unclear how ESA consultations for the States of Oregon and Idaho in any way pertain to many of the species listed in Washington, such as marine rockfish and the Southern resident killer whale, which spend more time in Puget Sound than they do in waters affected by toxic pollution coming from Oregon waters. Oddly, despite Ecology's fixation on the BiOps for other states' standards, the entire TSD mentions the Southern resident killer whales only once, on this list of ESA-listed species.

- Northwest Environmental Advocates

Response to 1.2.B

Washington, Oregon, and Idaho have many of the same endangered or threatened species under the Endangered Species Act. We can use this information to develop protective aquatic life criteria in Washington and determine if EPA's national aquatic life recommendations are adequate for Washington's most vulnerable species and populations. We understand that there are some unique species listed as endangered in Washington and some species are easier to evaluate than others. Southern resident killer whales are not easy to evaluate because we do not have data on exposure and toxicity relationships. For example, we cannot test the sensitivity of killer whales in a laboratory toxicity test. It is also difficult to evaluate growth, survival, and reproduction changes in killer whales due to a single chemical. Thus, when setting an individual criterion for a toxic chemical, toxicity information for killer whales cannot be incorporated and there are no known methods to assess direct impacts. We can look at indirect effects, such as effects to killer whale prey items. We can evaluate Chinook salmon, a primary prey item, and determine if the proposed criterion is protective. Chinook salmon are also listed on the Endangered Species Act list, and we do have information to evaluate their sensitivity using laboratory-based toxicity tests. We support the proposed criteria on this basis. We are interested in investigating additional methods to develop state-specific criteria in the future, such as tissue-based criteria for bioaccumulative toxics. These tissue-based criteria and the methods used to calculate them are only beginning to be developed. Future rulemaking may assess these tissue-based methods as they become established.

1.2.C Comment Summary – Ecology's discussion of EPA biological evaluations ("BE") fails to point out that EPA routinely concludes that toxic chemicals will not have an adverse effect on ESA-listed species and that the Services often take a contrary view, including but not limited to jeopardy determinations. Relying on EPA BEs, therefore, does not ensure sufficient protection

for species any more than relying on decades-old EPA recommended criteria. As for the Services, in one example, NMFS concluded that for DDT in Idaho "[t]he proposed chronic criterion may allow substantial bioaccumulation to occur because DDTs are taken up not only from the water column but also from sediments and prey organisms" but did not make a jeopardy finding for the salmonid species listed in Idaho waters. NMFS, Final Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Water Quality Toxics Standards for Idaho (May 7, 2014) (hereinafter "NMFS Idaho BiOp") at 232. However, at the same time, the Idaho BiOp did not evaluate the impacts of DDT criteria on Southern Resident killer whales—"resident" referring to Washington's Puget Sound waters—because EPA had not provided such an analysis to NMFS. See id. at 2. Likewise, the NMFS BiOp for Oregon toxic criteria observed that "Southern Residents are a highly contaminated whale population" and that some of these pollutants do not need to be in high concentration in a species to be toxic and have long been recognized as problematic for the Southern Resident killer whales. The organochlorines (e.g., PCBs and DDTs) are thought to pose the greatest risk to killer whales (Ross et al. 2000, Center for Biological Diversity 2001, Krahn et al. 2002). Organochlorines are . . . [d]esigned for their stability, most are highly persistent in the environment and can resist metabolic degradation. These persistent pollutants can accumulate in the food webs and are at relatively high concentrations in upper trophic-level species such as killer whales.

NMFS, Jeopardy and Adverse Modification of Critical Habitat Biological Opinion for the Environmental Protection Agency's Proposed Approval of Certain Oregon Administrative Rules Related to Revised Water Quality Criteria for Toxic Pollutants (Aug. 14, 2012) (hereinafter "NMFS Oregon BiOp") at 80. No jeopardy opinion was issued for organochlorines, and because DDT was not one of the pollutants that was the subject of the ESA consultation, NMFS did not determine whether the DDT criteria posed jeopardy to any species including the killer whales. That is not a basis upon which Ecology can rely to decide to do nothing.

Similarly, while NMFS concluded in its evaluation of Oregon toxic criteria that "[t]he available evidence for saltwater zinc indicates that listed species exposed to waters equal to the acute and chronic criteria concentrations **will suffer acute or chronic toxic effects including mortality** (low intensity) and reproductive failure (low intensity)," that agency did not make a jeopardy finding. NMFS Oregon BiOp at 394 (emphasis added). Similarly, for other toxic pollutants, NMFS identified hazards to threatened and endangered species but stopped short of issuing a jeopardy opinion for them. NMFS concluded:

> Based on the direct mortality population modeling results, juvenile salmon and steelhead exposed to aluminum, ammonia, arsenic, lindane, cadmium, chromium (III), chromium (VI), copper, dieldrin, endosulfan-alpha, endosulfan-beta, endrin, heptachlor epoxide, lead, nickel, pentachlorophenol, selenium, silver, tributyltin, and zinc is **predicted to result in mortality at the population level**—relative to the baseline population model." NMFS Oregon BiOp at 486 (emphasis added).

NMFS also observed in a separate analysis in the biological opinion that

> using formula-based criteria for aquatic life criteria derived following the [EPA] Guidelines are likely to be underprotective of listed species considered in this opinion. . . . The present formula-based metal method does not consider the environmental fate, transport, and transformations of metals in natural environments (specifically for arsenic,

> cadmium, chromium (III), chromium (VI), copper, lead, nickel, silver, and zinc), nor the influence of other water quality constituents on toxicity, and therefore affords incomplete protection for listed species and is likely to result in sublethal effects, such as central nervous system disruption, altered liver and kidney function, impaired reproduction, decreased olfactory response, delayed smoltification, impaired ability to avoid predation and capture prey, growth inhibition, growth stimulation, changes in prey species community composition (which will increase foraging budgets), and death of listed species considered in this opinion. NMFS Oregon BiOp at 694.

Yet most of these toxic pollutants were not identified as posing formal jeopardy to ESA-listed species in Oregon. Ecology's reliance on jeopardy calls instead of the Services' analysis, and EPA's analysis in its BEs, is a flawed approach to ensuring compliance with both the CWA and the ESA. If anything, it appears that Ecology's only concern is with the ESA, a statute that, by definition, does not apply to many other aquatic designated uses in the state.

- Northwest Environmental Advocates

Response to 1.2.C

We encourage commenters to provide additional methodologies that should be considered when developing aquatic life criteria. The framework for developing aquatic life criteria rely on effects to growth, survival, and reproduction. EPA does not typically consider other adverse effects measured in studies. Furthermore, development of criteria depends on empirical based studies that explain exposure and effect relationships in a controlled setting.

We found that many of the likely to adversely affect determinations in Idaho and Oregon were based on new scientific studies that EPA has yet to incorporate into national aquatic life recommendations. Thus, we acted upon this fact and incorporated the new scientific studies into criteria derivation within the confines of EPA's 1985 guidance. In some instances, we found additional protection was needed to meet the protection requirements outlined in BiOps under the Endangered Species Act. We are not in a position to develop new methods for deriving aquatic life criteria because that responsibility falls within the federal Clean Water Act biologically based criteria development process. We do not have the capacity to update EPA's 1985 guidance document and believe that updated guidance should originate from within EPA with states involvement.

1.2.D Comment Summary – The State has not established sufficient parameters or constituents to protect the designated use. The adoption of a 99% protection standard to protect 99% of species 99% of the time, has not been proven to be necessary or required for the protection of any endangered species in the State of Washington. Prior to the Washington State Department of Ecology implementing such a stringent measure, it would have been imperative for Ecology to furnish documentation demonstrating the factual basis, need, and prevailing conditions necessitating and mandating this action.

However, based on our review, we find no identified use of the 99 percentile criteria. It appears that the acute to chronic ratio methodology was used similar to the current rule. Ecology's documentation in this rule making is substantially incorrect and misleading to the public.

- U.S. Department of Energy Richland Operations Office

Response to 1.2.D

When Oregon and Idaho adopted EPA national recommendations for some aquatic life toxics criteria, it led to jeopardy determinations for similarly listed species in Washington. We believe that this is evidence that if we were to adopt EPA recommendations, that our proposed criteria would be disapproved by EPA due to not protecting the aquatic life use. In these instances, we first evaluated any new scientific studies since EPA last updated their national recommendations. For two chemicals, arsenic and cyanide, we used the 1st percentile derivation method to increase protection levels. Using the 1st percentile of the genus sensitivity distribution is a logical choice to increase protection levels to better protect vulnerable endangered species and their populations in Washington within the confines of EPA's existing 1985 guidelines for deriving aquatic life criteria. The 1st percentile was necessary based on the protection levels and the magnitude of effects outlined in the Idaho and Oregon BiOps for arsenic and cyanide. We highlight some of these discussions for these two toxics in the Technical Support Document and encourage the commenter to read these sections.

EPA 1985 derivation guidelines state that if acceptable data are available for a large number of taxa from diverse groups, a reasonable level of protection will be provided. The 5th percentile used to calculate the final acute value in EPA's 1985 guidance does not imply that this percentage of adversely affected taxa should be used to decide in a field situation whether a criterion is too high or too low. We applied the 1st percentile of the genus sensitivity distribution to freshwater acute arsenic and cyanide and freshwater chronic cadmium criteria. Acute arsenic and cyanide toxicity dataset had 17 GMAVs and chronic cadmium had a toxicity dataset consisting of 20 GMAVs. All three of these criteria have limited taxa representation. The basis of EPA 1985 guidelines indicates that the 5th percentile should represent reasonable level of protection when there are large amounts of toxicity data for taxa. Given the endangered species protection concerns and limited datasets and taxa representation, we found it appropriate to derive criteria based on the 1st percentile. Furthermore, states have the option to develop more stringent criteria than EPA when justified. We support higher protection levels for endangered species and their populations in Washington.

1.2.E Comment Summary – It is unjustifiably severe to apply criteria for the protection of endangered species to waters within the State that neither harbor nor have historically sustained such endangered species. Rather, the appropriate approach entails protecting the actual species present in each respective body of water. The imposition of financial burdens on operators of publicly owned treatment works (POTWs), which are predominantly municipal responsibilities, for the protection of species that do not inhabit the waters they discharge into, lacks any rational basis. Standards should be applied to safeguard the species inhabiting the specific water bodies into which discharge occurs.

State regulations explicitly stipulate that standards may be formulated based on a bodyspecific basis. WAC 173-201A-240 Toxic substances states the department may revise the criteria in Table 240 for aquatic life on a statewide or water body-specific basis as needed to protect aquatic life occurring in waters of the state and to increase the technical accuracy of the criteria being applied.

- U.S. Department of Energy Richland Operations Office

Response to 1.2.E

It is not feasible to develop site-specific criteria for every water body in the state of Washington. Rather, we develop statewide criteria protective of all aquatic life. We contend that if criteria cannot be protective of one species population in Washington, whether endangered or threatened, then it's not protective of any population of that species in any water body in the state. Because of the differences in how protection is evaluated from EPA and NMFS/USFWS, we need to develop criteria protective of Washington's most sensitive species and populations or the aquatic life criteria will not be approved. In other words, if the basis of EPA disapproving statewide criteria is endangered species protection, then to protect aquatic life, we support developing statewide criteria protective of all aquatic life, including endangered species and their populations. Disapproval of statewide criteria has occurred in Idaho and Oregon in instances where they proposed adopting EPA national recommendations. The same basis will apply to Washington. This rulemaking is a proactive approach to address protection issues for aquatic life.

1.2.F Comment Summary – The EPA appreciates Washington's commitment to the protection of aquatic life and its efforts to update aquatic life criteria to protect sensitive species in the state. The EPA does want to note that although consultation under the Endangered Species Act (ESA) is a legal requirement for federal agencies contemplating a CWA Section 303(c) approval action on a state's water quality standards package, the EPA's obligation under the CWA is to ensure that criteria protect applicable water body designated uses. As the state has provided an analysis of the protectiveness of its proposed standards for ESA listed species in Washington in its TSD, the EPA can consider this information when evaluating the effects of an approval of those standards under Section 7(a)(2) of the ESA. If any standard was likely to adversely affect (LAA) an individual member of a listed species, the U.S. Fish and Wildlife Service and National Marine Fisheries Service (Services) would then evaluate whether the approval action would jeopardize the continued existence of a listed species or adversely modify its designated critical habitat. A finding of LAA does not automatically constitute a jeopardy opinion. Usually, reasonable and prudent measures are issued with any affirmative finding that may or may not involve a revision to a standard. While a jeopardy opinion may cause the EPA to conclude that an applicable use would not be protected, LAA determinations would not be in conflict with a conclusion that the use is nonetheless protected.

- U.S. EPA

Response to 1.2.F

Thank you for the information. We continue to support updating the criteria with the latest scientific studies when a likely to adversely affect determination has been made to ensure aquatic life is fully protected in Washington.

1.2.G Comment Summary – Because Washington is downstream of a number of states with known aquatic toxic pollution issues, including Idaho, Oregon, and even small portions of Wyoming and Montana, some of its waters are already receiving significant pollutants from upstream states, which raises concerns about cumulative impacts, and suggests even more stringent criteria are required to address pollution in a legally sufficient manner. While in theory,

Clean Water Act section 303(d) total maximum daily loads (TMDLs) are the mechanism to address total pollutant loading, Washington's TMDL program is largely moribund, it issues very few TMDLs for toxic pollutants, and its TMDLs do not take into consideration the cumulative effects of multiple toxic pollutants. For these reasons, Washington's water quality criteria for toxic pollutants must address the need to provide full protection of these downstream waters.

- Center for Biological Diversity

Response to 1.2.G

Washington's standards have a narrative criterion in WAC 173-201A-260 paraphrased as "no toxics in toxic amounts" that can be applied in instances where there is evidence of toxic effects from cumulative impacts of multiple stressors. One possible avenue to address combined effects of multiple stressors is to conduct Whole Effluent Toxicity (WET) testing to evaluate effects to sensitive organisms from natural waters. We also have an interest in developing numeric criteria for mixtures of toxic chemicals within chemical classes. We are interested in future investigations into the science and methods behind developing mixture-based criteria. We encourage further comment on this topic during the upcoming triennial review process.

1.2.H Comment Summary – The premise and purpose of this rulemaking lacks real definition. Based on the general language, this rulemaking is to set standards and limitations for surface water discharges and will not be utilized for cleanup standards of soil or groundwater. Further, these standards will not be utilized for infiltration systems utilized for remediation systems. Please confirm this or identify the public notice in this rulemaking of that intent. We have carefully examined all the documents supporting this rulemaking and cannot find any discussion about remediation systems and activities.

- U.S. Department of Energy Richland Operations Office

Response to 1.2.H

The purpose of this rulemaking is to update the aquatic life toxics criteria for Washington under WAC 173-201A. Some pollutants have been demonstrated through litigation to be inconsistent with the Clean Water Act. Washington has not updated the majority of the aquatic life criteria since 1993 (over 30 years ago). We do not know the extent to which other programs utilize the aquatic life toxics criteria nor do we have the authority to modify any other regulations that are dependent on WAC 173-201A-240. We do not consider how the aquatic life toxics criteria are used when established protection levels of aquatic life in Washington. Rather, we use the best available scientific studies and information on protection levels of aquatic life to make our determination.

2. Comments on rulemaking process

2.1. General comments on rulemaking process and rule purpose

2.1.A Comment Summary – We request Ecology consider adding a provision to revisit the standards set forth when the EPA issues a new criteria for a new toxic. This would increase Ecology's accountability to ensure that the standards stay current with scientific advances, especially in regards to contaminants of emerging concern.

Comments on rulemaking process: General comments on rulemaking process and rule purpose

Please consider creating a plan to update your criteria following specific triggers or within a reasonable timeframe to ensure that the standards stay up to date.

- Spokane Riverkeeper

Response to 2.1.A

Thank you for your comment. We hold triennial reviews every three years of the water quality standards in accordance with the Clean Water Act. Triennial reviews are a platform for the public to suggest updates to standards and consider rulemaking prioritization. We encourage the commenter to be involved in the triennial review process. We intend to review and update the aquatic life toxics criteria on a more regular basis in the future.

2.1.B Comment Summary –Ecology's near obsession with avoiding jeopardy determinations puts it in a situation where it is likely to run afoul of both the CWA and the ESA. It repeatedly avoids looking at species in Washington waters that might be more sensitive than those that are the subject of federal ESA listings. It repeatedly focuses on jeopardy determinations and ignores the analysis contained in biological opinions when one or both of the Services stops short of a jeopardy determination.

Ecology's approach also fails to consider that different offices of the Services come to different conclusions even when they are considering protection of the exact same species and the same pollutant criteria. For example, contrast the outcomes of the FWS Oregon BiOp and the FWS Idaho BiOp in which the former contained zero jeopardy determinations. It's a fool's errand to think that Ecology can outguess the Services.

This does not even begin to account for the unique nature of Puget Sound and the species that rely upon its waters and its tributaries. As is noted in the page-by-page comments below, Puget Sound is not even mentioned once in this document and is clearly not addressed by Ecology. Ecology has itself studied, has accumulated others' studies, and has access to internal and external studies under development that pertain to accumulation of toxics, the movement of toxics, the bioaccumulation of toxics in the Puget Sound food web and species, and the impacts of toxics on species that depend on its waters, none of which have been taken into consideration in this proposal. The number of those studies is too numerous to cite here.

- Northwest Environmental Advocates

Response to 2.1.B

Ecology's review of BiOps and endangered species consultations is an objective review of the available information that provides insight into how the EPA national recommendations for aquatic life criteria are evaluated during Endangered Species Act consultation in states with similar species and habitat. Disapproval of the water quality criteria occurs when there is a jeopardy determination. Focusing on this determination is prioritized when developing aquatic life criteria in order to avoid disapproval while setting protective water quality criteria. We did utilize the information in the referenced BiOps beyond when a jeopardy determination was made. When a BiOp reported a likely to adversely affect (LAA) determination but not a jeopardy call, we evaluated new scientific studies to ensure all the available scientific studies were being utilized to derive criteria. We support the use of BiOps in decisions in this rulemaking versus not

considering them at all. We recognize that Washington does have unique habitats, but that does not change the number and content of scientific studies available on aquatic life effects that can be used and incorporated into the criteria derivation. We are interested in exploring additional methodologies for aquatic life criteria for bioaccumulative toxics in the future.

2.1.C Comment Summary – The rulemaking documentation and data analysis have not been externally peer reviewed, or if they have, this review has not been reported. We believe this is the most glaring issue with the entire rulemaking process. While we expect the technical support document to have a thorough editorial review to address some noted typos (e.g., page 239 mentions that exceedance of a benchmark is a permit violation, and on page 238 the formula for calculating respective calculated limit is incorrect), there is a need for a third-party technical review. The analysis and presentation of data used to derive default statewide criteria is insufficient to determine whether the data used are representative and unbiased. For example, the peer reviewed study that was used in developing copper criteria has a misprint and it does not include the values for the most important parameters. The correction to that study has not yet been issued. In other cases, where Ecology has summarized sources of data used to derive new formulas for computing criteria, it lacks details on the goodness of fit, potential outliers, standard errors, percent bias, or other statistics commonly used to indicate that the data follow the assumed (log-normal) distribution and how well the regression equations fit the data. These details are important for the public to have confidence that Ecology is using appropriate and representative data and making assumptions that are technically sound and reasonable.

- Association of Washington Business

2.1.D Comment Summary – We request that Ecology include a peer review step in the selection of new science. When developing criteria based on incorporating new scientific studies, peer review is important for conducting this step. It is best practice for more than one person to review scientific articles and to agree on the data used from the articles or primary source material. We understand the study acceptability criteria were reviewed by EPA headquarters. However, as indicated by Ecology in March 2024 workshop, only one person at Ecology conducted the reviews of the literature, selected the data to use, and calculated the new genus mean values. In addition, it is unclear if an independent quality control check on the data calculations used in calculating the new criteria occurred. We request Ecology include an appropriate level of peer review for new science data used and a quality control check of calculations (if it has not already occurred) before finalizing the criteria updates. Alternatively, we request that EPA perform a peer review of the new science as well as perform a quality control check of calculations when new proposed criteria are submitted to EPA for approval.

- King County

Response to 2.1.C and 2.1.D

The rulemaking documentation is reviewed internally by the water quality standards team and management as well as our stakeholders through the rule proposal process. This is standard practice for a rulemaking in Washington. EPA region 10 and headquarters have also reviewed the rulemaking package prior to the rule proposal, during the proposal, and will do a final evaluation of the rule package after state adoption, including review of the studies and criteria calculations. The copper MLR-based criteria adopted for Washington has been reviewed by the

authors of the MLR model. We have accommodated multiple requests for raw data and analyses presented in this rule. We support the current methods for reviewing the contents of rulemakings in the water quality program.

2.1.E Comment Summary – Ecology should fully comply with state rulemaking requirements. The adoption of water quality standards is subject to the significant legislative rule (SLR) requirements of the state Administrative Procedures Act (APA). RCW 34.05.328. These include the following:

Statement of general goals and objectives. A detailed statement of the general goals and objectives of the statute that the rule implements. RCW 34.05.328 (1)(a).

Statement of necessity and alternatives analysis. A determination that the rule is necessary to achieve the general goals and specific objectives, an analysis of alternatives to rulemaking, and analysis of the consequences of not adopting the rule. RCW 34.05.328 (1)(b).

Preliminary and final cost-benefit analysis. A preliminary cost-benefit analysis must be prepared at the time a draft rule is published for public comment. A final cost benefit analysis must be issued when the rule is adopted. RCW 34.05.328 (1)(c). The cost-benefit analysis must include a determination that the "probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented." RCW 34.05.328 (1)(d).

Least burdensome alternative analysis. A determination, after considering alternative versions of the rule, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives identified under RCW 34.05.328 (1)(a). RCW 34.05.328(1)(e). - Justification for more stringent requirements than federal law. Ecology must determine if the rule is more stringent than federal standards. If so, Ecology must determine that the difference is justified either by a state statute that explicitly allows the agency to differ from federal standards or by "substantial evidence" that the difference is necessary to achieve the general goals and specific objectives stated under RCW 34.05.328 (1)(a). RCW 34.05.328(1)(h).

Implementation plan. Prior to adoption, Ecology must provide an implementation plan that describes how the agency intends to implement and enforce the rule including a description of the resources the agency intends to use, how the agency will inform and educate affected persons about the rule, how the agency will promote and assist voluntary compliance, and an evaluation of whether the rule achieves the purpose for which it was adopted. RCW 34.05.328 (3).

Report to joint administrative rules review committee. After adopting a rule regulating the same subject matter as another provision of federal law, Ecology will be required to submit a report to the legislature identifying the existence of any overlap, duplication, or difference with federal law and making recommendations for any legislation necessary to eliminate or mitigate any adverse effects of such overlap, duplication or difference. RCW 34.05.328 (4). The APA also requires that the Ecology water quality program identify the sources of information reviewed and relied upon by the agency in preparing a SLR. RCW 34.05.272.

The APA further requires that a draft rule package include a small business economic impact statement (SBEIS) that complies with RCW 19.85.040. RCW 34.05.320 (1)(j). RCW 34.05.320. The SBEIS must include an evaluation of compliance impacts on small businesses and provide a determination of whether the rule will have a disproportionate cost impact on small businesses.

A rule can be invalidated under the APA where a court determines that it is arbitrary and capricious. RCW 34.05.570 (2)(c). A rule will not be upheld if it is "willful and unreasoning and taken without regard to the attending facts or circumstances." Wash. Indep. Telephone Ass'n v. WUTC, 149 Wn.2d 17, 65 (2003). Regulatory reform legislation in 1995, in findings appended to RCW 34.05.328, sets forth standards for what constitutes an arbitrary and capricious action. These standards direct courts reviewing administrative rules to "determine whether the agency decision making was rigorous and deliberative; whether the agency reached its result through a process of reason; and whether the agency took a hard look at the rule before its adoption." Laws 1995 c 403 §1. The 1995 legislative findings include several key principles applicable to Ecology's rulemaking:

- Rules should assure that policies are clearly understood, fairly applied, and uniformly enforced.
- Rules should not impose excessive, unreasonable, or unnecessary obligations.
- Rules should not be used to establish substantial policy decisions; those decisions should be made by the legislature.
- Rules should be justified and reasonable based on common sense criteria.

In the case of the proposed aquatic life criteria, the draft rule is not in full compliance with these important rulemaking requirements under state law. AWB requests that Ecology address these deficiencies in a revised draft rule package that is subject to public notice and comment.

- Association of Washington Business

Response to 2.1.E

The Preliminary Regulatory Analysis available during the public comment period, and the Final Regulatory Analysis provided at rule adoption, provide the Preliminary Cost-Benefit Analysis, the Least Burdensome Analysis, Administrative Procedures Act Determinations, and the Regulatory Fairness Act Compliance as required by RCW 34.05.328(1)(a)-(d) and (f)-(h), as well as Chapter 19.85 RCW. All determinations are based on the best available information at the time of publication.

We have also provided a draft Implementation Plan with the rule proposal packet, and a final plan at rule adoption. We encourage feedback (including specific data) that may improve the accuracy of this analysis and the information. However, we have not determined from the comment above any demonstration of how Ecology is not in compliance with the cited regulations, nor does the commenter present any specific deficiencies.

Ecology considers all comments provided during the rule proposal comment period when adopting the final rule language; based on the comments we received, we do not intend to provide a revised rule proposal for this rulemaking. The rule adoption may be appealed under procedures described in the Administrative Procedure Act (RCW 34.05), including those found in RCW 34.05.330.

2.1.F Comment Summary – The proposed criteria rule is not in compliance with the significant legislative rule requirements of the APA.

Ecology has not met its obligations under RCW 34.05.328 with respect to significant legislative rules. Under RCW 34.05.328(2) Ecology "must place in the rule-making file documentation of sufficient quantity and quality so as to persuade a reasonable person that the determinations [under RCW 34.05.328(1)] are justified." The foregoing comments document several instances where there is no explanation in the TSD regarding the use of some scientific studies and not other studies, the manner in which scientific data has been used in the derivation of standards, and the use of non-representative for establish regional background values for the aluminum and copper criteria. In the case of PFOS and PFOA, there is no analysis of how draft federal criteria relate to or fit in the context of Washington waters. Without this information, Ecology is not able to fulfill its obligations with respect to the determinations required under RCW 34.05.328(1) including any assessment of alternatives, cost benefit analysis, least burdensome alternative, or why any of the standards are more stringent than federal recommendations.

- Association of Washington Business

Response to 2.1.F

More specific instances where there is no explanation in the technical support document regarding the use of scientific studies is needed so we can specifically address individual issues. Generally, we followed EPA 1985 guidelines that indicates preferences for particular study designs (flow through over static-renewal over static tests) and other guidance stating that when multiple toxicity values (e.g., LC50s) exist for the same species and one toxicity value is 10x greater than the most sensitive toxicity value, then it should be omitted. These are a few examples where some data were prioritized over others within the confines of EPA's 1985 guidelines for deriving aquatic life criteria (Stephan et al. 1985). Details of the qualifications for data and methods are outlined in the Technical Support Document.

We have revised the geographical representation in our default criteria for copper and aluminum from east/west to EPA level II ecoregions. EPA level II ecoregions include three regions within Washington's borders. These updates can be found in the technical support document. These defaults are only used when site-specific water quality data are not available. We encourage all permittees to collect water quality data for use in the MLR model to develop criteria based on site-specific conditions for aluminum and copper.

PFOA and PFOS are known contaminants in Washington. The adoption of these criteria has unknown implications for permits until a reasonable potential analysis can be completed for each permittee and additional monitoring can be completed to identify areas of concern. There are currently fish advisories for PFOS in Washington, and the available monitoring data suggests that these pollutants are in tissues of wildlife and aquatic life as well as our rivers and streams[3] (Mathieu, 2022).

[3] Mathieu, C. 2022. Per- and Polyfluoroalkyl Substances in Freshwater Fish, 2018: Lake Meridian, Lake Sammamish, and Lake Washington. Publication 22-03-007. Washington State Department of Ecology, Olympia. https://apps.ecology.wa.gov/publications/SummaryPages/2203007.html.

2.1.G Comment Summary – We would like to stress that we are available as a technical resource as Ecology pursues bioavailability-based criteria. Please do not hesitate to contact us to discuss models and data.

- International Zinc Association

2.1.H Comment Summary – We would welcome the opportunity to work alongside the Washington Department of Ecology in a collaborative manner to assist in developing protective and scientifically robust criteria for metals in surface waters that fulfill the environmental objectives set forth by the Washington Department of Ecology and USEPA.

- CRADA Industry Partners

Response to 2.1.G and 2.1.H

Thank you for your offer for future collaboration and support. We look forward to working with the International Zinc Association as we continue to evaluate MLR models for additional metals. We also look forward to working with the CRADA Industry Partners as more bioavailability models become available through the CRADA Project.

2.1.I Comment Summary – With regard to [iron, hydrogen sulfide, and heptachlor epoxide], the Tribe requests that Ecology reconsider and strengthen those criteria, or, if so indicated above, commit to developing numeric criteria for those pollutants in the next triennial review.

- Port Gamble S'Klallam Tribe

Response to 2.1.I

We will continue to evaluate scientific studies and methods to develop criteria for iron, hydrogen sulfide, and heptachlor epoxide. It is not prudent to develop criteria without the appropriate and adequate toxicity data because criteria have meaningful implications in regulations. It is our duty to ensure criteria are protective and not unnecessarily burdensome. We support further research into hydrogen sulfide, heptachlor epoxide, and iron criteria in Washington and encourage further dialogue on these pollutants in the upcoming triennial review. We did a cursory evaluation of the scientific studies available and did not find adequate data to develop criteria at this time using EPA 1985 derivation methods.

2.1.J Comment Summary – The EPA also recommends that Ecology re-evaluate the [Aluminum regional] defaults periodically and update their rules accordingly as new data become available.

- U.S. EPA

Response to 2.1.J

We have revised our default criteria for aluminum and copper from east/west geographical representation to EPA level II ecoregions. We intend to update default criteria in the future as more data becomes available.

2.2. Sources cited

2.2.A Comment Summary – The protocol for study acceptability in evaluating scientific articles has not been consistently applied where the test species is invasive.

The test acceptability requirements set forth in the Technical Support Document (TSD), p. 38, states that the test species for scientific studies "must be non-invasive North American species." This requirement additionally states that "invasive species with established populations were not considered in this rule because they do not represent native fauna of Washington, there is a significant amount of time and resources used to eradicate these species, and they are generally less sensitive than native species thereby precluding their use as a surrogate." When "invasive species" is used, Ecology should clarify the spatial area to which it refers. That is, does the term "invasive" pertain to North America broadly or specifically Washington state? For example, Orconectes immunis (current taxonomic name, Faxonius immunis) was identified as a non-North American species and excluded from criteria derivation for pentachlorophenol (page 146/249). This is not accurate since its native range includes Lakes Erie, Ontario, Huron, and Southern Lake Michigan; lower Ohio, and upper Mississippi drainages; Massachusetts to Wyoming; and Alabama to Ontario, Canada (Hobbs 1974). In contrast, Orconectes rusticus (current taxonomic name, Faxonius rusticus) was included in the derivation calculations for the freshwater acute chromium VI, TSD criterion, TSD, at 67, despite being a prolifically invasive species with established populations in twenty states outside of its native range of the Ohio River basin. Neither of these species are documented in Washington, but both are handled differently in criteria derivation. Ecology use of studies with invasive species should be clarified, and the basis for identifying species as invasive evaluated to ensure that the species included in criteria derivation are consistent.

- Association of Washington Business

2.2.B Comment Summary – The EPA does not have clear guidelines for the inclusion of scientific articles into criteria derivation but does have some general guidance that can be used from their 1985 guidelines. Ecology used the 1985 EPA guidance in addition to standard method test acceptability requirements. The criteria used for the inclusion of scientific articles is outlined in the technical support document for the Proposed Updates to Aquatic Life Toxics Criteria. It states that those studies that do not meet the outlined criteria be disqualified and removed from consideration. One of the listed criteria includes the following:

Test species must be a non-invasive North American species (invasive species with established populations were not considered in this rule because they do not represent native fauna of Washington, there is a significant amount of time and resources used to eradicate these species, and they are generally less sensitive than native species thereby precluding their use as a surrogate).

Based on this criterion, the following species must be excluded from the analysis since they are not North American species – Pseudosida ramose, Hypisboas pulchellus, and Notodiaptomus conifer. These species are specific to South America.

- U.S. Department of Energy Richland Operations Office

2.2.C Comment Summary – In the "Study Acceptability" portion of the "Evaluating Scientific Articles for Criteria Derivation" section, Ecology indicates that the use of test species must be a non-invasive North American species. This requirement is carried throughout the document.

However, test species provide information that is applicable to species beyond the one being tested, whether it is invasive or not, unless certain water chemistry/habitat conditions would affect the sensitivity of non-native species that would make it uniquely uninformative for resident species. Genus sensitivity distributions are about expressing the range of sensitivities across aquatic life. Data are already generally limited and the more information about the sensitivity of aquatic life to chemicals, the more accurate standards will be.

For all chemicals, if a tested species is in the same genus as an untested species, then it's a surrogate for the untested species and the EPA recommends it be retained. If the tested species represents other similar sensitive taxa, the EPA also recommends that the data be retained. For many chemicals, Washington could include data on a wider span of species and therefore derive criteria using the EPA's recommended eight-family method approach rather than using other data-limited approaches. The EPA suggests giving clear rationale as to why data were not used for each available study.

- U.S. EPA

Response to 2.2.A,2.2.B, and 2.2.C

We have decided to include invasive species if they have established resident populations in North America. This decision is based on EPA's comment that invasive species should be included because they can serve as a surrogate for native species in North America.

2.2.D Comment Summary – One example of source material that Ecology should consider when evaluating the importance of assessing and updating its toxic criteria, are stormwater permits. Stormwater is known as a major source of toxic pollutants and water quality standards are key to regulation of this source. Ecology's Industrial Stormwater Permit requires sources to obtain coverage under this permit if they are, among other things, "reasonably . . . expected to cause a violation of any water quality standard." Ecology, Industrial Stormwater General Permit (Nov. 20, 2019) at 3. Generally, the permit requires that permittees have and carry out pollution prevention plans that "[e]nsure the discharge does not cause or contribute to a violation of the Water Quality Standards." Id. at 9; see also id. at 12 (management practices must be selected to prevent violations of water quality standards). The permit includes "benchmarks and sampling requirements" that apply to facilities of all industrial sectors that include copper and zinc. Id. at 21, Table 2. Additional benchmarks and sampling requirements are based on specific industrial sectors and include ammonia, arsenic, cadmium, cyanide, lead, mercury, selenium, and silver, all of which have EPA-recommended aquatic life criteria. Id. at 22–23, Table 3; 25, Table 4; 26, Table 5. Further sampling and effluent limits apply to discharges of industrial stormwater to waters that have been determined to violate water quality standards and have been placed on Washington's EPA-approved 303(d) list. Id. at 29, Table 6. Toxic pollutants covered under this provision include ammonia, copper, lead, mercury, zinc, and pentachlorophenol. Id.

The Western Washington Phase II Municipal Stormwater Permit that covers over 80 cities, five counties, and numerous ports and colleges. Similar to the industrial stormwater permit, this permit includes provisions that prohibit "the discharge of toxicants to waters of the State of Washington which would violate any water quality standard[.]" Ecology, Western Washington Phase II Municipal Stormwater Permit (July 1, 2019) at 77; see also Ecology, Phase I Municipal Stormwater Permit (July 1, 2019) (applies to Seattle, Tacoma, and King, Clark,

Pierce, and Snohomish counties) at 4 (identical language). Additional provisions apply to discharges of municipal stormwater to waters of the state that are known to be (or likely) violating water quality standards. Western Washington Phase II Municipal Stormwater Permit at 7–9; see also id. at 37–38 (provisions relating to discharges where there is a TMDL clean-up plan in place). Unlike the industrial stormwater permit, the municipal stormwater permit does not include reference to any specific pollutants. The Fact Sheet that Ecology wrote to support issuance of both Phase II and the Phase I municipal permits combined contains the following references to toxic pollutants in municipal stormwater: "Ecology identified the following chemical stressors that were capable of causing adverse effects that were detected on the native trout embryos and preswim-up fry: copper, lead, nickel, zinc, polycyclic aromatic hydrocarbons, and the agricultural fungicide Captan." Ecology, Fact Sheet for the Phase I, Western Washington Phase II, and Eastern Washington Phase II Municipal Stormwater Permits (Aug. 15, 2018) at 15.

The Fact Sheet for the municipal stormwater permits also cited Ecology's "Phase 3" toxics study, which it summarized as follows with regard to specific toxic parameters:

Surface water runoff, particularly from commercial and industrial areas, did not meet water quality or human health criteria for the following parameters: dissolved copper, lead, and zinc; total mercury; total polychlorinated biphenyls (PCBs); several carcinogenic polycyclicaromatic hydrocarbons (PAHs); and DDT related compounds. . . . Commercial land areas produced runoff with relatively greater concentrations of total lead, zinc, PBDEs, and PCBs

Id. at 21. "Copper, zinc, and lead most frequently exceeded (did not meet) the water quality criteria for protection of aquatic life." Id. at 23.

- Northwest Environmental Advocates

Response to 2.2.D

Thank you for the suggestion. We may be able to use these evaluations within permits to justify future rulemakings. Generally, this material will not help with developing numeric criteria development unless there are scientific studies mentioned that we have not considered.

2.2.E Comment Summary – Ecology's failure to look at its sister agency's own findings results in, for example, its ignoring that the "shortface lanx is an uncommon aquatic snail in Washington; its population size has a declining trend." WDFW, Species & Habitat, Species in Washington, Shorface lanx, available at https://wdfw.wa.gov/species-habitats/species/fisherola-nuttalli#desc-range. This snail is identified as a "Species of Greatest Conservation Need" under Washington's State Wildlife Action Plan, and a "Priority Species" under WDFW's Priority Habitat and Species Program. Id. at https://wdfw.wa.gov/species-habitats/species/fisherola-nuttalli#conservation. The "action needed" is to "protect water quality. Id. "A guiding principle of the SWAP planning process is to identify actions needed to conserve wildlife and their habitats before species become too rare and restoration efforts too costly." The purpose of this planning process is "to inform conservation priorities and guide conservation actions statewide" and "[i]t is envisioned that any government entity and conservation partner . . . [will] implement actions that align with their own conservation mission and goals." Id. "To that end, the SWAP provides tools and informational resources to support collaborative conservation initiatives across a range of organizations and entities." WDFW, Species & Habitats, At-risk species, State Wildlife Action Plan (SWAP), available at https://wdfw.wa.gov/species-habitats/at-risk/swap.

We strongly urge Ecology to use these informational resources, such as the Appendix A Species Fact Sheets, to ensure that it has identified the most sensitive designated aquatic life uses that require protection through water quality standards. For example, the Appendix A-5 for invertebrates identifies the aquatic species masked duskysnail (Lyogyrus sp. 2) as "critical/declining" and the ashy pebblesnail (Fluminicola fuscus) at "uncommon/declining," both statuses that appear dire. Id. at A5-84.

Note, too, that Ecology's sister agency has an entire program to monitor marine toxic contaminants. See WDFW, Species & Habitats, Marine toxic contaminants, available at https://wdfw.wa.gov/species-habitats/science/marine-toxics. The reason for this is the unique nature of Puget Sound, the focus of the state's marine toxic monitoring program, and a fact inexplicably ignored by Ecology. See WDFW, Species & Habitats, Marine toxic contaminants, Sampling locations, available at https://wdfw.wa.gov/species-habitats/science/marinetoxics/sampling-locations. This is illustrated by this overall map of sampling locations for English sole, mussels, Pacific herring, juvenile and adult chinook:

- Northwest Environmental Advocates

Response to 2.2.E

We understand that there are state-listed species that may be vulnerable to a wide variety of stressors. Many of the species likely have other stressors contributing to their listing such as habitat degradation. Until we can make a definitive statement that these state-listed species are a result of a particular toxic chemical and the criteria are not protective, then actions related to aquatic life criteria derivation will not likely occur. We have made our best effort at protecting aquatic life in Washington using new scientific studies when Biological Opinions indicated that the criteria are not protective based on an analysis of the science for each chemical and associated criterion. When we have information that suggests aquatic life aren't protected and there are additional data available, we have proactively taken action to ensure aquatic life protection. We recognize that there are other toxicity data available through other agencies and programs, but criteria derivation requires very specific types of toxicity information under a controlled environment to be used in criteria derivation. This information is needed to directly relate exposure to a single chemical to an effect. Much of the information presented cannot be used for criteria derivation.

2.2.F Comment Summary – The State's criteria lack a foundation in sound scientific rationale, thereby failing to fulfill its obligations under the EPA's Implementing Regulations pursuant to CWA Section 303(c), 33 U.S.C. § 1313(c), and 40 CFR 131.4. These regulations establish that states have the primary responsibility for reviewing, establishing, and revising water quality standards (WQS), which include the designated uses of a waterbody, or waterbody segment, and the water quality criteria necessary to protect those designated uses. Such criteria must be based on a sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use.

The term "new science" is misleading and implies the introduction of novel scientific technologies. However, "new science" merely refers to recent studies, many of which lack peer review and fail to correlate with or represent the conditions prevailing in the waters of

Washington State. The acceptance of these new studies as fact, when many have been challenged, appears completely premature and inappropriate.

- U.S. Department of Energy Richland Operations Office

Response to 2.2.F

We have updated the term "new science" throughout the technical support document to "new scientific studies." We think this should clarify the intent of reviewing new science. All studies used in criteria derivation in this rule have come from peer reviewed publications or reports. We aren't aware of any studies that have been challenged, except the ones found within the comments herein from DOE and preliminary reviews by EPA.

2.2.G Comment Summary – Ecology's updated aquatic life criteria are based on previous ESA consultations from the NMFS' and USFWS' Biological Opinions (BiOps) from other Pacific Northwest states (i.e., Idaho and Oregon) to determine whether additional considerations are needed to protect ESA-listed species in Washington. The Swinomish Tribe Biological Evaluation by EPA was also used to inform Ecology's decisions. It should be noted that according to EPA ruling on the August 4th, 2023 submittal of the Swinomish Indian Tribal Community's Surface Water Quality Standards related to Aquatic Life stated: EPA's action applies to water under the jurisdiction of the Swinomish Tribe. The action does not apply to water outside of the jurisdiction of the Swinomish Tribe which are under Washington State jurisdiction.

For all the metals where the Idaho and Oregon USFWS BiOps report likely to adversely affect (LAA) did not result in a jeopardy call, but the Swinomish Biological Evaluation concluded that endangered species and their populations may be at risk. For example, Cr(VI) and other metals where this scenario occurs, it must be emphasized that the EPA ruling states the Swinomish tribe surface water quality standards do not apply to waters outside the jurisdiction of the Swinomish Tribe. Ecology must not apply the new science in updating the aquatic life criteria under these circumstances. The current values provide adequate protection for endangered species and since there were no jeopardy calls for Idaho and Oregon, the state of Washington aquatic life criteria should match EPA recommendations. As stated in the states' BiOps, a likely to adversely affect determination with no jeopardy means that effects to endangered species are measurable, observable, and likely to occur, but will not affect the continued existence of the species at the population level or landscape scale (i.e., critical habitat).

- U.S. Department of Energy Richland Operations Office

Response to 2.2.G

The Swinomish Tribe BE was only used as ancillary support and was not used solely for any decisions in this rulemaking. The basis for any updates were the Oregon and Idaho Biological Opinions (BiOps). We only reviewed new scientific studies when there was a likely to adversely affect determination in the Idaho or Oregon BiOps. The incorporation of the most recent scientific studies is preferred over using outdated toxicity datasets, especially when a measurable affect is likely to occur. The aquatic life toxics criteria are intended to minimize any effects from the presence of toxic chemicals. When there is clear evidence of adverse effects within the context of criteria levels, and more scientific studies are available, then the science cannot be ignored.

2.3.Methods and models to derive criteria

2.3.A Comment Summary – Ecology continues to rely on EPA's 1985 methodology despite that it is inappropriate to do so. TSD at 34 ("When developing state-specific criteria using new science only, we used standard EPA methods (Stephan et al. 1985) to incorporate new science and calculate the new criteria."). EPA itself has demonstrated that the 1985 methodology is woefully out-of-date:

- Northwest Environmental Advocates

Response to 2.3.A

We agree that EPA methods need updating. However, EPA's 1985 guidelines[4] (Stephan et al. 1985) continue to be EPA's Clean Water Act foundation for aquatic life criteria development for toxic chemicals. Although EPA has deviated from their 1985 guidelines in more recent updates, they remain the primary guidelines. We attempted to incorporate more recent EPA methods into this rulemaking update. We are not in a position to update national Clean Water Act recommendations but would be interested in being involved. We are interested in becoming more involved in reviewing, understanding, and perhaps developing tissue-based aquatic life toxics criteria for bioaccumulative chemicals in the future from a state-specific perspective. In the meantime, we have developed a strategy that uses the best available studies that examine toxic effects to chemicals and, when appropriate, incorporates more conservative protection levels (e.g., 1st percentile of genus sensitivity distribution) when necessary. We encourage continued involvement in aquatic life criteria updates in the future and in our triennial review process.

2.3.B Comment Summary – Ecology procedure for evaluating pollutants for which the Services in the Oregon and Idaho BiOps issued no likely to adversely affect or jeopardize conclusions and where "new science did not provide adequate protection" ignores entirely that the criteria might not be protective for species that are not ESA-listed and is highly flawed.

- Northwest Environmental Advocates

Response to 2.3.B

Generally, endangered species are some of the most sensitive aquatic life in their respective states (this especially applies to the northwest). We can only develop criteria on the basis of the scientific studies available. The conservatism built into the toxicity studies and the methods used to derive the criteria are intended to provide adequate protection for aquatic life. EPA contends that toxicity data for some aquatic organisms serve as surrogates for other species without toxicity information. These relationships between test organisms and surrogates have been demonstrated in EPA's WEB-ICE model. We are not aware of a method to incorporate species for which we do not have toxicity information. There is a degree of conservatism that is often overlooked using laboratory-based toxicity studies. Laboratory studies have potential to

[4] Stephan, C.E., Mount, D.I., Hansen, D.J., Gentile, J.H., Chapman, G.A. and Brungs, W.A., 1985. *Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses* (p. 98). Washington, DC: US Environmental Protection Agency.

represent worst-case scenarios compared to field scenarios. We continue to support EPA derivation methods unless demonstrated that they are not protective of aquatic life in Washington.

2.3.C Comment Summary – Ecology's first category—"We are proposing taking no action ("No change"). No action means that Washington aquatic life criteria are identical to EPA CWA recommendations and there are no ESA consultation jeopardy calls."—relies entirely on the outdated 1985 methodology and jeopardy determinations in the two consultations evaluated. Where states had no reason to update their criteria because EPA has long failed to update its 304(a) recommended criteria, no ESA consultation would have taken place. Therefore, Washington is short-changing its aquatic life by following in EPA's footsteps even as it demonstrates it has the ability to update the science and calculate more protective criteria for some pollutants. After its incredible delay, broken only by a 2013 petition from Northwest Environmental Advocates and two lawsuits later, Ecology still does not want to protect its aquatic species. That Ecology seeks to continue to rely, for example, on EPA-recommended criteria for DDT that date from 1980—a whopping 44 years ago—demonstrates the fallacy of Ecology's approach. See TSD at 35, Table 6.

- Northwest Environmental Advocates

Response to 2.3.C

Washington is required to be consistent with the Clean Water Act. States are afforded the opportunity to develop their own state-specific criteria when necessary. Updating all national recommendations on a state level would be a significant undertaking. Updating national recommendations is the responsibility of EPA. We encourage you to reach out to EPA to discuss updating particular criteria for their national recommendations. We may consider reviewing the available science for toxics not proposed to change in a future rulemaking.

2.3.D Comment Summary – Ecology's use of the Interspecies Correlation Estimation (WEB-ICE) model [for 6ppd-q] raises questions about why it did not use the WEB-ICE model for other criteria derivations?

- Northwest Environmental Advocates

Response to 2.3.D

We did not use the WEB-ICE model to develop the 6PPD-quinone criterion but did consider it. The WEB-ICE model did not function well for 6PPD-quinone because of the extreme sensitivity of a few species and the tolerance of most other species. WEB-ICE model outputs have been associated with high variability and uncertainty, and we question whether the model is valid for criteria development. More research needs to be done to determine the best scenarios to apply the WEB-ICE model for specific chemicals.

2.3.E Comment Summary – Aspects of the methodology used by Ecology to derive standards are not scientifically justified.

Ecology's methods are not reflective of the scientific approach described by EPA guidance that incorporates data from multiple studies, species, and taxa groups to generate criteria. Rather,

Ecology structured their calculations using lower criteria threshold values defined by a subset of studies or species cited in BiOps to achieve more stringent criteria. While establishing criteria based on the most conservative observed effects among available data or target species (e.g., threatened, and endangered taxa) is a valid management decision, better articulation is needed to clarify the intended management decision and why it is scientifically justified. Note that EPA guidance seeks to ensure that criteria are not reliant on the outcomes from a select few studies, since they may not be reflective of true exposure risk given the variability in toxic response within and across species, methods used in toxicity testing, and other factors. Departure from EPA guidance needs to be transparent, and the scientific underpinning clearly expressed.

Additionally, there is no empirical evidence that the modified approach used to derive criteria will definitively enhance species and endangered species protection. Instead, protection of species should be informed by observed drivers of impairment. That is, empirical data are needed to better understand and quantify the principal factors contributing to ecosystem impairment and inform criteria protective of ESA-listed species. If habitat loss, temperature, or barriers to movement are key factors affecting ESA species, more stringent water quality criteria will not alleviate these pressures and further protect populations. In the absence of such data, it is prudent to adhere to established EPA recommendations (utilizing the 5th percentile; Stephen et al. 1985) or scientifically justified deviations from these until additional evidence and data are available. By grounding percentile choices in EPA recommendations (or, alternatively, with new empirical evidence and scientific consensus), Ecology can enhance the credibility, acceptance, and effectiveness of its aquatic life toxics criteria, ensuring they serve the intended purpose of safeguarding aquatic ecosystems and the species they support.

Ecology should not deviate from EPA recommended criteria for several toxics on the premise that EPA criteria are not adequately protective of aquatic species listed as threatened or endangered in Washington under the Endangered Species Act (ESA). ESA-listed species are not present in all the waters covered by the criteria and therefore these species should not be the driver for developing state-wide criteria. Toxicity studies based on ESA-listed species, when available, can be used for the derivation of criteria through the standard scientifically supported process recommended by EPA. Ecology should rely on the ESA consultation process to develop site-specific criteria for waters naturally inhabited by ESA-listed species. This approach specifically relates the designated beneficial uses for aquatic life in Washington surface waters to the water quality criteria used to evaluate whether those uses are adequately protected.

- Association of Washington Business

Response to 2.3.E

There are only three pollutants where we slightly modified EPA 1985 methods and used the 1st percentile of the genus sensitivity distribution: arsenic, cadmium, and cyanide criteria. For arsenic and cyanide, there was a jeopardy call in Oregon and Idaho for a similarly listed endangered species in Washington. Incorporating new scientific studies alone into the arsenic and cyanide criteria did not result in protective criteria for endangered species in Washington. Thus, increasing protection levels were necessary.

EPA 1985 guidelines allow aquatic criteria to be developed based on a single species when that species is commercially, culturally, or recreationally important and particularly sensitive to a chemical. EPA recommends taking a geometric mean of the acute toxicity values when using a

single species. Another instance where we decided to modify EPA methods was for cadmium. We used the 20th percentile of the rainbow trout SMAVs (species mean acute value) to develop the freshwater acute cadmium criteria. Washington's proposed freshwater acute cadmium criterion was developed to align with Idaho- and Swinomish-approved criteria. The latest scientific publications are supportive of a cadmium acute criterion based on a 20th percentile of SMAVs of rainbow trout or using the most sensitive species presented in Mebane (2006). We have updated the technical support document with the following supporting information.

The decision to use a 20th percentile or lower of the SMAV is supported by USGS (Mebane, 2022):

"In the present dataset, there are 47 acceptable hardness normalized acute values for rainbow trout with cadmium EC50 values ranging from 0.96 µg/L to 10.0 µg/L, with a median value of 3.71 µg/L. Although the math (geometric mean versus median) and datasets differ, this median is effectively the same concentration as the species mean acute value derived in USEPA (2016), 3.727 µg/L cadmium. Instead of using a central value of the rainbow trout dataset distribution such as the geometric mean or median to define the SMAV (which for cadmium is set equal to the FAV), a lower statistic such as the 20th percentile or the 10th percentile could be used in the calculation. The effect of doing so would reduce the acute CMC criterion from 1.86 µg/L in the 2016 version to 1.40 µg/L for a FAV using the "species 20th percentile acute value" or 0.82 µg/L for a FAV using the "species 10th percentile acute value" (Table 4). The lowest value in the dataset or a lower percentile than the 20th percentile such as the "species 10th percentile acute value" would be a logical choice from a species protection perspective."

Alternatively, Washington could justify the acute cadmium criterion of 1.3 µg/L by using the cadmium criteria developed by Mebane (2006). Mebane (2006) used EPA's single species method, but with different datasets than the EPA 2016 cadmium update. Notably, Mebane (2006) included the *Oncorhynchus clarkii* SMAV of 1.50 µg/L (hardness of 50 mg/L), which serves as the basis for the calculated criteria. EPA (2016) did not include *Oncorhynchus clarkii* data in their update. We support the use of the Mebane (2006) dataset or using the 20th percentile of the rainbow trout SMAV in EPA's 2016 update. Either method results in the same acute cadmium criterion of 1.3 µg/L (dissolved; hardness of 100 mg/L).

We used the recent Biological Opinions (BiOps) from Oregon and Idaho to drive criteria decisions because there are many similarities in the aquatic environments and endangered species compared with Washington. The BiOps that form the basis for these decisions evaluate both direct and indirect effects of aquatic life criteria on the population of endangered species. If we proposed criteria that are not approvable through ESA consultation, then the criteria will be disapproved. This occurred in Oregon and Idaho when they sought to adopt EPA national recommendations. Rather than submit criteria based on EPA national recommendations bound for disapproval, we developed state-specific criteria that used the latest scientific studies and/or increased protection levels for endangered species. We have supported these decisions by citing the BiOps used for these justifications.

In regard to deriving statewide criteria to protect endangered species in particular water bodies, if criteria are not protective of a species population in Washington, whether endangered or threatened, then the criteria are not protective of that species in any water body in the state. Because of the differences in how protection is evaluated by EPA and NMFS/USFWS, criteria must be protective of Washington's most sensitive species and populations, or the criteria will

not be approved. In other words, if the basis of disapproving statewide criteria is endangered species protection, then we need to develop statewide criteria protective of all aquatic life, including endangered species and their populations. Disapproval of statewide criteria has occurred in Idaho and Oregon for some pollutants where they proposed adopting EPA national recommendations. The same basis will apply to Washington. Rather than watching the situation play out, we were proactive in this rulemaking to address the issue before receiving disapproval.

2.3.F Comment Summary – Ecology has improperly deviated from EPA guidance on derivation of water quality criteria.

Ecology is inconsistently deviating from EPA guidance for deriving numerical water quality criteria. The goal of establishing aquatic life criteria is to be protective of ecosystems within waterbodies within the state (plants, invertebrates, fish). The EPA methodology is designed to provide a reasonable and adequate amount of protection considering the uncertainty associated with translating laboratory-based toxicity studies to environmental exposures. Further, if inadequate studies are available demonstrating the toxicity associated with a chemical, a value should not be derived (Stephen et al. 1985). EPA methods aim to protect 95% of the aquatic genera with the use of 5th percentile of the genus sensitivity distribution (GSD) divided by two. Recognizing that some species may be more sensitive, EPA recommends that if the acute toxics criteria calculated using the methods above (i.e., one half of the 5th percentile of the GSD) is greater than the mean acute value for an individual species, then the Species Mean Acute Value (SMAV) should be used (Stephen et al. 1985). Ecology did not follow this approach and instead arbitrarily used the 1st percentile of the GSD for pollutants that have been determined in previous biological opinions as being more harmful to Washington threatened and endangered species. While protecting these species is important, Ecology did not provide sufficient rationale or empirical evidence that the 1st percentile value is more scientifically justified or protective than the 5th percentile value particularly when considering other factors affecting species survival (habitat loss, migration barriers, competition from non-native species, etc.). Additionally, Ecology has not provided sufficient justification where their methods differ from EPA guidance when the datasets are the same. Ecology expressed in an email communication on April 17, 2024, that it has changed the intercepts of some hardness- based metals equations to "accurately predict the criteria from hardness" based on new studies. However, in the case of the cadmium criteria, the studies cited by Ecology are the same studies used by EPA. The datasets were the same, however, Ecology changed the intercepts of the equations to result in more conservative criteria. Ecology needs to provide a more rigorous justification for altering these equations, including goodness of fit statistics for both the EPA model and Ecology model.

- Association of Washington Business

Response to 2.3.F

The Biological Opinions (BiOps) in Oregon and Idaho demonstrate that the 5th percentile of the genus sensitivity distribution (EPA 1985 guidelines) is not adequate for protection of aquatic life in Washington for all toxic chemicals. The 5th percentile aims to protect 95% of the species. To remedy the concern and possible future disapproval, we developed a strategy that uses the 1st percentile and protects 99% of the species. This method was only used for cyanide, arsenic, and cadmium in this rulemaking. The toxicity datasets available for arsenic and cyanide are relatively small compared to other toxic chemicals, and thus there is some uncertainty on whether EPA

protection levels are adequate. BiOps for arsenic and cyanide suggest that EPA methods are not adequate for protection in Washington. The 1st percentile provides additional protection needed. The national draft BiOp for cyanide (2012) suggests a chronic criterion of 0.68 µg/L is protective of bull trout, which is higher than our proposed chronic cyanide criterion of 1.9 µg/L. However, we have concerns regarding the derivation of the 0.68 µg/L and support the 1.9 µg/L chronic criterion. This is one example where BiOps indicate aquatic life are not protected using EPA's national recommendations and where application of only EPA's methods and newer scientific studies is not adequate.

Anytime metal's criteria are updated, and the criteria is based on hardness, the intercept needs to be updated. The intercepts for hardness-based criteria are based on the criterion maximum concentration (acute criterion) or the criterion continuous concentration (chronic criterion). If the acute cadmium criterion changed, then the intercept for the hardness-based criterion would also need to be updated to maintain the relationship between toxicity and hardness. EPA used the 50th percentile of the rainbow trout SMAV to calculate national freshwater acute cadmium recommendations. We used the 20th percentile of the rainbow trout SMAVs or alternatively, the most sensitive species, *Oncorhynchus clarkii* SMAV of 1.5 µg/L (based on a hardness of 50 mg/L) in our final freshwater acute cadmium criterion. This required the intercept to be updated for the hardness equation to reflect the new criterion.

2.3.G Comment Summary – Ecology has improperly excluded toxicological data in deriving the proposed criteria.

The standard EPA methodology develops criteria based on toxicological data that represent sensitive species. However, Ecology has excluded mortality of 50% of the population (LC50) results that would likely increase the resulting criteria. There may be some justifiable reasons for excluding data (e.g., selecting results from flow-through studies over static exposure studies); however, exclusion of data based on the result alone is insufficient and unnecessarily biases the calculated criteria. Further, developing criteria when there are an insufficient number of studies is inappropriate (i.e., use of a single study to represent a genus).

- Association of Washington Business

Response to 2.3.G

We are not certain what toxicological data was excluded based on this comment. We have decided to include invasive species with established resident populations in North America based on EPA's comment on the proposed rule. EPA contends that these species serve as surrogates for other native species in North America. EPA 1985 guidelines state: "if the acute values available for a species or genus differ by more than a factor of 10, some or all of the values probably should not be used in calculations." We excluded data if the acute values were 10x greater than other acute values for the same species. This is justified based on the 1985 EPA guidance.

2.3.H Comment Summary – The western Washington criteria for aluminum and copper are not based on representative water quality conditions.

The default criteria for aluminum and copper have been calculated using the 5th percentile of the data from the western and the eastern part of the state. For western Washington, more than 5% of the data are from national parks (Olympic and Mount Rainier) with pristine water quality with

naturally low hardness and organic carbon, making the criteria exceptionally strict and not representative of many water bodies of the state.

- Association of Washington Business

Response to 2.3.H

The 5th percentile default criteria are intended to be conservative because they apply when site-specific water quality data are not available. We must ensure that the default criteria protect the most sensitive water bodies. We recommend that permittees collect their own receiving water body data and use the water quality information to calculate criteria for site-specific conditions for freshwater aluminum and copper.

2.3.I Comment Summary – An uneven distribution of samples potentially biases the default criteria calculation for aluminum and copper. To calculate the default criterion for aluminum, Ecology used the ambient monitoring data for the entire state, classified the data into East (2210 data points) and West Washington (1127 data points) (e.g. Figure 2), applied the EPA Multiple linear regression (MLR) calculator for each data point (about 3337), and used the fifth percentile for East and West Washington to calculate the respective default criteria (e.g. Figure 3 in comment letter).

A review of the default criterion calculations using this method by Geosyntec, Appendix B, illustrates potential issues with spatial and temporal distribution of samples used for the analysis. The following examples describe the issues with the distribution.

1. Almost 50% of the samples for western Washington were collected in 2015, whereas the samples for eastern Washington were more uniformly collected for the twenty-year period for which the data was used. 2. The samples for eastern and western Washington are more concentrated at specific locations. For example, for eastern Washington, 20% of the samples (>200) were collected at one location on the Yakima River, and for western Washington, more than 5% (149) samples were collected at the North Fork Skokomish River in the Olympic National Forest and Sunbeam Creek in Mount Rainier National Park.

The uneven distribution (spatially and temporally) of samples potentially biases the default criteria calculation. A criterion for western Washington that is based on the 5th percentile, where more than five percent of the data were collected in pristine national forests, makes the western Washington default criterion biased and exceptionally low for other water bodies in the region.

- Association of Washington Business

Response to 2.3.I

Thank you for this analysis. We support the use of all data available to calculate default criteria for the aluminum and copper MLR models, including data from pristine waters. Incorporating a highly diverse dataset of different water quality conditions from various water bodies provides a more representative default value for the state. The 5th percentile default criteria are conservative and based on water quality from areas that are sensitive to aluminum or copper contamination. Permittees are not required to use these default criteria and can collect their own water quality data to calculate criteria for their receiving water body.

We have replaced the east/west default criteria with EPA Level II ecoregional default values for the copper and aluminum MLR-based criteria. The default criteria are now represented by three, geographically distinct regions. These regions better represent the geographical features that contribute to observed water quality conditions. Please see the updated rule language and technical support document for the updated default criteria.

2.3.J Comment Summary – The default criteria for aluminum and copper should be based on more spatially explicit data.

The technical support document states that "We considered ecoregional default values (e.g., EPA level III ecoregions), but we had limited geospatial representation in some ecoregions and therefore developed default values for western and eastern Washington" (page 73/249). While AWB appreciates that Ecology is prioritizing the use of site-specific chemistry data from permittees when available, Ecology should establish ecoregional defaults allow for the use of eastern and western defaults for those ecoregions that do not have sufficient local data. Ecology should consider the use of default and estimated values for the relevant factors in calculating the applicable aluminum and copper criteria in the proposed aluminum and copper criteria in Oregon (ODEQ, 2024a, Endnotes N and O). Ecology should postpone rulemaking and prioritize collecting enough representative data for each ecoregion.

- Association of Washington Business

Response to 2.3.J

We have replaced the east/west default criteria with EPA Level II ecoregional default values for the copper and aluminum MLR-based criteria. The default criteria are now represented by three, geographically distinct regions. These regions better represent the geographical features that contribute to observed water quality conditions. Please see the updated rule language and Technical Support Document for the updated default criteria.

Additional data can be considered and incorporated into default values in future rulemaking updates. We support moving forward with default values based on the current dataset and think there is adequate geospatial representation in these regions. We do not believe that limited representation in some EPA level III ecoregions is a legitimate reason to delay the adoption of the aluminum and copper MLR model when there is adequate data to calculate EPA level II ecoregional default criteria. Furthermore, site-specific water quality information can be collected and used to develop criteria and would supersede the default criteria.

2.3.K Comment Summary – EPA Methodologies for Derivation of Water Quality Criteria Do Not Prevent Adverse Effects to Listed Species and Critical Habitats

To the extent that Ecology based its proposed criteria on EPA's methodology, its analysis will suffer from the same issues as EPA's methodology—issues that are detailed in the NMFS biological opinions for EPA's national 304(a) cyanide criteria and Oregon's toxics criteria. The Center appreciates Ecology's attempts to account for some shortcomings in EPA's methodology by utilizing alternative derivation methods for some toxics and by using the 1st percentile of the genus toxicity data distribution rather than the 5th percentile. However, considering the extensive flaws underlying the toxicity data developed by EPA, using the 1st percentile of that data is not sufficient to protect endangered and threatened species.

For the freshwater acute cadmium criterion, for example, Ecology appears to be using the same derivation methods as EPA's recommendation; for its chronic cadmium criterion, it used an EPA dataset and the 1st percentile of the toxicity distribution. Although using the 1st percentile is more protective of species than the 5th, it is possible that issues in the underlying data still would not allow for a sufficiently protective calculation. Additionally, as discussed above, the proposed chronic cadmium criterion is in excess of the EPA criteria of 0.25µg/L, which is the current nationwide criteria following vacatur of EPA's 2016 criteria.

For cyanide, Ecology used new science in developing its proposed acute criterion, and an "acute to chronic" (ACR) ratio to develop its proposed chronic criterion because it lacked the toxicity data needed to calculate a chronic criterion using other methods. The ACR is the ratio of the mean LC50 (concentration causing 50% lethality following acute exposure) for the species to the concentration following chronic exposure that causes a level of adverse effect that is the threshold of unacceptability. Since the ACR was calculated by EPA and is based on underlying values that could suffer from the flaws in EPA's methodology highlighted by NMFS in its national 304(a) cyanide and Oregon toxics biological opinions, it is possible that the values proposed by Ecology reflect some of those issues as well.

Importantly, EPA's methodology for calculating toxicity values at which adverse effects occur does not adequately account for compounding stressors such as temperature, dissolved oxygen, and others on the responses of aquatic life to toxics. In its biological opinion for Idaho's toxics standards, FWS recommended that any new standards be calculated "using a temperature/toxicity correlation" to account for the inverse relationship between cyanide toxicity and temperature. Dissolved oxygen is also important to account for because in environments with less than optimal dissolved oxygen, fish compensate by increasing gill movement and ventilation volume to maintain adequate oxygen volumes. Since cyanide is a powerful asphyxiant, additional cyanide in waters with low dissolved oxygen further stresses fish and reduces the lethal concentration at which survival is expected. In the NMFS biological opinion for the national 304(a) cyanide criteria, the agency pointed out that EPA's attempts to "avoid confounding factors" in their analysis that prevents them from replicating realistic conditions in the wild.

It is not clear whether or to what extent Ecology accounted for the increased toxicity of cyanide at low temperatures. This is an important consideration, particularly for salmonids that spawn in cold waters and could face serious consequences from increased toxicity of cyanide at these low temperatures. It is also unclear whether the proposed criteria accounted for the impact of low dissolved oxygen or concurrent exposures with other contaminants and stressors.

- Center for Biological Diversity

Response to 2.3.K

We encourage future suggestions on how to calculate criteria that account for multiple stressors. We aren't aware of any methods available to derive aquatic life criteria in this manner nor does EPA have recommendations. This may be a project that the Center of Biological Diversity is interested in funding in the future to better develop criteria. Perhaps future models can consider the concomitant effects of water quality stressors alongside toxic effects from chemicals. We support that our temperature and dissolved oxygen criteria are protective alongside our proposed

aquatic life toxics criteria. If the Services (NMFS/USFWS) disagree, we will be required to consider additional actions on a state-specific level.

The EPA's chronic cadmium criterion of 0.25 µg/L is based on an outdated dataset. The EPA 2016 update (now vacated) incorporated several new scientific studies into the criteria derivation. We support using the updated dataset with the latest science. Sometimes when new studies are considered in updated criteria derivations, the criteria are driven higher because the new scientific studies provide additional confidence and species information that suggests that higher criteria are still protective. Our proposed chronic cadmium criterion of 0.41 µg/L is lower than previously approved chronic cadmium criteria in Idaho and the Swinomish of 0.60 µg/L and 0.55 µg/L, respectively.

We support the fundamentals of EPA's derivation methodologies, but modification can sometimes be necessary due to the disconnect between how the Services (NMFS/USFWS) evaluate effects to endangered species and how EPA derives aquatic life criteria. To harmonize the disconnect, federal agencies will need to harmonize their evaluation and criteria methods.

2.3.L Comment Summary – We do not agree with the state's proposed criteria for hardness dependent metals. These include cadmium, chromium III, lead, nickel, silver and zinc. Many of our waters in the Puyallup watershed are much softer than 100 mg/L, which the state uses to derive the criteria for these metals. As such, the criterion should be hardness-dependent to the waters for which the criteria apply.

- Puyallup Tribe

Response to 2.3.L

The criterion is hardness-dependent, and we believe you may have misunderstood our approach. We presented the hardness-based metals criteria in terms of a hardness of 100 mg/L to demonstrate the numeric differences between Washington's current criteria, EPA's recommendation, and the newly proposed criteria. Each one of the metals that are dependent on hardness continue to have an associated hardness-based equation that is used for different water quality conditions. Nothing has changed in this regard. We encourage the commenter to review the rule language and associated footnotes for a demonstration of the hardness-based equations for cadmium, chromium III, lead, nickel, silver, and zinc. Each one of these metals has an equation that is used to calculate criteria based on the hardness.

2.3.M Comment Summary – We recommend that Ecology consistently apply its metrics for developing criteria using new science. We understand (per Ecology's Technical Support Document, workshop, and public hearing) that Ecology applied the new science, and the 5th percentile of ranked genus means to cases where the ESA consultation for Oregon or Idaho resulted in "likely to adversely affect." And Ecology used the new science and 1st percentile of ranked genus means (or, in some cases, used 5th percentile of ranked species means) when "jeopardy" was assigned to the criteria. However, we request that Ecology review and confirm the application of those metrics since we observed at least two cases where the 1st percentile was applied when a jeopardy determination was not found in Oregon or Idaho.

The first case was where no ESA concerns were found for the arsenic acute criteria. In that case, Ecology still adjusted the arsenic acute criteria using a conservative 1st percentile approach. We

recommend that Ecology use the EPA nationally recommended acute criteria where no ESA concerns are found and only adjust the chronic criteria where ESA concerns are found.

The other case was for chromium VI for the chronic freshwater criteria where a jeopardy determination was not found. In this case, per Ecology's methodology, the 5th percentile should be used with new science when setting the criteria, not the 1st percentile. Based on these two cases, we recommend Ecology review and confirm the approach while still following EPA methods when developing state-specific criteria.

- King County

Response to 2.3.M

Thank you for your comment. We agree that there is a jeopardy call for the freshwater chronic arsenic criterion and not for the acute arsenic criterion. While a jeopardy determination may not have occurred for acute arsenic criteria, there is an inherent link between acute and chronic criteria when an acute to chronic ratio is used to calculate the chronic criteria. The acute to chronic ratio is applied to the final acute value (FAV) in the acute criterion development to calculate the chronic criterion. To develop a protective chronic criterion for arsenic and address the jeopardy call, we had to provide increased protection levels to both the acute and chronic criteria. Therefore, updating the acute criteria using the 1st percentile is the method used to lower the chronic criteria and provide protection for endangered species. We explained that this scenario occurs in a few instances in the rule proposal during the public hearing. We will provide additional information in the Technical Support Document. Chromium VI only used new scientific studies in the proposed update to the chronic criterion.

2.3.N Comment Summary – Although the Department of Ecology's current proposal supports the application of Multiple Linear Regression models for copper and aluminum, the approach proposed for other metals (i.e., hardness based criteria) is not consistent with best-available science nor the updated criteria and methodologies under development by USEPA Office of Water. On behalf of the CRADA industry partners, we recommend that the methods applied in developing the aquatic life criteria for metals be reconsidered. In particular, we encourage the Department of Ecology to strive for alignment, consistency, and to more broadly apply bioavailability concepts in the criteria development for metals in the state of Washington.

- CRADA Industry Partners

Response to 2.3.N

We support EPA's CRADA project to further develop and recommend additional MLR models for metals. EPA only recommends bioavailability models for two metals, aluminum and copper and we have adopted models for each of these metals. We are encouraged and optimistic that additional recommendations for bioavailability models will be available in the near future and intend to evaluate them for incorporation into Washington's standards. EPA currently recommends hardness-based criteria for the other metals which is consistent with the current proposal.

2.3.O Comment Summary – We are pleased to see that the State of Washington intends to adopt the copper MLR model and to replace the hardness-based approach. We support this approach and encourage the Department of Ecology to update its aquatic life criteria for copper with this state-of-the-science model.

- Copper Development Association

Response to 2.3.O

Thank you for your support. We are encouraged that future MLR models will be available and recommended by EPA for additional metals.

2.3.P Comment Summary – The Methodologies Used by Ecology and EPA for Deriving Water Quality Criteria Are Legally Deficient and Under-Protective of Endangered Species and Critical Habitats The presence of toxic pollutants in waterways has a significant impact on aquatic and aquatic-dependent species' survival. According to the National Marine Fisheries Service (NMFS), "degraded water quality has been one of the contributing factors for the decline of almost all of the anadromous fish species NMFS has listed since the mid-1980s." Cyanide, cadmium, and mercury are three toxic pollutants that present significant threats to endangered and threatened aquatic species and their critical habitats.

Over the last two decades, a series of lawsuits and consultations regarding EPA's national criteria and its approval of state standards and criteria for various pollutants—including cyanide, cadmium, and mercury—have raised profound concerns regarding the overall approaches that EPA utilizes in reviewing and approving water quality criteria; these cases also raise concerns about the inadequate and antiquated methodologies EPA used to establish national water quality criteria. See, e.g., Center for Biological Diversity v. EPA, Case No. 22-138, 2023 U.S. Dist. LEXIS 145674 (D. Ariz. Aug. 18, 2023) (finding that EPA acted unlawfully when it failed to engage in Endangered Species Act Section 7 consultation prior to issuing nationwide water quality criteria for cadmium and vacating EPA's 2016 chronic freshwater cadmium criterion); Northwest Environmental Advocates v. National Marine Fisheries Service et al., Case No. 10-907-BR (2010) (dealing with the Oregon's Endangered Species Act consultation history and failures); Northwest Environmental Advocates v. The National Marine Fisheries Service et al., Case No. 13-00263-DCN (2013) (dealing with the Idaho's Endangered Species Act consultation history and failures).

The Center hereby attaches and incorporates into these comments past biological opinions and draft biological opinions and request they be made part of the record for this rulemaking as well as incorporated into EPA's review of Ecology's ultimate submission. The biological opinions describe severe methodological flaws and inadequate approaches that have inevitably yielded legally insufficient and under protective criteria. Each document included provides information that can guide Ecology's development of its criteria. More recent science, however, suggests the need for even more protective standards to fully comply with the Endangered Species Act.

Even further, because Washington is downstream of a number of states with known aquatic toxic pollution issues, including Idaho, Oregon, and even small portions of Wyoming and Montana, some of its waters are already receiving significant pollutants from upstream states, which raises concerns about cumulative impacts, and suggests even more stringent criteria are required to address pollution in a legally sufficient manner. While in theory, Clean Water Act section

303(d) total maximum daily loads (TMDLs) are the mechanism to address total pollutant loading, Washington's TMDL program is largely moribund, it issues very few TMDLs for toxic pollutants, and its TMDLs do not take into consideration the cumulative effects of multiple toxic pollutants. For these reasons, Washington's water quality criteria for toxic pollutants must address the need to provide full protection of these downstream waters.

While the Center is generally supportive of Ecology's proposal to establish more stringent criteria, the proposed criteria still raise concerns regarding their effects on Washington's threatened and endangered species, including salmonids, southern resident orcas, and amphibians. Illustratively, for example, Washington's proposed chronic cyanide criteria is significantly higher than the level recommended in Fish and Wildlife Service's (FWS) biological opinion on EPA's national 304(a) cyanide criteria for bull trout. The proposal also does not appear to account for or address amphibian sensitivity to these toxics—another issue identified in FWS's biological opinion on EPA's national 304(a) criteria for cyanide.

- Center for Biological Diversity

Response to 2.3.P

We encourage commenters to provide additional methodologies that should be considered when developing aquatic life criteria. We found that many of the likely to adversely affect determinations were based on new scientific studies that EPA has yet to incorporate into national recommendations. Thus, we acted upon this fact and incorporated the new scientific studies where there was a likely to adversely affect or jeopardy determination for similarly listed species in Idaho or Oregon. In some instances, we found additional protection was needed to meet the protection requirements outlined in Biological Opinions (BiOps) under the Endangered Species Act. We worked within the confines of EPA's 1985 guidance for deriving aquatic life criteria. We are not in a position to develop new methods for deriving aquatic life criteria and believe that updated guidance should originate from EPA with states involvement.

We found high uncertainty in the suggested chronic cyanide criterion for bull trout found in the draft nationwide BiOp. The Services (USFWS/NMFS) use data from fathead minnow, brook trout, and bluegill as surrogate response species to estimate magnitude of chronic effects to bull trout. They also use the WEB-ICE model to estimate species sensitivity. These methods are known to generate high variability compared with actual toxicity values. Given this high uncertainty within the draft cyanide BiOp, we support the proposed chronic value of 1.9 µg/L as protective of Washington's endangered species and encourage the Services (USFWS/NMFS) to consider updated datasets and the uncertainty associated with their analysis when making final determinations.

We understand that there are some data gaps with cyanide (e.g., amphibian data) and a more robust toxicity dataset would be ideal. We have accounted for these uncertainties by using the 1st percentile of the toxicity distribution rather than the 5th percentile recommended by EPA in their 1985 guidelines. This modification provides additional protection to aquatic life in Washington and represents a viable pathway forward that should be acceptable to EPA and other states.

2.4.Preliminary Regulatory Analyses

2.4.A Comment Summary – Section 3.2.10 6PPD-quinone (freshwater acute) pg.46 [of the Preliminary Regulatory Analyses] indicates that there may be a future need for stormwater permittees to take corrective actions such as source control or retrofits to mitigate and/or treat for 6ppd-q in watershed areas with 6ppd-q impairment. Ecology has not yet approved any stormwater treatment technology for 6ppd-q that municipalities could employ through an approved stormwater management plan. Additionally, without an approved treatment best management practice, either operational or structural, municipal roads projects will continue to be held up under Endangered Species Act consultation requirements. We appreciate that Ecology is involved in funding and reviewing studies which evaluate the effectiveness of operational and structural treatments for 6PPD-q. We support these efforts and Ecology best management practice approval, such that stormwater permittees can employ them through an approved stormwater management plan, and so municipal roads projects may proceed in a timely fashion.

- Snohomish County

Response to 2.4.A

Thank you for your support. We look forward to future developments for permittees to address 6PPD-quinone.

2.4.B Comment Summary – Section 3.2.10 6PPD-quinone (freshwater acute) pg.46 [of the Preliminary Regulatory Analyses] indicates that costs to test for 6ppd-q in water are negligible @ roughly $75/sample. To our knowledge the only lab in Washington accredited for analysis of 6ppd-q is Manchester. It is our understanding that a state, city, county, or tribal organization may enter into an Interagency Agreement (IAA) with Manchester for analysis. Under an IAA, the cost for analysis through Manchester per sample ranges from $500-700 depending upon the number of project related samples. Snohomish County's current contract lab must subcontract sample analysis out to Anatek labs in Moscow Idaho at a cost of $400.00/sample. If these same costs hold true for others, Ecology has severely underestimated the potential cost to the regulated community, which would likely then be passed to ratepayers. We recommend Ecology conduct additional research to develop a better estimate of costs to the regulated community.

- Snohomish County

Response to 2.4.B

We thank you for your comment and have revised cost estimates for 6PPD-quinone sampling. As you note, Ecology is working to identify and test the effectiveness of BMPs to address 6PPD-quinone in stormwater runoff. Ongoing funding will help continue research on the ability of stormwater systems to filter out this toxic tire chemical and to develop BMPs to treat contaminated stormwater (see our information sheet on Best Management Practices for 6PPD-

quinone[5] for more information), and also visit our resource page on 6PPD-quinone[6] to stay up to date on Ecology's 6PPD-quinone efforts.

2.4.C Comment Summary – A preliminary cost-benefit analysis is absent from the Preliminary Regulatory Analyses given one was provided for the freshwater acute criteria. A greater than 2x reduction in the freshwater chronic criteria for many of the analytes more than justifies an analysis of costs. Additionally, the cost benefit analysis must account for the impacts to WAC 173-340-730, because the surface water quality standards include consideration of water quality standards within WAC 173-201A. Because Ecology has failed to provide the economic impact analysis for freshwater chronic criteria as required by the State Administrative Procedures Act, this rulemaking is invalid on its face. The cost impacts must be discussed and provided for public comment.

- U.S. Department of Energy Richland Operations Office

Response to 2.4.C

We evaluated acute and chronic criteria based on the appropriate criteria applicable to the permit. Appendix D of the technical support document explains the methods used in determining the cost-benefit analysis results. We consulted with the permit program at Ecology to determine the most applicable criteria for a given permit. We support the decisions made to develop the cost-benefit analysis. Below is a summary of the methods that incorporate both acute and chronic aquatic life criteria.

"For analysis of individual permits, we applied the acute and chronic dilution factors from each individual permit fact sheet to the proposed acute and chronic aquatic life criteria. The application of dilution factors to the newly proposed aquatic life criteria was representative of the potential effluent limit for each pollutant. We then compared the maximum reported effluent concentration from each permit's dataset to the respective calculated limit (aquatic life criterion divided by the dilution factor). Some permits do not have a dilution factor, for example if they discharge to a 303(d) listed water body. If the calculated limit was less than the maximum concentration reported in the monitoring data, then that discharge was deemed to have a reasonable potential to cause an exceedance of the proposed criterion, which could result in a new or revised effluent limits. This method for estimating permit limits is a conservative approach because it does not account for effluent variability, sampling frequencies, flow, and statistical based approaches typically used to calculate effluent limits that would likely drive effluent limits lower than the approach used in this analysis."

"For determining whether general permits could be affected by this rule, we compared maximum concentrations reported in DMRs or priority pollutant scans in PARIS to the applicable acute aquatic life toxics criteria. The acute toxics criteria are the more pertinent criteria to the general permits based on the short-term duration of general permit discharges such as stormwater runoff and time-limited discharges. If the maximum toxic concentration in effluent for a given permit exceeded the proposed aquatic life toxics acute criteria, the permit was listed as potentially of

[5] https://apps.ecology.wa.gov/publications/documents/2310001.pdf
[6] https://www.ezview.wa.gov/site/alias__1962/37858/addressing_6ppd.aspx

concern under the new criteria. Comparing the acute toxics criteria to the effluent data represents a conservative estimate of the number of permits potentially affected in this rulemaking."

2.4.D Comment Summary – The cost benefit analysis additionally fails to include many additional costs that will be incurred by the ISGP permit holders to comply with new or revised permit conditions based on the proposed rule. For example, the analysis assumes that a level 1 ISGP corrective action would require 1-2 hours of labor by an environmental engineering technician, estimated at $24.51 per hour. A quick review of current job openings on most common employment portals suggests an hourly wage of at least $30/hour for an entry level environmental engineer position. However, the cost to an industry is typically two to three times the hourly pay rate. In addition, Ecology also states they assume this work would be done by existing staff. However, many ISGP holders do not have environmental engineers on staff and would need to hire a consultant. Typically, the cost of hiring an environmental engineering consultant starts at about $150/hour.

- Association of Washington Business

Response to 2.4.D

Level 1 corrective actions include:

- moving materials out of the path of stormwater,
- checking the operation and maintenance of any treatment already installed, and
- source tracing.

While these activities do not require an environmental engineering technician and may be performed by anyone on staff, Ecology used the wages for this job classification so as to not underestimate the cost. Updating wages using most recent data and including environmental technologists and technicians yields a median wage of $38.88 for Washington State.

2.4.E Comment Summary – Additionally, in the analysis of the additional costs that ISGP permit holders may incur in the future due to lower benchmarks and the subsequent triggering of Level 3 Corrective Actions (Appendix C of the Preliminary Regulatory Analysis), Ecology did not consider the many steps that permittees must take to implement advanced treatment systems. These steps typically include pollutant source investigations, preliminary alternatives analyses, pre-design activities (e.g., site surveys, pipe condition assessments, geotechnical investigations), engineering design and production of plans and specifications, permitting, and construction.

- Association of Washington Business

Response to 2.4.E

While these costs were included in the cost estimates for the PRA, this has been explicitly referenced in the FRA.

2.4.F Comment Summary – Ecology also assumed that commonly used technologies (passive and active media filters) will be sufficient to meet the more stringent limits and benchmarks for copper and zinc. Based on effluent data from the International Stormwater BMP Database, there are no passive BMPs that can achieve the proposed default water quality criteria for copper

(Clary et al. 2020). The omission of critical steps in completing a Level 3 Corrective Action and the assumed technology needed to comply with more stringent limits and benchmarks indicates the financial impacts estimated by Ecology are orders of magnitude lower than they will be for ISGP permit holders. In fact, Ecology acknowledged that the cost estimates could be improved during the workshop and requested the public to submit cost data.

- Association of Washington Business

Response to 2.4.F

For any standard rulemaking at Ecology, the public is invited to submit written comments and/or attachments through our online public comment webpage; this would include cost estimate data or other relevant data. For this rulemaking, 173-201A WAC, in particular:

- Ecology spent 16 months in rule development from June 2022-October 2023. During this time, the public invited to engage in developing rule language and submitting comments and data. Activities included public workshops and an online comment period.
- On February 15, 2024, Ecology filed their rule proposal, opened a public comment period, and held two public hearings. This public comment period was extended to May 7, 2024, during which time the public was invited to submit written comments and/or attachments through our online public comment webpage; this would include cost estimate data. All comments and data that were submitted during this period were considered when adopting the final rule language.

Ecology is providing an implementation plan to explain how the rule will be implemented after it has become effective, including what technical assistance will be available to help regulated parties comply with the adopted rule. The implementation plan is not meant to solicit public comment; instead, it explains how the rule is being implemented.

2.4.G Comment Summary – The process for submitting cost information and the schedule impacts for Ecology to review and incorporate these data into a revised regulatory analysis is unclear. Ecology should adopt a formal process for soliciting this type of critical information from the public as part of the implementation plan included in the draft rulemaking package that is open to public comment with the draft rule. It is inherently difficult if not impossible to comment on this aspect of the draft rule without a fully articulated implementation plan.

AWB is further concerned that the cost benefit analysis is limited to potential impacts to permittees coverage under the ISGP with no consideration of individual or other general permits. This is particularly true since compliance with numeric water quality-based effluent limits, or, for example, the copper benchmarks in the Boat Yard General Permit are not strictly based on corrective actions. For individual permits exceeding an effluent limit is a permit violation. It does not appear that Ecology has made any effort to adequately address compliance issues for individual permits or assess those impacts in a cost benefit analysis or the other determination required under RCW 34.05.328(1).

- Association of Washington Business

Response to 2.4.G

The cost benefit analysis considers exceedance potential of all individual and general permits, not only ISGP.

Upon review, we found an error in the first sentence of section 3.2.1 Permits affected by new criteria, sub-section Exceedance levels and corrective actions, which read "…if permit benchmark levels are set according to the new criteria, Industrial Stormwater general permit (GP) effluent levels high enough to exceed…". This was corrected to "…if permit benchmark levels are set according to the new criteria, general permit (GP) effluent levels high enough to exceed…". We see how this could have been misleading and apologize for any confusion.

Note that in Table 18 in Appendix B, we provide a further breakdown of permit types with potential to exceed the adopted criteria limits in this rulemaking. Beyond ISGP, these include Boatyard GP Construction stormwater GP and industrial IP. Permit categories in which permittee were not predicted to violate criteria limits based on historical monitoring data were not included in the analysis.

With respect to corrective IP actions (costs), we assume the equivalent costs of a level one action for every IP with potential to exceed, and we discuss the potential of additional costs qualitatively (see section 3.2.1). As discussed in section 2.2.3 and 3.3.2, this is because compared to GPs, violations of IP limits are considered for correction on a case-by-case basis. Corrective actions also depend on effluent variability, different sampling frequencies (daily, monthly, yearly etc.), and receiving water conditions and mixing data we cannot predict in advance. Ultimately, the response to individual permit violations is up to the discretion of the permit manager, compliance specialist, and supervisor team who work with facilities to implement a variety of compliance schedules if needed.

Combined with analysis and discussion in Chapter 4 (Likely Benefits of the Proposed Rule Amendments) this analysis considers both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented—thus satisfying the portion of the RCW 34.05.328(1) we believe this comment is directed toward.

2.4.H Comment Summary – It is also imperative that the implementation plan and cost benefit analysis consider how the proposed copper and acrolein criteria will apply to aquatic pesticide permits. The 2023 Irrigation System Aquatic Weed Control Permit allows the use of specific pesticides that include copper and acrolein. These applications are critical to operations of irrigation systems and to management of beneficial uses of water for agricultural purposes. Ecology cannot finalize the aquatic life criteria without undertaking a thorough evaluation of how it will implement the standards in context of aquatic pesticide permits and what the cost benefit of the standards will be for agriculture and other businesses and property owners who rely on the permits.

- Association of Washington Business

Response to 2.4.H

Thank you for your response. If the adopted rule conflicts with any current general permits, these conflicts will be resolved during the next permit cycle.

3. Comments on the Technical Support Document

3.1. General comments

3.1.A Comment Summary – As Ecology notes, EPA is under court order to evaluate chromium III, DDT and metabolites, endosulfan, endrin, tributyltin, zinc, lead, and nonylphenol by June 2026 as the result of one of Northwest Environmental Advocates' lawsuits against EPA. This appears to have motivated Ecology action on some criteria but not all of them. As a policy matter, it is unclear why Ecology has adopted an inconsistent approach.

- Northwest Environmental Advocates

Response to 3.1.A

The technical support document outlines the strategy we followed in updating aquatic life toxics criteria in this rulemaking. We have updated criteria where EPA national recommendations may not be appropriate for protection of aquatic life in Washington. Where there were likely to adversely affect determinations for EPA national criteria in Idaho or Oregon during Endangered Species Act consultation, we reviewed new scientific studies, and when jeopardy determinations were made, we reviewed new studies and increased protection levels when necessary. This approach was consistently applied throughout this rulemaking. Some pollutants criteria are not known to cause adverse effects (e.g., growth, survival, or reproduction) or jeopardy to populations of endangered species.

3.1.B Comment Summary – Ecology notes [on page 31 of the Technical Support Document] that as the outcome of a lawsuit by the Center for Biological Diversity, "EPA may be required to consult on Washington's existing cyanide criteria under the Endangered Species Act." If Ecology were to adopt new, protective cyanide criteria in line with our comments below, EPA would not be required to consult on the existing criteria but, rather, the new criteria would undergo consultation to ensure they were protective of ESA-listed species in Washington waters. The uncertainty that Ecology cites is both a product of its own delays and inherent in a regulatory program that is intended to respond to new information, whether it is new science on the hazards of pollutants or new information on the decline of species.

- Northwest Environmental Advocates

Response to 3.1.B

We agree that more regular updates to the aquatic life toxics criteria are needed. We intend to review aquatic life toxic criteria prioritization efforts during the triennial review process and encourage stakeholder involvement.

3.1.C Comment Summary – Ecology's list of ESA-listed species is missing species. For example, the Oregon spotted frog, Rana pretiosa, was listed as threatened in 2014. 79 Fed. Reg. 51658 (Aug. 29, 2014). This species is found in Washington State. Id. at 51659. It is an aquatic species. Id. ("Oregon spotted frogs' highly aquatic habits[.]"); id. at 51661 ("This is the most aquatic native frog species in the Pacific Northwest (PNW), as all other species have a terrestrial life stage. It is found in or near a perennial body of water, such as a spring, pond, lake, sluggish

stream, irrigation canal, or roadside ditch (Engler 1999, pers. comm.).” Toxic chemicals pose a hazard to the Oregon spotted frog. See, e.g., id. at 51689-51690.

Ecology’s list also misses an aquatic species in Washington waters with a federal listing status “under review,” namely the western ridged mussel (Gonidea angulata). See FWS, Environmental Conservation Online System, western ridged mussel (Gonidea angulata), available at https://ecos.fws.gov/ecp/species/10893; see also 86 Fed. Reg. 40186 (July 27, 2021), Endangered and Threatened Wildlife and Plants; 90-Day Findings for Three Species (“we find that the petition[] to list the . . . western ridged mussel (Gonidea angulata) present[s] substantial scientific or commercial information indicating that the petitioned action[] may be warranted.”); 40189 (potential threats to the western ridged mussel include water quality).

Moreover, Ecology’s singular focus on federally ESA-listed species ignores species that are at risk in Washington waters, as identified by the Washington Department of Fish and Wildlife (“WDFW). Aquatic species and their state imperiled status include:

- Northwest Environmental Advocates

Response to 3.1.C

Thank you for your comment. We have added the Oregon spotted frog to the list of endangered and threatened species in the technical support document. We have only included listed species for the federal Endangered Species Act because an analysis of the protectiveness of the criteria has not been completed for state listed species, and EPA methods are intended to be protective of aquatic life. We have not excluded toxicity data that is relevant to protection of state listed aquatic species in the criteria development process, and thus, any criteria expected to be protective of federally listed species should also be protective of state listed species. We are limited by the available toxicity data in the scientific literature. EPA contends that one species toxicity information is a surrogate for other species.

3.1.D Comment Summary – Table 9 [of the Technical Support Document] (EPA acute and chronic conversion factors (CF) for metals (Kinerson et al. 1996) includes the note that “Conversion factors for cadmium and lead are hardness dependent. The values shown are with a hardness of 100 mg/L as calcium carbonate (CaCO3)” but fails to explain whether that hardness level is relevant to Washington waters.

- Northwest Environmental Advocates

Response to 3.1.D

We presented proposed numeric criteria in terms of 100 mg/L hardness water quality conditions for comparative purposes to EPA recommendations and existing Washington criteria. There is a hardness equation associated with each metal that has been found to be dependent on hardness. This hardness equation is used to calculate the applicable numeric criteria for a given hardness. We choose 100 mg/L hardness to present numeric criteria because EPA does the same for their national aquatic life criteria recommendations. Permittees and ambient monitoring will need to measure hardness and use the applicable hardness equation to calculate the appropriate criteria values.

3.1.E Comment Summary – Page 77 [of the Technical Support Document], lines 10-12: Recommended changes are in [bold] for clarification: "The reverse ACR based equation is calculated by application of the ACR to the chronic criterion followed by division by two to be consistent with 1985 USEPA methods for CMC calculations for a **final acute value (FAV)**."

- Copper Development Association

Response to 3.1.E

We believe the original statement is correct. The FAV is generated when the ACR is applied. The FAV is divided by two to generate the criterion maximum concentration. We have revised it slightly to clarify the intent.

3.1.F Comment Summary – For contaminants that the State does not propose adopting criteria, the Technical Support Document should discuss whether alternative methods for deriving criteria were adequately evaluated and describe the proposed approach to be used for applying narrative criteria. At elevated concentrations, iron and hydrogen pose significant threats to aquatic organisms. The presence of iron particles can irritate gill tissue in salmonids, leading to gill damage and bacterial infection. Exposure to iron has been shown to reduce the immune response of salmonids. Hydrogen sulfide can have lethal effects on fish. Sublethal effects include reduced appetite and erratic swim behavior. Heptachlor epoxide is a priority pollutant, highly toxic to finfish, shellfish, waterfowl and aquatic plants. Section 303(c)(2)(B) requires Ecology to develop numeric criteria for priority pollutants. The Department of Ecology should provide additional justification for not adopting numeric criteria for these compounds.

- Northwest Indian Fisheries Commission

Response to 3.1.F

The EPA recommended criteria for hydrogen sulfide, heptachlor epoxide, and iron are based on limited and uncertain toxicity data, and derivation does not follow standard derivation methods. It is not prudent to develop criteria without the appropriate and adequate toxicity data because criteria have meaningful implications in regulations. It is our duty to ensure criteria are protective and not unnecessarily burdensome. We support further research into hydrogen sulfide, heptachlor epoxide, and iron criteria in Washington and encourage further dialogue on these pollutants in the upcoming triennial review.

3.1.G Comment Summary – Throughout the TSD the word "toxic" is used to describe a chemical or criteria/criterion. The EPA recommends using the term "chemical," "criteria" or "criterion" as appropriate instead of the term "toxic."

- U.S. EPA

Response to 3.1.G

Thank you for your comment. We use the term aquatic life toxics criteria to distinguish the criteria for toxic chemicals from aquatic life criteria for conventional pollutants that describe a water condition such as pH, temperature, and dissolved oxygen. We understand that EPA may use different terms, but this is commonplace for Ecology. We do not use aquatic life toxics

criteria in rule language and only use it in supporting documents. Given the usage at Ecology, we have decided it is appropriate to use the term for supporting documents.

3.1.H Comment Summary – Throughout the TSD the term "new science" is used as well as the term "new scientific data." The term "new science" could potentially have a broader implication/meaning than "new data." For instance, new science could mean new types of effects not traditionally used in criteria but shown to be significant.

The EPA suggests defining these terms to ensure clarity. The EPA further suggests that Ecology specify that it is using both "new science" and prior established science in the derivation of criteria.

- U.S. EPA

Response to 3.1.H

We have clarified throughout the rule documents that new science is intended to mean new scientific studies. In our strategy outlined in the technical support document, we indicate that new scientific studies are studies that are new since EPA last updated national recommendations for aquatic life. We think this is an adequate explanation and does not need repeated throughout the document.

3.1.I Comment Summary – The Services finalized a new rule on April 5, 2024, that revises portions of the ESA implementation regulations, including portions of the regulations summarized in the TSD. For example, "direct and indirect effects" are no longer included in the ESA rule language. The new rule is effective May 6, 2024 and can be found at https://www.federalregister.gov/documents/2024/04/05/2024-06902/endangered-andthreatened-wildlife-and-plants-regulations-for-interagency-cooperation.

The EPA suggests Ecology update this section of the TSD to incorporate changes from the new rule.

- U.S. EPA

Response to 3.1.I

We have updated "direct and indirect effects" to consequences as indicated in the new rule. Thank you.

3.1.J Comment Summary – For clarity, the EPA suggests removing previous values from Table 3 "Ambient water quality criteria for toxic pollutants submitted for consultation in EPA's 1999 Assessment and revisions by the State of Idaho (NMFS, 2014; USFWS, 2015)."

- U.S. EPA

Response to 3.1.J

This table is in a similar format as Oregon's 2004 submission and both tables mimic the tables in the relevant Biological Opinions (BiOps). We have decided to make no changes to the tables for transparency of how criteria have changed and to align the tables with the BiOps that were used to make decisions in this rulemaking.

3.1.K Comment Summary – In Table 8 of the "Evaluating Scientific Articles for Criteria Derivation" section, cyanide is noted to have been most recently updated in November 2013; however, the latest update was completed in the summer of 2023. There were approximately 84 new papers added to ECOTOX in that update, some of which appear to be included in the TSD with ECOTOX reference numbers, but a majority appear to be missing in this document.

The EPA suggests updating Table 8 to reflect the latest ECOTOX update and incorporate the new cyanide papers. It should be noted that none of these new papers appear to be lower than the draft cyanide criteria proposed.

- U.S. EPA

Response to 3.1.K

Thank you for the information. We reviewed new publications in ECOTOX from 2013 to 2023 and did not find any relevant studies to include in the cyanide criteria derivation.

3.1.L Comment Summary – In the Aluminum section, the EPA suggests discussing if there was any type of outlier analysis performed on those conductance data that did not have a good fit with the regression model for aluminum and the outcome of any analysis performed.

- U.S. EPA

Response to 3.1.L

After running the logistic regression, negative values were removed because they were below the detection limit of the method. There was one location with a conductivity value that was removed because it met the definition for marine water. There was a second location that had 90 values, with one value that was several magnitudes higher than the other 89 values. This single sample was removed after graphing data in a box and whisker plot, with results demonstrating the sample as an outlier.

3.1.M Comment Summary – The EPA suggests adding additional discussion in the Arsenic section highlighting the live-diet experiment from Erickson et al. 2019

https://www.sciencedirect.com/science/article/abs/pii/S0166445X18310130?via%3Dihub.

In short, Erickson exposed worms to arsenic in water, then exposed those worms to rainbow trout. The results are as follows: ? AsIII in water treatment = 2.4 mg/L, ? Resultant AsIII in worms = 32.6 ug/g (dw), ? Resultant AsIII in trout = 4.2 ug/g (dw). ? AsV in water treatment = 6.0 mg/L, ? Resultant AsV in worms = 37.9 ug/g (dw), ? Resultant AsV in trout = 4.2 ug/g (dw).

Overall, the exposed fish did not experience any effects and there were no significant effects on growth through this live-diet experiment, which was initiated with relatively high concentrations of AsIII and AsV in the worm treatment waters.

- U.S. EPA

Response to 3.1.M

Thank you for this information. We have incorporated this study into the arsenic section as supporting information.

3.2. Corrections and clarifications

3.2.A Comment Summary – For clarity, in Table 5 "Biological evaluation results for the Swinomish Tribe (LAA = likely to adversely affect; NLAA = not likely to adversely affect; USEPA, 2022a)," the EPA suggests defining the meaning of "-" to differentiate it from the "not evaluated" designation.

- U.S. EPA

Response to 3.2.A

Thank you for your comment. We have clarified the intent of the "-" designation in the table.

3.2.B Comment Summary – In the background section, when Ecology is discussing the Swinomish Tribal water quality standards biological evaluation, it would be helpful to include the criteria that were adopted, similar to the layout of Idaho and Oregon in that same section.

- U.S. EPA

Response to 3.2.B

We have referenced EPA's Biological Evaluation of Swinomish tribal aquatic life criteria. These criteria were not used for strategy decisions but were used as supporting information, and therefore, a reference is adequate.

3.2.C Comment Summary – In the "Endangered and Threatened Species in Washington" section, consider adding the latin names for the species for clarity and to be consistent with the other species discussions throughout the document.

- U.S. EPA

Response to 3.2.C

We have added the species Latin names. Thank you.

3.2.D Comment Summary – In the six categories listed in the "Alternative Aquatic Life Toxics Derivation Method" section, ESA jeopardy and LAA determinations are discussed. It is unclear if Ecology is only using determinations made by the Services or by both the EPA and the Services.

The EPA suggests clarifying that Ecology is only using determinations made by the Services in this evaluation. In addition, Ecology should follow the methods that it set out in the Methods section of the TSD. For instance, the salt water (SW) acute and chronic arsenic values do not appear to follow Ecology's current method of using new science only when the Services made a LAA determination for that species in a nearby state.

- U.S. EPA

Response to 3.2.D

Thank you for your comment. We updated the saltwater arsenic criteria to reflect the strategy in the rule. There were no indications that EPA recommendations are inadequate for protection of endangered species. We have provided an explanation to support the continued use of saltwater arsenic criteria and the newly proposed freshwater arsenic criteria.

The technical support document already states that the biological opinions were used in making determinations on reviewing new scientific studies or increasing protection levels. "We decided to set state-specific criteria for certain pollutants where Oregon and Idaho Biological Opinions concluded that EPA recommendations for those pollutants would likely adversely affect or jeopardize ESA-listed species and their populations that also exist in Washington." We have made no changes to the methods section based on this comment.

3.2.E Comment Summary – The EPA suggests amending the footnote to Table 1 "Oregon aquatic life toxics criteria submitted in 2004" to clarify that the value is hardness-dependent and the value shown is for a hardness of 100 mg/L. Additionally, the EPA suggests indicating this footnote is applicable to only the freshwater values.

- U.S. EPA

Response to 3.2.E

We have updated the table to clarify where the hardness assumption applies for each criterion. Thank you.

3.2.F Comment Summary – When deriving metals criteria, the EPA recommends that Washington ensure that final criteria values are reported as dissolved metals concentrations except for aluminum which is expressed as the total recoverable form. For clarity, ensure that each metals section is explicit on this point throughout the TSD.

- U.S. EPA

Response to 3.2.F

Thank you for your comment. We have clarified that aluminum criteria are based on total recoverable aluminum.

3.2.G Comment Summary – Table 10 "Proposed acute and chronic aquatic life toxics criteria for freshwater (FW) and saltwater (SW) and EPA recommendations" appears to include some criteria that are not being proposed.

The EPA suggests removing criteria that are not being proposed or changing the title of the table.

- U.S. EPA

Response to 3.2.G

We have modified the title of the table to align it with the table contents. The purpose of the table is to compare all Washington's criteria to EPA recommendations to evaluate consistency with the Clean Water Act.

3.2.H Comment Summary – Table 11 "Strategy for each freshwater (FW) and saltwater (SW) aquatic life toxics criterion considered in this rulemaking. Detail on each strategy can be found in the Alternative Aquatic Life Toxics Method section described above" lists "EPA recommendation" for SW acute and chronic lead and "New science" for SW acute pentachlorophenol. According to the discussion portion of the TSD and the rule language these should all be listed as "no change."

The EPA suggests updating the table with corrected information.

- U.S. EPA

Response to 3.2.H

We corrected Table 11 for lead. We did review new scientific studies for pentachlorophenol SW acute, but it did not change the criterion. No changes are needed for pentachlorophenol.

3.2.I Comment Summary – In the Aluminum section Ecology discusses the concurrent samples and locations used for developing regional default values including maps of locations. The EPA suggests adding the timeframe these data were collected and how many years of data were used in the calculations.

- U.S. EPA

Response to 3.2.I

This information is provided in Appendix B. We have added this information to the criteria calculations section of the technical support document as well.

3.2.J Comment Summary – In the Aluminum and Copper sections, Ecology discusses sampling data needs for determining site specific criteria. For consistency, the EPA suggests including the minimum number of sampling events required for site-specific criteria development and more specifics on sampling requirements.

- U.S. EPA

Response to 3.2.J

We have made some recommendations for sampling for the multiple linear regression model application in the implementation plan for this rule. However, we understand that this may be permit specific and include flexibility in this guidance.

3.2.K Comment Summary – The EPA suggests adding a footnote to all metals tables in the TSD to clarify if the criteria are total, total recoverable, or dissolved.

- U.S. EPA

Response to 3.2.K

This information is already included in the rule language for each metal in the footnotes. We also present the criteria in the dissolved form under each criteria calculation section.

3.2.L Comment Summary – Throughout the document all references to the EPA's 304(a) recommendations for freshwater chronic cadmium criteria should reference the 2001 304(a) recommendation of 0.25 ug/l found at

https://www.epa.gov/sites/default/files/2019-03/documents/ambient-wqc-cadmium-2001.pdf.

- U.S. EPA

Response to 3.2.L

We have updated the technical support document.

3.2.M Comment Summary – In the Freshwater Acute Cadmium Section it states: The 20th percentile was used to align with Idaho and the Swinomish Tribe freshwater acute cadmium criteria that has been demonstrated to be protective of endangered species and approved through ESA consultation.

The language around demonstrating the criteria to be protective and approved through ESA consultation is not fully accurate. The EPA suggests modifying the language to reflect that EPA concluded that the criteria would be not likely to adversely affect listed species.

- U.S. EPA

Response to 3.2.M

We have corrected this text to better reflect the Biological Evaluation.

3.2.N Comment Summary – The EPA suggests reviewing the proposed freshwater acute chromium VI criteria and cross reference the statement made in the chromium VI summary that endangered species and their populations in Washington may be at risk at EPA's recommendations.

- U.S. EPA

Response to 3.2.N

We have updated the text to reflect our analysis of Idaho and Oregon biological opinions in context to aquatic life protection in Washington.

3.2.O Comment Summary – Suggest adding a footnote to Table 27 "Comparison of Washington's current freshwater (FW) and saltwater (SW) acute and chronic copper criteria (duration in parentheses) with EPA recommendations and the newly proposed criteria" to clarify that criteria calculated using concurrently sampled pH, hardness, and DOC for a specific water body supersede the default criteria, regardless of whether the default criteria are higher or lower.

- U.S. EPA

Response to 3.2.O

Thank you for this comment. We have updated the footnotes in this table.

3.2.P Comment Summary – Throughout the Copper section the EPA suggests using the term "a copper MLR model" instead of "the copper MLR model."

- U.S. EPA

Response to 3.2.P

We aren't aware of multiple copper MLR models available at this time. However, we have changed some instances to "a copper MLR model" where we found it appropriate.

3.2.Q Comment Summary – For clarity, the EPA suggests adding the equations the criteria are based on in the Copper section.

- U.S. EPA

Response to 3.2.Q

These equations are presented below the individual criteria calculation sections. In the rule language, we use footnotes to link each copper criterion to the appropriate equation.

3.2.R Comment Summary – In Table 28 "Acute to chronic ratios used in the development of the copper multiple linear regression equation that are representative of data presented in Brix et al. 2021" the species mean ACR is missing for Oncorhynchus mykiss.

- U.S. EPA

Response to 3.2.R

Thank you. We have added the mean ACR for *Oncorhynchus mykiss*.

3.2.S Comment Summary – In Table 37 "Acute to chronic ratios (ACR) used in chronic criterion derivation" all the acute and chronic values from Ceriodaphnia dubia to the end of the table are transposed. The EPA suggests fixing these transposed values.

- U.S. EPA

Response to 3.2.S

Thank you for this correction. We found adequate data to calculate criteria for chronic nickel based on the eight-family method and no longer use an acute to chronic ratio.

3.2.T Comment Summary – For consistency, the EPA suggests adding the latin name for Mozambique tilapia in Table 50 "Freshwater acute studies not used from previous EPA criteria derivations."

- U.S. EPA

Response to 3.2.T

Thank you for this correction. We have deleted this table because of the decision to incorporate resident North American test species into criteria development.

3.2.U Comment Summary – Lake trout (Salvelinus namaycush) seem to be missing from Table 55 "Acute toxicity data considered for criteria development for 6PPD-quionone," but do appear in Figure 7 "Species sensitivity distribution for fish species LC50 values for 6PPD-quinone." The EPA suggests adding the Salvelinus namaycush study to Table 55 for clarity. The study can be found at https://www.biorxiv.org/content/10.1101/2024.03.26.586843v2.abstract.

- U.S. EPA

Response to 3.2.U

Thank you for this comment. We have updated this table with this data.

3.2.V Comment Summary – Table 64 "Freshwater acute toxicity data used for criteria derivation" lists an acute value for Gambusia affinis which was not used in the EPA's 1984 criteria derivation. For clarity, the EPA suggests adding the study for this species to Table 65 "New freshwater acute studies that met data acceptability requirements since EPA last updated cyanide criteria (S = static, R = static renewal, FT = flow-through, U = unmeasured test concentrations, M = measured test concentrations)."

- U.S. EPA

Response to 3.2.V

Thank you. We decided to remove this study based on EPA recommendations and the high turbidity reported.

3.2.W Comment Summary – In the Freshwater Chronic Cyanide Criterion section, Washington stated that: "There was not adequate toxicity data available to calculate a chronic cyanide criterion using the eight-family method, and therefore, an ACR was used." For clarity, the EPA suggests identifying which of the minimum data requirements were not met.

- U.S. EPA

Response to 3.2.W

We did not find any new relevant scientific studies to develop a freshwater cyanide criterion, and therefore, do not think an analysis of minimum data requirements is needed. We agree with EPA's previous conclusions.

3.2.X Comment Summary – In Table 12 "Comparison of Washington's current freshwater (FW) and saltwater (SW) aluminum acute and chronic criteria (duration in parentheses) with EPA recommendations and the newly proposed criteria," the EPA suggests adding a footnote to clarify that criteria calculated using concurrently sampled pH, hardness, and dissolved organic carbon (DOC) for a specific water body supersede the default criteria, regardless of whether the default criteria are higher or lower.

- U.S. EPA

3.2.Y Comment Summary – In the Swinomish Tribe Biological Evaluation portion of the Cadmium section, it states that: The Swinomish BE concluded no effects of their submission of a freshwater acute cadmium criterion of 1.3 µg/L (hardness of 100 mg/L) and chronic cadmium criterion of 0.55 µg/L (hardness of 100 mg/L; USEPA, 2022a).

- U.S. EPA

The BE for the Swinomish water quality standards had a finding of not likely to adversely affect for acute cadmium, therefore, the EPA suggests this section be updated to reflect the BE's findings.

3.2.Z Comment Summary – Both the Chromium VI and Lead sections indicate that Ecology used the 1st percentile of the toxicity data distribution to derive the draft criteria. However, the calculations do not show the use of the 1st percentile of toxicity data. The EPA suggests removing the reference to the 1st percentile of toxicity data.

- U.S. EPA

3.2.AA Comment Summary – The EPA suggests adding a "^" to EPA's FW Acute and Chronic values In Table 33 "Comparison of Washington's current freshwater (FW) and saltwater (SW) acute and chronic nickel criteria (duration in parentheses) with EPA recommendations and the newly proposed criteria," as the values are expressed in terms of the dissolved metal in the water column.

- U.S. EPA

3.2.BB Comment Summary – The EPA suggests adding an "*" to the freshwater chronic criteria in Table 47 "Comparison of Washington's current freshwater (FW) and saltwater (SW) acute and chronic zinc criteria (duration in parentheses) with EPA recommendations and the newly proposed criteria," as it is hardness based.

- U.S. EPA

Response to 3.2.X – 3.2.BB

Corrections were made.

4. Implementation

4.1. Comments on Rule Implementation Plan

4.1.A Comment Summary – Under RCW 34.05.328(3) Ecology is required to publish an implementation plan with any proposed water quality standard update. The implementation plan is critical to making the determinations under RCW 34.05.328(1). The implementation plan in this instance lacks any substance and consists, without any substance, a disclosure that Ecology will have to implement the rule in permitting, water quality assessments, TMDLs, and section 401 water quality certifications. Without any understanding of how the criteria will be implemented, the assessment of impacts on impaired water body listings, existing individual and general permits, and the cost benefit analysis are illusory. Regarding all the elements in the rulemaking package, Ecology calculated putative water quality criteria, permit limits and benchmarks for the freshwater copper criteria on the basis of eastern and western Washington values for pH, hardness, and DOC. There is no basis in the actual or the implementation plan for this approach. Indeed, the proposed criteria state that if site specific and concurrent data are not available, the copper applicable default criteria will be as stated in the draft rule.

The implementation plan should be clear on how concurrent data will be collected, who will be responsible for the collection of that data, and how the quality of that data will be assured. The plan should also disclose whether the opportunity to collect that data, if needed, will be afforded to permittees prior to application of the new criteria.

In the case of stormwater, the implementation plan should disclose how Ecology intends to derive copper and aluminum benchmarks. Ecology should also include information in the implementation plan as to whether it intends to include benchmarks for aluminum in the general permit and how those benchmarks will be derived. This discussion should include some disclosure as to whether the western and eastern calculated values for the MLR factors may be used to set benchmarks. The basis for copper benchmarks in the current Industrial Stormwater General Permit and Boatyard General Permit includes a modest dilution factor of 5. (Herrera 2009; WDOE 2022a). The implementation plan needs to disclose whether Ecology will continue this practice. Without this information, the assessment of impacts on permits and the cost benefits analysis is simply speculative. The significant legislative rule requirements demand more.

- Association of Washington Business

Response to 4.1.A

The majority of Clean Water Act programs (i.e., water quality assessment, TMDLs, permit updates, 401 water quality certifications) mentioned by the commenter have a separate public process where stakeholders can comment on any changes to these programs. Some of these programs will need to be updated in the future, but this cannot occur until EPA approval. We have included an assessment of impacts to impaired water body listings and permits in Appendix D and E, respectively. We encourage the commenter to review these analyses to gain an understanding of potential changes to these programs. Most of these changes will occur on a permit-by-permit basis and require a specific analysis conducted by the permit writer at the time of the update. It is not feasible to conduct a reasonable potential analysis for all permits at this time. Similarly, the water quality assessment is a two-year process to evaluate impaired water bodies and cannot be fully evaluated during this rulemaking. If changes are required to Policy 1-11, the policy used to evaluate impaired water bodies, then a public process will ensue.

We have made some small updates in the Rule Implementation Plan in response to comments that include considerations for collecting water quality data for implementation of the MLR-based criteria for aluminum and copper. To calculate criteria for site-specific conditions for copper and aluminum, the permittee will need to collect water quality data from the receiving water body. In the absence of site-specific water quality data, the default criteria will apply. Typically, permits are updated every five years and thus, if the aquatic life criteria are EPA approved, permit updates will not occur until the permit is updated. Permit writers should encourage permittees to collect water quality data for the MLR-based criteria in the period after EPA approval but before the permit renewal. It is also important to note that The Washington State APA states:

RCW 34.05.328(3)
Before adopting rules described in subsection (5) of this section, an agency must place in the rule-making file a rule implementation plan for rules filed under each adopting order.

The Water Quality Program provides a draft implementation plan at the proposed rule step to help rule reviewers understand how the rule will be implemented. This is not required at this stage, and it represents our effort to educate rule reviewers.

4.1.B Comment Summary – The Tribe requests Ecology to include outreach to tribal and NWIFC staff regarding implementation of new or revised WQS. As detailed in Ecology's ALTC rule implementation plan, outreach should include informational briefings and training for tribal staff involved in reviewing or implementing water quality regulations, including review of NPDES permits and 401 certifications, toxics impairment listings under Water Quality Program Policy 1-11, and development and implementation of Total Maximum Daily Loads (TMDLs).

- Suquamish Indian Tribe of the Port Madison Reservation

Response to 4.1.B

The implementation of any state adopted aquatic life criteria will occur after EPA approval for Clean Water Act purposes. We do not have a timeline for approval. We encourage tribes to reach out to Ecology with any implementation questions specific to actions that are related to implementing new federally approved criteria in programs such as NPDES permits, TMDL

development, and our list of impaired waters. The water quality program has a defined tribal government engagement process for the water quality assessment.

4.2.Water Quality Assessment

4.2.A Comment Summary – Given the adoption of bioavailability language in EPA-approved state aluminum criteria, the Association asks that Washington include provisions in its water quality assessment methodology that contemplates the availability of the bioavailable aluminum test method and data obtained through its use.

- The Aluminum Association

Response to 4.2.A

Thank you for the comment. We have incorporated a footnote in the rule language regarding the bioavailable aluminum test method. Consideration will be made to incorporating any EPA approved aquatic life criteria into Ecology's water quality assessment methodology, Policy 1-11, in a separate public process.

4.3. Irrigation concerns

4.3.A Comment Summary – Please elaborate on the rulemaking process if adjusted acute and chronic criteria for copper at a site-specific location or water body is established and a request is made to use these criteria instead of the default criteria. Will these adjusted criteria be applied to WA State Surface Water Quality Standards (Chapter 173-201A WAC) only? Can they be applied to discharge effluent limits in NPDES and SWD permits? or both?

- Kennewick Irrigation District
- Naches-Selah Irrigation District
- Roza Irrigation District
- Roza-Sunnyside Board of Joint Control
- Sunnyside Valley Irrigation District

Response to 4.3.A

There is no rulemaking process needed to calculate criteria values using the MLR model for copper or aluminum and incorporating those criteria into Clean Water Act programs. Adoption of the MLR model establishes the process to develop the applicable criteria values similar to how hardness is required to develop criteria for other metals. The MLR model can be applied once the necessary water quality input data is collected. The applicable criteria values for a site or water body are the outputs from the MLR model equation. A permittee will need to work with the permit writer to share the water quality information, ensure all data requirements are met, and to confirm criteria calculations. Once this process is completed, the permit writer can incorporate the applicable criteria into the permit.

4.3.B Comment Summary – Managing aquatic vegetation in an irrigation conveyance system as large as ours is exceptionally challenging. It requires numerous resources and options to achieve this monumental task in a feasible manner. Every additional regulatory requirement diminishes our ability to achieve that goal, and increasingly puts our grower's viability at risk. Beyond the simple economics of the issue, many of our facilities are critical in nature; failure simply is not an option. While some may view aquatic vegetation as trivial, we can assure you, it is not. Excessive vegetation could impede flow in these critical facilities and cause washouts impacting thousands of people and causing millions of dollars of damage. Due to the location and accessibility of portions of our infrastructure, mechanical management simply is not a viable option.

While we are still able to operate as we have under the previous General Permit for Irrigation System Aquatic Weed Control, we would like to remind Washington State Department of Ecology (Ecology) that we are co-stewards of our clean water resources here in the great state of Washington. Our practices conform with existing guidance documents and permitting requirements, including the Ecology General permit, U.S. Environmental Protection Agency's guidance on Clean Water Act Exemption for Return Flow, and all of our product's Federal Insecticide, Fungicide, and Rodenticide Act labeling directions for application. As such, we hope that Ecology continues to recognize that irrigation districts, like ours, are successfully balancing the water quality needs of our growers and the conservation-based stewardship of Washington's natural aquatic resources. If we are to continue the latter, then we must maintain the ability to manage the former through the appropriate use of all the tools in the toolbox, including chemical-based vegetation management.

- Wenatchee Reclamation District

Response to 4.3.B

Thank you for your comment. We understand the challenges in maintaining the irrigation canals vital to the state's resources. We anticipate future collaboration with stakeholders on updating the Irrigation System Aquatic Weed Control general permit and discussion on implementation concerns and compliance determinations.

4.3.C Comment Summary – QCBID's ability to deliver water reliably depends on controlling aquatic vegetation in its irrigation conveyance system with copper and acrolein herbicides. Acrolein is the most effective and reliable herbicide on the market, and it provides broad-spectrum control of large vascular plants and algae in irrigation conveyance systems. Copper is one of the most reliable products on the market, effectively controlling algae species that commonly thrive in irrigation conveyance systems. Proactive use of these herbicides towards aquatic vegetation management is vital, considering the risks of choking conditions characterized by heavy aquatic infestations. Choking conditions can lead to structural damage to canal infrastructure, impediments to water deliveries, impairment of pumping stations, and destruction of farmland and surrounding properties. The irrigation conveyance system's functionality, analogous to a circulatory system, relies on unimpeded flow; any blockage can trigger a domino effect, resulting in widespread damage. Thus, effectively controlling aquatic weeds within the canal system is paramount to safeguarding its integrity and mitigating potential catastrophic consequences.

The rule proposed revisions to Chapter 173-201A WAC include adding substances such as copper and acrolein to the list of aquatic chemicals. This update to water quality standards to protect surface waters and aquatic life proposes limiting the acute copper criterion to 2.5 ug/L and the acrolein criterion to 3 ug/L, effectively removing the ability to use these products. These proposed changes are based on new scientific data, a review of existing criteria, and an assessment of protection levels for endangered species. It is important to understand that "Delivering Irrigation Water Efficiently and Economically. including these substances in the standards at the proposed limits will significantly impact QCBID's ability to control aquatic vegetation.

It is essential to understand that setting limits lower than currently allowed under the NPDES and SWD General Permit: Irrigation System Aquatic Weed Control (ISAWC) that enable QCBID to use copper and acrolein, 25 ug/L and 21 ug/L, respectively, would remove these essential tools to manage aquatic vegetation within its irrigation conveyance system. QCBID requests that Ecology not revise Chapter 173-201A WAC as proposed by limiting copper to 2.5 ug/L and acrolein to 3 ug/L. This proposed rule change at these low limits will be detrimental to irrigation water conveyance that supports agricultural production in the State of Washington.

- Qunicy-Columbia Basin Irrigation District

4.3.D Comment Summary – We wish to reiterate that acrolein and copper remain vital tools for irrigation districts to control nuisance aquatic vegetation. The current regulatory scheme districts adhere to features a multitude of regulatory and safety measures to ensure these products are applied in a responsible and safe manner. Additionally, there are no alternative products available that deliver the same benefits.

The proposed freshwater acute limits for acrolein and copper would effectively eliminate use of these essential tools. With no viable alternatives, this would greatly hinder the ability to deliver water to farms.

Food security is already a challenge for our state, nation, and the world. Without sufficient irrigation water, it will be further threatened. Washington produces approximately $8.6 billion in crop production each year. More than 75% of this is from irrigated agriculture. We cannot afford to negatively impact our ability to feed ourselves and the world with safely produced, nutritious food.

We believe the current standards are protective and encourage you to not adopt the proposed changes.

- Washington State Water Resources Association

4.3.E Comment Summary – According to table 240 in the Proposed Rule Language document, the acute copper criterion for Eastern Washington will be changed from 25 ug/L to 2.5 ug/L, and the acrolein criterion will be set at 3 ug/L. The current effluent limit for acrolein in the Irrigation System Aquatic Weed Control General Permit (ISAWC Permit) is 21 u/L. We depend heavily on aquatic pesticides that contain both acrolein and copper as active ingredients. There are currently no other available options that have the same utility as either acrolein or copper products to control nuisance vegetation in irrigation systems. If the proposed criteria are imposed as effluent limits in the ISAWC Permit, two irreplaceable tools could be effectively removed from the already limited list of options. As a result, there will likely be associated economic and safety impacts of the kind stated above.

The proposed criteria for acrolein and copper would negatively impact the beneficial uses of waters of the state, specifically for those in the agricultural industry. We kindly ask the Department of Ecology to consider the totality of the impact of these proposed criteria.

- South Columbia Basin Irrigation District

Response to 4.3.C, 4.3.D, and 4.3.E

We would like to clarify that the acute copper criterion is not limited to 2.5 µg/L. That was the proposed default value. We encourage permittees to collect their own water quality data (pH, hardness, and DOC) to determine the appropriate site acute copper criterion. In the absence of site-specific water quality data, the default criteria are applicable. We have revised the geographical representation of default values to EPA level II ecoregions and the desert cold ecoregion that covers much of eastern Washington has a default criterion of 4.8 µg/L. We anticipate future collaboration with stakeholders on updating the Irrigation System Aquatic Weed Control general permit and discussion on implementation concerns and compliance determinations.

4.4. Permit monitoring and compliance

4.4.A Comment Summary – EPA's draft method for analysis of 6ppd-q in water is not approved for Clean Water Act compliance monitoring unless and until it has been proposed and promulgated through rulemaking. We recommend that Ecology and EPA work closely to ensure methods for analysis are promulgated through rulemaking before requiring municipal stormwater permittees to either sample and test for 6ppd-q or pay for it through the Stormwater Action Monitoring program.

- Snohomish County

Response to 4.4.A

The EPA's release of a draft 6PPD-quinone method enables quantification and identification of 6PPD-quinone in stormwater and surface waters. We understand that this method is not approved for Clean Water Act NPDES permit compliance determinations at this time, but many entities are using the draft method, and it may be finalized in the near future. If there are any updates to permits in regard to 6PPD-quinone monitoring, we encourage the commenter to be active in the public process and comment on the permit updates. This rulemaking establishes a 6PPD-quinone criterion using the best available science to protect aquatic life.

4.4.B Comment Summary – What is the anticipated timeline for compliance subsequent to permit modifications? Will permit holders be granted a grace period to navigate compliance procedures, such as locating certified laboratories and implementing new Best Management Practices (BMPs) in order to meet new added monitoring requirements?

If grace periods are not provided, what are the immediate consequences for failing to meet the new criteria?

- Snohomish County

Response to 4.4.B

We anticipate a time gap between state adoption of aquatic life criteria and implementation in Clean Water Act programs, including permits. Clean Water Act approval of new water quality standards has taken several years in the past because of the Endangered Species Act consultation process. No permit limits based on the new criteria would be implemented before this approval. In the meantime, permits may require additional monitoring of wastewater or stormwater for any pollutant that has new or modified criteria. At the next permit renewal after the criteria are approved, the permit writer will evaluate the potential for the permitted discharge(s) to cause or contribute to violations of the water quality standards. If there is a reasonable potential to pollute, numeric effluent limits or benchmarks and adaptive management requirements will be included in the permit, along with any necessary schedules for compliance. The timeline for each permit will be unique and will be subject to the normal public review and comment process.

4.4.C Comment Summary – Are there any available lists or proposed new toxics to be included per permit/site for incorporation into monitoring plans before final permit updates issuance?

Provision of a list detailing newly added requirements per site to each permit holder before final permit issuance would facilitate preparation and readiness for impending changes. This proactive approach may mitigate instances of non-compliance when new requirements are implemented immediately following the issuance of updates.

- Snohomish County

Response to 4.4.C

The best time to evaluate additional requirements for permits would be when the draft permit goes out for public comment. During this time, Ecology will explain any changes to the permit such as additional monitoring requirements. No new requirements are implemented until a renewed permit is issued. We encourage discussion with your permit writer as soon as possible to anticipate any future changes or impending updates to the permit.

4.4.D Comment Summary – With a particular focus on the industrial stormwater general permit and its potential impacts concerning copper and zinc, the following questions/comments are raised:

Have the Department of Ecology and the Environmental Protection Agency compiled a repository of BMPs, procedural guidelines, available technologies, engineered structures, and manufactured mediums validated to align with the new stringent criteria for copper and zinc? Moreover, are these methodologies readily accessible to permit holders to facilitate adherence to the amended levels?

- Snohomish County

Response to 4.4.D

Yes, Ecology recently republished the Stormwater Management Manuals (SWMMs) for Western Washington and Eastern Washington. The 2024 SWMMs have source control and treatment BMPs that can achieve water quality-based benchmarks at Industrial Stormwater General Permit

(ISGP) facilities. The design and selection of BMPs varies depending on the industrial activity, exposed materials, vehicle/equipment traffic, impervious surfaces, and stormwater infrastructure. Some ISGP facilities with copper and/or zinc problems have used the SWMMs to select, design and install traditional or proprietary treatment BMPs [e.g., approved through Ecology's technology assessment protocol (TAPE)], including but not limited to advanced treatment systems to enhance filtration. Many ISGP facilities have achieved compliance with water quality-based benchmarks for copper and zinc, and this is expected to remain true in the future. The stormwater team will continue to evaluate best management practices and technologies to address stormwater pollutants.

4.4.E Comment Summary – If industrial stormwater permit limits or benchmarks are imposed on WWTPs (Wastewater Treatment plants), it's probable that wastewater treatment plants will need to impose new limits in their IWDP permits (industrial wastewater discharge permits). However, has any consideration been given to how this will impact the solid waste industry, given that facilities routinely accept domestic waste containing many regulated chemicals? When waste is processed at a transfer station, these chemicals are often released into the wastewater collection system, which then discharges to the sewer. How will the solid waste industry manage to meet IWDP discharge requirements without severely restricting what can be disposed of at a transfer station?

- Snohomish County

Response to 4.4.E

This rulemaking may require delegated municipalities, POTWs, and Ecology to reevaluate local limits and/or modify discharge permits for industries if necessary for the POTW to comply with new limits in their NPDES permit and changing water quality criteria. We cannot definitively say whether the aquatic life updates will impact a particular permit until an analysis is completed for each facility by the permit writer. If Ecology makes any changes to requirements for a delegated POTW, that municipality will evaluate the need for any new requirements or compliance schedules for their industrial wastewater permittees.

4.4.F Comment Summary – Unlike stormwater, there is limited technology that can successfully treat wastewater that is high in TSS and BOD (e.g. wastewater from a transfer station). Will technology be developed for this purpose?

- Snohomish County

Response to 4.4.F

No new technology will be developed as part of this rule. This rule's purpose is to appropriately assign protection levels for aquatic life from exposure to toxic chemicals in Washington. We encourage the permittee to work with their permit writer to discuss best management practices, and the available treatment technologies.

4.4.G Comment Summary – Many lakes in WA are currently listed on the state's 303d list as "impaired" for phosphorus. High levels of phosphorus can lead to excessive algal growth and blooms of harmful or toxic algae that harm lake users and aquatic life. One of the primary tools

for lake in these cases is the application of alum (aluminum sulfate) to permanently bind phosphorus as an agent that promotes prolific algae growth. When applied in quantities required for deactivation of excess phosphorus, alum treatments have shown to be effective at preventing harmful algal bloom and beneficial to aquatic life (e.g., clarifying water column that enables re-establishment of natural aquatic plant communities and the diversification of phytoplankton and zooplankton communities). However, treatment of lakes with alum will likely lead to temporary exceedances of the criteria for aluminum listed in Table 240 - Toxic Substances Criteria. To ensure that the proposed criteria do not prevent the use of alum treatments for lake restoration, the Department of Ecology's Aquatic Plant and Algae Management permit should allow for a temporary exceedance of the aluminum criteria following alum treatments. Furthermore, the monitoring requirements of the permit related to aluminum criteria should be clearly defined and limited to ensuring the exceedances are temporary.

- Snohomish County

Response to 4.4.G

Currently, the aquatic plant and algae management (APAM) permit uses short-term modifications to apply ALUM treatments that allows for a temporary zone of impact with recognition of the benefits of the application to the water body and full restoration following application. We anticipate that if aluminum aquatic life criteria are adopted, short-term modifications will continue to be used for ALUM treatments in the APAM permit and that it will have minimal impact to this permit. Future monitoring of aluminum during ALUM applications may need to be considered when this permit is updated to account for the new aluminum aquatic life criteria.

While ALUM is used to treat lakes, we encourage pollution control strategies that proactively prevent phosphorus loading from occurring.

4.4.H Comment Summary – The Technical Support Document and Implementation Plan do not adequately explain how ambient water quality data will be collected and applied for the aluminum and copper criteria.

The MLR criteria are dependent on the ambient water quality (e.g., pH, hardness, dissolved organic carbon). The TSD mentions that permittees will be able to measure the ambient data themselves to calculate the site-specific criteria. However, it is not clear if the ambient data must be collected in the receiving water or at the NPDES discharge point. In addition, the cost due to additional sample collections has not been included in the regulatory analysis.

Ecology should explain in the TSD exactly how it will apply the copper and aluminum criteria in both individual and general permits. The draft cost benefit analysis is a limited analysis of the impact of the proposed copper criteria on facilities covered under the Industrial Stormwater General Permit. The cost benefit analysis used regional pH, hardness, and DOC values for eastern and western Washington without any reference to TSD or Implementation Plan. Ecology should explain how it intends to develop copper effluent limits and benchmarks and whether it intends to add any new parameters to the ISGP based on the other proposed aquatic life toxics criteria. Ecology should also explain whether it will continue to a modest dilution factor of 5 in deriving copper benchmarks as it has done in the Industrial Stormwater General Permit (ISGP) and Boatyard General Permit. Absent this information, the cost benefit analysis is illusory.

- Association of Washington Business

Response to 4.4.H

We have added some guidance on data collection needs to develop site-specific copper criteria in the implementation plan. Collection of water quality data should consider flow conditions and well mixed portions of the receiving water body. Ideally, water quality data should be collected during average flow conditions. At least three sampling events should occur per season, but more may be necessary depending on the purpose of the criteria calculation. If only one year of water quality data are available, more than three sampling events per season are recommended to establish MLR input values. The variability between seasons may allow for data to be combined in other ways such as wet/dry seasons or average annual conditions. We suggest that permittees work with permit writers to develop input values that are indicative of receiving water conditions. The data needed to use the MLR model may be specific to a given permit and/or receiving water.

Permittees do not have to collect pH, hardness, and dissolved organic carbon (DOC) to receive aluminum and copper criteria. However, if water quality data are not available for a site, then the conservative default criteria will apply. Because these sampling costs for pH, hardness, and DOC are considered optional due to the ability to apply default criteria, additional costs do not need to be assessed for the regulatory analysis.

Future updates to permits and associated benchmarks are difficult to predict. Updating all permits, limits, and benchmarks is beyond the scope of updating the aquatic life criteria and would not account for the public process and comment period associated with each permit update. We made a conservative evaluation of potential permit limits stemming from the updated aquatic life toxics criteria in this rule. We anticipate that the impacts outlined in the preliminary regulatory analysis are greater than what will be experienced once the rule is implemented because of the conservative assumptions built into the analysis. This is explained in Appendix D of the technical support document.

4.4.I Comment Summary – The Tribe is encouraged to hear Ecology is working to implement the timely reissuance of existing NPDES permits (every 5 years) to ensure new or revised criteria are incorporated as soon as feasible. In addition, while compliance schedules are an accepted permitting tool, they should be used as necessary rather than by default.

- Suquamish Indian Tribe of the Port Madison Reservation

Response to 4.4.I

Thank you for your comment. We do our best to update all permits in a timely manner and implement water quality tools when necessary to achieve compliance.

4.5. Impacts to clean up work under Model Toxics Control Act

4.5.A Comment Summary – The Hanford Site offices are subject to an extensive cleanup framework and schedules under the Tri-Party Agreement and Consent Order. The proposed rulemaking could affect existing and future cleanup decisions and actions if the proposed standards are incorporated into soil and groundwater standards.

Ecology should provide clarification about whether the rule may impact cleanup considering WAC 173-340, if so, Ecology should provide a cost analysis. The rule appears to have potential for such impact, because surface water quality values are considered in establishing cleanup levels.

- U.S. Department of Energy Richland Operations Office

Response to 4.5.A

The purpose of this rulemaking is to update the aquatic life toxics criteria to align with new scientific studies on toxic effects to aquatic life and endangered species protection. Ecology is obligated by the Federal Clean Water Act to protect all aquatic life in Washington regardless of the impacts to cleanup decisions. We understand that other programs may incorporate sections of WAC 173-201A into their regulations to ensure protection of aquatic life.

We did not quantify the cost impacts to cleanup site for this rulemaking, because those costs are site-dependent and depend on factors beyond the protection of aquatic life. Ecology also does not have primary authority at the Hanford cleanup site. That authority is EPA's under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and we do not know what decisions are made to carry out those requirements. Therefore, it is not reasonable for Ecology to contact all cleanup sites and speculate on potential costs. However, we have added some general considerations in the Final Regulatory Analyses on impacts to clean up sites.

We are required to be consistent with the Clean Water Act and protect Washington's aquatic life species, including endangered species. We encourage you to contact the respective program that implements aquatic life toxics criteria to understand the impacts on cleanup sites.

5. Comments on specific toxic chemicals

5.1. 6PPD-q

5.1.A Comment summary – Commenters support Ecology adopting 6PPD-q criteria. Commenters note the toxic effects of 6PPD-q on aquatic life, and in particular coho, steelhead and rainbow trout. Specifically, commenters support adopting a freshwater acute criterion of 8 ng/L.

- Franks, Larry
- Jamestown S'Klallam Tribe
- Lake Sammamish Kokanee Work Group
- Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Salmon Recovery Council
- Northwest Environmental Advocates
- Northwest Indian Fisheries Commission
- Port Gamble S'Klallam Tribe
- Puget Soundkeeper

- Snohomish Basin Salmon Recovery Technical Committee
- Spokane Riverkeeper
- Squaxin Island Tribe
- Suquamish Indian Tribe of the Port Madison Reservation
- Washington Council of Trout Unlimited

5.1.B Comment summary – Commenters want Ecology to update criteria, including adopting additional criteria for 6PPD-q, in the future as more information becomes available on 6PPD-q and its toxic effects in fresh and marine water.

- Jamestown S'Klallam Tribe
- Lake Sammamish Kokanee Work Group
- Northwest Indian Fisheries Commission
- Spokane Riverkeeper
- U.S. EPA
- Washington Council of Trout Unlimited

Response to 5.1.A and 5.1.B

Thank you for your support. We have updated the 6PPD-quinone criterion based on new toxicity data released since the proposal and have adopted derivation methods that EPA used in their screening level value[7] (USEPA, 2024). The revised freshwater acute 6PPD-quinone criterion is 12 ng/L. We plan to track any new toxicity data that becomes available in the future.

5.1.C Comment Summary – Please do all you can to prohibit and or remove 6-PPD Quinone from the environment by banning or utilizing bioswales to neutralize the chemical.

- Byrne, Jim

5.1.D Comment Summary – Washington State needs to phase out the sale and use of tires made with 6ppd.

- Washington Council of Trout Unlimited

Response to 5.1.C and 5.1.D

Thank you for your comment. The scope of this rulemaking is limited to updating aquatic life criteria. The aquatic life 6PPD-quinone criteria may have environmental benefits when implemented through Clean Water Act programs.

Strategies to remove 6PPD-quinone from the environment is beyond the scope of this rulemaking. Ecology's other programs are reviewing alternatives and strategies to address 6PPD

[7] U.S. Environmental Protection Agency (USEPA). 2024. Acute Aquatic Life Screening Value for 6PPD-quinone in Freshwater. Office of Water: Washington D.C. EPA-822-R-24004.

and 6PPD-quinone. We encourage the commenters involvement in public processes for other regulatory actions related to 6PPD such as permitting processes and development of stormwater practices.

5.1.E Comment Summary – Soundkeeper asks Ecology to use the power of momentum around 6PPD-quinone to develop chronic marine and freshwater criteria. Given the extreme mortality caused by this chemical wherever it is discharged – including into estuaries, rivers, marshes, and in places at the very mouths of salmon spawning streams, Soundkeeper also asks Ecology to apply the current freshwater acute criteria in marine waters as well.

- Puget Soundkeeper

Response to 5.1.E

Thank you for your comment. Unfortunately, there is only adequate data to develop criteria for the freshwater acute criterion at this time. This analysis has also been confirmed by USEPA (2024).[8] We will continue to track new research and may consider additional criteria in the future as data become available.

5.1.F Comment Summary – Commenter expresses safety concerns in tire wear if 6PPD is banned.

- Davies, Paul

Response to 5.1.F

Thank you for your comment. We are not proposing a ban on 6PPD-quinone in this rulemaking. We are proposing a criterion for 6PPD-quinone to protect aquatic life from experiencing effects to their growth, reproduction, and survival. The adoption of a 6PPD-quinone criterion will assist regulatory programs in identifying water of concern where aquatic life are not protected and where implementing best management practices may assist in reducing the impact of 6PPD-quinone in the environment.

5.1.G Comment Summary – The acute criterion is to prevent risk of mortality from a 1-h exposure. In support of a 1-h exposure duration as relevant, research conducted at WSU PREC showed that juvenile coho salmon (O. kisutch) exposed to 25% roadway runoff experienced some mortality after as little as a 1-h exposure. This data is currently unpublished but will be incorporated into an upcoming publication and can be provided upon request.

- Washington Stormwater Center

[8] U.S. Environmental Protection Agency (USEPA). 2024. Acute Aquatic Life Screening Value for 6PPD-quinone in Freshwater. Office of Water: Washington D.C. EPA-822-R-24004.

Response to 5.1.G

Thank you for your comment. The 1-hour averaging period is recommended by EPA in the 1985 EPA guidelines for acute criteria development and is based on the duration of the toxicity tests used to develop the criteria.

5.1.H Comment Summary – The proposed 6PPD-quinone acute freshwater criterion is not supported by sufficient data.

EPA's minimum data requirements for deriving aquatic life criteria (Stephen et al. 1985) for 6PPD-quinone were not met, and data informing toxicity and species-specific impacts remain sparse. In addition, there remain large gaps in knowledge regarding chronic effects of 6-PPDquinone, but also regarding its mechanisms of toxicity and interaction with environmental stressors. The extent to which 6PPD-quinone poses a risk to diverse aquatic species is still poorly understood, and therefore development of criteria protective of aquatic life are premature. Research efforts should prioritize elucidating the sub-lethal and cumulative impacts of 6PPDquinone exposure across a range of concentrations, environments, and time scales. Additionally, studies aimed at identifying the sensitivity variances among species and life stages can help refine water quality criteria, ensuring they quantifiably protect the most vulnerable members of aquatic ecosystems. Until these data are available, following EPA recommendations by abstaining from proposing aquatic life criteria until minimum data requirements are met may result in more robust, scientifically defensible criteria.

- Association of Washington Businesses

Response to 5.1.H

EPA recently released screening level values for a freshwater acute 6PPD-quinone criterion based on the currently available data. We reviewed EPA methods and our proposed criterion using a species sensitivity distribution using the latest scientific studies. Both methods resulted in a similar criterion of 8 ng/L for the updated species sensitivity distribution and 12 ng/L using EPA's screening level method. We updated EPA's screening level using new scientific studies released in 2024 and removed one study EPA used because zebrafish is not a surrogate for native North American species. We have decided to use EPA methods as the pathway for developing a 6PPD-quinone freshwater acute criterion, while using the species sensitivity distribution as secondary support. The freshwater acute criterion is 12 ng/L. See the Technical Support Document for a full explanation of decisions as well as USEPA (2024) for justifications on data inclusions and exclusions.[9]

We support moving forward with a 6PPD-quinone criterion because coho salmon have been shown to be highly sensitive to 6PPD-quinone, and there is low variability among the results of the three supporting toxicity studies available for coho salmon. Coho salmon are the most sensitive aquatic species to date, and other data indicates high sensitivity for other commercially, culturally, and recreationally important species such as the rainbow trout and coastal cutthroat trout. The toxicity data used for acute criterion development are based on survival data. The

[9] U.S. Environmental Protection Agency (USEPA). 2024. Acute Aquatic Life Screening Value for 6PPD-quinone in Freshwater. Office of Water: Washington D.C. EPA-822-R-24004.

studies available indicate there are clear effects to particular fish species, while other aquatic life are not sensitive. Many of the toxicity studies are shorter in duration because toxic effects of 6PPD-quinone manifest in a short amount of time. The effect of longer duration tests on the 6PPD-quinone criterion would only lower the value because longer exposures lead to additional toxicity. Given the nature of 6PPD-quinone's short-pulsed exposures in the environment during stormwater events, we support short duration tests for the acute criterion development.

We have received overwhelming support to move forward with a 6PPD-quinone criterion from interested parties, including Tribes. While other data on 6PPD-quinone, such as the mechanism of action, would be a benefit to the scientific community, it is not necessary to develop aquatic life criteria. We agree with EPA and the commenter in that there is not adequate toxicity data to develop saltwater or chronic criteria based on sub-lethal effects and that more research is needed. We will assess additional data in the future when it becomes available.

5.1.I Comment Summary – In Table 55 [of the Technical Support Document] "Acute toxicity data considered for criteria development for 6PPD-q," observed loss should be taken into account with comparing the LC50 values, both for the coho studies and more broadly across the dataset. The author reported LC50 values are a mix of initial concentrations and averaged concentrations over the exposure duration.

- U.S. EPA

Response to 5.1.I

We have corrected studies to account for loss over the study duration in a similar manner to EPA's screening values for 6PPD-quinone.

5.1.J Comment Summary – [U.S. Tire Manufacturers Association] (USTMA) identified several errors in the interpretation of the results of some cited studies that informed the derivation of the Criterion. These errors are outlined below.

a. In Ecology's Technical Support Document, page 118 states that "the only available data with definitive toxicity values included five fish species", and these five are listed in Table 55. However, it appears that the distribution (Figure 7) was generated using a sixth species (lake trout), which is not listed in Table 55.

USTMA requests that Washington Ecology provide a reference for the lake trout data or remove the inclusion of this species and update Table 55 and Figure 7.

b. The LC50 value reported in Table 55 for Oncorhynchus mykiss (rainbow trout) by Di et al., 20227 is 1.66 µg/L; however, this value is for the S-enantiomer of 6PPDQ only. Di et al. report an LC50 value of 2.26 µg/L for 6PPDQ racemate. Since 6PPDQ is unlikely to ever occur as a discrete enantiomer in surface water, the LC50 value of 2.26 µg/L is more appropriate for derivation of a criterion value. Additionally, it is not appropriate to include the S-enantiomer only in Table 55, as all other toxicity tests in the table would have been conducted with racemate and, as Di et al. noted in the article, 6PPDQ effects may indeed be enantioselective.

USTMA recommends that the value for the 6PPDQ racemate be used rather than the enantiomer, as it is more environmentally relevant and consistent with the other 6PPDQ toxicity studies reported in Table 55.

c. The LC50 value in Table 55 for Oncorhynchus tshawytscha (Chinook salmon) by Greer et al., 2023 is incorrect (LC50 = >80 µg/L). A definitive value of 82.1 µg/L is presented in Table S1 of Greer et al., 2023.

USTMA requests that this definitive value be incorporated in the dataset and the 6PPDQ criterion be recalculated using an LC50 = 82.1 µg/L for Chinook salmon.

d. The LC50 for zebrafish (Danio rerio; Varshney et al., 20228) is incorrectly reported as 139 µg/L in Table 55. The correct value is 132.92 µg/L. Additionally, zebrafish are a nonNorth American species, which is not noted in Table 55. It is, however, noted for other species in Table 55 as a basis for exclusion.

Zebrafish are a non-native North American species. If Washington Ecology chooses to include zebrafish in the final criterion derivation, USTMA requests that the agency provide justification for including a non-North American species, and the correct LC50 value should be used.

e. The LC50 values in Table 55 for Acipensar transmontanus (white sturgeon, Brinkmann et al., 2022) and Oryzias latipes (medaka, Hiki et al., 20219) are incorrect.

Although these two species and LC50 values were not used in criterion derivation, the LC50 for Acipensar transmontanus is >12.7 µg/L as reported in Brinkmann et al., 2022. The LC50 for Oryzias latipes is >34 µg/L as reported in Hiki et al., 2021. USTMA requests that Washington Ecology revise these values in Table 55 for technical accuracy.

- U.S. Tire Manufacturers Association

Response to 5.1.J

The reference in the development of the species sensitivity distribution for the sixth fish species was intended to be the Roberts et al. (2024) paper that discussed acute toxicity test results to lake trout. We have now included that reference in the Technical Support Document.

We have updated the Di et al. (2022) acute toxicity value with the racemic-based 6PPD-quinone LC50. The original thinking was to use the most conservative LC50 value representing the species for criteria development, but we acknowledge that this may not represent environmentally relevant exposures.

The Greer et al. (2023) study did extrapolate data beyond the concentration-response curve to calculate a LC50 value. We have decided to use this extrapolated value in the final criterion calculations as suggested by the commenter.

The Varshney et al. (2022) LC50 of 132.9 µg/L was used correctly in the criterion calculations, but there was a grammatical error in the technical support document. We have corrected this error. We have decided to remove zebrafish from criterion calculations because zebrafish is not a resident North American species and does not serve as a surrogate for other native North American species.

We have updated the LC50 values for *Acipenser transmontanus* and *Oryzias latipes* to align with this comment and USEPA (2024) reported values.[10]

Overall, we have decided to adopt EPA screening value methods for Washington's freshwater acute 6PPD-quinone criterion.

5.1.K Comment Summary – New LC50 to include in derivation. The criterion calculations should include the new LC50 by Liao et al. (2024) for O. mykiss (0.9 µg/L), with the caveat detailed below about concentration basis.

Liao, X.-L., Z.-F. Chen, S.-P. Ou, Q.-Y. Liu, S.-H. Lin, J.-M. Zhou, Y. Wang & Z. Cai (2024). Neurological impairment is crucial for tire rubber-derived contaminant 6PPDQ-induced acute toxicity to rainbow trout. Science bulletin, 69(5): 621.

- Washington Stormwater Center

Response to 5.1.K

We have included this recently released data into our criterion calculations.

5.1.L Comment Summary – Concentrations reported by Varshney et al. (2022) for the acute lethality determination on zebrafish (Danio rerio) are nominal and no measurements were made to confirm exposure concentrations. This LC50 should probably not be included in the analysis.

Varshney, S., A. H. Gora, P. Siriyappagouder, V. Kiron & P. A. Olsvik (2022). Toxicological effects of 6PPD and 6PPD quinone in zebrafish larvae. Journal of Hazardous Materials, 424: 127623.

- Washington Stormwater Center

Response to 5.1.L

According to EPA 1985 guidelines, acute toxicity studies do not need to have measured test concentrations for criteria development. We have decided to remove zebrafish data for other reasons. EPA 1985 guidelines suggest only using toxicity data for resident North American species for criteria development. Zebrafish are not resident North American species and do not represent surrogates for native North American species.

5.1.M Comment Summary – In many of the studies in Table 55 "Acute toxicity data considered for criteria development for 6PPD-q," no definitive LC50 was recorded and so they are not being used for criteria derivation. Generally, ">" values are considered conservative because the effective concentration is likely higher than the value reported. Although these are not definitive values, they do provide some information about other effects to aquatic life. If there are other reasons to not use some of these studies, the EPA suggests noting them here as well.

- U.S. EPA

[10] U.S. Environmental Protection Agency (USEPA). 2024. Acute Aquatic Life Screening Value for 6PPD-quinone in Freshwater. Office of Water: Washington D.C. EPA-822-R-24004.

Response to 5.1.M

We have included non-definitive LC50 values in the 6PPD-quinone criterion development. However, we are not supportive of applying non-definitive values in the four lowest GMAV/SMAVs.

5.1.N Comment Summary – Ecology could justify an even lower criterion based on 1/10th of the 96-hour LC50 toxicity.

Not only does Ecology's Technical Support Document (Feb. 2024) (the "TSD") provide a reasonable justification for the 8 ng/L WQC, but Ecology could have proposed an even stricter WQC. Ecology explained that most toxicity tests on coho salmon were 24 hours long and that most toxicity tests for invertebrates are 96 hours. Ecology posited that the LC50 result for coho might be twice as conservative if the tests were run for 96 hours, based on prior work (Brinkman et al. 2022) on rainbow trout. If that were the case—and further research should be pursued—then a 96-hour LC50 for coho would be closer to 20 ng/L, which would result in a WQC of 4 ng/L using the same five-fold safety factor.

- Washington Council of Trout Unlimited

Response to 5.1.N

The standard toxicity test duration for fish is 96 hours and invertebrates is 48-hours. We considered the discrepancy between the LC50 values reported in scientific literature and standard toxicity testing when developing the criterion value for 6PPD-quionone. Based on the available scientific studies, we support a 6PPD-quinone criterion of 12 ng/L as protective. We have added additional explanations in our justification section for 6PPD-quinone. We have received criticism for deviating from EPA's standard method for developing criteria. Therefore, we have developed freshwater acute 6PPD-quinone criterion using methods based on EPA's screening level values (USEPA, 2024) and a species sensitivity distribution (same as proposal). The EPA's screening level value method resulted in a criterion of 12 ng/L and the species sensitivity distribution resulted in a criterion of 8 ng/L, indicating close agreement between methods. Based on criticisms from commenters on deviating from EPA methods, we decided to move forward with methods presented in EPA's screening level values document (USEPA, 2024).[11]

5.1.O Comment Summary – Washington ecology's approaches to derive an acute aquatic life value for 6ppdq lack transparency and reproducibility

For 6PPDQ, several approaches were utilized to derive an acute aquatic life value. Given the limited availability of data for 6PPDQ toxicity in aquatic organisms included by Washington Ecology, multiple refinements were made. However, the document lacks transparency regarding the agency's reasoning and methodologies, which inhibit the replication of the agency's work.

The standard derivation method in the 1985 Guidelines that Washington Ecology used to derive aquatic life criteria requires toxicity data from at least eight taxonomic families. Washington Ecology was unable to derive a criterion value using this method due to insufficient data. To

[11] U.S. Environmental Protection Agency (USEPA). 2024. Acute Aquatic Life Screening Value for 6PPD-quinone in Freshwater. Office of Water: Washington D.C. EPA-822-R-24004.

account for this lack of data, the agency utilized the Web-based Interspecies Correlation Estimation (WEB-ICE) model to estimate toxicity data for the missing families. This method does not follow the 1985 Guidelines, which states:

Criteria should attempt to provide a reasonable and adequate amount of protection with only a small possibility of considerable overprotection or underproduction. It is not enough that a national criterion be the best estimate that can be obtained using available data; it is equally important that a criterion be derived only if adequate appropriate data are available to provide reasonable confidence that it is a good estimate…. If all the required data are not available, usually a criterion should not be derived [emphasis added].

The 1985 Guidelines clearly emphasize that a standard should not be set without the appropriate data, which Washington Ecology does not have. Without sufficient data to set a water quality standard for 6PPDQ, Washington Ecology should reconsider the Criterion for 6PPDQ.

Although Ecology reports the 6PPDQ WEB-ICE results in Appendix C, it is unclear which of these results (e.g., which LC50s) were incorporated into the "eight-family method" to fill in toxicity values for the three missing taxonomic families. Therefore, it is not possible to replicate this method, so we were unable to verify the resulting value of 46 ng/L as reported by Washington Ecology (p. 118).

Additionally, Washington Ecology's reference to "EPA's single species alternative method" is unclear. USTMA assumes that the agency is referring to using the geometric mean of the acute values for the most sensitive species (i.e., coho salmon), which is recommended in the 1985 Guidelines when this value is lower than the calculated Final Acute Value (based on the eightfamily method).

Furthermore, for the species sensitivity distribution (SSD) using data available data for 6PPDQ provided in Table 55, and the methodology described in subsequent text for derivation of an aquatic life criterion for 6PPDQ (e.g., use of EPA's SSD Toolbox), USTMA was unable to replicate or verify a species sensitivity distribution 5 th (LC5) percentile value of 0.008 µg/L.

USTMA requests that Washington Ecology provide additional information in the Technical Support Document that would enable verification of the Criterion derivation approaches, such as information on which specific EPA SSD tool was used, which SSD distribution was selected (e.g., normal, logistic), which fitting method was used (e.g., maximum likelihood, linearization), and the raw data used in the analysis to increase transparency and reproducibility.

- U.S. Tire Manufacturers Association

Response to 5.1.O

We did not base the 6PPD-quinone proposed or final criterion on WEB-ICE data and it was not included in the final eight family method. We used WEB-ICE data as an exercise to see if data gaps could be filled, similar to how EPA used WEB-ICE to develop draft PFOA/PFOS criteria in 2022. We have removed this exercise to avoid the confusion.

The single species method is the geometric mean of the LC50s for the most sensitive species which we refer to as the single species method. This is a standard method presented in EPA 1985 guidelines for deriving aquatic life criteria.

For the final 6PPD-quinone criterion, we developed a freshwater acute 6PPD-quinone criterion using methods based on EPA's screening level values (USEPA, 2024) and a species sensitivity distribution (same as proposal). There was close agreement between both methods (12 vs. 8 ng/L). We believe there are adequate and appropriate data to provide reasonable confidence that this criterion is a good estimate of protection. Coho salmon are clearly the most sensitive species known to 6PPD-quinone, and we have no reason to believe that this will change in the future based on the scientific literature. We have included reasons that support the protectiveness of the final 6PPD-quinone criterion in the technical support document as it relates to coho salmon sensitivity and the *Oncorhynchus* genus.

We have added additional information in Appendix C of the Technical Support Document that outlines the inputs of the different methods and exercises used. This should provide additional transparency on the derivation process. We also encourage the commenter to review EPA's methods for their 6PPD-quinone screening level value that use time-weighted average LC50 values (USEPA, 2024). We have adopted a similar approach.

U.S. Environmental Protection Agency (USEPA). 2024. Acute Aquatic Life Screening Value for 6PPD-quinone in Freshwater. Office of Water: Washington D.C. EPA-822-R-24004.

5.1.P Comment Summary – The proposed acute aquatic life value is 0.008 µg/L (1-hour) for freshwater organisms. This means that freshwater aquatic organisms and their uses should not be affected unacceptably if the 1-hour average concentration of 6PPDQ does not exceed 0.008 µg/L. However, there is a lack of rationale for the decisions for refinements that Washington Ecology used to derive the Criterion. The agency utilized an inappropriate interpretation of the 1985 Guidelines which served as the basis for these derivations.

Within the Technical Support Document, Washington Ecology does not provide an adequate technical rationale for deviating from the 1985 Guidelines. The rationale for performing a "species sensitivity distribution, rather than a genus sensitivity distribution" is not consistent with the 1985 Guidelines for deriving water quality criteria. From the 1985 guidelines:

The Final Acute Value is now defined in terms of Genus Mean Acute Values rather than Species Mean Acute Values. A Genus Mean Acute Value is the geometric mean of all the Species Mean Acute Values available for species in the genus. On the average, species within a genus are toxicologically much more similar than species in different genera, and so the use of Genus Mean Acute Values will prevent data sets from being biased by an overabundance of species in one or a few genera.

Ecology's decision to use species instead of genus results in a heavily biased distribution by omitting effect values of more resistant species, which would normally be accounted for in a Final Acute Value derived according to the 1985 Guidelines. Indeed, the basis for inclusion of only certain species in Washington Ecology's distribution is not fully explained.

Washington Ecology states that the 8 ng/L value derived using the SSD approach is sufficiently protective because it is below the currently reported LC5 values for coho. However, the 1985 Guidelines do not make any recommendations to compare final criterion values to a single species LC5 value when determining sufficiency of protection.

USTMA requests that Washington Ecology provide a rationale and reference in the Technical Support Document to support the exclusion of 6PPDQ data for tolerant species and further justification to support a "species sensitivity distribution" rather than a "genus

sensitivity distribution". Additionally, USTMA recommends that Washington Ecology provide rationale and reference for comparing the criterion value to a LC5 to support reasonable protection.

The agency also calculated the species mean acute value using only toxicity data from coho salmon studies in accordance with the 1985 Guidelines (i.e., single species method) to obtain the Criterion value of 34 ng/L. However, Washington Ecology concluded that this value was not protective of coho because the toxicity tests were conducted over 24 hours, instead of the standard 96 hours. Further, the agency cites the findings of Brinkmann et al., 20223 to indicate a 2-fold increase in toxicity to 6PPDQ from 24 to 96 hours in rainbow trout. No technical justification is provided for this generalization across species and dose-responses to assume that there will be a two-fold increase in toxicity from 24h to 96h for coho salmon.

USTMA recommends that the 1985 Guidelines be followed when deriving a criterion value for a commercially or recreationally important species (i.e., coho salmon) that shows sensitivity to the chemical of interest. The 1985 Guidelines state that

if for a commercially or recreationally important species the geometric mean of the acute values from the flow-through tests in which the concentrations of test material were measured is lower than the calculated Final Acute Value, then that geometric mean should be used as the Final Acute Value instead of the calculated Final Acute Value (Stephen et al., 1985).

If the genus mean acute value is correctly calculated (see comments below re: inclusion of "greater than" values and non-North American species), it will likely result in a criterion that is not protective of coho salmon, due to their sensitivity to 6PPDQ. Thus, a more appropriate derivation for a Criterion Maximum Concentration (i.e., acute criterion) is the geometric mean of coho salmon effect concentrations and a safety factor of two, in accordance with the 1985 Guidelines. The resulting value would be 34 ng/L. This value is ~15% less than the lowest reported LC50 for coho salmon (41 ng/L; Lo et al., 2023).

Although standard Organisation for Economic Co-operation and Development (OECD) acute fish toxicity tests are 96h, the 24h tests presented in Table 55 of the Technical Support Document are still substantially longer than the 1-hour averaging period, which is used in a criteria statement because "high concentrations of some materials can cause death in one to three hours" (Stephen et al., 1985). Therefore, 24h test results should be considered as reported, with no extrapolations. Furthermore, a 96h study using coho salmon fry indicated an LC50 of 70 ng/L (Lang et al., unpublished), which is similar to the range of 24h values from Tian et al., 2022, Lo et al., 2023 , and Greer et al., 2023. USTMA recognizes that this (Lang et al.) data has not yet been peer-reviewed (SETAC 2023 poster). However, the lake trout toxicity data, which was used in the Criterion derivation, is also not yet peer reviewed. Further, USTMA notes that while the lake trout data is used to derive the Criterion, it is not cited in the Technical Support Document. USTMA recommends that the agency reevaluate its rationale for the extrapolation from 24h to 96h LC50 values by consulting the 1985 Guidelines and further review of the available evidence base.

- U.S. Tire Manufacturers Association

Response to 5.1.P

In our final criterion development, we have decided to explore methods that use the traditional eight family method in accordance with EPA's screening level values for 6PPD-quinone that was recently released (USEPA, 2024), as well as the species sensitivity distribution outlined in the proposal. There was agreement between both methods (12 vs. 8 ng/L). Based on this comment and others, we have decided to use the eight family method as outlined in USEPA (2024)[12], resulting in a 6PPD-quinone criterion of 12 ng/L. We believe there are adequate and appropriate data to provide reasonable confidence that this criterion is a good estimate of protection. Coho salmon are clearly the most sensitive species to 6PPD-quinone, and we have no reason to believe that this will change in the future based on the scientific literature. We have included reasons that support the protectiveness of the final 6PPD-quinone criterion in the Technical Support Document as it relates to coho salmon sensitivity. We compare the final 6PPD-quinone criterion to the reported LC5 and LC10s for coho salmon reported in scientific literature because LC10s are commonly used as a threshold for determining endangered species protection by the National Marine Fisheries Service and US Fish and Wildlife Service during Endangered Species Act consultation[13]. These LC5 and LC10s likely underestimate toxicity because they are based on 24-hour toxicity studies, while standard toxicity tests with vertebrates are 96-hours and are the suggested test duration for criteria development.

Here you will find EPA's justification for not combining the *Oncorhynchus* genus in EPA's screening value methods: "The species average LC50 for sensitive coho salmon (O. kisutch) was approximately 1,000 times lower than the least sensitive Oncorhynchus species average LC50 (Chinook salmon, O. tshawytscha). The Guidelines recommend that species values that vary by more than a factor of ten not be averaged; averaging the Oncorhynchus species tests would likely not be protective of the very sensitive endangered coho salmon. Thus, the EPA decided to develop the sensitivity distribution based on the individual Oncorhynchus species averages." We decided it was only appropriate to use single species in the eight-family method when the species are known to be a commercially, culturally, or recreationally important species and that species fall within the four lowest genus mean acute values. We combined other *Oncorhynchus* data outside of the four lowest GMAVs that were relatively insensitive to not overinflate the number of GMAVs available for the dataset. EPA's methods were necessary for protection of the most sensitive species within the *Oncorhynchus* genus.

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[12] U.S. Environmental Protection Agency (USEPA). 2024. Acute Aquatic Life Screening Value for 6PPD-quinone in Freshwater. Office of Water: Washington D.C. EPA-822-R-24004.

[13] U.S. Fish and Wildlife Service (USFWS). 2012. Formal section 7 consultation on USEPA's proposed approval of Oregon water quality criteria for toxics. Oregon Fish and Wildlife Office, Portland, Oregon. TAILS no.13420-2009-F-0011. 419 pp. + appendices.

U.S. Fish and Wildlife Service (USFWS). 2015. Formal section 7 consultation on USEPA's proposed approval of Idaho water quality criteria for toxics. Idaho Fish and Wildlife Office, Boise, Idaho. TAILS no. 01EIFW00-2014-F-0233. 352 pp.

National Marine Fisheries Service (NMFS). 2012. Formal section 7 consultation on USEPA's proposed approval of certain Oregon administrative rules related to revised water quality criteria for toxic pollutants. Northwest Region, Seattle, Washington. NMFS No. 2008/00148.

National Marine Fisheries Service (NMFS). 2014. Final Endangered Species Act section 7 formal consultation and Magnuson-Stevens Fishery Conservation and Management Act essential fish habitat consultation for water quality toxics standards for Idaho. Northwest Region, Seattle, Washington. NFMS No. 2000-1484. 376 pp. + appendices

States are allowed to develop state-specific criteria when justified.

5.1.Q Comment Summary – There are errors in the reporting and application of the study acceptability requirements.

The requirements for study acceptability are described on page 37-38 of Washington Ecology's Technical Support Document, which states that the requirements are based upon the 1985 Guidelines. Notably, two of these requirements specifically impact Ecology's evaluation of 6PPDQ. First, the Technical Support Document notes that acute values reported as "greater than" should not be used when they represent one of the four lowest genus mean acute values.

This requirement contradicts the 1985 Guidelines and directly influences the aquatic hazard data included or excluded in the evaluation. The 1985 Guidelines state, "if the tests were conducted properly, acute values reported as "greater than" values and those which are above the solubility of the test material should be used, because rejection of such acute values would unnecessarily lower the Final Acute Value by eliminating acute values for resistant species [emphasis add]." As indicated in Table 55 of the Ecology's Technical Support Document, the majority of the currently available evidence on toxicity of 6PPDQ in aquatic organisms was excluded on this basis. The inclusion of any of these values, in accordance with the 1985 Guidelines, would result in a higher final acute value.

USTMA requests that "greater than" i.e., non-definitive toxicity values (page 118; Table 55 of the Technical Support Document) be considered in the Criterion derivation for 6PPDQ in accordance with the 1985 Guidelines.

Second, Washington Ecology's Technical Support Document requires test species to be noninvasive North American species. This requirement is consistent with the 1985 Guidelines but was incorrectly applied by Washington Ecology. The 1985 Guidelines state, "data obtained with non-resident species in North America [emphasis added], or previously exposed organisms may be used to provide auxiliary information but should not be used in the derivation of criteria [emphasis added]." Table 55 and Figure 7 of Ecology's Technical Support Document indicate that two non-North American species were included in the derivation of the Criterion. White spotted char (Salvelinus leucomaenis pluvius) is not a North American species. Additionally, zebrafish (Danio rerio) are specifically listed as "nonresident" in Appendix 1 of the 1985 Guidelines and is not a North American species.

USTMA requests that Washington Ecology exclude S. leucomaenis pluvius and D. rerio from the Criterion derivation calculations in accordance with the study acceptability protocol provided in the Technical Support Document and recommended by the 1985 Guidelines.

- U.S. Tire Manufacturers Association

Response to 5.1.Q

We have clarified that "greater than" or non-definitive LC50 values are not to be used in the four lowest GMAVs unless data are limited. We do not support using non-definitive LC50 values in the four lowest GMAVs because of the uncertainty associated with the toxicity value. The LC50 could be orders of magnitude higher and it would not be known. We have included "greater than" LC50 values in the 6PPD-quinone final criterion derivation but not the four lowest GMAVs/SMAVs.

We have decided to include invasive species with established resident populations in North America based on EPA's comment on the rule. EPA contends that these species serve as surrogates for other resident species in North America.

We have removed zebrafish from the 6PPD-quinone dataset, even though EPA uses zebrafish data in their screening level value calculations (USEPA, 2024). EPA states that they used nonresident North American test species (i.e., zebrafish and white-spotted char) because they serve as surrogates for other North American resident species. We think there should be a slight deviation to this policy and that non-resident North American test species should only serve as surrogates for genera that are native to North America. The *Danio* genus of zebrafish does not have a native species in North America. The white-spotted char serves as a surrogate for other species in the *Salvelinus* genus that are native to North America.

5.1.R Comment Summary – Initial VS time-weighted concentrations. Concentrations of 6PPD-quinone experienced early during an exposure are more important to causing mortality than concentrations experienced later during an exposure. This was shown by Chow et al. (2019) for coho exposed to roadway runoff, whereby fish transferred to clean water midway through a 24-h exposure died at the same timing and rate as fish that remained in the exposure water. Many of the studies used to develop the criterion reported significant decreases in exposure concentration (47-97%) across 24 hours. Several of those studies based the LC50 determination on time weighted average concentrations (TWA), which would produce a falsely low estimate of the LC50. Due to the importance of earlier concentrations, initial concentrations should be used to determine LC50s. The LC50 value of 0.51 ug/l reported for S. leucomaenis (Hiki et al. 2022) in Table 55 is based on the TWA and should be replaced by the value of 0.80 ug/L which Hiki et al. reported as based on initial concentrations. The estimated LC50 based on initial concentrations should be requested from Liao et al. (2024). It is unclear whether values from Di et al. (2022) and Brinkmann et al. (2022) are also based on TWA, which should be verified with the study authors and corrected to initial concentration basis.

Brinkmann, M., D. Montgomery, S. Selinger, J. G. P. Miller, E. Stock, A. J. Alcaraz, J. K. Challis, L. Weber, D. Janz, M. Hecker & S. Wiseman (2022). Acute toxicity of the tire rubber-derived chemical 6PPD-quinone to four fishes of commercial, cultural, and ecological importance. Environmental Science & Technology Letters, 9(4): 333.

Di, S., Z. Liu, H. Zhao, Y. Li, P. Qi, Z. Wang, H. Xu, Y. Jin & X. Wang (2022). Chiral perspective evaluations: Enantioselective hydrolysis of 6PPD and 6PPD-quinone in water and enantioselective toxicity to Gobiocypris rarus and Oncorhynchus mykiss. Environment International, 166: 107374.

Hiki, K. & H. Yamamoto (2022). The tire-derived chemical 6PPD-quinone is lethally toxic to the white-spotted char Salvelinus leucomaenis Pluvius but not to two other salmonid species. Environmental Science & Technology Letters, 9(12): 1050.

- Washington Stormwater Center

Response to 5.1.R

Thank you for your comment. We agree that there should be consistency in deriving LC50s using initial or time-weighted average concentrations. We support using time-weighted averaged concentrations for deriving LC50 values because it better represents exposure over the duration

of the test. More data are needed on loss of initial concentrations over time in relation to toxicity before discounting chemical loss in LC50 calculations. EPA took a similar approach in using time-weighted averages in their 6PPD-quinone screening level value (USEPA, 2024).

We have included reasons that support the protectiveness of the final 6PPD-quinone criterion in the Technical Support Document as it relates to coho salmon sensitivity. We compare the final 6PPD-quinone criterion to the reported LC5 and LC10s for coho salmon reported in scientific literature because LC10s are commonly used as a threshold for determining endangered species protection by the National Marine Fisheries Service and US Fish and Wildlife Service during Endangered Species Act consultation (USFWS, 2012; NMFS, 2012: USFWS, 2015, NMFS, 2015). These LC5 and LC10s likely underestimate toxicity because they are based on 24-hour toxicity studies, while standard toxicity tests with vertebrates are 96-hours and are the suggested test duration for criteria development.

5.1.S Comment Summary – 24-h VS 96-h durations. Given that the exposure window for the criterion is assumed to be 1 hour, LC50 values based on a 24-h exposure duration are more relevant than LC50 values based on a 96-h exposure. The O. mykiss value from Brinkmann et al. (1.0 ug/L) currently included in the criterion derivation in Table 55 is from a 96-h exposure. The 24- h criterion reported by Brinkmann et al. was 1.96 ug/L. The 24-h value should be used. Values reported by Di et al. are also from 96-h exposures and 24-h values should be requested and used in the derivation.

- Washington Stormwater Center

Response to 5.1.S

EPA recommends an averaging period of 1-hour for acute criteria for aquatic life according to their 1985 EPA guidelines[14]. The averaging period dictates how often we might require sampling and to avoid "averaging out" of high pulsed exposures of a pollutant by averaging multiple samples over a long period of time. EPA states that high concentrations of some materials can cause death in one to three hours and that delayed effects from a pulsed exposure are difficult to know in the environment. The averaging period is intended to restrict allowable fluctuations in the concentration of a pollutant in receiving water and restrict the amount of time the concentration in the receiving water can be above the criterion. We support moving forward with a 1-hour averaging period.

5.1.T Comment Summary – We applaud Ecology's decision to propose criteria for 6PPD-quinone. 6PPD-quinone is an emerging contaminant of concern for WDFW and many of the effects on salmonid species and other aquatic life are still unknown. Although criteria are typically derived using 96-hour toxicity tests, we agree with Ecology's decision to use the currently available data from 24-hour toxicity tests to derive a value based on the 5th percentile species sensitivity distribution. Given the high toxicity of 6PPD-quinone to coho salmon, a culturally, ecologically, and economically important species to Washington state, **we would also**

[14] Stephan, C.E., Mount, D.I., Hansen, D.J., Gentile, J.H., Chapman, G.A. and Brungs, W.A., 1985. *Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses* (p. 98). Washington, DC: US Environmental Protection Agency.

support Ecology using the 1st percentile species sensitivity distribution instead of the 5th percentile to ensure 6PPD-quinone criteria are sufficiently protective of salmonids.

- WA Department of Fish and Wildlife

Response to 5.1.T

We support using the 5th percentile of the species sensitivity or genus sensitivity distribution at this time. In comparing the final freshwater acute 6PPD-quinone criterion with the most sensitive species (i.e., coho salmon) toxicity data, adequate protection is provided. We have included reasons that the final criterion is appropriate in the Technical Support Document.

5.1.U Comment Summary – We request that Ecology clarify the 6-ppd-quinone freshwater acute water quality criteria and conduct a peer review. We support Ecology's efforts to establish a freshwater acute water quality criteria value for 6-ppd-quinone, which is an important step to protect coho salmon from the significant toxicity of this compound. We request that Ecology provide more clarity on the derivation of the 6-ppd-quinone freshwater acute water quality criteria and conduct a peer review of the science and methods used.

For the selected value of 8 ng/L, we do not find a clear linkage between the methods and selected value in the Technical Support Document. For instance, in Figure 7 of the Technical Support Document the x-axis is labelled "stressor intensity" even if it appears to be 6-ppd-quinone concentration. We also would appreciate better understanding how the curve was derived, and the confidence limits. The 8 ng/L proposed criteria concentration appears to be highly dependent on that curve fit. We note the lowest LC5 value in the Technical Support Document is 16.6 ng/L for coho salmon. Thus, we ask that Ecology provide more clarity on the derivation of this criteria.

- King County

Response to 5.1.U

We have included additional information in Appendix C of the Technical Support Document to provide more transparency to the methods used. The EPA species sensitivity distribution toolbox is available online through EPA's website and the reference included in the technical support document. We can provide this calculator and data inputs upon request. For the final criterion, we have used EPA methods outlined in their 6PPD-quinone screening level value (USEPA, 2024). This rulemaking is reviewed internally and externally by EPA headquarters through each critical step in the rule development process. We have a lengthy and inclusive public process in our rule development and have had substantial feedback throughout that process.

5.1.V Comment Summary – As a stormwater permittee, we are very concerned about the impacts of 6PPD-q to water quality. However, in general, the addition of 6PPD-q to the Code at such an early stage of study is concerning.

There is a lot that is still unknown about 6PPD-q, including its fate and transport in the environment, impacts on species, and strategies for reducing its presence. We strongly advocate that Ecology utilize existing resources to address these issues, including: ensuring laboratories are certified and capable of handling sample analysis, an independent SAM study to better

understand the potential impacts to our receiving waters and aquatic life; how to control sources through best management practices; and identifying strategies for design/redesign of infrastructure to support source control.

- Port of Tacoma

Response to 5.1.V

Thank you for your comment. Our agency and others are continuing to develop resources to address any implementation concerns regarding the 6PPD-quinone criteria such as best management practices, water quality monitoring, laboratory accreditation and method development, and source control. This work will continue and is another piece of important work to address this toxic chemical. We anticipate making advancements with all of the efforts that are underway to address 6 PPD-Q. The criteria that we adopt will need final EPA approval prior to use for Clean Water Act purposes. We anticipate that during this process, we will make advancements in addressing strategies to control 6PPD-quinone.

5.2. Acrolein

5.2.A Comment Summary – Ecology is required to adopt criteria for acrolein. Its comment that it is "not aware of endangered species protection issues for Washington endangered species in regards to EPA's recommended acrolein criteria" and therefore need not give any further consideration to assessing whether EPA's recommended criteria are sufficiently protective is nonsensical because there have been no ESA consultations on this pesticide.

- Northwest Environmental Advocates

Response to 5.2.A

We developed a strategy that utilizes available information on ESA consultation in the Pacific Northwest. You are correct that acrolein has not been consulted on in the past. The adoption of acrolein in Washington will allow for EPA and the Services (NMFS/USFWS) to conduct an ESA consultation on EPA's national recommendations. We have no reason to believe that EPA national recommendations for acrolein will be disapproved.

5.2.B Comment Summary – Commenters request Ecology to reconsider establishing both the acute and chronic toxicity criteria for acrolein at 3.0 [ug/L (or ppb). Many irrigation districts and companies in the State of Washington rely on the usage of this chemical tool for aquatic vegetation management in their respective irrigation conveyance systems. There is major concern that the establishment of these newly low standards will have an enormous impact on a current effluent limit allowed under the NPDES and SWD General Permit: Irrigation System Aquatic Weed Control (ISAWC). These proposed low standards do not align with the practicable usage of an EPA and WSDA registered herbicide product and its FIFRA and SEN approved labels: Magnacide H™ (EPA Reg. No. 10707-9) which contains the active ingredient acrolein. The Magnacide (or acrolein) federal FIFRA label was approved for reregistration by EPA in 2014, and the WA State SEN label was approved by WSDA in 2022. This chemical is the most effective and reliable herbicide tool on the market that provides broad spectrum control of large vascular plants and algae in irrigation conveyance systems throughout the western United States and worldwide. When applied in accordance with the product labels and manual this herbicide

will provide results in a short time frame of hours opposed to days, and its non-selective mode of action will eliminate all types of aquatic vegetation pests such as pondweeds, elodea, watermilfoil, and algae. Irrigation Districts and companies have the responsibility to deliver satisfactory water supply to landowners and/or growers when they need it. The ability to control overgrowth of aquatic weeds and algae with acrolein must be available to operate the conveyance system(s) efficiently and economically as possible. By setting very low WA state surface water quality standards (and potentially lowering future NPDES and SWD effluent limits) for acrolein, it will cause major disruption on the sustainability of designated agricultural water uses and the continued viability of agricultural production in the State of Washington.

- Association of Washington Business
- Kennewick Irrigation District
- Roza Irrigation District
- Roza-Sunnyside Board of Joint Control
- Sunnyside Valley Irrigation District

5.2.C Comment Summary – The utilization of acrolein and copper within irrigation districts in Washington State is already subject to stringent regulation. Some regulations have been recently updated through the implementation of a revised April 2022 Section 24c SLN label for acrolein and a renewed October 2023 Irrigation System Aquatic Weed Control NPDES Permit. A 2023 Washington State Department of Ecology Environmental Impact Statement (EIS) analyzed the potential impacts of using these chemicals for controlling aquatic plants and algae within an Integrated Pest Management framework. In conclusion with its own recent EIS, ecology reaffirmed the previously established maximum instantaneous use concentration of 21 ug/L for acrolein and 25 ug/L for copper.

The proposed Freshwater Acute acrolein limit of 3 ppb (ug/L) would effectively render acrolein unusable as a means for irrigation districts to manage aquatic plants and algae. Acrolein stands out as the sole non-selective and rapidly acting herbicide within our already constrained toolbox. Drawing from experience, the East District understands the challenges inherent in operating facilities without access to acrolein. The selective limitations of alternative products have facilitated the resurgence of previously controlled invasive plants and algae, requiring increased copper usage and undesirable mechanical cleaning efforts to sustain essential water deliveries.

- East Columbia Basin Irrigation District

Response to 5.2.B and 5.2.C

We understand that there may be a conflict between approved labels for the application of herbicides that contain acrolein that are used by irrigators and protection levels for aquatic life under the federal Clean Water Act. We do not consider the usage or label recommendations for herbicides when developing aquatic life toxics criteria. The primary focus of developing aquatic life criteria is to protect the most sensitive organisms and life stages from experiencing effects to growth, survival, and reproduction. We proposed to adopt EPA national recommendations for acrolein with the notion that levels higher than EPA recommendations may be detrimental to aquatic life. In a determination on May 25, 2023, stemming from litigation (CASE NO. C20-1362 MJP), EPA determined Washington needs to adopt acrolein aquatic life criteria and that

Washington is inconsistent with the Clean Water Act. If we do not adopt acrolein aquatic life criteria, EPA will likely promulgate national recommendations for acrolein for Washington. We anticipate future collaboration with interested parties, including the irrigation districts, on updating the Irrigation System Aquatic Weed Control general permit and discussion on implementation concerns and compliance determinations when Washinton has a federally approved acrolein criteria.

5.3.Aluminum

5.3.A Comment Summary – The Association supports the proposed water quality criteria for aluminum and is happy to see that Washington is taking a leading role among the states in implementing the new criteria in this manner. Furthermore, the Association supports DOE's proposal to allow permittees to gather their site's water chemistry data to calculate site-specific default criteria that may supersede the proposed 5th percentile regional acute and chronic default criteria.

- Association of Washington Business

Response to 5.3.A

Thank you for your support.

5.3.B Comment Summary – Proposed changes in Table 240 - Toxic Substances Criteria, footnote "e" indicates the following: Criteria are calculated using the Aluminum Criteria Calculator V.2.0 that is published in EPA's "Final Aquatic Water Quality Criteria for Aluminum 2018" (EPA-822-4-1-001). In this EPA calculator, the description in line 123 of the "Read me" tab indicates: EPA aluminum criteria recommend staying within specific limits for pH (5.0-10.5), total hardness (0.01-430 mg/L as CaCO3) and DOC (0.08-12.0mg/L) for generating criteria. If input data are not within the range described for each analyte, the EPA calculator flags the result as "outside model inputs". Question 1: How does one interpret the calculated result if the inputs for one or more analytes are outside model limits? Question 2: In the multiple scenarios spreadsheet, the flag "outside model inputs" is generated at times even when values are within the limits described above for each analyte. For example, a DOC reading of 8.2, Hardness value of 22.6 and pH value of 8.92 resulted in flagged output. One of the reasons for a flagged result when none was expected could be the formula used in column "J" appears to be using an upper limit for pH of 8.2 rather than the referenced upper limit of 10.5. Could you clarify how to interpret the result when a flag is generated, even though input values for pH, hardness and DOC are all within the model limits indicated in the "Read me" tab.

- Snohomish County

Response to 5.3.B

The toxicity tests that served as the basis for the MLR model did not examine all scenarios of pH, hardness, and DOC. Therefore, EPA extrapolated the predicted toxicity (and associated criteria) for some water quality conditions. There is some inherent uncertainty with this extrapolation as EPA points out below. If inputs are within the model boundaries that EPA provides in the README spreadsheet, then it is an acceptable criterion to implement. When pH,

hardness, and DOC are outside the specified range, the model automatically assumed the minima or maxima boundary of the parameter as the input value.

EPA's technical support document for the aluminum MLR model states:

"The models were developed using data that encompass a pH range of 6.0-8.7, DOC range of 0.08-12.3 mg/L and total hardness range of 9.8-428 mg/L (as CaCO3)."

The model boundaries are greater than the dataset used to develop the model. EPA addresses extrapolated criteria below:

"Extrapolated criteria values outside of the empirical pH data tend to be more protective of the aquatic environment (i.e., lower criteria values) in situations where pH plays a critical role in aluminum toxicity. However, criteria values generated outside of the range of the pH conditions of the toxicity tests underlying the MLR models are more uncertain than values within the pH conditions of the MLR toxicity tests, and thus should be considered carefully and used with caution."

5.3.C Comment Summary – Ecology discusses having default criteria where state-specific data are not available to use the MLR model but it fails to state what water chemistry data are and demonstrate that they are likely to be protective when used. What is the distinction that Ecology is seeking to make in stating that its criteria distribution is "intended to protect the majority of waters with regulated discharge of aluminum"? TSD at 47. Water quality criteria are not limited to discharges but, rather, apply to all waters.

- Northwest Environmental Advocates

Response to 5.3.C

The distinction we are making is that using the 5th percentile default criteria for aluminum is a conservative approach. When we evaluated the statewide dataset for concurrently sampled pH, hardness, and DOC, it included all locations in the state, including the most sensitive water bodies (low hardness and low DOC). Many of the most sensitive water bodies are found outside of developed/urban locations where regulated discharges do not occur. The 5th percentile default criteria are driven by those most sensitive waters. Using the 5th percentile default criteria has a high likelihood of providing adequate protection for all waters, but specifically and more confidently, for locations where there is a necessity to calculate aluminum criteria due to a regulated discharge.

5.3.D Comment Summary – The default criteria for aluminum should be based on more spatially explicit data.

Ecology's methodology for deriving aluminum criteria, which aligns with EPA's latest recommendations, lends itself well to the calculation of site-specific criteria that leverage local dissolved organic carbon (DOC), pH, and hardness (or conductivity) input data. However, as proposed, only East/West defaults were calculated and noted to be used in the absence of available local data. Given the spatial distribution of available concurrently sampled inputs (as shown, e.g., in Fig 1 of the technical support document), consideration should be given to deriving ecoregion-specific aluminum criteria using more regionally specific input data. Oregon's Department of Environmental Quality, for example, used Level III Ecoregions when

deriving its default aluminum criteria (ODEQ 2021). At the very least, a thorough data analysis should be conducted to justify the spatial extent chosen for default criteria, and locally prioritized data should be considered for constructing more than simply East/West defaults.

- Association of Washington Business

Response to 5.3.D

We took into consideration your comment and have replaced the east/west default criteria with EPA Level II ecoregional default values for the copper and aluminum MLR-based criteria. The default criteria are now represented by three regions. Please see the updated rule language and technical support document for the updated default criteria.

5.3.E Comment Summary – Ecology should consider the background concentrations of aluminum in water bodies in Washington to ensure there is empirical data to support the theoretically calculated default and site-specific aquatic life criteria.

Aluminum is the second most abundant element in the Earth's crust and therefore is ubiquitous in the environment. In Washington (and along the west coast in general), the aluminum content of soils is among the highest in the nation (Figure 1). This has a direct impact on the concentrations of aluminum in surface waters and stormwater runoff, as well as in stormwater treated by proprietary media filters and natural treatment systems, most of which contain sand and soils. Ecology should consider the naturally higher aluminum content in soils and the potential for aquatic species to be better adapted to these conditions when applying EPA's recommended MLR model for computing aquatic toxicity.

- Association of Washington Business

Response to 5.3.E

An analysis of background aluminum concentrations in waters throughout the state would be an interesting study. However, the purpose of the aluminum water quality criteria is to protect the most sensitive species and life stages from experiencing reductions in growth, reproduction, and survival. While background concentrations of aluminum should be evaluated in regulated discharges, it has no bearing on setting protection levels for aquatic life. The 5th percentile default criteria are intended to be conservative to ensure the default criteria are protective of all waters in Washington. Furthermore, every permittee will have the opportunity to collect site-specific water quality information on pH, hardness, and DOC to calculate aluminum criteria representative of the receiving water where they discharge. We encourage any regulated entities to collect site-specific water quality information to receive the most appropriate criterion value.

5.3.F Comment Summary – The Association requests that the final rule add an additional footnote (qq) for the use of the acute and chronic aluminum criteria, as consistent with other federal and state initiatives, that states:

(qq) the criteria are expressed as the bioavailable portion of aluminum consisting of those concentrations of aluminum which may contribute to toxicity as modeled in the "Final Aquatic Life Ambient Water Quality Criteria for Aluminum 2018 (EPA-822-R-18-001), December 2018." Aluminum concentrations identified through an approved test method which do not

contribute to aluminum concentrations considered within this model, including sources from particulate matter which lack bioavailability under ambient conditions, shall be excluded from these criteria.

This proposed revision addresses the misalignment of laboratory water testing conditions versus ambient natural water conditions and provides for use of the new pH 4 method once it has been validated through the ASTM process. The addition of this footnote is in line with and would assist in the promulgation of Washington DOE Water Quality Policy 1-11, Chapter 2, Ensuring Credible Data for Water Quality Management, which directs monitoring entities to use new, accredited methods published by EPA and ASTM, among other groups and laboratories, as soon as is practical.

- The Aluminum Association

Response to 5.3.F

We agree with your comment and have added footnote to the rule language to address and recognize the analytical concerns regarding total recoverable aluminum methods that utilizes a pH of 2. We have added a footnote similar to Oregon's footnote that allows for the use of the bioavailable aluminum method when within the confines of state and federal regulations.

5.3.G Comment Summary – For aluminum, there is no mention of the form of aluminum that would be considered under the rule. Since aluminum is the most abundant metal in earth's crust, it would be reasonable to find it in every natural waterbody. Mr. Finch clarified that the rule is only geared at free aluminum, such as would be the result of mining. This should be inserted into the aluminum discussion starting on Page 45 of the document for clarification.

- Washington Association of Sewer and Water Districts

Response to 5.3.G

The rule language states whether the criteria are based on total or dissolved fractions in the footnotes. The aluminum MLR-based criteria are based on total recoverable aluminum. The scientific consensus has been that the total recoverable method for aluminum overestimates bioavailable fraction of aluminum and that a method that better addresses dissolved aluminum and aluminum bound to particulate matter would be useful and more accurately reflect toxicity under natural instream conditions (e.g., He and Ziemkiewics 2016; Ryan et al. 2019). We are addressing this issue by adding a footnote to the aluminum criteria in the rule language and discussing it further in the technical support document.

5.4. Arsenic

5.4.A Comment Summary – Ecology might be interested to know that neither Idaho nor EPA has timely met the reasonable and prudent alternatives for arsenic criteria in Idaho. See, e.g., Northwest Environmental Advocates, Before the United States Environmental Protection Agency, Petition for Rulemaking to Implement Reasonable and Prudent Alternatives in Biological Opinions from the U.S. Fish and Wildlife Service and National Marine Fisheries Service for Toxic Water Quality Criteria in Idaho Water Quality Standards (June 1, 2023) (hereinafter "NWEA Idaho RPA Petition") (EPA has failed to promulgate aquatic life criteria for

Idaho waters for chronic arsenic, acute and chronic cyanide, chronic lead, acute and chronic nickel, acute and chronic zinc, and to remove the low hardness floor to meet the reasonable and prudent alternatives in the Idaho Biological Opinions and avoid jeopardy to numerous ESA-listed species). We support updating the marine chronic criterion but not using the 1985 Guidelines.

- Northwest Environmental Advocates

Response to 5.4.A

As EPA pointed out in their comment on Washington's aquatic life toxics proposal, we mistakenly applied the 1st percentile to the arsenic saltwater criteria based on our rule strategy to apply the 1st percentile when there is a jeopardy determination in another Region 10 state. While the Swinomish Tribe BE suggests effects to from the saltwater arsenic criteria, we believe the data used in the analysis to be out of date and that more recent data would significantly lower the magnitude of effect described. We encourage EPA and the Services to reevaluate saltwater arsenic criteria. We did not find any new marine arsenic studies that would effectively lower the arsenic criteria using EPA 1985 guidance. We encourage EPA to update their 1985 guidance, but it remains the standard to developing criteria. Without additional toxicity data to warrant lower criteria using the confines of the guidelines, we propose no changes to marine arsenic criteria.

5.4.B Comment Summary –The arsenic criteria are problematic because Washington State is the land of volcanoes, which are enriched in arsenic. This was brought to light some years ago during Ecology's Puyallup River Mediation. Ecology found elevated amounts of arsenic in Puyallup River waters as part of the reallocation of dissolved oxygen in the system. Ecology stated that they were going to examine treatment plants and industries on the river to discover how the elevated arsenic was getting into the river. A number of scientists involved in the mediation stated that was a waste of time because the arsenic was coming from the volcano. Ecology studied this for a number of weeks and came back to the group to state that the arsenic was coming from the volcano. Mr. Finch stated in an email that a Use Attainability Analysis (UAA) would need to be done when naturally occurring pollutants prevent the attainment of the aquatic life use. Ecology needs to document this in the rulemaking, but also needs to rethink this for natural systems that we already know are enriched with arsenic. A UAA is expensive and difficult to do. It seems pointless when we know that volcanoes are a key source in this state as already shown for the Puyallup River system.

- Washington Association of Sewer and Water Districts

Response to 5.4.B

When developing criteria, we only consider the concentrations of toxic chemicals that elicit a toxic effect in setting protective aquatic life values. During permit development, background concentrations of metal’s may be assessed to account for specific background issues.

5.5. Cadmium

5.5.A Comment Summary – Ecology notes that "[s]altwater cadmium criteria match EPA recommendations, and there are no known endangered species concerns." It appears, looking at Table 19, that Ecology means to say that "proposed criteria" match EPA recommendations, but it reads as if it is talking about current criteria. What Ecology does not say is whether, given Puget Sound in particular, there might be any saltwater concerns for cadmium and ESA-listed species. For example, Idaho has no saltwater in its state boundaries and neither does Oregon have anything that is the equivalent of Puget Sound. Ecology needs to evaluate whether EPA's recommended criteria are sufficiently protective of Washington marine species. We support Ecology's updating its freshwater criteria.

- Northwest Environmental Advocates

Response to 5.5.A

Saltwater cadmium criteria correction was made in the Technical Support Document. We are not aware of any additional toxicity data for cadmium in saltwater, especially for Washington relevant species. We are unaware of any concerns regarding the saltwater cadmium criteria at this time and can reevaluate the criteria in a future rulemaking.

5.5.B Comment Summary – More information is needed to comment on the proposed cadmium criteria.

Ecology is proposing to make the freshwater cadmium criteria even more stringent than EPA recommendations. The cadmium freshwater criterion maximum concentration (CMC) and the freshwater criterion continuous concentration (CCC) equations slopes match those from previously presented EPA equations (USEPA 2016). However, the intercepts of the Ecology equations do not match EPA equations, but Ecology notes that they used the same toxicity studies identified in EPA's guidance (2016). The methods and results for derivation of the CMC and CCC equations should be presented in the technical support document and the information presented (e.g., calculated slope, statistical significance, etc.) should be similar to Table 6 of EPA guidance (2016) with the selected intercept highlighted.

Ecology selected the criteria to match with the Idaho and Swinomish approved criteria and then back calculated the percentile/calculation to justify the number. For calculating the freshwater chronic cadmium criterion, Ecology used the 1st percentile of the toxicity data distribution from the EPA toxicity dataset but provided no scientific justification for this selection (vs. the 5th percentile used in the EPA guidance).

- Association of Washington Business

Response to 5.5.B

While it can be said that Washington's proposed freshwater acute cadmium criterion was developed to align with Idaho and Swinomish approved criteria, the latest scientific publications are supportive of such criteria. We have updated the Technical Support Document with the following supporting information. Regardless of choosing the 20th percentile of rainbow trout SMAVs or using the most sensitive species, *Oncorhynchus clarkii*, SMAV of 1.5 µg/L (hardness of 50 mg/L), the result is the same.

The decision to use a 20th percentile or lower of the SMAV is supported by USGS (Mebane, 2022)[15]:

"In the present dataset, there are 47 acceptable hardness normalized acute values for rainbow trout with cadmium EC50 values ranging from 0.96 µg/L to 10.0 µg/L, with a median value of 3.71 µg/L. Although the math (geometric mean versus median) and datasets differ, this median is effectively the same concentration as the species mean acute value derived in USEPA (2016)[16], 3.727 µg/L cadmium. Instead of using a central value of the rainbow trout dataset distribution such as the geometric mean or median to define the SMAV (which for cadmium is set equal to the FAV), a lower statistic such as the 20th percentile or the 10th percentile could be used in the calculation. The effect of doing so would reduce the acute CMC criterion from 1.86 µg/L in the 2016 version to 1.40 µg/L for a FAV using the "species 20th percentile acute value" or 0.82 µg/L for a FAV using the "species 10th percentile acute value" (Table 4). The lowest value in the dataset or a lower percentile than the 20th percentile such as the "species 10th percentile acute value" would be a logical choice from a species protection perspective."

Alternatively, we could justify the acute cadmium criterion of 1.3 µg/L by using the cadmium criteria developed by Mebane (2006). Mebane (2006) used EPA's single species method but with different datasets than the EPA 2016 cadmium update. Notably, Mebane (2006) included the *Oncorhynchus clarkii* SMAV of 1.50 µg/L (hardness of 50 mg/L) which serves as the basis for the calculated criteria. EPA (2016) did not include *Oncorhynchus clarkii* data in their update. We support the use of the Mebane (2006) dataset or using the 20th percentile of the rainbow trout SMAV in EPA's 2016 update[17]. Either method results in the same acute cadmium criterion of 1.3 µg/L (dissolved; hardness of 100 mg/L).

We did not use any new data or examine the slope of toxicity data for cadmium in this rulemaking. The slope is based on the relationship between toxicity and hardness and requires an evaluation of the raw toxicity data. We did, however, calculate a new intercept where criteria were modified. When the CMC and CCC changes, the intercept must also change to maintain the relationship and best fit between toxicity and hardness. This method of modifying criteria and updating the intercept has been demonstrated in several EPA documents. Below is one example:

$$\ln(criterion\ maximum\ intercept) = \ln(CMC) - (\ slope * \ln(hardness)).$$

See EPA's 1986 nickel criteria derivation as an example[18].

5.5.C Comment Summary – Washington's Cadmium Water Quality Criteria are Not Adequately Protective of Listed Species and Critical Habitats.

a. Freshwater Cadmium For cadmium, Ecology proposes a freshwater acute criterion of 1.3µg/L and a chronic freshwater criterion of 0.41 µg/L. Since EPA's nationwide 304(a) freshwater

[15] Mebane, C.A. 2022. The protectiveness of aquatic life criteria for threatened or endangered aquatic species: Cadmium in California. OSF Preprints. https://doi.org/10.31219/osf.io/d3tpe

[16] U.S. Environmental Protection Agency (USEPA). 2016. Aquatic Life Ambient Water Quality Criteria Cadmium. Office of Water: Washington D.C. EPA 820-R-16-002.

[17] Mebane, C.A., 2006. Cadmium risks to freshwater life: Derivation and validation of low-effect criteria values using laboratory and field studies (No. 2006-5245). US Geological Survey.

[18] U.S. Environmental Protection Agency (USEPA). 1987. Ambient Aquatic Life Water Quality Criteria for Nickel. EPA 440/5-86-004. National Technical Information Service, Springfield, VA.

cadmium criterion was vacated by court order, the maximum concentration reverted back to the 2001 criterion of 0.25 µg/L; at a minimum, Washington must do the same.

However, based on the outcome of Endangered Species Act consultation, these criteria must be set at a level that is protective of federally listed species in Washington. Comparatively, the FWS biological opinion for Oregon toxics stated that "chronic exposure to cadmium at the proposed chronic level [of 0.25µg/L] is considered to have adverse effects to all bull trout potentially exposed by reducing their fitness through a reduction in growth." The NMFS biological opinion for Oregon similarly found that "listed species exposed to waters equal to the acute or chronic [cadmium] criteria concentrations will suffer acute and chronic toxic effects."

a. Saltwater Cadmium Ecology's proposed change to saltwater cadmium criteria is also likely to put threatened and endangered species at risk. Ecology proposes to set saltwater cadmium criteria at EPA's 304(a) chronic criterion of 33µg/L and acute criterion of 7.9µg/L. During the peer review of EPA's 304(a) criteria, it was pointed out that the development of these criteria was based on insufficient toxicity data for effects on anadromous salmon and that "only one study evaluated Cd toxicity in coho salmon smolts in saltwater conditions, and this was at nearly full seawater strength." This was a concern because anadromous salmonids encounter cadmium at lower salinities. It is important to better understand the impact of varying levels of salinity on cadmium toxicity of anadromous fish species and incorporate those findings into Washington's criteria.

The same peer review also noted that sea level rise associated with climate change is likely to cause saltwater intrusion into salmonid spawning habitat making it particularly important to understand how salinity affects cadmium toxicity. Comparatively, in NMFS's biological opinion for Oregon's cadmium criteria, the agency pointed out various issues with EPA's criteria derivation methods, including for saltwater cadmium. Therefore, relying on the EPA's 304(a) will not necessarily result in adequate protection for threatened and endangered species and their critical habitats in Washington waters.

- Center for Biological Diversity

Response to 5.5.C

We support the proposed freshwater chronic cadmium criterion of 0.41 µg/L. We understand in a previous Biological Opinions (BiOps) by Oregon that a LAA was determined at the chronic cadmium criterion of 0.25 µg/L. The basis for this decision relies on the Hansen et al. (2002) study. However, we encourage the Services (NFMS/USFWS) to reevaluate the Hansen et al. (2002) work because the dataset has several inconsistencies that make the data questionable. We outline our concerns in the Technical Support Document, including the lack of a dose-response relationship.

From the technical support document:

"While the Oregon BiOps from USFWS and NOAA clearly suggest a potential for adverse effects of the EPA 2001 freshwater acute and chronic cadmium criteria, the chronic criterion (0.25 µg/L) was accepted by EPA and incorporated into Oregon's aquatic life toxics criteria. One potential reason for this acceptance is the inconsistent dose response curve in Hanson et al. (2002) that served as the basis for the "likely to adversely affect" determination for the chronic criterion, suggesting a questionable data set. We advise NMFS/USFWS to reconsider the use of

this inconsistent dataset when determining effects of chronic cadmium exposure to endangered species.

Furthermore, we have applied the 1st percentile of the genus sensitivity distribution to the freshwater chronic cadmium to provide additional protection. This method represents a more conservative method than EPA utilizes in the 1985 guidelines. The additional scientific studies included in the 2016 cadmium update likely drove the cadmium criteria higher than previously recommended in 2001. This is not uncommon has toxicity datasets get larger and more toxicity information becomes available on a wider range of species that end up being less sensitive."

5.5.D Comment Summary – In regards to the criteria calculations in the Freshwater Acute Cadmium Section the EPA suggests reviewing the paper by Mebane https://osf.io/preprints/osf/d3tpe for additional information.

- U.S. EPA

Response to 5.5.D

We have updated our justification for freshwater cadmium criteria based on work by Mebane (2006) and Mebane (2022).

5.5.E Comment Summary – The significant figures used in calculating the cadmium values need to be supported and consistent with the underlying data and rounded as appropriate.

- U.S. EPA

Response to 5.5.E

We have updated the cadmium calculations to reflect the specified number of significant figures in the Technical Support Document. The final rule language is reflective of our state proposed criteria and should serve as the basis for any future Clean Water Act submittals.

5.6. Carbaryl

5.6.A Comment Summary – Ecology states that it is not aware of any ESA concerns about the EPA recommended criteria for this pesticide. However, it fails to point out that there are other biological opinions that pertain to carbaryl. In 1989, the FWS issued a BiOp on pesticides that include carbaryl. FWS, U.S. Fish and Wildlife Service Biological Opinion on Selected Pesticides (June 14, 1989, rev. Sept. 14, 1989) (hereinafter "FWS Pesticide BiOp"). This BiOp includes a large number of jeopardy determinations for species that are similar to those present in Washington waters, e.g., suckers, trout, and mussels—relevant not because of an ESA-listing status but to the CWA requirement to protect designated uses. 40 C.F.R. § 131.11(a)(criteria must support the most sensitive use). According to FWS, this BiOp does not even begin to provide full protection to ESA-listed species. See Letter from David C. Frederick, FWS, to Gregg Cooke, EPA Regional Administrator, Re: EPA's noncompliance in Texas on National Pesticide Consultations (June 28, 2001). Ecology also misses the 2009 NMFS BiOp on the carbaryl registration. See, NMFS, National Marine Fisheries Service Endangered Species Act Section 7 Consultation Biological Opinion Environmental Protection Agency Registration of Pesticides Containing Carbaryl, Carbofuran, and Methomyl (April 20, 2009) (finding that

pesticide products containing carbaryl are likely to jeopardize the continuing existence of 22 listed Pacific salmonids and that the effects of carbaryl are likely to destroy or adversely modify designated habitat for 20 of 26 listed salmonids. Some of the species identified are present in Washington waters.). We are not in a position to assess the relevance of the science in these biological opinions to the EPA recommended criteria; that is Ecology's job.

- Northwest Environmental Advocates

Response to 5.6.A

Thank you for the information. Carbaryl was last updated by EPA in 2012 which should have accounted for any available toxicity data presented in Biological Opinions (BiOps) from 1989 or the 2009 NMFS BiOp on carbaryl registration. The method of evaluating effects in a pesticide BiOp is going to be inherently different than assessing the impacts of aquatic life criteria. Pesticide application evaluates labels, application rates, and target and non-target organisms. It can be difficult to translate those findings to the protectiveness of a water quality criteria. We may consider looking further into carbaryl criteria at a future date but are not aware of any data that would result in disapproval.

5.7.Chromium III

5.7.A Comment Summary – Ecology states there are no known concerns regarding ESA-listed species protection using EPA recommended criteria for chromium III. This is false. Chromium (III) is "predicted to result in mortality at the population level" by NMFS. NMFS Oregon BiOp at 486.

- Northwest Environmental Advocates

Response to 5.7.A

We stand corrected. There was a "likely to adversely affect" determination for bull trout in Oregon. This initiated an evaluation of new science for chromium III. There were two new toxicity studies that have been incorporated into the chromium III criteria, leading to lower freshwater acute (470 µg/L) and chronic (61 µg/L) compared with EPA recommendations. Thank you for the comment.

5.8.Chromium VI

5.8.A Comment Summary – We support Ecology's looking past the lack of jeopardy calls for freshwater chromium VI criteria in Idaho or Oregon and using new science available and the 1st percentile of the toxicity data distribution to derive chromium VI criteria. Chromium VI is "predicted to result in mortality at the population level" by NMFS. NMFS Oregon BiOp at 486.

- Northwest Environmental Advocates

Response to 5.8.A

We mistakenly said in the Technical Support Document that the 1st percentile was used. Only new science was used to update freshwater chromium VI criteria. This error has been corrected.

5.8.B Comment Summary – Wang et al. 2017 was used in the determination of the Cr(VI) ACR values. The study is based on a 28-day exposure of Lampsilis siliquoidea. The concentrations used to develop the dose-response curve did not have an adequate organism response that is required to establish a NOEC and LOEC. Based on the reported results of Wang et al. 2017, the concentration range is too large and should have been set between 20 and 50 ug/L (see below figure). An organism response occurring between only two concentrations indicates that incorrect test concentrations were used and a NOEC and LOEC (used to determine the MATC) cannot be established. Based on the study design and the lack of dose response, the results from this study must not be considered in calculating the ACR for Cr(VI).

- The U.S. Department of Energy Richland Operations Office

Response to 5.8.B

Wang et al. (2017) uses a dilution factor of two in the test design with concentrations being set at 0, 2.5, 5, 10, 20, 40, and 80 µg/L. Using a 6 concentration dilution series with a dilution factor of two follows standardized testing methodology for toxicity testing. We have no concerns regarding Wang et al. (2017) test design. We encourage the commenters to review ASTM, OECD, and EPA methods for conducting toxicity tests.

The MATC value is a common toxicological endpoint that takes the geometric mean of the NOEC and LOEC to calculate a threshold value. This endpoint is recommended to be used by EPA in their 1985 guidelines for deriving aquatic life criteria.

5.8.C Comment Summary – For the Cr(VI) chronic analysis, studies based on non-North American species must be removed in addition to the Wang et al. 2017 study (based on the lack of dose response). When these studies are removed based on established criteria, the previously excluded study using Pimephales promelas (EPA 1996) must also be removed from the Cr(VI) ACR calculations. This study was previously excluded due to the ACR being 10x greater than the other studies considered in the analysis. Additionally, the results reported in EPA 1996 for daphnia species must take precedence over those reported by Hickey 1989. The criterion listed in the technical document states the hierarchy based on study design are as follows: flow through > static renewal > static (if multiple studies existed for same species, studies were rejected if the more representative test design was used).

In addition, studies measuring chemical concentrations must be given precedence over those that do not. Hickey 1989 used a static renewal design (not flow through) and did not measure test concentrations. Based on these criteria, the studies used in the previous determination of Cr(VI) must be given precedence over the Hickey et al. 1989 studies for daphnia and ceriodaphnia. Overall, the new studies used to update the chronic criteria for Cr(VI) must be excluded based on the use of non-North American species, the lack of dose response, study design, lack of analytical testing, and the ACR being 10x higher than other studies. When these studies are removed, the previous ACR value of 2.917, consistent with current EPA aquatic life criteria, will be used in establishing Cr(VI) chronic criterion.

- The U.S. Department of Energy Richland Operations Office

Responses to 5.8.C

Based on EPA's comment on this proposed rule that recommends we include invasive species with established populations in North America, we have decided to include all resident North American species in the criteria derivation, whether invasive or not. EPA recommends using any species that have established resident populations in North America because they can serve as a surrogate for untested native species. We have decided to follow EPA guidelines.

Based on the new toxicity studies and associated ACRs, we found that EPA's previous exclusion of *Pimephales promelas* ACR of 18.55 is not warranted because Wang et al. 2017 found a similar ACR for *Lampsilis siliquoidea* (17.44). The consistency and high quality of these studies indicates they are appropriate and should be used.

After reviewing the Hickey 1989, Diamaninto et al. 2000, Gutierrez et al. 2010, Frietas and Rocha (2013), and Garza Leon et al. (2021) studies, we have decided not to include these studies in the ACR development for hexavalent chromium. These studies did not measure test concentrations in the chronic toxicity tests. The Natale et al. 2006 study used a species that is not resident to North America. We have revised the ACR to 5.349 and recalculated a freshwater chronic hexavalent chromium criterion of 6.7 µg/L.

5.9.Copper

5.9.A Comment Summary – Commenters support the use of bioavailability-based water quality criteria and acknowledge that the use of multiple linear regression (MLR) models facilitates their development and application of site-specific water chemistry in effluent permits. A commenter supports the use of the MLR model for copper freshwater criteria over EPA's biotic ligand model because it requires less complex site-specific data while offering the same protective levels as the biotic ligand model.

- Copper Development Association
- King County

Response to 5.9.A

Thank you for your support.

5.9.B Comment Summary – Commenters requested clarity on how often and for how long concurrent samples of pH, hardness, and dissolved organic carbon (DOC) would need to be collected to calculate acute and chronic criteria for copper at specific sites. Commenters also asked to explain what DOC is when talking about water quality in freshwater and to explain its relationship to copper.

- East Columbia Basin Irrigation District
- Kennewick Irrigation District
- Naches-Selah Irrigation District
- Roza Irrigation District
- Roza-Sunnyside Board of Joint Control

- Sunnyside Valley Irrigation District

5.9.C Comment Summary – Will districts be mandated to adopt the default (in our case East) MLR Model acute criteria of (2.5 ppb) or will there be sufficient time allocated for the collection of data necessary to formulate a more accurate site-specific criterion? Similar to acrolein, imposing a 2.5 ppb threshold for copper would greatly limit the beneficial use of the product and cause widespread operational difficulties.

- East Columbia Basin Irrigation District

Response to 5.9.B and 5.9.C

We have added some guidance on data collection needs to develop copper criteria using the MLR model in the implementation plan. Collection of water quality data should consider flow conditions and well mixed portions of the receiving water body. Ideally, water quality data should be collected during average flow conditions. At least three sampling events are recommended per season but more may be necessary depending on the purpose of the criteria calculations. If only one year of water quality data is available, more than three sampling events per season may be needed to establish MLR input values. The variability between seasons may allow for data to be combined in other ways such as wet/dry seasons or average annual conditions. We suggest that permittees work with permit writers to develop input values that are indicative of receiving water conditions. The data needed to calculate criteria based on site-specific conditions will be specific to a given permit and/or receiving water.

Dissolved organic matter, typically quantified as DOC, is a heterogeneous mix of organic matter of natural and anthropogenic origin that is impermeable to biological membranes. Generally, an increase in DOC decreases metal bioavailability and toxicity by complexing with free metal ions, thereby reducing metal binding at the biotic ligand. There are several well-established methods for measuring DOC such as EPA Method 415.3 and USGS Method O-1122-92.

In response to a different comment in this rule, we have decided to use EPA ecoregion level II for default criteria. This has led to higher default values for the eastern region (cold desert area) of 4.8 µg/L for the copper acute criterion and 3.2 µg/L for the chronic criterion. These defaults will only apply if water quality information is not collected for a site. We encourage permittees to collect their own site-specific water quality information and to work with their permit writer. We do not consider the usage or label recommendations for herbicides when developing aquatic life toxics criteria. The primary focus of developing aquatic life criteria is to protect the most sensitive organisms and life stages from experiencing effects to growth, survival, and reproduction.

5.9.D Comment Summary – Revising the copper criteria in Eastern Washington to a default value of 2.5 pg/L (or 0.0025 mg/L) will have significant impacts on the current discharge effluent limit allowed under the NPDES and SWD General Permit: Irrigation System Aquatic Weed Control (ISAWC). By restricting the permitted copper effluent discharges it will remove the ability to use copper algaecide products that irrigation districts rely on to manage and eliminate specific aquatic weed species in its conveyance systems, which actively grow every year during the warm irrigation season months. We request that Ecology reconsider setting the Eastern Washington default copper acute criteria at 2.5 pg/L and default copper chronic criteria

at 1.8 pg/L as these such low standards are going to make irrigation water conveyance more difficult to support agricultural growers and production in the State of Washington.

- Naches-Selah Irrigation District
- Roza Irrigation District
- Roza-Sunnyside Board of Joint Control
- Sunnyside Valley Irrigation District

Response to 5.9.D

To clarify, the proposed default copper acute criteria for eastern Washington was 2.5 µg/L and 1.8 µg/L for the chronic criterion. The units are µg/L rather than pg/L. Furthermore, these are default values and permittees may receive higher criteria values if they collect pH, hardness, and DOC in receiving waters and calculate criteria using the copper MLR-based equations provided in the rule language. The default values are intended to be conservative and protect the majority of waters in Washington. In response to a different comment in this rule, we have decided to use EPA level II ecoregions for default criteria. This has led to higher default values for the eastern region (cold desert region) of 4.8 µg/L for the copper acute criterion and 3.2 µg/L for the chronic criterion. However, we encourage permittees to collect site-specific water quality data to receive more appropriate criteria values for a given water body.

We understand that there may be a conflict between approved labels for the application of herbicides that are used by irrigators and protection levels for aquatic life that are required under the federal Clean Water Act. We do not consider the usage or label recommendations for herbicides when developing aquatic life toxics criteria. The primary focus of developing aquatic life criteria is to protect the most sensitive organisms and life stages from experiencing effects to growth, survival, and reproduction.

5.9.E Comment Summary – The explanation of Ecology's reliance on Mebane et al. (2023) is clear. What is not clear is the implication of the following: "Brix et al. (2021) noted differences in performance on a species-specific basis and differences in criteria depending on water chemistry." TSD at 72. Ecology should explain further the implications of the species-specific performance differences, as well as the water chemistry differences. For an approach that is rooted in providing species specific protections, failing to explain this leaves a lot to the imagination. The same is true of citing to Mebane's conclusion that the MLR-based criteria were "largely protective."

- Northwest Environmental Advocates

Response to 5.9.E

When developing MLRs on a species-specific basis, there is an expectation that the performance of the MLR will differ based on the datasets available. Brix et al. 2017 and 2021 cite these differences in the MLR model performance among different species and toxicity modifying factors (pH, hardness, and DOC). We adopted the pooled model that incorporates all the species-specific models into a single model. We have added language in the Technical Support Document that supports the use of the pooled model: "While statistical analysis to test for

species-specific slopes and intercepts revealed that some species slopes differed from the mean slope, the pooled model was still able to explain variability in copper toxicity for individual species at a comparable level to that explain by individual species models (Brix et al. 2017)."

We found it not necessary to explain Mebane's conclusion further in the text of the Technical Support Document, but for context here is the full statement from Mebane (2023): "Comparisons of the MLR based chronic criterion with field and experimental ecosystem studies with Cu indicated that other than shifts in water column or benthic algal communities, the MLR criteria was largely protective and fared better in these comparisons than did the hardness-based or BLM criteria." Generally, plants are less sensitive than early life stages of animals. There are many uncertainties associated with toxicity testing with plants and using shifts in algal communities is tenuous.

5.9.F Comment Summary – Firstly, we commend Ecology for considering a bioavailability-based approach for developing Cu criteria for the state of Washington. The work of Kevin Brix, David DeForest, Lucinda Tear, and others to develop MLR models has provided MLR models for several metals, including both Cu and Zn that follow sound scientific principles and the US EPA (1985) guidelines for deriving criteria. Further, the current nationally recommended Cu BLM-based criteria, and the Phase 1 CRADA report indicate that bioavailability considerations are important for Cu and several other metals. Available MLR models are certainly an improvement over the existing hardness equations, and they have been shown to be predictive of ecotoxicological data under finite sets of exposure conditions. However, MLR models – specifically those parameterized as separate acute and chronic models for criteria – have not been widely applied to natural surface waters. Whereas the Cu BLM (USEPA 2007) has been adopted by several states as statewide criteria (e.g., Idaho and Oregon) or as site-specific criteria (e.g., Colorado, Iowa, and several others).

As MLR models continue to be applied to US surface waters, their behavior in a wide range of natural surface waters (with widely varying combinations of toxicity modifying factors [TMFs]) will be thoroughly examined. Ecology has already recognized the issue associated with inversion of MLR model-based acute and chronic Cu criteria (i.e., where chronic criteria are higher than acute criteria) under certain circumstances and has proposed a simple remedy for that situation by applying a reverse acute-to-chronic ratio (ACR) on the chronic MLR model results. While this approach is simple, and it may be appropriate, what it emphasizes is that there appears to be a limit to the linearity assumption associated with MLR models (at least for some metals under some situations).

Given Ecology’s references to the NMFS and USFWS biological opinions (BiOps) on Oregon’s and Idaho’s Cu criteria, the lower level of protectiveness of the Cu MLR based criteria (compared to the BLM-based criteria) should be cause for concern. In fact, the path that Oregon and Idaho took to address the protectiveness concerns over the hardness equation was to adopt the nationally recommended Cu BLM. With the concerns raised here, we strongly recommend that Ecology follow a similar path as Oregon and Idaho on Cu criteria. If Ecology fails to do so, we predict that there will be future challenges from stakeholders on the lack of protectiveness and on the apparent departure from the best available science under some exposure scenarios. Furthermore, the proposed Cu criteria are different than the national recommendations and are likely different than any Cu criteria that will be recommended nationally by U.S. EPA in the future (i.e., U.S. EPA will develop their own MLR-based criteria). Therefore, the most

appropriate pathway to incorporate bioavailability for Cu (at this time) is to use the nationally recommended Cu BLM (U.S. EPA 2007).

- International Zinc Association

Response to 5.9.F

Thank you for your evaluation of the copper MLR model and BLM. According to Brix et al. (2021), the BLM and MLR show close correspondence for hardness and DOC based on the chronic MLR and for pH based on the acute MLR. Compared to the acute MLR, the BLM has a shallower response for hardness and a steeper response for DOC, whereas compared to the chronic MLR, the BLM has a steeper response to pH. Brix et al. (2021) concluded that the acute copper BLM and MLR model performances are quite comparable overall and the chronic MLR performs better than the chronic copper BLM. We understand that there are differences between the copper MLR and BLM model and the resulting criteria depending on the water quality condition. We anticipate that in some instances, the copper MLR model will be more conservative and other times it may not (Figure 9 of Brix et al., 2021). Given the implementation challenges of the copper BLM and the available water quality data in the state of Washington, we support moving forward with the copper MLR model at this time and may consider the copper BLM in the future.

5.9.G Comment Summary – The freshwater acute copper criteria as proposed appears complicated to implement. The EPA suggests that Ecology consider the sampling that will be needed to implement the criteria protectively and how many hardness samples will be needed to determine that hardness at a site indicates a more or less protective regression/model. The EPA believes that it might be less complicated to adopt the reverse acute to chronic ratio (ACR) approach. This is not an EPA recommendation for the proposed criteria, but rather information sharing for Ecology to consider.

- U.S. EPA

Response to 5.9.G

We agree that the acute copper criterion is more complex from a calculation perspective than the chronic copper criterion because two equations must be evaluated versus only one for the chronic. We do not agree that the acute copper criterion requires any additional water quality sampling such as hardness. The water quality samples used to represent the receiving water body will be applicable to the acute MLR based criterion the same as the chronic based MLR criterion. Two separate calculations do not change frequency or amount of data needed for pH, hardness, or DOC. The acute empirical model crosses over the chronic model at low pH as well due to slope steepness; thus, this isn't limited to hardness only. These toxicity datasets under different pH, hardness, and DOC scenarios are integrated into the empirical model and thus, the rule language allows both the acute empirical model and the reverse ACR model to be evaluated to determine the most appropriate criteria.

The acute empirical MLR model better aligns copper toxicity and water quality than the reverse ACR approach alone. The reverse ACR approach alone is the simpler approach, but incorporates a high degree of conservatism, ignores the empirical dataset, and is overall less accurate at

predicting acute toxicity. While we recognize there are advantages and disadvantages to both approaches, we chose the more accurate modeling approach for the acute MLR-based criterion.

5.9.H Comment Summary – The proposed freshwater copper criteria should be deferred until the basis for the criteria is corrected and peer reviewed.

EPA recommends using a Biotic Ligand Model (BLM) that depends on at least twelve water quality parameters for derivation of water quality criteria for copper. Ecology has not demonstrated that the MLR model is as protective as the BLM model for the state of Washington. The model used by Ecology for copper is based on Brix et al. (2021). However, the published study has a misprint and that a correction will be issued later this year. This was confirmed in a personal communication with Geosyntec on April 17, 2024. (WDOE 2024b) Some parameters of the formula (intercepts for the MLR equation) are missing, and the technical support document authors had to request information about these parameters separately. The study should not be used for developing the copper criteria until the correction is published and peer reviewed. Moreover, this study should be independently replicated. This is standard practice for new research with new methodologies. Peer review of a single study alone is not enough. Additional analysis or new data may result in completely different coefficients for the MLR equation.

- Association of Washington Business

Response to 5.9.H

The Brix et al. (2021) paper that serves as the basis for the copper criteria in this rulemaking has been corrected in a corrigendum. You can find this corrigendum at https://doi.org/10.1002/etc.5012 where it will indicate a correction has been made. The correction includes the full model equations for the pooled acute and chronic models.

The copper MLR model is a model that has incorporated world-wide datasets of toxicity information and toxicity modifying factors (TMFs) such as pH, hardness, and DOC. There is nothing unique about the water quality in Washington that would suggest that the BLM or the MLR does not provide protection and is not suitable. Brix et al. (2021)[19] and Mebane (2023)[20] demonstrate high comparability between the BLM and MLR models. Mebane et al. (2023) compared the MLR-based chronic criteria from Brix et al. (2021) to an independently compiled chronic criteria dataset and concluded the Brix et al. (2021) copper MLR model generated criteria protective of the 95th percentile level as intended by EPA's 1985 guidelines for deriving aquatic life toxics criteria. Mebane et al. (2023) also compared the MLR-based chronic copper criterion with field and experimental ecosystem studies with copper and found the MLR-based criteria were largely protective and performed better than the hardness-based or BLM-based criteria.

[19] Brix, K.V., Tear, L., Santore, R.C., Croteau, K. and DeForest, D.K., 2021. Comparative performance of multiple linear regression and biotic ligand models for estimating the bioavailability of copper in freshwater. *Environmental toxicology and chemistry*, *40*(6), pp.1649-1661.

[20] Mebane, C.A., 2023. Bioavailability and Toxicity Models of Copper to Freshwater Life: The State of Regulatory Science. *Environmental Toxicology and Chemistry*.

You suggest that the MLR study should be independently replicated. The BLM model has not been independently replicated. The MLR model has been peer reviewed in multiple publications, reviewed in a Society of Environmental Toxicology and Chemistry Pellston workshop, and reviewed by USEPA through the Cooperative Research and Development Agreement process. Additional data are unlikely to change the acute MLR, given that it changed very little between 2017 and 2021 despite additional data. When datasets become large as they are with the MLR model, additional data has less effect. Additional species could change the chronic copper MLR, but the same could be said for the BLM. The majority of new data have been incorporated in the MLR equation; arguably more recent research compared with the EPA 2007 copper BLM recommendation.

5.9.I Comment Summary – It is unfortunate that the acute and chronic models have different slopes and cross over at low copper concentrations - the critical zone. We support the use of the chronic model in preference to the acute model as the primary model. This model has had the most use in many risk assessments and gives the best agreement with the BLM.

- Copper Development Association

Response to 5.9.I

Thank you for your support. We used the chronic copper model as the basis for the chronic criteria and used the acute empirical model to the point of inflections with the reverse ACR based equation applied to the chronic model. This method uses the chronic model as the basis for the copper criteria, while relying on the empirical models to the highest degree possible and where the crossover occurs, applying the reverse ACR based equation. We believe this represents the most accurate model-based criteria moving forward.

5.9.J Comment Summary – One could argue that the acute values that are predicted to be lower than the predicted chronic values should be used. However, the acute model lacks robustness at low hardness and low pH because the sensitive species (daphnids) driving the model outputs are not well suited to these conditions. We know that Ceriodaphnia dubia does not reproduce well below a pH of 6.3 in the laboratory. This is suggestive that they may also be experiencing stress in laboratory acute studies at low pH and hardness. Frequently, the daphnids are not acclimated to both low pH and low hardness for 2-3 generations before the studies start.

- Copper Development Association

Response to 5.9.J

Thank you for the information. We have concerns on the mechanics of the acute empirical model at low hardness and low pH. We don't believe that acute copper criterion should be lower than chronic criterion based on the differences in durations used in the toxicity tests. Thus, where there is uncertainty under specific water quality conditions, we have developed a solution that uses the ACR approach applied to the chronic model. The ACR is a method that EPA uses when there is limited data and a relationship needs to be established between acute and chronic toxicity.

5.9.K Comment Summary – The Department of Ecology (DOE) has derived a cross-over fix using a reverse ACR applied to the chronic MLR criteria. This is a bit complicated for industries having to apply the approach. If DOE proceeds with this, it is recommended that several examples be provided in the Appendix describing how this is to be done using several different water chemistries to make the approach transparent.

- Copper Development Association

Response to 5.9.K

We agree that the reverse ACR in addition to the acute empirical model is more complex than using only a reverse ACR approach. However, we also believe that this approach most accurately represents the toxicity data for copper. Rule language is quite straightforward in that a permittee will need to calculate criteria values for two equations and the higher criterion is used to represent the acute criterion. We have added some examples in the Appendix from our Washington dataset.

5.9.L Comment Summary – A simplified approach, rather than the reverse ACR, would be to use the chronic MLR model and apply an ACR to the chronic criterion…. And don't use the acute MLR. The merits of this approach are that the model produces the final chronic value and the ACR is a fixed value. The calculation is simple and easy to use. While the ACR approach has been criticized as being too uncertain for many chemicals, this is not the case for copper. The ACRs for copper, at concentrations near the 5th percentile, are typically in the 1-3 range. As a generalization, when the ACR values are larger than 1-3, the studies performed were at concentrations well above the chronic criterion. In support of this statement, we provided a figure from Brix et al. (2001) showing the change in the cumulative frequency distribution using variable ACRs.

The proposed approach we suggested may have some consequences in terms of calculating the chronic criterion in the mid-range of pH, and hardness. There is the potential for the estimated chronic values to be somewhat overly conservative. This must be weighed against the complexity of the reverse ACR fix, the degree of conservatism introduced, and the likelihood that the values generated are low enough to be an issue to permits issued in the State of Washington. Will these values be higher than the default values – if so, perhaps they are not an issue for existing permits.

- Copper Development Association

Response to 5.9.L

Thank you for the information. We considered using the reverse ACR approach only for the acute copper criterion, but decided we should not ignore the empirical dataset. Utilizing it to the highest degree possible is the more accurate method to represent the acute copper criterion. When the crossover issue occurs, we institute the ACR approach to the chronic model to develop an acute criterion. As you mention, there are concerns for the conservatism in using the reverse ACR approach across all water quality scenarios that could have implications for permits. We appreciate the discussion here on the issue.

5.9.M Comment Summary – Permittees will have the opportunity to collect site-specific data to calculate site-specific criteria. Additional clarification is needed, if the concurrent data must be collected at the receiving waterbody or at the discharge source.

- Association of Washington Business

Response to 5.9.M

Water quality data should be collected in receiving water bodies to calculate criteria for the MLR-based criteria.

5.10. Cyanide

5.10.A Comment Summary – Washington's Proposed Cyanide Water Quality Criteria are Not Adequately Protective of Listed Species or Critical Habitats

a. Salmonids

Past consultations by FWS and NMFS on toxics criteria nationally and standards in several Pacific Northwest states indicate that the presence of cyanide threatens a number of federally listed salmonids species found in Washington, including bull trout, Chinook salmon, chum salmon, coho salmon, sockeye salmon, and steelhead.8

On the basis of these past actions, the bull trout appears to be the most sensitive of Washington's federally endangered and threatened species that is threatened by presence of cyanide. As detailed in the above chart, Ecology's proposed criteria for cyanide are higher than levels established through past biological opinions as necessary to adequately protect bull trout as required by the Endangered Species Act.9

Cyanide has been shown to cause reduced growth rates, reproductive performance, and survival in bull trout.10 High chronic levels of cyanide can reduce the number of eggs spawned by females, reduce the number of eggs that hatch, and drastically reduce the survivorship of young fish. In the biological opinion for EPA's national 304(a) cyanide criteria, FWS found that exposure to bull trout at the chronic criterion proposed by EPA would likely "substantially reduce their reproduction" and that exposure at the proposed acute criterion would likely cause "substantial reductions in survival."11 Based on this "magnitude of adverse effects," FWS found that the species was likely to be extirpated from the waters where they are exposed to cyanide toxicity at either criterion amount and suggested a chronic freshwater criterion of 0.68 µg/L—significantly lower than the chronic freshwater criterion of 2.7µg/L for cyanide the Ecology proposes here.

Washington should, therefore, revisit its proposed criteria and revise downward to a proposed chronic freshwater criterion for cyanide of no more than 0.68 µg/L, more so if updated science shows that a more stringent standard is necessary to protect bull trout and other salmonid populations; the Center does not take immediate issue with Washington's proposed acute freshwater criteria but request that it be revised as necessary subject to the outcome of further Washington-specific Endangered Species Act consultation activities.

b. Oregon Spotted Frog

In its 2010 consultation with EPA regarding national 304(a) water quality criteria for cyanide, FWS noted a lack of data for effects of cyanide on amphibian species but concluded that because

amphibians are among the most sensitive species for a significant number of the pollutants examined, it is likely that amphibian species are highly sensitive to cyanide.12 There, FWS used data for relative sensitivity of amphibians to rainbow trout, since rainbow trout is a species often used for criteria development.13 Based on this analysis, FWS concluded that amphibian species are estimated to be as or more sensitive to cyanide than rainbow trout and thus likely to be adversely affected by exposure to cyanide at EPA's suggested chronic criterion of 5.2µg/L.

Since that consultation was completed, the Oregon spotted frog was listed as a threatened species in 2014 and has two critically imperiled populations in Washington.14 The Oregon spotted frog is considered "the most aquatic native frog species in the Pacific Northwest (PNW)."15 In making its listing determination, the FWS determined that toxic chemicals pose a hazard to the Oregon spotted frog.16 Yet, Ecology does not even appear to have included the Oregon spotted frog on its list of relevant Endangered Species Act listed species.17 Cyanide criteria must therefore be adjusted accordingly following Endangered Species Act consultation.

c. Orcas Southern Resident

Orcas could also be indirectly affected by Ecology's proposed cyanide criteria due to the possible reduction in salmonid populations.18 Salmon, particularly Chinook salmon, are a key food source for the southern resident orcas and if proposed criteria harm salmonids, it is likely that the orcas will suffer as well. In NMFS consultation for EPA's national 304(a) cyanide criteria, the agency found that EPA's criteria would "reduce freshwater production of all listed salmon species, as well as non-listed salmon species where cyanide concentrations are allowed to reach EPA's recommended aquatic life criteria concentrations."

- Center for Biological Diversity

Response to 5.10.A

Thank you for the information. We have incorporated other considerations from commenters (e.g., EPA) and updated the freshwater acute cyanide criterion to 8.3 µg/L and the chronic criterion to 1.9 µg/L. We understand that the chronic criterion is still greater than what was suggested as a freshwater chronic cyanide criteria of 0.68 µg/L in the draft national 304(a) consultation for cyanide. The 0.68 µg/L protective level recommended in the national draft BiOp is based on modeling methods with high levels of uncertainty rather than relying on empirical data related to cyanide toxicity. To the best of our knowledge, we have used all the available toxicity information to develop these proposed criteria using methods we deem acceptable and appropriate for the state of Washington. Washington's proposed cyanide criteria are lower than EPA 304(a) recommendations.

We found high uncertainty in the suggested chronic cyanide criterion for bull trout found in the draft nationwide Biological Opinion (BiOp). The Services (USFWS/NMFS) use data from fathead minnow, brook trout, and bluegill as surrogate response species to estimate the magnitude of chronic effects to bull trout. They also use the WEB-ICE model to estimate species sensitivity. These methods are known to generate high variability compared with actual toxicity values. Given this high uncertainty within the draft cyanide BiOp, we support the proposed chronic value of 1.9 µg/L as protective of Washington's endangered species and encourage the Services (USFWS/NMFS) to consider updated datasets and the uncertainty associated with their analysis when making final determinations.

We understand that there are some data gaps with cyanide (e.g., amphibian data) and a more robust toxicity dataset would be ideal. We have accounted for these uncertainties by using the 1st percentile of the toxicity distribution rather than the 5th percentile recommended by EPA in their 1985 guidelines. This modification provides additional protection to aquatic life in Washington and represents a viable pathway forward that should be acceptable to EPA and other states.

5.10.B Comment Summary – In Table 64 [of the Technical Support Document] "Freshwater acute toxicity data used for criteria derivation," the SMAV for Daphnia magna is from an unmeasured acute toxicity study from 2013. Only the nominal concentration of NaCN was reported in the reference, so the EPA suggests calculating the free cyanide concentration. Per the EPA's calculation, the free cyanide concentration for Daphnia magna is 10.08 ug/L. All calculations based on this value should also be updated. It appears that another LC50 value of 160 ug/L for Daphnia magna was used in the EPA's 1984 criteria derivation, but Washington omitted this value from the calculation of SMAV in Table 64 and it is not discussed in Table 66 "Freshwater acute studies not used from previous EPA criteria derivations."

- U.S. EPA

Response to 5.10.B

Thank you for the comment. We have updated our dataset to reflect free cyanide concentrations and addressed any previously used data from EPA that were omitted in this rule.

5.10.C Comment Summary – For consideration, the Salmo salar study from 1983 used in [Technical Support Document] Table 64 "Freshwater acute toxicity data used for criteria derivation" and Table 65 "New freshwater acute studies that met data acceptability requirements since EPA last updated cyanide criteria (S = static, R = static renewal, FT = flow-through, U = unmeasured test concentrations, M = measured test concentrations)" was omitted from the EPA's 1984 criteria derivation because the exposure duration of the study was only 24 hours.

- U.S. EPA

Response to 5.10.C

Thank you for the comment. We support using the data for *Salmo salar* because it is rank 3 in the genus sensitivity distribution. If this study was extended to 96-hours, the acute toxicity value or LC50 would likely be lower. Omitting this study (Alabaster 1983) on the basis of study duration is not appropriate unless there are additional *Salmo salar* data that would supersede the Alabaster 1983 study and because it has significant influence on the final acute criterion.

5.11. Diazinon

5.11.A Comment Summary – Diazinon was determined to cause jeopardy to a large number of ESA-listed species in the 1989 FWS Pesticides BiOp. Species at jeopardy include mussels, trout, salamanders, chub, darter. It is Ecology's job to determine if the information on the pesticide registration is applicable to the EPA recommended criteria or Ecology's proposed criteria. This is particularly true when Ecology, as it is here, proposes to adopt criteria that it had not bothered to include in its standards to date. That Ecology is "not aware" of ESA issues does not mean that EPA's recommended criteria are the end of the analysis. See 40 C.F.R. § 131.11. Moreover,

Ecology should be aware of a significant source of information on diazinon: the NMFS, Revised Conference and Biological Opinion on the Environmental Protection Agency's Registration Review of Pesticide Products containing Chlorpyrifos, Malathion, and Diazinon (June 30, 2022). This BiOp did not result in a jeopardy determination only because "EPA and all diazinon applicants have subsequently agreed to modify the action by adopting Conservation Measures to avoid the likelihood of jeopardizing the continued existence of ESA-listed species or resulting in the destruction or adverse modification of critical habitat[.]"Regardless, the BiOp pertains to this pollutant and contains relevant analysis.

- Northwest Environmental Advocates

Response to 5.11.A

Thank you for the information. EPA last updated diazinon in 2005 and at that time should have considered datasets from Biological Opinion (BiOp) in 1989. The method of evaluating effects in a pesticide BiOp is going to be inherently different than assessing the impacts of aquatic life criteria. Pesticide application evaluates labels, application rates, and target and non-target organisms. It can be difficult to translate those findings to the protectiveness of a water quality criteria. We do not intend to develop state-specific criteria for diazinon at this time but may consider additional toxicity data in future rulemakings. We are not aware of any concerns that would result in the disapproval of the diazinon criteria. The triennial review process is a platform for stakeholders to express concerns and provide compelling information for prioritization of future rulemakings.

5.12. Dieldrin

5.12.A Comment Summary – Ecology notes that EPA's recommended saltwater criteria and existing Washington criteria for dieldrin are based on the now outdated 1985 methodology. That alone strongly suggests, for the reasons explained above, that Ecology should reassess those criteria rather than blindly continuing to rely upon them. See 40 C.F.R. § 131.11. The same is true of EPA's 1995 update to the freshwater criteria, upon which Ecology is relying. Dieldrin is known to be found in Washington's waters, making accuracy of the criteria particularly important. In its 2018 list, Washington had 55 waterbody segments in Category 5 and 386 in Category 3, for which it had insufficient data. Finally, dieldrin is "predicted to result in mortality at the population level" by NMFS.

- Northwest Environmental Advocates

Response to 5.12.A

We do not intend to develop state-specific criteria for dieldrin at this time based on our rule approach but may consider additional toxicity data in future rulemakings. Developing state-specific criteria for a single toxic is time and resource intensive. Dieldrin criteria were not determined to be a concern at this time but we are interested in continued evaluations of new data and aquatic life toxics criteria in the future. The triennial review process is a platform for stakeholders to express concerns and provide compelling information for prioritization of future rulemakings.

5.13. Endrin

5.13.A Comment Summary – Ecology notes that EPA's recommended saltwater criteria and existing Washington criteria for endrin are based on the now outdated 1985 methodology. That alone strongly suggests, for the reasons explained above, that Ecology should reassess those criteria rather than blindly continuing to rely upon them. See 40 C.F.R. § 131.11. The same is true of EPA's 1995 update to the freshwater criteria, upon which Ecology is relying. Shorebirds are among jeopardy calls for endrin in the FWS Pesticide BiOp, suggesting that Ecology should look at that information. Endrin is also "predicted to result in mortality at the population level" by NMFS. Blindly using EPA's recommended criteria is not sufficient.

- Northwest Environmental Advocates

Response to 5.13.A

We do not intend to develop state-specific criteria for endrin at this time based on our rule approach but may consider additional toxicity data in future rulemakings. Developing state-specific criteria for a single toxic is time and resource intensive. Endrin criteria were not determined to be a concern at this time but we are interested in continued evaluations of new data and aquatic life toxics criteria in the future. The triennial review process is a platform for stakeholders to express concerns and provide compelling information for prioritization of future rulemakings.

5.14. gamma-BHC

5.14.A Comment Summary – Lindane is "predicted to result in mortality at the population level" by NMFS. Blindly using EPA's recommended criteria, based on the outdated 1985 methodology is not sufficient.

- Northwest Environmental Advocates

Response to 5.14.A

We do not intend to develop state-specific criteria for gamma-BHC at this time based on our rule approach but may consider additional toxicity data in future rulemakings. Developing state-specific criteria for a single toxic is time and resource intensive. Gamma-BHC were not determined to be a concern at this time but we are interested in continued evaluations of new data and aquatic life toxics criteria in the future. The triennial review process is a platform for stakeholders to express concerns and provide compelling information for prioritization of future rulemakings.

5.15. Guthion

5.15.A Comment Summary – Advocates is also not aware of any endangered species protection issues with guthion. Guthion was not the subject of Oregon, Idaho, or California ESA consultations. This is likely because other states had already adopted EPA's 1986 criteria, an action Ecology failed to do for 38 years. We urge Ecology to adopt the missing criteria but we also urge that it engages in the evaluation of the sufficiency of EPA's 38-year old recommended criteria rather than relying on the absence of any ESA consultations done to date.

- Northwest Environmental Advocates

Response to 5.15.A

We do not intend to develop state-specific criteria for guthion at this time based on our rule approach but may consider additional toxicity data in future rulemakings. We are not aware of any concerns that would result in the disapproval of the EPA recommended guthion criteria. Developing state-specific criteria for a single toxic is time and resource intensive. Guthion were not determined to be a concern at this time but we are interested in continued evaluations of new data and aquatic life toxics criteria in the future. The triennial review process is a platform for stakeholders to express concerns and provide compelling information for prioritization of future rulemakings.

5.16. Lead

5.16.A Comment Summary – In general, ILA supports the proposed aquatic life toxics criteria for lead as being protective in fresh waters under high lead bioavailability conditions (e.g., low hardness). However, as noted in the general comment letter submitted on behalf of the metals associations collaborating with the U.S. Environmental Protection Agency (USEPA) in developing updated metals criteria under a Cooperative Research and Development Agreement (CRADA), ILA encourages Ecology to consider updated methods for considering the bioavailability of lead in developing updated freshwater criteria.

Ecology's proposed lead criteria for freshwater are based on a hardness model. These criteria are unchanged from Ecology's current lead criteria (last updated in 1992) and are consistent with the USEPA's currently recommended lead criteria (last updated in 1984). Based on the information provided in Ecology's TSD, it is ILA's understanding that Ecology developed updated lead criteria based on consideration of more recent lead toxicity data and use of the 1st percentile of the genus sensitivity distribution instead of the 5th percentile that is typically used following USEPA procedures. Because the acute and chronic lead criteria based on updated toxicity data and the 1st percentile of the genus sensitivity distribution were greater than the current criteria, the current criteria were determined to be protective of aquatic life and updated lead criteria were not proposed. As such, ILA agrees with Ecology's decision that the aquatic life criteria for lead did not need to be lowered to ensure aquatic life protection.

- International Lead Association

Response to 5.16.A

Thank you for your comment and support. We look forward to future EPA recommendations that include bioavailability models for lead and other metals through the Cooperative Research and Development Agreement (CRADA) project. We intend to evaluate these bioavailable models in future rulemakings as EPA completes their review.

5.16.B Comment Summary – There are, however, factors other than hardness that influence lead bioavailability. Dissolved organic carbon (DOC), for example, has a stronger influence on lead bioavailability than hardness, with hardness being more important in low DOC conditions and pH having a moderate effect (Adams and Garman 2023; DeForest et al. 2017, 2020). As part of the CRADA collaboration with the USEPA, acute and chronic multiple linear regression

(MLR) models were developed to account for the influence of hardness, DOC, and pH on lead bioavailability (DeForest et al. 2020). These MLR models performed similarly to the lead biotic ligand model (BLM) previously described in DeForest et al. (2017). Additionally, both the lead MLR models and lead BLM were used to derive acute and chronic water quality criteria following USEPA (1985) guidelines, which likewise resulted in acute and chronic lead criteria that responded similarly to changes in hardness, DOC, and pH (DeForest et al. 2020). Environment and Climate Change Canada also adopted MLR-based water quality guidelines for lead following similar procedures (ECCC 2020; Adams and Garman 2023).

The important influence of DOC on lead bioavailability is illustrated in Figure 1 [of the comment letter]. In this example, a hardness concentration of 100 mg/L and pH of 7 are assumed, with chronic lead criteria plotted as a function of DOC concentration. The hardness criteria are Ecology's currently proposed chronic lead criteria, which are of course constant as a function of DOC since the criteria are only based on the hardness of 100 mg/L assumed. The chronic lead criteria based on the MLR model consider the combined influence of the assumed hardness and pH along with the increasing DOC concentrations plotted. As shown, the chronic lead criteria derived from these two approaches are comparable when DOC is low, but the MLR-based criteria increase with increasing DOC. This reflects decreasing lead bioavailability with increasing DOC.

Consideration of bioavailability parameters beyond just hardness would result in lead criteria that are more relevant to the targeted level of protection over a broader range of water chemistry conditions, as well as criteria that are developed following the state-of-the-science and consistent with the direction the USEPA is heading for metals criteria under CRADA.

- International Lead Association

Response to 5.16.B

We agree with the commenter that bioavailability models that consider dissolved organic carbon as well as hardness and pH are better suited for predicting metal bioavailability and toxicity. We intend to evaluate these bioavailability models in future rulemaking and look forward to future collaboration with the commenter.

5.17. Malathion

5.17.A Comment Summary – Washington has gone 38 years without a malathion criterion and now it proposes to adopt recommended criteria of that are likewise 38 years old because it is not aware of any ESA issues. Again, this is likely because adjoining states managed to adopt these criteria a long time ago. Even so, FWS found that malathion posed jeopardy to numerous aquatic species, many of which are likely relevant to designated uses in Washington, possibly including ESA-listed species. FWS Pesticide BiOp. For example, malathion was found to pose jeopardy to suckers, mussels, darters, and amphibians. Malathion was also a part of the NMFS consultation on the 2016 reissuance of the EPA Pesticide General Permit. See e.g., id. at 76-77; see also id. at 86 ("Mixtures containing malathion resulted in additive effects (when mixed with DDT, toxaphene), synergistic effects (when mixed with Baytex, parathion, carbaryl, perthane) and antagonistic effects (when mixed with copper sulfate) (Macek, 1975)."). Malathion was the subject of NMFS's biological opinion on EPA registration for malathion that required additional conservation measures to avoid jeopardy. See NMFS, Revised Conference and Biological

Opinion on the Environmental Protection Agency's Registration Review of Pesticide Products containing Chlorpyrifos, Malathion, and Diazinon (June 30, 2022). Regardless of the determination of jeopardy, the data and analysis in the NMFS BiOp is essential for Ecology to include when it adopts malathion criteria. For example, in evaluating the risk to Chinook salmon, Puget Sound ESU, NMFS found that prior to the adoption of the measures, malathion posed a "high risk," including:

Reductions in prey and degradation of water quality are likely to reduce the overall conservation value of designated critical habitat. Exposure to mixtures and elevated temperature expected to increase adverse effects.

To assert that Ecology is "not aware of endangered species protection issues with EPA recommended malathion criteria in Region 10 states" may be accurate but it is distinctly disingenuous considering the existing BiOps.

- Northwest Environmental Advocates

Response to 5.17.A

Thank you for the information. The Biological Opinions (BiOps) referenced are not specific to the protectiveness of EPA nationally recommended aquatic life criteria but evaluate the application of pesticides in relation to label requirements. Furthermore, it is also difficult to know if different pesticides will simultaneously occur at a given location and how applicable an analysis of mixtures is for the state of Washington in relation to adopting aquatic life criteria. The scope of BiOps for the EPA pesticide general permit is different than adoption of state aquatic life criteria. We aren't positive on how this information on pesticide use patterns can be used in relation to criteria development under the Clean Water Act. We will continue to track any movement on EPA recommended criteria related to malathion.

5.18. Mercury

5.18.A Comment Summary – As Ecology itself illustrates, the Oregon and Idaho BiOps never could and still cannot provide a comprehensive roadmap to how to approach updating Washington's criteria. For example, mercury/methylmercury does not show up on the list of Oregon toxic criteria adopted in 2004 and therefore subject to the ESA consultation because Oregon specifically excluded mercury from its aquatic life updates in order to avoid a possible jeopardy decision. See TSD at 25, Table 1 (Oregon aquatic life toxics criteria submitted in 2004); Oregon Department of Environmental Quality, Memorandum from Stephanie Hallock, Director, to Environmental Quality Commission, Re: Agenda Item B, Rule Adoption: Water Quality Standards, Including Toxic Pollutants Criteria, OAR Chapter 340, Division 41, May 20-21, 2004, EQC Meeting (April 29, 2004) at 1 ("The proposed criteria incorporate all of EPA's currently recommended criteria for toxic pollutants except for maintaining Oregon's current criteria for a) mercury, because of concerns that the revised criteria are not protective of threatened or endangered populations of salmonids."), 5 ("[T]he Department now believes that issues raised by NOAA-Fisheries and US Fish & Wildlife Service in the Biological Opinion on the 2000 California Toxics Rule resonate in Oregon concerning the protectiveness of these criteria for threatened and endangered salmonids in the state's waters. The Department is aware of efforts by EPA and the federal fisheries services to develop new aquatic life criteria for mercury.").

While Oregon held back, Idaho moved ahead in a manner of speaking. See TSD Table 3 (Ambient water quality criteria for toxic pollutants submitted for consultation in EPA's 1999 Assessment and revisions by the State of Idaho (NMFS, 2014; USFWS, 2015).). In 2008, EPA disapproved Idaho's removal of acute and chronic criteria for mercury, citing its own 2004 comment letter that stated EPA's 304(a) recommended chronic criterion "may not be adequately protective for Idaho." Letter from Michael F. Gearheard, Director, Office of Water and Watersheds, EPA Region 10, to Barry Burnell, Idaho Department of Environmental Quality, Re: EPA Disapproval of Idaho's Removal of Mercury Acute and Chronic Freshwater Aquatic Life Criteria, Docket No. 58-0102-0302 (Dec. 12, 2008) at 1. EPA also cited the CTR BiOp in its disapproval letter to Idaho. In Northwest Environmental Advocates' 2013 lawsuit against EPA and the Services, we alleged that EPA had failed to promptly publish and promulgate mercury water quality standards after disapproving Idaho's revision of those standards. After extensive delays, a federal court in Idaho ruled that EPA had a mandatory duty to publish and promulgate a water quality standard for mercury in Idaho. Northwest Environmental Advocates et al. v. United States Environmental Protection Agency, Case No. 1:13-cv-00263-DCN (Memorandum Decision and Order, ECF No. 103, July 19, 2021). As a result of a stipulated order in that case, on April 3, 2024, EPA issued a proposed rule providing for both tissue and water column criteria for mercury. See EPA, Mercury Criterion to Protect Aquatic Life in Idaho, 89 Fed. Reg. 24758 (April 9, 2024). The proposed chronic total mercury criteria are 0.225 µg/kg wet weight for muscle fish tissue, 0.162 µg/kg wet weight for whole body fish tissue, and 0.0021 µg/L for water column values. Id. at 24774. EPA asserts these results are consistent with the Services BiOps' reasonable and prudent alternatives. Id. at 24768. In contrast, Washington's proposed water column value is 0.012 µg/L. As EPA explains, it is important to include both a tissue and water column value in mercury and methylmercury criteria. See, e.g., id. at 24762 ("Because tissue measurements provide a more direct measure of toxicity for bioaccumulative pollutants such as mercury, the EPA has considered it appropriate to establish tissue criteria for these pollutants. However, criteria expressed as organism tissue concentrations can prove challenging to implement in CWA programs such as NPDES permitting and Total Maximum Daily Loads (TMDLs) because these programs typically demonstrate that water quality standards are met by using a water column concentration to calculate a load-based effluent limit or daily load, respectively.").

Consistent with extensive work done in California on looking at bioaccumulation at trophic levels in standards and TMDLs—which Ecology appears to ignore entirely—EPA's proposed mercury criteria for Idaho address the fact that "[m]ethylmercury can also biomagnify (i.e., increase in concentration at successively higher trophic levels) within aquatic food webs[.]" Id. at 24760; see also id. at 24764 ("[M]ercury bioaccumulation potential among fish species varies widely (up to 20-fold differences) due primarily to their diets: as trophic level increases so does mercury bioaccumulation. In order to protect higher trophic level fish, such as salmonids, which are commercially, recreationally, and ecologically important in Idaho, the EPA made adjustments to account for known bioaccumulation differences among fish species. Doing so ensures that higher trophic level fish species are protected when evaluating sampling data from lower trophic level species (e.g., bluegill, suckers, pumpkinseed) for implementation purposes."). This is done through footnotes 2 and 3 to Table 1 to Paragraph (b) in the federally-proposed criteria. Id. at 24775. These footnotes address the need to use a Bioaccumulation Trophic Adjustment Factor based on the trophic level of the fish from which data have been derived.

The work in California includes final, EPA-approved, mercury criteria based on trophic levels. See, e.g., California State Water Resources Control Board, Final Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions (undated, 2017); Letter from Tomás Torres, Director, Water Division, EPA Region 9, to Felicia Marcus, Chair, California State Water Resources Control Board, Re: Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California – Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions (July 14, 2017) (EPA approval letter describing the Sport Fish Objective that is "applicable both to human health use and to aquatic life and aquatic-dependent wildlife uses," the Prey Fish Objective, and the California Least Tern Prety Fish Objective); California State Water Resources Control Board, Draft Staff Report: Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California – Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions, Appendix K. Wildlife Targets (undated). These were all provided to Ecology by email on May 9, 2022. None of this was cited by Ecology. See also, FWS, Derivation of Numeric Wildlife Targets for Methylmercury in the Development of a Total Maximum Daily Load for the Guadalupe River Watershed (April 2005); FWS, Evaluation of the Clean Water Act Section 304(a) Human Health Criterion for Methylmercury: Protectiveness for Threatened and Endangered Wildlife in California (Oct. 2003).

Putting aside the details, Ecology's justification for waiting simply does not hold water.

- Northwest Environmental Advocates

Response to 5.18.A

Thank you for the information. We are tracking the proposed mercury criteria in Idaho and EPA's messaging that mercury national recommendations for aquatic life will be updated in the future. We will consider updating mercury in the future based on new national recommendations. We are interested in evaluating methods used to develop tissue-based criteria that incorporate trophic level considerations. An in-depth evaluation of the water and tissue data available for mercury in Washington will need to be completed prior to mercury criteria development.

5.19. Methoxychlor and Mirex

5.19.A Comment Summary – Another EPA recommended criteria that date to 1986. We reiterate the same points as set out above regarding the reason why there are no consultations completed on this pollutant and why that should not be relied upon by Ecology to simply adopt outdated EPA recommendations. NMFS has pointed out that methoxychlor is a co-constituent in formulations with malathion. Formulated products are more toxic than methoxychlor alone. It is also an organo-chlorine insecticide that is toxic to fish and aquatic invertebrates. Johnson and Finley (1980) reported LC50s less than 20 µg/L and one 96-hour LC50 of 1.7 µg/L was reported for Atlantic salmon (Howard 1991). NMFS Pesticide General Permit BiOp at 76.

- Northwest Environmental Advocates

5.19.B Comment Summary – Same comments [as given for Methoxychlor] regarding the reason why Ecology is not finding any consultations on mirex and why it should not rely on the lack of consultations for other states.

- Northwest Environmental Advocates

Response to 5.19.A and 5.19.B

EPA nationally recommended criteria for freshwater and saltwater methoxychlor chronic criteria is 0.03 µg/L, which is substantially less than the reported LC50s referenced of 20 and 1.7 µg/L. EPA does not have acute criterion recommendations for methoxychlor which would be the appropriate criterion to be compared to LC50 results.

We understand that EPA has not incorporated new data into the development of methoxychlor and mirex criteria for some time. We encourage EPA to update their national recommendations. States typical evaluate EPA national recommendations and follow their lead on criteria development. We have made determinations in this rule that some of EPA's national recommendations will not be approved based on recent Biological Opinions for states (i.e., Oregon and Idaho) with similar habitat and species. Developing state-specific criteria for a single toxic is time and resource intensive. Methoxychlor and mirex were not determined to be a concern at this time but we are interested in continued evaluations of new data and aquatic life toxics criteria in the future. The triennial review is a platform for stakeholders to express where Ecology should focus their rule prioritization efforts.

5.20. Nickel

5.20.A Comment Summary – Ecology's rationale for updating the freshwater criteria is sound. Ecology is incorrect, however, to ignore the jeopardy determination for the Snake River physa, Bliss Rapids snail, Banbury Springs lanx, and the Bruneau hot springsnail in Idaho as if they are irrelevant to Washington, as explained above with regard to lead and the Banbury Springs lanx. FWS found that:

> The proposed acute and chronic aquatic life criterion for nickel are likely to result in mortality to the Snake River physa, the Bliss Rapids snail, and the Bruneau hot springsnail and affect the reproduction, numbers, and distribution of these snails at the rangewide scale.

The proposed acute and chronic aquatic life criteria for nickel are likely to create habitat conditions that cause ionoregulatory disruption and cellular damage oxidative stress (Pyle and Couture 2011) and mortality to the Banbury Springs lanx. These effects are likely to have lethal and sub-lethal impacts affecting the reproduction, numbers, and distribution of the lanx at the rangewide scale.

- Northwest Environmental Advocates

Response to 5.20.A

We support the adopted criteria for nickel as protective of Washington aquatic life species. The freshwater nickel criteria have incorporated all known and available scientific studies relevant to criteria development. If there was specific toxicity information on the Snake River physa, Bliss Rapids snail, Banbury Springs lanx, and the Brunea hot springsnail, we would incorporate the data into the nickel criteria development. The new scientific studies used in our proposal lowered the freshwater nickel criteria compared with EPA recommendations and are at levels protective of aquatic life according to the latest studies and criteria development methods.

5.20.B Comment Summary – Ecology has not justified the exclusion of data in deriving criteria for nickel.

Ecology is proposing new nickel criteria that are much lower than EPA recommendations. The derivation of the final acute value (FAV), the basis of the acute criteria and by extension the chronic criteria, is based on four genus mean acute values (GMAVs). The four GMAVs are based on Leptoxis ampla, Ceriodaphnia dubia, Neocloeon triangulifer, and Somatogyrus sp. One study for Ceriodaphnia dubia was excluded, but Ecology believes the same study was of sufficient quality to include to represent Daphnia pulex. The juxtaposition of exclusion for one species over another is justified based on the resulting LC50 value. However, this is insufficient justification to exclude a calculated LC50 value from a toxicity study if the study is deemed to be appropriate for inclusion.

- Association of Washington Business

Response to 5.20.B

It is difficult to address the concern without reference to the particular study. We believe that the commenter is referencing a study by Griffitt (2008). Study results can be excluded for various reasons. Most common reasons include test designs that are preferred over others and result in a more accurate assessment of organism sensitivity to a toxic chemical (e.g., flow through design preferred over static tests). Sometimes toxicity values are excluded because other studies reported toxicity values 10x less than the other studies, suggesting there is concern with the integrity of the reported study. Water quality criteria are intended to be protective of the most sensitive species and life stages and thus, criteria development should incorporate the most sensitive toxicity values representative of a given species. We reviewed Griffitt (2008) and found no data appropriate to be used for the nickel criteria derivation. After further review, *Daphnia pulex* testing used an adult life stage which does not represent the most sensitive life stage and EPA methods recommend using neonates (<24 hours) for testing. *Cerdiopahnia dubia* data from Griffitt (2008) was excluded because other studies demonstrated sensitivity to nickel at 10-fold lower concentrations.

The nickel criteria have been updated based on additional scientific studies suggested by commenters. The revised freshwater nickel criteria are slightly higher than the proposed nickel criteria.

5.20.C Comment Summary – Since the 1985 USEPA WQC derivation methods (Stephen et al., 1985) were published, extensive work has gone into establishing a better understanding of metal toxicity and its effects on the environment (Adams et al., 2020). These efforts have led to approaches in quantifying the relationship between multiple environmental physicochemical parameters (e.g., pH, hardness, dissolved organic carbon) and the toxic effects observed in the presence of a metal substance (Mebane et al., 2020). In order to use the concept of bioavailability to predict the toxicity of an environment, models such as the Biotic Ligand Models (BLMs) and Multiple Linear Regressions (MLRs) have been developed (Brix et al., 2020; Di Toro et al., 2001). The principle behind these models differs in that BLMs follow a mechanistic approach to describe ionic binding at a site associated with the biota while MLRs are mathematical distillations of empirical toxicity observations. Despite these differences, the models developed for nickel have been extensively validated for applicability to a wide-range of waters throughout

the U.S. and globally (Besser et al., 2021; Croteau et al., 2021; Stauber et al., 2021). Furthermore, the bioavailability models have been illustrated to perform markedly better than hardness-based equations that have been employed in the U.S. for nearly four decades (Smith et al., 2015).

Within a regulatory context, the importance of considering bioavailability has been recognized since 2007 by the USEPA and Canada (Canadian Council of Ministers of the Environment, 2007; USEPA, 2007) and in Europe since 2008 (European Commission, 2008). The guidance and implementation methods surrounding the use of these tools has varied by jurisdictions in which Europe and Canada utilize BLMs and Australia has recently elected to move forward with MLR methodology for nickel. In 2017, the USEPA initiated a Cooperative Research and Development Agreement (CRADA) with eight metals associations, including NiPERA Inc., as signatories. The objective of this ongoing agreement is to support the development of bioavailability-based aquatic life criteria (USEPA, 2023).

Since 2018, and in support of criteria development under the CRADA, NiPERA has developed expanded nickel ecotoxicity databases and bioavailability models, generated model comparison documents, and produced several peer-reviewed publications supporting the continued use of bioavailability concepts in regulatory settings (Besser et al., 2021; Croteau et al., 2021; Peters et al., 2023; Santore et al., 2021). These peer-reviewed resources should be considered for use in the derivation of statewide guidance.

- NiPERA Inc

Response to 5.20.C

Thank you for the information. We have evaluated additional scientific studies suggested by the commenter and have incorporated several new studies. We intend to consider the work being conducted in the Cooperative Research and Development Agreement (CRADA) project and will evaluate nickel bioavailability models in future aquatic life updates.

5.20.D Comment Summary – Several manuscripts have been published in recent years detailing updates to the nickel ecotoxicity database as well as updated bioavailability models. In 2021, Santore et al. (2021) reviewed the water quality parameters that affected nickel toxicity in aquatic systems and concluded that, along with hardness, the concentration of dissolved organic carbon (DOC) was also a significant factor in accurately quantifying nickel effects. The impact of pH on nickel toxicity has been observed to be inconsistent but, for most organisms, there was little pH effect or a reduction in nickel toxicity observed at low pHs. This manuscript used these observations to refine the previous nickel BLM and to validate the model in both synthetic and natural waters. In a step further, Besser et al. (2021) examined the performance of the updated nickel BLM in the waters of the U.S. Midwest. These waters are considered unique as compared to the majority of freshwaters, having combinations of low pH, low hardness, and high DOC (Minnesota) or high pH, high hardness, and low DOC (Illinois). The prediction performance of BLMs was evaluated to determine the reliability and ultimately the BLM framework successfully modeled variation in toxicity for nickel across the wide ranges of chemistries.

Besser JM, Ivey CD, Steevens JA, Cleveland D, Soucek D, Dickinson A, Van Genderen EJ, Ryan AC, Schlekat CE, Garman E, Middleton E. Modeling the bioavailability of nickel

and zinc to Ceriodaphnia dubia and Neocloeon triangulifer in toxicity tests with natural waters. Environmental Toxicology and Chemistry. 2021 Nov;40(11):3049-62.

Santore RC, Croteau K, Ryan AC, Schlekat C, Middleton E, Garman E, Hoang T. A review of water quality factors that affect nickel bioavailability to aquatic organisms: Refinement of the biotic ligand model for nickel in acute and chronic exposures. Environmental Toxicology and Chemistry. 2021 Aug;40(8):2121-34.

Nickel Multiple Linear Regression (MLR) Models

Multiple linear regression models are developed using mathematical regressions to quantify relationships in observed toxicity data, thus making them an empirical counter-part to BLMs (Brix et al., 2020). MLRs are often calibrated by accounting for the interactions of only major toxicity modifying factors (TMFs) such as pH, hardness, and dissolved organic carbon rather than a 'full suite' of water chemistry parameters. In early 2023, the USEPA published the CRADA Phase 1 Report (USEPA, 2023) which provides a review of models available to predict the toxicity of metals to aquatic life by considering toxicity modifying factors. The conclusion of this report identified that: "Given the similarities in performance between the BLM and MLR approaches for several metals, EPA intends to use MLR models as the bioavailability-modelling approaching in AWQC development because of the robustness, relative simplicity, transparency, decreased number of input data needed, and ease of use of the MLR approach compared to the BLM approach." (Note: Despite this endorsement by USEPA, updated nickel criteria following this approach has yet to be released from the Office of Water and certain regions/states may find the BLM usage more aligned with their specific needs.)

The most recent development of multiple linear regression models has been published by Croteau et al. (2021) pertaining to U.S./North American freshwaters and, by Stauber et al. (2021) applicable to Australian freshwaters. Specifically, Croteau et al. (2021) calibrated eight acute models considering invertebrate and fish species, and eleven chronic models covering invertebrate, fish, algae and plant species. This manuscript also compared the performance of the MLR models to the BLM that was developed in Santore et al. (2021) and concluded that the performance of the two models were largely equal, though more apparent differences were noted when examining specific subsections of data.

Croteau K, Ryan AC, Santore R, DeForestD, Schlekat C, Middleton E, Garman E. Comparison of multiple linear regression and biotic ligand models to predict the toxicity of nickel to aquatic freshwater organisms. Environmental Toxicology and Chemistry. 2021 Aug;40(8):2189-205.

- NiPERA Inc

Response to 5.20.D

Thank you for this information. We have reviewed these articles and are in support of moving forward with bioavailability models once the Cooperative Research and Development Agreement (CRADA) work is completed. We look forward to future collaborations on water quality standards in Washington.

5.20.E Comment Summary – Application of an Acute-Chronic Ratio (ACR) The concept of Acute-Chronic Ratios (ACRs) was developed to support guideline derivations in instances where insufficient data was available, as was generally the case of chronic studies in the 20th century. Today, however, a substantial amount of high-quality ecotoxicity data is available for both acute and chronic endpoints across a wide variety of species, genus, and families. This data has been generated over the past two decades largely to support the development of bioavailability models and hazard regulations within the European jurisdictions (e.g., REACH) but, importantly, toxicity evaluations generally follow standard methodologies and use model organisms, making them applicable on a global level. Furthermore, similar to nickel toxicity, ACRs have been observed to vary depending on the different water chemistry parameters of the exposure. For instance, an ACR determined at high pH, low hardness waters will not be the same ACR observed in low pH, high hardness waters. Due to the abundance of available data surrounding nickel ecotoxicity for both acute and chronic exposures, and the inherent variability in accurate ACRs, we advocate for the Washington Department of Ecology to consider bioavailability-based criteria for both short-term and long-term exposures, rather than applying an ACR.

- NiPERA Inc

Response to 5.20.E

Thank you for your comment. Based on the commenters suggested scientific studies, we were able to calculate a freshwater chronic nickel criterion based on the eight-family method. We intend to consider MLR-based bioavailability models for nickel in future rule updates.

5.20.F Comment Summary – The EPA suggests reviewing the data available for nickel as there are enough data to calculate criteria using the eight-family method.

- U.S. EPA

Response to 5.20.F

Thank you for your comment. We have incorporated additional studies into the freshwater chronic nickel criterion and calculated criteria based on the eight-family method.

5.20.G Comment Summary – For the calculation of nickel criteria there are currently known studies with LC50s lower than the proposed acute criterion. Ecology should justify why they chose not to include those studies in their database and calculations.

- U.S. EPA

Response to 5.20.G

We have outlined all the reasons for excluding scientific studies in Appendix A of the Technical Support Document. We have included additional acute toxicity values into the freshwater acute nickel criterion based on comments received.

5.20.H Comment Summary – The EPA cannot reproduce the species mean acute value (SMAV) value for Daphnia magna in Table 34 "Freshwater acute toxicity data used for criteria derivation reported as total recoverable nickel." Adding the study by Lari et al (2017) in Table

35 “New freshwater acute studies that met data acceptability requirements since EPA last updated nickel criteria (S = static, R = static renewal, U = unmeasured test concentrations, M = measured test concentrations)” with a normalized LC50 = 893.2 to those studies used in 1986 and 1995, the recalculated SMAV for Daphnia magna is 1070 and not 1033.

The EPA suggests recalculating the SMAV value for Daphnia magna and all other values that rely on the outcome of that calculation.

- U.S. EPA

Response to 5.20.H

We could not recreate the SMAV of 1102 µg/L presented in the 1986 nickel update. The Chapman et al. manuscript data includes independent conducted studies at different water quality, and therefore, the LC50s should be considered independent test results and not combined. EPA may have taken the geometric mean of the Chapman et al. manuscript results (1378 µg/L) and combined it with data from Call et al. 1983 (898.3 µg/L). The resulting geometric mean of Call et al. 1983 acute toxicity value and the geometric mean of Chapman et al. manuscript results is 1112 µg/L. The resulting SMAV of 1112 µg/L does not align with EPA's reported SMAV of 1102 µg/L. We initially followed EPA's logic for the proposed freshwater acute nickel criterion by using the geometric mean of all study results in Chapman et al. manuscript (1378 µg/L), Call et al. 1983 (898.3 µg/L), and Lari et al. 2017 (892.3 µg/L), which results in a SMAV of 1033 µg/L. In the newly revised nickel proposal, we have considered the Chapman et al. manuscript results as independent studies and have incorporated each acute toxicity value for each hardness level into the overall SMAV calculation.

Based on other comments that have suggested additional scientific studies be considered, we have incorporated more acute toxicity values into the *Daphnia magna* SMAV and the overall nickel calculations. These updates can be found in the updated Technical Support Document.

5.20.I Comment Summary – Commenter cannot reproduce the ACR values for Daphnia magna of 122.4, for Pimephales promelas of 53.03, and for the Species Mean ACR Geometric mean in Table 37 “Acute to chronic ratios (ACR) used in chronic criterion derivation.” The EPA suggests recalculating this value and all other values that rely on it. In addition, the ACR value for Daphnia magna of 122.4 despite being in error is within 10X the lowest ACR (13.94) and could be included in the species mean ACR calculation.

- U.S. EPA

Response to 5.20.I

Thank you for your comment. The ACR is no longer relevant to the freshwater chronic nickel criterion calculation. Based on other comments suggesting we evaluate additional scientific studies, we have calculated a revised freshwater chronic nickel criterion based on the eight-family method.

5.20.J Comment Summary – In reviewing the proposed nickel criteria, it is evident that a substantial number of pertinent manuscripts were not considered in the update. Specific citations that have been identified as being omitted are listed in appendices following this document.

Detailed databases of nickel ecotoxicity information have been made publicly available in the supplemental material for Croteau et al. (2021) and Peters et al. (2023). Additionally, NiPERA maintains an internal database of catalogued ecotoxicity data from peer-reviewed manuscripts and we would be happy to work with the Department of Ecology to share the applicable data and references in an effort to streamline a revision to this proposal.

For some cases in which a study was reviewed, it was accompanied by a "note" justifying its omission from being included in the criteria derivation. We appreciate and commend the transparency of this process. In reviewing the omitted studies, we note that four references (Klemish et al., 2018; Niyogi et al., 2014; Nys et al., 2016; Nys et al., 2017) accompanied the note: "staticrenewal test design, according to EPA 1985 guidance chronic studies should be flow-through". However, the "Final Chronic Value" section VI-B of the 1985 guidance prescribes:

"Chronic values should be based on results of flow-through (except renewal is acceptable for daphnids) chronic tests in which the concentrations of test material in the test solutions were properly measured at appropriate times during the test." (Stephan et al., 1985)

With this exception noted in the guidance, chronic toxicity tests in which daphnids were exposed to nickel in static-renewal exposures should be acceptable for consideration in criteria development.

- NiPERA, Inc

Response to 5.20.J

Thank you for this comment. We have incorporated several new nickel studies based on the commenter's suggestion. We reviewed references included by the commenter in addition to those included in the nickel MLR model. The technical support and criteria have been updated with these studies. In personal communication with EPA, they suggest that static renewal test designs are acceptable for chronic criteria development under specific scenarios and thus, we have included additional studies and found that the minimum data requirements for the eight family method have been met for the freshwater chronic nickel criterion.

5.21. Nonylphenol

5.21.A Comment Summary – Ecology seems to have missed the information that there are ESA-listed marine mammals in Washington waters. It cites the EPA BE on the Swinomish consultation that "exposure at the level of the marine chronic nonylphenol criterion is likely to adversely affect rainbow trout (steelhead), Chinook salmon, chum salmon, bull trout, bocaccio and yelloweye rockfish." TSD at 137. But it fails to consider the designated use of ESA-listed Southern resident killer whales. On the basis of no other ESA consultations having been completed, it has decided to adopt EPA's recommended criteria. We suggest starting with Kiah Lee, et al., Emerging Contaminants and New POPs (PFAS and HBCDD) in Endangered Southern Resident and Bigg's (Transient) Killer Whales (Orcinus orca): In Utero Maternal Transfer and Pollution Management Implications, 57 Environ. Sci. Technol. 360-374 (2023) at 360. This study not only found the chemical 4-nonylphenol predominated the orcas' toxic burden but identified it as the chemical having the highest transfer rates from mothers to fetuses, as high as 95 percent.

There is information on nonylphenol in Puget Sound waters despite Ecology's not recognizing it as a pollutant of concern. For example, Dr. James P. Meador and his team found the following:

Nonylphenol (NP) was one of the more ubiquitous compounds in our study and was observed in every sample (except Sinclair Inlet estuary water) at relatively high concentrations in water (14–41 ng/L) and tissue (8–76 ng/g). The ethoxylates of nonylphenol (NP1EO and NP2EO) were also detected in most effluent and tissue samples. The U.S. Environmental Protection Agency (2005) chronic water quality criterion (WQC) for nonylphenol in marine systems is 1.7 ng/mL, a value that approximates the observed effluent concentration for the Tacoma WWTP reported here. Also, the U.S. Environmental Protection Agency (2010) provides toxic equivalency factors (TEFs) for aquatic species exposed to nonylphenol ethoxalates and these are considered to be about 50% as potent as NP (NP = 1; NP1EO and NP2EO = 0.5). When these TEFs are applied to the observed effluent concentrations, the combined concentrations of NP and these 2 ethoxylates exceed the WQC approximately 2-fold.

Ecology should respond to the need to have criteria based on TEFs for nonylphenol ethoxalates.

Nonylphenol, entirely ignored by Ecology to date, is of grave concern. For example, in 1999–2000, the U.S. Geological Survey ("USGS") found the compounds in 80 percent of 139 streams across 30 states. Dana W. Kolpin, et al., Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance, 36 Environ. Sci. Technol. 1202-1222 (2002), available at https://pubs.acs.org/doi/pdf/10.1021/es011055j. Of the 95 compounds evaluated, 4-nonylphenol was among top seven. Id. at 1202. A driver of EPA's concern in 2005, when it issued its recommended criteria for nonylphenol, was the large—and increasing—production of nonylphenol:

Nonylphenol is produced in large quantities in the United States. Production was 147.2 million pounds (66.8 million kg) in 1980 (USITC 1981), 201.2 million pounds (91.3 million kg) in 1988 (USITC 1989), 230 million pounds (104 million kg) in 1998 (Harvilicz 1999), and demand is increasing about 2 percent annually.

Meanwhile, Ecology does not even account for the existence of nonylphenol on its 303(d) list database. In adopting nonylphenol criteria, Ecology must evaluate the sufficiency of EPA's recommended criteria.

- Nothwest Environmental Advocates

Response to 5.21.A

We understand the concerns for nonylphenol and its presence relative to EPA's recommended criteria. Monitoring data for nonylphenol and related compounds are important to determining impaired waters. However, specific types of toxicity values are needed to be incorporated into criteria using the current methods available. We reviewed the new scientific studies available since EPA last updated nonylphenol in 2005 and the new scientific studies resulted in an increase over EPA recommended criteria values. This is because the number of species with toxicity values increased, and the majority of toxicity values were higher than the current dataset. Following the outlined strategy in this rule, the new scientific studies were not incorporated because there are no completed Biological Opinions that provide information on endangered species protection for similarly listed species in Washington. We will continue to assess the new scientific data for nonylphenol in the future to determine if updates are necessary.

We are interested in researching methods to address complex mixtures of chemicals within classes. We hope to explore methods to address mixture toxicity in the future.

If this rule is approved by EPA, nonylphenol will be incorporated into the water quality assessment in future iterations.

5.21.B Comment Summary – APERC supports Ecology's decision to not rely on the 2022 EPA BE of the Swinomish WQS for the identification of ESA concerns. This is appropriate as it is a preliminary document that has not undergone full review under the ESA. In addition, as discussed below, APERC has identified issues in the 2022 EPA BE for the Swinomish WQS that raise technical concerns about its endangered species conclusions related to [nonylphenol (NP)]. Therefore, it is premature to draw any conclusions regarding potential concerns for NP in endangered species. APERC agrees with Ecology's assessment that there are "no known ESA concerns in other PNW states" for NP.

- Alkylphenols & Ethoxylates Research Council

Response to 5.21.B

Thank you for your support.

5.21.C Comment Summary – APERC does not support Ecology's proposal to use updated science or increased protection levels only for compounds that have undergone full ESA review and have final Biological Opinions in Idaho and Oregon. APERC supports the use of the more recent and broader dataset for NP, which was identified and qualified by Ecology to calculate criteria for this substance. While these data are not provided in the Technical Support Document, Ecology acknowledges that they result in the calculation of higher criteria values.12 Nevertheless, the Technical Support Document proposes to adopt the lower EPA's 2005 WQC recommendations for NP in an effort to be more protective of endangered species.13

As discussed below, APERC supports the adoption of the NP ALTCs listed in Table 1 below. These criteria were calculated based on an updated and broader data set, including data available from the 2005 EPA WQC as well as more recent studies identified by Ecology as meeting data quality standards in accordance with EPA guidance. In addition, there is no basis to assume that criteria calculated for NP using an updated dataset, which includes a greater number of genera and species, are less protective than EPA's WQC to endangered species in Washington State.

1.0 APERC supports adoption of NP ALTCs based on the broad data set available from the 2005 EPA WQC and including additional data available since 2005, which have been identified and evaluated for data quality by the Department of Ecology.

Ecology reports that it examined new science available for NP since EPA finalized the NP WQC in 2005 and that these new data resulted in a higher ALTC values; however, these updated calculations and values are not provided in the Technical Support Document.

Ecology provided APERC with its updated dataset for NP allowing calculation of updated criteria as described in Attachment I to these comments.15 The updated criteria are compared to EPA's 2005 WQC for NP in Attachment I, Table A3 as well as below in Table 1 [of comment letter].

The additional studies and species provided in the updated dataset allow a more comprehensive view of the range of species sensitivities and as such, provide more confidence in the calculated values, both in terms of their accuracy and protectiveness. The impact of NP on endangered species has not been reliably assessed, and development of aquatic criteria that are based on an updated, high quality data set representing a broader range of species and genera is scientifically justified.

- Alkylphenols & Ethoxylates Research Council

Response to 5.21.C

We will continue to evaluate new scientific studies on nonylphenol and related compounds into the future. The results of future Washington's Endangered Species Act consultations from this rule will provide a valuable assessment of endangered species protection.

5.21.D Comment Summary – US EPA's 2022 Biological Evaluation (BE) of the Swinomish Tribe's WQS is pending review under the ESA and its assessment of NP raises some issues and technical concerns about its endangered species conclusions related to NP.

The purpose of the Endangered Species Act (ESA) is to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide a program for the conservation of such species. The ESA directs all federal agencies to participate in conserving these species. Specifically, section 7(a)(1) of the ESA charges federal agencies to aid in the conservation of listed species, and section 7(a)(2) requires the agencies to ensure their activities are not likely to jeopardize the continued existence of federally listed species or destroy or adversely modify designated critical habitat.

Pursuant to section 7 of the ESA, EPA submitted a BE of the Swinomish Tribe WQS to the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) on June 23, 2022.17 Recent correspondence from the US Fish and Wildlife Service to US EPA (February 22,2024) confirms receipt of the request for an ESA consultation; however, it also notes that USFWS staffing constraints and competing workload priorities restrict the Service's ability to complete the consultation in a timely manner.18 To APERC's knowledge NMFS has not yet responded to the request for consultation. Therefore, EPA 2022 BE of the Swinomish Tribe WQS cannot be considered as complete under the ESA.

In addition, based on APERC's review, the 2022 EPA BE includes errors and raises technical concerns about its endangered species conclusions related to NP. As discussed in more detail below, the most important problems with the EPA BE report related to NP relate to concerns about the approach to systematic review and study review. Of note is the fact that some of the data used in this assessment cannot be tracked back or does not agree with the cited source report, leading to incorrect conclusions regarding the protectiveness of the US EPA 2005 criteria for NP for endangered species.

2.1 The acute Prey Category Lowest Toxicity Value (PCTLV) and Prey Category Mean Acute Value (PCMAV) for NP indirect (prey) effects for salmonids in the EPA 2022 BE for the Swinomish Tribe WQS appear to be based on an erroneous LC50, which is not consistent with data in the cited source study; the correct data would result in a "no impact likely" to endangered species conclusion.

For indirect acute effects, toxicity data related to the prey species for salmonids is considered in the BE, since fish constitute a major portion of the endangered species' diet. The only NP acute toxicity study that was used in the EPA 2022 BE for the evaluation on prey was for bluegill (Lepomis macrochirus) from a study by Brooke, 1993. 19 Table 2 lists the PCMAV, PCTLV and range for acute values for the Brooke, 1993 study, as reported in the 2022 EPA BE document along with APERC's calculated values based on the reported acute LC50 value for this species in Brook, 1993.

Since the PCLTVs for chironomids (Chironomus tentans) and fathead minnows (Pimephales promelas) were greater than the proposed Swinomish criterion, which adopted the 2005 EPA chronic freshwater WQC for NP (6.6 µg/L), the 2022 EPA BE concluded the WQC would be protective of these prey species.

The only chronic study identified in the 2022 EPA BE document with a PCLTV for NP that was less than the EPA chronic freshwater WQC was by Geffard et al, 2010 for the species Gammarus fossarum. The BE document lists a PCLTV of 5.0 µg/L, based on reduced gamete production; however, review of Geffard, 2010 finds that gamete production was not affected by NP. The only endpoint that was adversely affected by NP in this study was an increase in abnormalities in the C2 molt stage. In this study only two exposure levels were included (0.05 µg/L and 5.0 µg/L). Also, effects on this endpoint at other molting stages were not mentioned and differences between solvent and clean controls were not provided.

One of the stated goals of this study was to establish testing protocols for a reproduction test with G. fossarum rather than to determine effect levels for WQS purposes. The dosing metric of a 100 (0.05 µg/L and 5.0 µg/L) in this study does not follow OECD/USEPA recommendations for other tests with similar species where differences between doses should be less than 5-fold. Therefore, it is difficult to use these data as no real dose response curve was noted due to the 100-fold dosing difference between the two treatment levels. It is not known if the observed effect occurred at other stages of molting. It is possible that this was a transitory effect and it is reasonable to assume that the effect was not observed at other stages or it would have been mentioned. This study could be classified as a method development study as the authors were working out the methodology; therefore, reliance on this study for PCMAV or PCLTV for the assessment endangered species is not advised.

- Alkylphenols & Ethoxylates Research Council

Response to 5.21.D

Thank you for this analysis. We encourage EPA and the Services (National Marine Fisheries Service and US Fish and Wildlife) to consider these comments during Endangered Species Act consultation.

5.21.E Comment Summary – Overall, these issues with systemic review, errors with endpoint identification and reliance on erroneous LC50 values that cannot be traced to source studies raise questions about the reliability of the conclusions of EPA 2022 BE regarding NP. Therefore, as discussed in section 1.0 and Appendix I of these comments, APERC supports adoption of NP ALTCs based on the broader data set which has been identified and evaluated for data quality by the Department of Ecology.

- Alkylphenols & Ethoxylates Research Council

Response to 5.21.E

Thank you for the comment. We intend to move forward with EPA national recommendations for nonylphenol.

5.22. Pentachlorophenol

5.22.A Comment Summary – We support Ecology's having derived more protective criteria for pentachlorophenol based on the very language that we have cited above concerning the predicted mortality from this pollutant. It's a mystery why Ecology applied a different approach to this pollutant as compared to the other ones for which Ecology decided not to conduct an evaluation. NMFS did find that pentachlorophenol is "predicted to result in mortality at the population level." NMFS Oregon BiOp at 486. We note, in addition, that in California, the CTR BiOp determined that pentachlorophenol posed jeopardy to salmonids, among other species, an action that postdated EPA's recommended criteria. CTR BiOp at 188 ("Based on the documented toxicity of pentachlorophenol to early life stage salmonids, with adverse effects seen at water concentrations between 2.5 to 7.5 times below the proposed chronic criterion, together with the potential for exposure of anadromous salmonids to occur, the Services conclude that the proposed numeric criteria are likely to significantly impair the survival and recovery of all listed anadromous salmonids, and are likely to adversely affect populations of the Lahontan cutthroat trout, Paiute cutthroat trout, and Little Kern golden trout if an exposure pathway is created within the habitat for these species."). The Services also found that "the chronic criterion may also pose a potential hazard to some nonsalmonid species. Among the non-salmonids, suckers and minnows appear more sensitive." Because Ecology has not referenced the CTR, it is unclear whether the agency has taken the Services' analysis into account in deriving proposed criteria for Washington. If not, it should.

- Northwest Environmental Advocates

Response to 5.22.A

Thank you for the information. There is compelling evidence from the Oregon Biological Opinion (BiOp) that new scientific studies should be reviewed for pentachlorophenol. While the California BiOp is supportive, citing additional work will not change the studies that are available and have been incorporated into criteria development within the confines of EPA 1985 guidance. Pentachlorophenol followed a similar strategy as all other toxic chemicals reviewed in this rule. When a likely to adversely affect determination was made in Idaho or Oregon, new scientific studies were reviewed since EPA last updated the criteria. We reviewed and incorporated any new studies into the pentachlorophenol criteria.

5.23. PFOA and PFOS

5.23.A Comment Summary – Commenters support adopting EPA's draft recommendations for PFOA and PFOS. Commenters note the importance of acting now to protect against these harmful chemicals.

- Northwest Environmental Advocates
- Port Gamble S'Klallam Tribe
- Spokane Riverkeeper
- Squaxin Island Tribe
- Washington Department of Fish and Wildlife

5.23.B Comment Summary – Commenters request Ecology consider developing state-specific PFOA and PFOS criteria in lieu of adopting EPA draft recommendations.

- Jamestown S'Klallam Tribe
- Northwest Indian Fisheries Commission
- Port Gamble S'Klallam Tribe
- Squaxin Island Tribe
- Suquamish Indian Tribe of the Port Madison Reservation

5.23.C Comment Summary – Commenter supports Ecology's proposal to not adopt PFOA and PFOS criteria before EPA finalizes the nationally recommended criteria for these two chemicals.

- King County

Response to 5.23.A, 5.23.B, and 5.23.C

Thank you for your comment. We have decided to adopt EPA's draft PFOA and PFOS recommendations and will consider adopting updated criteria in the future.

5.23.D Comment Summary – Ecology has not provided a sufficient basis for the PFOS/PFOA standards.

Information describing Ecology's analysis of EPA's PFOS and PFOA aquatic life recommendations is lacking, and there does not appear to be sufficient guidance to clarify the implementation of these criteria in Washington waters. Rather than adopting EPA recommendations (if they are finalized), a more scientifically defensible and robust approach would be to implement a full rulemaking review with scientific evaluation of the appropriateness of EPA recommendations for Washington waters.

It is also premature for Ecology to adopt tissue-based standards for PFOS and PFOA without an implementation plan for implementing the criteria in NPDES permits, impairment determinations, water quality improvement plans, and section 401 certifications. In 2016 Ecology declined to adopt tissue-based human health water quality criteria for methylmercury in the absence of information on how a tissue-based criterion will be implemented in discharge permits, in water quality assessments, and in Section 401 water quality certifications. (Ecology

2016). The TSD and implementation plan for this rule include no information that addresses these issues. Absent that information, adoption of draft EPA tissue-based criteria for PFOS and PFOA should be deferred.

Specifically, further clarification is needed to quantify "steady-state" conditions when determining whether fish tissue or water column concentration criteria should apply. In addition, Washington-specific field sampling requirements are needed to ensure fish tissue measurements are spatially and temporally representative and reflect conditions that are intended to be protected. It is well known that sampling design (e.g., number and proximity of measurements), species characteristics (e.g., life history, size, sex, lipid content, functional group), and environmental conditions (e.g., seasonality, habitat conditions) play important roles in bioaccumulative substances (Barnhart et al. 2021). Therefore, detailed guidance is needed and should be approved through targeted rulemaking initiatives rather than included in this round of aquatic life criteria updates. Rather than adopting EPA fish-tissue criteria recommendations, a more scientifically defensible and robust approach would be to implement a full rulemaking review with scientific evaluation of the appropriateness of EPA's tissue-based recommendations for Washington waters.

- Association of Washington Business

Response to 5.23.D

EPA developed national recommendations for aquatic life for states to consider. EPA used the latest science to develop their draft PFOA[21] and draft PFOS[22] recommendations that were published in 2022. A state-specific analysis is not likely to reveal any other additional toxicity data and would be a time and resource intensive task. We have no reason to believe that EPA's recommendations are not appropriate for the state of Washington. EPA has available a PFOA technical support document[23] and a PFOS technical support document[24] that include the scientific data and decision making. We encourage the commenters to review these documents for defensibility and robustness.

The PFOA/PFOS recommendations have both water and tissue-based criteria. In the absence of tools to implement tissue-based criteria in permits, permit writers may use the water-based criteria.

Generally, steady-state conditions will be indicated by whether there is a new source or discharge of PFOA/PFOS in which equilibrium in environmental phases have not been achieved. We discuss steady-state assumptions under selenium in the implementation plan for this rule. "We are proposing the selenium tissue-based criteria under the assumption that all waters are at steady-state conditions unless a new selenium input (such as a new discharge of selenium) is identified. If there are new releases of selenium, the water-based criteria are the applicable criteria. We do not find it necessary or feasible to conduct waterbody specific evaluations of steady-state conditions for all waters of the state where selenium is present."

[21] https://www.epa.gov/wqc/aquatic-life-criteria-perfluorooctanoic-acid-pfoa
[22] https://www.epa.gov/wqc/aquatic-life-criteria-perfluorooctane-sulfonate-pfos
[23] https://www.epa.gov/system/files/documents/2022-04/pfoa-report-2022.pdf
[24] https://www.epa.gov/system/files/documents/2022-04/pfos-report-2022.pdf

EPA's rule language does not include steady-state assumptions for PFOA/PFOS, but the data used to develop the criteria considers steady-state conditions.

5.23.E Comment Summary – WA should use the OECD definition of PFAS which includes f-gas and TFA because the EPA remains far behind Europe in this area and we have many natural refrigerant alternatives to HFC's and HFO's. Without taking that step we risk a massive increase in forever chemicals in our local watersheds and growing risk to health.

- Moe, Eric

Response to 5.23.E

We do not have a definition of PFAS in Washington's water quality standards and do not support definitions for particular pollutants. There is very limited toxicity data for aquatic life for many PFAS compounds. At this time, EPA only has draft criteria for PFOS and PFOA.

5.24. Selenium

5.24.A Comment Summary – Ecology oddly states that "[w]e are not aware of endangered species concerns for Washington's ESA-listed species related to EPA recommended criteria for selenium." TSD at 90. First, selenium is "predicted to result in mortality at the population level" by NMFS. NMFS Oregon BiOp at 486. Second, Idaho's chronic selenium criterion was the subject of a jeopardy determination by both the Services. For example, FWS found that Idaho's proposed 5 µg/L criterion was "likely to create habitat conditions that cause reproductive failure in the bull trout due to maternal transfer of selenium resulting in embryo toxicity and teratogenicity, and reduced bull trout prey abundance within 44 percent of the streams and 34 percent of the lakes and reservoirs occupied by the bull trout within its range." FWS Idaho BiOp at 265. It also found that "reproductive failure in fish and wildlife is likely to occur at aquatic concentrations of 2 µg/L of inorganic selenium or less than 1 µg/L of organic selenium." Id. at 266. Because Ecology merely observed that the current EPA recommended criteria have not been the subject of ESA consultation, it ignored these findings. Ecology should explain how the analysis in the Services' Idaho BiOps is met by adopting EPA's current recommended criteria. It should also evaluate the effects on species not covered by those BiOps that might be as sensitive or more than ESA-listed species in Washington waters.

- Northwest Environmental Advocates

Response to 5.24.A

We understand there were some endangered species protection concerns regarding EPA's previous selenium criteria. However, EPA recently released updated selenium criteria in 2016 that are based on tissue and water concentrations. We are not aware of any aquatic life concerns for EPA's newly recommended criteria that are proposed to be adopted by Washington. EPA recommendations are intended to be protective of aquatic life and adoption of these criteria ensures consistency with the Clean Water Act. These proposed selenium criteria will be evaluated during a future Endangered Species Act consultation.

5.24.B Comment Summary – It is premature for Ecology to adopt tissue-based criteria for selenium. As with the proposed criteria for PFOS and PFOA, it is premature to adopt freshwater chronic tissue-based criteria for selenium. The TSD and implementation plan is devoid of any information or analysis as to how Ecology plans to implement the tissue-based criteria in NPDES permit limits, water quality assessments, and section 401 certifications.

Ecology should take the same approach as the state of Oregon in deferring action on the current EPA recommendations for tissue-based criteria for selenium. The rationale of the Oregon Department of Environmental Quality is equally applicable to the state of Washington:

DEQ is not proposing to adopt EPA's 2016 selenium criterion at this time because of the crucial need for implementation guidance to make it feasible for Oregon to apply the complex four-part criterion effectively and efficiently in state water quality programs. Further, Oregon does not have high concentrations of selenium in state waters compared with other regions of the U.S, and Oregon currently has water-column criteria for selenium to protect fish and aquatic life that is only slightly higher (5.0 µg/L) compared with the 2016 recommendation (3.1 µµg/L or 1.5 µg/L). DEQ may propose to adopt the 2016 selenium criterion in the future if DEQ can work with EPA to develop selenium criterion implementation guidance before adopting the criteria.

- Association of Washington Business

Response to 5.24.B

The selenium criteria have water-based criteria that can be directly applicable to permitting. Other Clean Water Act programs implemented by Washington will incorporate selenium criteria after EPA approval. Many of these updates will occur through public processes. EPA has released implementation guidance for the new selenium criteria[25] that can be used by states.

There are many concerns regarding endangered species protection outlined in Oregon and Idaho Biological Opinions. We have concerns regarding Washington's current selenium criteria and support moving forward with EPA's new recommendations.

5.24.C Comment Summary – For future reference, the EPA has recently finalized technical support materials for the aquatic life selenium 304(a) criteria recommendations, which can be found at https://www.epa.gov/wqc/aquatic-life-criterion-selenium.

- U.S. EPA

Response to 5.24.C

Thank you for the information.

5.25. Silver

5.25.A Comment Summary – We support Ecology's proposing chronic criteria for silver where EPA has no recommendations. Silver is "predicted to result in mortality at the population level" by NMFS. NMFS Oregon BiOp at 486. Again, this demonstrates that Ecology can do better than EPA when it puts its mind to it. However, Ecology misses an opportunity to be more clear on

[25] https://www.epa.gov/wqc/aquatic-life-criterion-selenium

why silver criteria are important to protection of ESA-listed species by not mentioning the Idaho BiOps. While the Services did not make a jeopardy determination for silver, FWS in Idaho did conclude that the acute criterion for silver has the "potential to adversely affect the prey base of the bull trout." FWS Idaho BiOp at 228. Although the FWS concluded that bull trout have sufficiently diverse diets such that this would not pose a risk to the species, the information is certainly not to be ignored. Likewise, FWS concluded:

The data reviewed on chronic effects of silver (as silver nitrate) to rainbow trout indicate that the proposed acute criterion, which effectively acts as a chronic criterion, would not avoid chronic toxicity at concentrations below the acute criterion. For example, the work of Davies et al. (1978) suggests that the maximum acceptable silver concentration to prevent chronic mortality in rainbow trout embryos, fry, and juveniles, and avoid premature hatching, is less than 0.17 µg/L for a water hardness equal to 26 mg/L (Davies et al. 1978). The proposed acute criterion at a water hardness value of 26 mg/L is twice that concentration, 0.34 µg/L. Likewise, Nebeker et al. (1983) concluded that the maximum acceptable toxicant concentration of silver to prevent inhibition of growth of steelhead embryos was less than 0.1 µg/L for a water hardness value equal to 36 mg/L. The proposed acute criterion for silver at a water hardness value of 36 mg/L is six times that concentration, 0.6 µg/L.

FWS Idaho BiOp at 227-8. Ecology should evaluate its proposed criteria (hardness based on 100 mg/L) to these recommendations. For the reasons stated above, Ecology should not use EPA's 1985 methodology to calculate saltwater silver criteria.

- Northwest Environmental Advocates

Response to 5.25.A

Thank you for the support. The Davies et al. (1978) and Nebeker et al. (1983) studies were used in the silver criteria calculations. All the available silver data to our knowledge was used to update the criteria.

The Idaho Biological Opinion concluded that they do not expect significant adverse effects to the bull trout to be caused by the proposed acute criterion for silver. We do not find compelling evidence for revising silver beyond the current revisions.

5.25.B Comment Summary – Ecology has not justified the exclusion of data in deriving criteria for silver.

As with nickel, Ecology is proposing a new freshwater acute criterion for silver that is much lower than the EPA recommendation. Additionally, Ecology has developed proposed freshwater and saltwater chronic criteria, while EPA does not have established recommendations. The derivation of the FAV, the basis of the acute criteria and by extension the chronic criteria, is based on four GMAVs. The four GMAVs are based on Ceriodaphnia dubia, Daphnia magna, Danio rerio, and Hyalella Azteca. Four studies for Ceriodaphnia dubia were excluded, but Ecology believes the same study was of sufficient quality to include to represent Pimephales promelas. The juxtaposition of exclusion for one species over another is justified based on the resulting LC50 value. However, this is insufficient justification to exclude a calculated LC50 value from a toxicity study if the study is deemed to be appropriate for inclusion.

- Association of Washington Business

Response to 5.25.B

EPA 1985 guidelines state: "if the acute values available for a species or genus differ by more than a factor of 10, some or all of the values probably should not be used in calculations." We excluded data if the acute values were 10x greater than other acute values for the same species. This explains the exclusion of data from Diamond et al. (1997) for *Ceriodaphnia dubia* that is supported by the 1985 EPA guidance for criteria derivation.

5.26. Tributyltin

5.26.A Comment Summary – Ecology, which even with Puget Sound in its state waters has astoundingly failed to adopt criteria for this highly toxic pollutant, asserts that it is "not aware of endangered species protection issues with EPA recommended tributyltin ("TBT") criteria in Region 10 states." Yet for PCP, it quoted this very statement from the NMFS Oregon BiOp (edited for TBT):

Based on the direct mortality population modeling results, juvenile salmon and steelhead exposed to . . . tributyltin . . . [are] predicted to result in mortality at the population level—relative to the baseline population model.

NMFS Oregon BiOp at 486 (emphasis added). It's enough to render anyone speechless.

Nonetheless, we will note the following and urge Ecology to respond to these findings in its decision to adopt EPA recommended criteria for TBT. While use of TBT as an antifouling paint has been restricted, in the early 1980s through mid-1990s, water column concentrations in the 0.1–1.0 ng/mL range were found, as compared to the EPA recommended criteria of 0.07 ng/mL for freshwater and 0.007 ng/mL for marine water, "certainly result[ing] in severe biological effects in many ecosystems." James P. Meador, Organotins in Aquatic Biota: Occurrence in Tissue and Toxicological Significance (2011), published in Environmental Contaminants in Biota: Interpreting Tissue Concentrations, 2nd edition, ed. W. Nelson Beyer & James P. Meador (Boca Raton: CRC, 2011), available at http://digitalcommons.unl.edu/usdeptcommercepub/552 at 260–261 (citing K. Fent, Ecotoxicology of organotin compounds, 26 Crit. Rev. Toxicol. 1–117 (1996)). Since then, as water column levels have improved, sediment concentrations have remained high and "sediment-associated TBT will likely continue to be a source and lead to elevated water and tissue concentrations." Id. at 260.

Bioaccumulation of organotins has proven difficult to assess but high bioconcentration factors ("BCF") for aquatic invertebrates have been observed, such as a BCF of 15,000 for marine snails for TPrT and in the range of 2,000 to 95,000 for TBT. Id. at 264. As with some other toxic pollutants, "rate of uptake for TBT is highly variable among species" and similarly the rate of elimination is also highly variable, but NMFS generally concluded that "TBT (and likely other organotins) is very slowly eliminated from tissue." Id. at 265, 266. NMFS summarized the body burden of marine mammals with regard to several organotins:

Marine mammals also appear to accumulate relatively high concentrations of organotins. Several recent studies and reviews demonstrate that numerous marine mammal species exhibit high levels in various tissues, including liver, blubber, and muscle. Tanabe (1999) found concentrations of TBT at high concentrations (35-2200 ng/g ww) in several different tissues of finless porpoise (Neophocaena phocaenoides) from waters around Japan, with similar high

concentrations for DBT and MBT. A review article by Kajiwara et al. (2006) presents data for 11 marine mammals species from various locations (Japan, Great Britain, Mediterranean, United States, Indo-Pacific, and India) showing high concentrations of TBT in liver (mean values 20-820 ng/g ww, maximum = 1200 ng/g). A number of studies examined organotins in killer whales (Orcinus orca). Harino et a1. (2008) found TBT concentrations in the range of 6-25 ng/g ww and far higher levels of DBT (16-556 ng/g) and MBT (16-152 ng/g) in the liver of this species (Table 7.2). They also report low levels of TPT (

Id. at 263.

In 2011, NMFS concluded that "[i]n all cases an organotin compound is far more toxic than its individual components," and identified multiple types of toxic responses including: inhibition of cellular energy metabolism, endocrine disruption including imposex and intersex abnormalities, neurotoxicity, inhibition of ion pumps, inhibition of cytochrome P450, inhibition of intracellular enzymes, immune system impairment, reduced growth, shell chambering (excessive shell growth) in bivalves, maternal transfer to eggs and young, reproductive effects including impairment, behavioral alterations, as well as mortality. Id. at 266, 269-277.

These and additional toxic responses are discussed in a 2017 analysis of data from 160 references that focused on TBT as an endocrine disrupter. Laurent Lagadic, et al., Tributyltin: Advancing the Science on Assessing Endocrine Disruption with an Unconventional EndocrineDisrupting Compound, 245 Reviews of Environmental Contamination and Toxicology 65–127, 67 (2017), available at https://link.springer.com/chapter/10.1007/398_2017_8. This paper drew conclusions about the toxicity of TBT as well as the implications for adequate regulation of complex toxic compounds:

[A] more thorough evaluation of the available data clearly shows that TBT is highly toxic to a variety of aquatic taxa. Through a comparative analysis of the potency of TBT in various aquatic species, our review highlights the observation that fish are as sensitive, or more so, compared to molluscs when based on water exposure. This is an important conclusion because molluscs were long recognized as uniquely sensitive to this compound. TBT's precise MeOA is still incompletely understood but may include link/cross-talk between PPARs (i.e., carbohydrate, lipid, protein metabolism), RXRs (i.e., development), thyroid (growth) and even sex determination and differentiation pathways; the latter pathways may be stronger affected by TBT exposure in species where environmental factors play a significant role in determining sex ratios (e.g., zebrafish).

Current screening and assessment methodologies are able to identify TBT as a potent endocrine disruptor with a high environmental risk. If those approaches were available when TBT was introduced to the market, it is likely that its use would have been regulated sooner, thus avoiding the detrimental effects on marine gastropod populations and communities as documented over several decades.

This retrospective evaluation of TBT, a very potent endocrine disruptor in vertebrates and invertebrates, should serve as an example demonstrating how shortfalls within the framework of chemical toxicity evaluation can result in under-protective regulatory assessment. Nowadays, the assays included in the OECD Conceptual Framework, including those recently developed on gastropod molluscs would likely recognize TBT as a chemical of concern with respect to endocrine disruption, although its mechanism of action and potency across taxonomic groups would remain largely unknown. Reflective analysis of wellstudied, but potentially misunderstood

contaminants, such as TBT, provides important lessons that should serve as a guiding principle for future studies and refinements of assessment protocols.

Id. at 105.

Adoption of EPA's recommended criteria without consideration to issues pertaining specifically to Puget Sound waters and without consideration of impacts to highly sensitive species is in error.

- Northwest Environmental Advocates

Response to 5.26.A

We are not aware of any concerns that would result in the disapproval of the EPA recommended criteria. The US Fish and Wildlife Service biological opinion for Oregon and the Swinomish Tribe Biological Evaluation resulted in not likely to adversely affect determinations for tributyltin. The National Marine Fisheries Service does report effects but not a jeopardy determination. We used this as the basis for our decision to adopt EPA recommendations.

Meador (2011) discusses tributyltin water concentrations in the 1980s to mid-1990s when tributyltin was actively being used. Tributyltin is now banned, but the pollutant continues to circulate in the environment. Tributyltin is a known endocrine disruptor; however, EPA only considers effects to growth, survival, and reproduction in the development of aquatic life criteria. It is unknown if effects to growth, reproduction, or survival occur at levels lower or higher than other endocrine related effects.

The intention of developing tributyltin aquatic life criteria is to regulate discharges into receiving water bodies. We aim to address tributyltin in surface waters by implementing the tributyltin criteria recommended by EPA. In a cursory review of ECOTOX, we did not find any indication that new scientific studies would significantly reduce EPA tributyltin recommendations. We may consider updates to tributyltin in the future based on new scientific studies.

5.27. Zinc

5.27.A Comment Summary – We support Ecology's updating its zinc criteria. Ecology's stormwater permit for discharges including zinc was the topic of a series of letters from NMFS regarding its failure to establish sufficiently protective limits on stormwater permits. See, e.g., Letter from Steven W. Landino, Washington State Director for Habitat Conservation, NMFS, to Mike Gearheard, Director, Office of Water and Watersheds, EPA (May 4, 2007) (re: Ecology issuance of Industrial Stormwater General Permit); Letter from Steven W. Landino, NMFS, to Mike Gearheard, EPA (Jan. 10, 2008) (same); Letter from Steven W. Landino, NMFS, to Mike Gearheard, EPA (July 15, 2009) (same).

Ecology should provide an explanation as to whether its proposed criteria appear to be sufficiently protective given the concerns expressed by NMFS in those letters (and referenced studies); see also NMFS, Water Quality How Toxic Runoff Affects Pacific Salmon & Steelhead (Spring 2012) (referencing the harm to ESA-listed species from zinc).

- Northwest Environmental Advocates

Response to 5.27.A

Thank you for your support. We used all available toxicity data to update zinc criteria in this rulemaking using the methods outlined in the Technical Support Document. We support that the revised zinc criteria are protective of aquatic life in Washington.

5.27.B Comment Summary – Ecology has not justified the use of certain data in deriving criteria for zinc.

The derivation of the FAV for zinc, the basis of the acute criteria and by extension the chronic criteria, is based on four GMAVs. The four GMAVs are based on Neocloeon triangulifer, Hyalella Azteca, Euchlanis dilatate, and Ceriodaphnia dubia. However, the first three (i.e., most sensitive species) are based on a single toxicological study. Development of a GMAV based on a single study is insufficient and the resulting FAV has very low confidence.

- Association of Washington Business

Response to 5.27.B

Thank you for your comment. It is acceptable to use a single species to represent a genus when other species data is not available. Please see EPA's previous derivations for other pollutants. EPA does not require multiple toxicity values for species within a genus to be used in criteria development.

5.27.C Comment Summary – Since 1995, a substantial amount of data on the toxicity of Zn to several freshwater species has overwhelmingly demonstrated that multiple water chemistry characteristics, in addition to hardness, influence the bioavailability and toxicity of Zn. Therefore, Zn criteria should be updated to reflect Zn bioavailability more accurately in freshwaters.

As recognized by U.S. EPA (2007, 2022), BLMs and MLR models are appropriate tools for incorporating bioavailability into criteria. Currently, there are acute and chronic Zn MLR models (DeForest et al. 2023) and acute and chronic Zn BLMs (DeForest and Van Genderen 2012; DeForest et al. 2023) for characterizing Zn bioavailability in freshwaters. Further, both MLR models and BLMs have been applied in a manner consistent with U.S. EPA (1985) guidelines for criteria development (DeForest and Van Genderen 2012; DeForest et al. 2023), and the outcome of those applications represents technically robust alternatives to hardness-based Zn criteria. In fact, DeForest et al. (2023) demonstrated that Zn MLR models and BLMs performed similarly with available ecotoxicity data, and that both performed substantially better than the hardness equation. We recommend that Ecology take a closer look at DeForest et al. (2023), and avoid using the hardness equation.

Ecology's willingness to consider the Cu MLR models from Brix et al. (2021) suggests that Ecology would be willing to consider similar bioavailability-based models for other metals. Application of the acute and chronic pooled MLR models described in DeForest et al. (2023) indicates that the Zn MLR model results can suffer from the same acute-chronic inversion (Figure 7) that occurs with the Cu MLR models. However, it occurs for Zn in only approximately 5% of the samples in our nationwide dataset, and it tends to occur in softer waters (Figure 8). If the acute and chronic Zn BLMs were used, the inversion would occur in fewer than

0.02% of samples. So, we recommend that Ecology considers updating the bioavailability-basis for the Zn criteria (i.e., by using the Zn MLR models or BLMs), as well as the normalized sensitivity distributions. On both aspects, IZA is happy to provide technical assistance to Ecology, and we would be willing to share our ecotoxicological database with Ecology for update of the Zn sensitivity distributions.

In summary, the IZA encourages Ecology to adopt bioavailability-based freshwater WQC for Zn (and other metals). Technically robust MLR model- and BLM-based approaches that are consistent with U.S. EPA guidelines for development of criteria are currently available. We believe that bioavailability-based criteria for Zn represent a fundamental advancement that will serve to achieve appropriate environmental protection and regulation.

- International Zinc Association

Response to 5.27.C

Thank you for your comment. We support using bioavailability models in developing zinc criteria. We are anticipating the release of a zinc MLR model by EPA in the near future and intend to evaluate this model for incorporation into Washington's standards after we have reviewed EPA's analysis.

5.27.D Comment Summary – The EPA suggests recalculating the zinc final acute value (FAV). Since the number of genus mean acute values (GMAV) is greater than 59, the FAV should be calculated using the ranks that are closest to 0.05 for its percentile rank; therefore, the FAV should be calculated using the ranks 2-5 instead of 1-4. Using this guidance, the FAV is calculated as 63.35 and the CMC=31.7 ug/L total Zn at hardness of 50. This calculation procedure for the FAV is found in the 1985 guidance (page 21): **N. Select the four GMAVs which have cumulative probabilities closest to 0.05 (if there are less than 59 GMAVs, these will always be the four lowest GMAVs)**. The 1985 guidance can be found at:

https://www.epa.gov/sites/default/files/2016- 02/documents/guidelines-water-quality-criteria.pdf

- U.S. EPA

Response to 5.27.D

Thank you for your comment. We have updated the freshwater acute zinc criterion.

5.27.E Comment Summary – Table 49 [of the Technical Support Document] "New freshwater acute studies that met data acceptability requirements since EPA last updated zinc criteria (S = static, R = static renewal, FT = flow-through, U = unmeasured test concentrations, M = measured test concentrations)" indicates that the Rhithrogena hageni study will not be used in the derivation of zinc criteria. No other acute zinc studies for Rhithrogena hageni could be found in the TSD. The EPA suggests reviewing the data again and including the data if this is the only study found for Rhithrogena hageni, or providing an explanation of why it should not be included.

- U.S. EPA

Response to 5.27.E

Thank you for this correction. We have included *Rhithrogena hageni* into the criteria calculations.

5.27.F Comment Summary – The EPA cannot replicate the calculation of the criterion continuous concentration (CCC) for freshwater chronic zinc. The EPA suggests recalculating this value as well as all other values relying on it.

- U.S EPA

5.27.G Comment Summary – The EPA suggests updating Table 51 "Acute to chronic ratios (ACR) used in chronic criterion derivation" to develop a species mean ACR for cottus bairdi and recalculating the ACR for Prosopium williamsoni as the EPA cannot replicate this number. All values that rely on these updates should be recalculated as well.

- US. EPA

Response to 5.27.F and 5.27.G

We have recalculated the freshwater chronic zinc criterion based on the eight family method and have removed previous calculations relying on acute to chronic ratios.

5.28. Human health criteria footnotes

5.28.A Comment Summary – While not the subject of this rulemaking effort, in updating the Toxic Substances Criteria table (Table 240, WAC 173-201A-240) the State has added footnotes for the human health criteria in Table 240, including footnote H, which states "Human health criteria applicable for Clean Water Act purposes in the state of Washington are contained in 40 C.F.R. 131.45 and effective as of December 19, 2022 (87 FR 69183)." The criteria values in the table that include this footnote have been disapproved by EPA and are not valid for Clean Water Act purposes. We recommend that as part of this update Ecology also update the values for human health criteria to reflect the federally promulgated criteria that are applicable.

- Northwest Indian Fisheries Commission
- Squaxin Island Tribe
- Puyallup Tribe of Indians

5.28.B Comment Summary – The Tribe reiterates its longstanding request that Ecology swiftly take action either to remove the disapproved human health criteria in WAC 173-201A240 (Table 240) or, better, to formally adopt the federally promulgated human health criteria, which Ecology has proposed only to reference by a new footnote to Table 240 through this rulemaking.

- Port Gamble S'Klallam Tribe

5.28.C Comment Summary – Ecology proposes to add the following footnote H to Table 240 at WAC 173-201A-240: "Human health criteria applicable for Clean Water Act purposes in the state of Washington are contained in 40 C.F.R. 131.45 and effective as of December 19, 2022 (87 FR 69183)." In its materials, the agency describes the footnote as a "[m]inor, non-substantive edit[] to rule language in WAC 173-201A-240 . . . to cite federal regulations for human health

criteria where they apply for Clean Water Act purposes," and indicates "[w]e are adding a footnote in the surface water quality standards that cite the federal regulations for EPA promulgated human health criteria where they are the applicable criteria for Clean Water Act programs in Washington." The Tribe appreciates this minor, ministerial effort to alert the public that some of the human health criteria in Table 240 in the Washington Administrative Code (WAC) are not actually in force for Clean Water Act purposes and pointing them to the HHC that are in effect. However, as the Tribe has explained to Ecology on multiple occasions since the federally promulgated human health criteria were reinstated in November 2022, Ecology must engage in a rulemaking to increase the durability of the effective human health criteria by removing the disapproved human health criteria from Table 240 altogether. The State of Washington has already invested significant resources in its efforts to defend the federally promulgated human health criteria in two separate lawsuits, and what is needed now is a rulemaking to ensure that the old disapproved HHC are no longer in the WAC, and so are no longer available as a possible fallback in the face of industry opposition to the federally promulgated HHC, which are necessary to ensure Washingtonians can safely eat fish from Washington waters. While serving as useful notice to the public, footnote H simply does not go far enough to guard the HHC that have been in force since 2022 (and which were in force from 2016 to 2020). We exhort Ecology either to remove the disapproved HHC from Table 240 entirely (such that all that appears for those pollutants in the HHC columns of the table is the footnote and not the disapproved numeric criteria) through an expedited rulemaking or, even better, to formally adopt the federally approved HHC and update Table 240 with these criteria, which were based on sound science, including the 2015 304(a) national recommendations.

- Port Gamble S'Klallam Tribe

5.28.D Comment Summary – We understand that Ecology intends to retain the out-of-date human health criteria values in Table 240 (Toxics Substances Criteria) and add a footnote to cite applicable human health criteria in the federal register. Instead of adding this new footnote (H) noting that human health criteria are contained in 40 CFR 131.45 (effective as of December 19, 2022), we recommend Ecology update the values in Table 240 to be consistent with 40 CFR 131.45. We do not believe this would be considered a revision and the footnote could note they were updated to reflect the December 2022 changes. We believe it will be clearer and more effective to have updated human health values reflected in the table.

- King County

Response to 5.28.A, 5.28.B, 5.28.C, and 5.28.D

We will consider additional actions related to the human health criteria in the future. Human health related actions beyond minor and non-substantive changes are beyond the scope of this rulemaking.

6. Comments on toxic chemicals not included in proposed rule

6.1. Not in proposal - 44'-DDT and metabolites

6.1.A Comment Summary – Ecology proposes to take no action to update its 4,4'-DDT and metabolite criteria because "[w]e are not aware of endangered species protection issues with EPA recommended 4,4'-DDT and metabolites criteria in Region 10 states." TSD at 117. DDT

was not the subject of the Oregon BiOp and in Idaho, with FWS rationalizing that DDT was unlikely to adversely affect ESA-listed species because "[n]o new discharges permitted and human health criteria will minimize exposure risk." FWS Idaho BiOp at 231. However, NMFS concluded that for DDT in Idaho "[t]he proposed chronic criterion may allow substantial bioaccumulation to occur because DDTs are taken up not only from the water column but also from sediments and prey organisms" while not making a jeopardy finding for the salmonid species listed in Idaho waters. NMFS Idaho BiOp at 232. However, this biological opinion did not evaluate the impacts of DDT criteria on Southern Resident killer whales because EPA had not provided such an analysis to NMFS. See id. at 2. Likewise, in the Oregon BiOp, DDT was not a subject of the ESA consultation but NMFS observed:

some of these pollutants do not need to be in high concentration in a species to be toxic and have long been recognized as problematic for the Southern Resident killer whales. The organochlorines (e.g., PCBs and DDTs) are thought to pose the greatest risk to killer whales (Ross et al. 2000, Center for Biological Diversity 2001, Krahn et al. 2002). Organochlorines are . . . [d]esigned for their stability, most are highly persistent in the environment and can resist metabolic degradation. These persistent pollutants can accumulate in the food webs and are at relatively high concentrations in upper trophic-level species such as killer whales.

Oregon BiOp at 80. Similarly, in its 2009 report on toxics in the Columbia River Basin, EPA highlighted four toxic pollutants including the long-banned DDT, explaining that "[d]ata collected in the 1980s showed that fish in the Yakima River Basin had some of the highest concentrations of DDT in the nation." EPA, Columbia River Basin: State of the River Report for Toxics (Jan. 2009) at 20. EPA also wrote that DDT is "still regularly detected in the fish, plants, and sediments of the River and many of its tributaries, indicating that DDT continues to cycle through the food web," and that "[t]he primary source of DDT to the Columbia River Basin is the considerable acreage of agricultural soils in which DDT accumulated over three decades of intensive use (1940s to early 1970s)." Id. at 19. In its conclusion that DDT levels in the Columbia River can be reduced, EPA cited to the CWA provisions of Section 303(d) to identify and prepare "water quality improvement plans for those impaired waters so they will meet water quality standards." Id. at 30. These Total Maximum Daily Loads ("TMDL") cannot be protective if the standards they seek to meet are not adequate.

DDT is a problem in Washington's waters statewide. In its latest 303(d) list of impaired waters, DDT and its metabolites accounted for 173 segments in Category 5 and 1,076 in Category 3. In Puget Sound, DDT is a continuing problem.

As EPA states on its website:

High levels of persistent organic pollutants (e.g. PCBs and DDT, which were banned from use in Canada and the U.S. long ago) and newer pollutants like those found in flame retardants (PBDEs), may be preventing the population of Southern Resident Killer Whales from increasing at a rate required for recovery. Individuals have been found to carry some of the highest PCB concentrations reported in animals, with levels in blubber exceeding those known to affect the health of other marine mammals. Other contaminant levels, such as the levels of DDT and PBDEs, are also found in high levels, especially in juvenile killer whales.

EPA, Southern Resident Killer Whales, Why is it Happening?, Current Threats to Killer Whale Recovery, Pollution and Contaminants (updated June 2021). Ecology's "Phase 3" study, cited in the Western Washington Phase II Municipal Stormwater Permit (July 1, 2019) Fact Sheet,

evaluated DDT because it was highlighted as being a "key contaminant" in the report for the Phase 2 study of toxics in surface runoff (EnviroVision et al. 2008; Herrera 2010)." Id. at 41. See Herrera Environmental Consultants, Inc. 2011, Toxics in Surface Runoff to Puget Sound, Phase 3 Data and Load Estimates, Washington State Department of Ecology, Olympia, WA (2011). The report concluded:

Total DDT was detected in 8.3 percent of the storm-event samples and 6.7 percent of the baseflow samples for all land-use types. Total DDT was detected almost solely in commercial/industrial subbasin samples. Lastly, DDT was detected more frequently in the Puyallup watershed than the Snohomish watershed.

Id. (internal citations omitted). This means that, although banned for decades, DDT is still present in discharges authorized by NPDES permits

It is not difficult to find extensive documentation of the threat posed by DDT to the Southern Resident killer whales that could be easily described as "endangered species protection issues." See, e.g., NMFS, Exposure to a Mixture of Toxic Chemicals: Implications for the Health of Endangered Southern Resident Killer Whales (Nov. 2016) at 4 (Table 1, describing DDT as persistent, bioaccumulative "pesticide still used in some countries, currently banned in North America; persists in terrestrial runoff 30 years post-ban, enters atmosphere from areas where still in use" that poses the risk to killer whales of "reproductive impairment, immunosuppression, adrenal and thyroid effects." DDT is also described as being maternally transferred to young killer whales during both gestation and lactation. Id. at 27-31. While NMFS identifies DDT as a "signature of foraging in California waters," id. at 56, Washington's contribution is not nothing, as demonstrated by the 303(d) list, and the killer whales do not care what the source of the DDT is; to provide protection for them, Ecology must consider their current level of contamination. Likewise, Ecology must consider the nutritional stress on the orcas from reduced Chinook salmon populations in the Puget Sound region, see, e.g., id. at 57, for which the State of Washington bears full responsibility.

In any event, it is ludicrous for Ecology to assert that there are no ESA concerns with EPA's 1980 recommended criteria, criteria that are 44 years old.

- Northwest Environmental Advocates

Response to 6.1.A

We have revised sentences throughout the technical support document that better specifies the intent of the statement surrounding concerns for EPA recommended criteria. Rather than state that we are not aware of any endangered species protection issues related to a particular toxic, we are specific in saying that we are not aware of any concerns for aquatic life related to the EPA recommended criteria. While there is a significant dataset on DDT and other chemicals, attributing the exposure and effects to EPA's recommended aquatic life criteria is uncertain. DDT is a bioaccumulative compound, and updates to the criteria should consider tissue-based criteria. We are interested in exploring these novel methods in future rulemakings and will continue to track EPA's development in tissue-based criteria and trophic level considerations.

6.2. Not in proposal – Ammonia

6.2.A Comment Summary – [TSD pg] 35. Ecology notes that it last updated its criteria for ammonia in 2003, prior to EPA's last updated criteria. Nowhere in the TSD does Ecology discuss ammonia, including why it is not discussed. Yet for older criteria, ammonia is "predicted to result in mortality at the population level" by NMFS. NMFS Oregon BiOp at 486. Ammonia is a concern for both salmonids and freshwater mussels, the former often an ESA-listed species, and the latter well on their way to ESA listings. See, e.g., EPA, Aquatic life Ambient Water Quality Criteria for Ammonia (2013) available at https://www.epa.gov/sites/default/files/2015-08/documents/aquatic-life-ambientwater-quality-criteria-for-ammonia-freshwater-2013.pdf at 52-61 (protection of mussels, snails, and salmonids). Ammonia is hardly an irrelevant pollutant in Washington waters, with 22 segments listed in Category 5 and 599 in Category 3. Why is Ecology not even considering updating the state's ammonia criteria? This omission also raises the question: what other toxic pollutants has Ecology ignored?

- Northwest Environmental Advocates

Response to 6.2.A

Washington's ammonia criteria are being reviewed by EPA for endangered species protection in relation to their own recommendations. We are awaiting their analysis before considering any changes to ammonia.

6.3. Not in proposal – Chlordane

6.3.A Comment Summary – Chlordane is prevalent in Washington waters, with 15 segments on the Category 5 303(d) list and 473 in Category 3. Ecology should conduct an evaluation of whether the criteria are protective of ESA-listed and sensitive species.

- Northwest Environmental Advocates

Response to 6.3.A

We do not intend to develop state-specific criteria for chlordane at this time based on our rule approach but may consider additional toxicity data in future rulemakings. The triennial review process is a platform for stakeholders to express concerns and provide compelling information for prioritization of future rulemakings. To our knowledge, the EPA recommended criteria are protective.

6.4. Not in proposal – Chloride

6.4.A Comment Summary – We are not aware of any ESA protection issues with regard to chloride or EPA's recommended criteria but given Ecology's frequent, and misguided, invocation of this excuse for not evaluating the need to update criteria, we do not place any store by its conclusion.

- Northwest Environmental Advocates

Response to 6.4.A

We do not intend to develop state-specific criteria for chloride at this time based on our rule approach but may consider additional toxicity data in future rulemakings. We are not aware of any concerns that would result in the disapproval of the EPA recommended chloride criteria. The triennial review process is a platform for stakeholders to express concerns and provide compelling information for prioritization of future rulemakings.

6.5. Not in proposal – Chlorine

6.5.A Comment Summary – We appreciate Ecology's discussion of the Swinomish Tribe BE. However, EPA's evaluation suggests that the Services might have a different perspective on the potential hazards of chlorine. Given that chlorine is a common constituent of regulated discharges, we urge Ecology to either adopt the 12.56 µg/L EPA calculated or re-adopt the EPA recommended criteria and give the Services an opportunity to determine whether these criteria are sufficiently protective to ESA-listed species in Washington waters. Given the State of Washington and Ecology's ostensible goal to protect salmonids and the Southern Resident killer whale, it is the least the agency could do.

- Northwest Environmental Advocates

Response to 6.5.A

We do not intend to develop state-specific criteria for chlorine at this time based on our rule approach but may consider additional toxicity data in future rulemakings. EPA's analysis of the Swinomish Tribal standards does not constitute final Endangered Species Act consultation considerations. We intend to wait to get a full analysis by the Services (National Marine Fisheries Service and US Fish and Wildlife) before considering updates to chlorine. After reviewing scientific studies, we did not find any compelling data that would lower the chlorine criteria.

6.6. Not in proposal - Chloromines

6.6.A Comment Summary – Based on my professional experience, I advise that Chlorine disinfectant by-products such as Trihalomethanes or Haloacetic acids should also be listed on the proposed revised list of toxic substances. Concentrations of Chlorine disinfectants resulting from water treatment processes threaten both aquatic plants and wildlife in two separate ways. First, Chlorine can harm living organisms by damaging or destroying their cell walls. Next, the chemicals that are present in these disinfectant products (Chlorine, Calcium Hypochlorite) can bond with other materials in water forming more harmful compounds. Disinfection by-products such as Trihalomethanes or Haloacetic acids are known to be toxic to aquatic organisms and are active in surface waters with high dissolved organic matter. Additionally, water disinfectants can also combine with Nitrogen forming Chloramine or N-nitrosodimethylamine compounds which are carcinogenic in nature. As a result of this, drinking water treatment processes must be closely monitored and other water treatment technologies such as UV treatment must be considered as an alternative.

- Vlad, Daniel

6.6.B Comment Summary – I noted that there once no reference taken to Choloromines which have been transitioned into the water treatments systems to extend the sanitization of operational systems.

Please add Chloromines to the list, for evaluation at least, to ensure that they are not leaving our water treatment systems in large quantities from existing municipal systems. Also please add then to the non-applied list as the slide 13 of the Aquatics Life Toxics Rulemaking presentation given by DOE on Oct. 10th 2023, noting EPA recommendations are not planned to be used. Please reconsider to ensure that Chloromines are not hidden chemical combination that might have the potential in damaging small marine life and plants.

- Tabayoyon, Paul

Response to 6.6.A and 6.6.B

EPA does not have aquatic life criteria recommendations for chloromines. Chloromines are more relevant to drinking water as a result of the water treatment disinfectant process. The aquatic life criteria are intended to protect aquatic life in water bodies and do not apply to drinking water. This comment is beyond the scope of this rulemaking.

6.7. Not in proposal – Chlorpyrifos

6.7.A Comment Summary – Once again, Ecology invokes its lack of awareness about "endangered species protection issues" to avoid evaluating whether the 1986 EPA recommended criteria are sufficient to protect ESA-listed species and designated uses writ large in Washington waters. There is plenty of evidence that EPA might have gotten the criteria wrong 38 years ago. In that intervening time period, NMFS made a jeopardy determination for the registration of this pesticide, a consultation that was reinitiated by EPA following a modification of the federal action (e.g., removal of high risk uses from the authorized use). See NMFS, Revised Conference and Biological Opinion on the Environmental Protection Agency's Registration Review of Pesticide Products containing Chlorpyrifos, Malathion, and Diazinon (June 30, 2022). Nonetheless, the science on the effects of chlorpyrifos on designated uses, including but not limited to ESA-listed species, is highly relevant to evaluating whether the 38-year old EPA recommended criteria are sufficiently protective. Regardless of how chlorpyrifos is allowed to be used through the registration, Washington already has identified 15 waterbody segments that violated current criteria and 132 for which it had insufficient information (Category 3). These alone demonstrate that chlorpyrifos is present in Washington waters. Moreover, EPA issued a final rule revoking all chlorpyrifos tolerances and setting an expiration date for those tolerances of February 28, 2022. EPA, Chlorpyrifos, available at https://www.epa.gov/ingredients-usedpesticide-products/chlorpyrifos. Regardless of subsequent action by the Eight Circuit Court of Appeals, see id., EPA has finally determined this pesticide is not safe for people. NMFS has identified it is not safe for salmon. Ecology has an obligation to assess the sufficiency of the outdated EPA recommended criteria for protection of Washington's aquatic species.

In addition, Ecology is ignoring the potential impacts to the ESA-listed Oregon spotted frog. There is evidence that amphibians, including but not limited to those with ESA listings, are more sensitive to pesticides than other biota. See, e.g., Sara J. McClelland, et al., Insecticide-induced changes in amphibian brains: How sublethal concentrations of chlorpyrifos directly affect neurodevelopment, 10 Environ Toxicol Chm 2692 (Oct. 2018) ("Previous work has shown that

trace amounts of the pesticide chlorpyrifos altered tadpole morphology and neurodevelopment in artificial ponds[.]. * * * Developmental exposure to chlorpyrifos resulted in metamorphs with a relatively wider optic tectum, medulla, and diencephalon compared with controls, and this result was found regardless of the zooplankton population within the mesocosm. Thus, chlorpyrifos directly impacted brain development, independent of the effects on the trophic community. . . . To conclude, low, ecologically relevant doses of organophosphorous pesticides can directly impact neurodevelopment in a vertebrate model.")

- Northwest Environmental Advocates

Response to 6.7.A

EPA aquatic life criteria recommendations are based on effects to aquatic species growth, survival, or reproduction. Other effects or endpoints (e.g., neurodevelopment) that are referenced in this comment are not considered in criteria development. We have changed our statement about lack of awareness about endangered species protection issues to specific reference to we are not aware of any concerns that would result in the disapproval of the EPA recommended chlorpyrifos aquatic life criteria.

We do not intend to develop state-specific criteria for chlorpyrifos at this time based on our rule approach but may consider additional toxicity data in future rulemakings. The triennial review process is a platform for stakeholders to express concerns and provide compelling information for prioritization of future rulemakings. To our knowledge, the EPA recommended criteria are adequately protective.

6.8. Not in proposal – Chromium VI saltwater criterion

6.8.A Comment Summary – It makes no sense, however, to ignore the possibility that saltwater criteria might need updating based on the fact that Washington's saltwater criteria are identical to EPA recommendations, and there are no endangered species protection issues highlighted in previous ESA consultations in Oregon. Puget Sound is unique among the three Northwest states. But, oddly, Puget Sound is not even mentioned anywhere in the TSD. It makes even less sense when Ecology acknowledges that "[t]he Swinomish biological evaluation found that there would likely be indirect effects to prey species for ESA listed species in Washington from exposure to the freshwater chronic and saltwater acute and chronic chromium VI criteria (USEPA, 2022a)." TSD at 65 (emphasis added). That EPA and NMFS relied on levels of chromium VI in the "action area is unlikely" suggests that Ecology should engage in looking at potential sources of chromium VI in Puget Sound. Ecology's relying on action area conclusions that have no overlap with the action area in question is illogical.

- Northwest Environmental Advocates

Response to 6.8.A

We are not aware of any concerns that would result in the disapproval of the saltwater chromium VI criteria. We may consider reviewing available information for saltwater chromium VI in the future.

Comments on toxic chemicals not included in proposed rule: Not in proposal - Copper saltwater criterion

6.9.Not in proposal - Copper saltwater criterion

6.9.A Comment Summary – Ecology's conclusion that no changes will be considered for saltwater copper criteria because "Washington's current saltwater copper criteria are identical to EPA recommendations, and there are no known ESA consultation issues in other Region 10 states," ignores the unique nature of Puget Sound, its municipal, industrial, and stormwater discharges, and its species. This is in error.

- Northwest Environmental Advocates

Response to 6.9.A

We do not intend to develop state-specific criteria for saltwater copper criteria at this time based on our rule approach but may consider additional toxicity data in future rulemakings. Deviating from EPA's recommended criteria would require toxicity data regarding aquatic species growth, reproduction, or survival demonstrating EPA's recommendations are not protective. Special attention to the quality of scientific studies and the toxic effects being examined are necessary to determine if toxicity data can be incorporated into criteria development. To our knowledge, the EPA recommended criteria are protective.

6.10. Not in proposal - Cyanide saltwater criterion

6.10.A Comment Summary – Ecology states: "Washington's current saltwater cyanide criteria are identical to EPA recommendations and to our knowledge there are no endangered species protection concerns in Washington." This is absurd. First, Ecology fails to accurately reflect its current cyanide saltwater criteria. These are inaccurately shown in TSD at 126, Table 63. In fact, as Ecology knows full well, its saltwater criteria include an entirely separate provision in a footnote: The cyanide criteria are: 2.8µg/l chronic and 9.1µg/l acute and are applicable only to waters which are east of a line from Point Roberts to Lawrence Point, to Green Point to Deception Pass; and south from Deception Pass and of a line from Partridge Point to Point Wilson. The chronic criterion applicable to the remainder of the marine waters is l µg/L. WAC 173-201A-240, Table 240, footnote mm. Second, Ecology cites only the Idaho BiOps for information about ESA consultation, ignoring the draft BiOps by both Services in a failed national consultation on cyanide that shed light on saltwater criteria that would not have been covered in an ESA consultation for an inland state, such as Idaho.

While differences between EPA and the Services, and litigation brought by Northwest Environmental Advocates against the Services over their failure to complete the consultation, brought about EPA's withdrawal of the request for consultation, NMFS found that the current EPA recommended cyanide criteria are likely to reduce the viability of one or more populations throughout the range of listed Pacific salmon, steelhead, and sturgeon species, we expect that the action is likely to reduce the viability (that is, increase the extinction probability or appreciably reduce their likelihood of both surviving and recovering in the wild) of the listed species as a whole. The specific listed species at risk are: California coastal Chinook salmon, Central Valley spring-run Chinook salmon, Lower Columbia River Chinook salmon, Upper Columbia River spring-run Chinook salmon, Puget Sound Chinook salmon, Sacramento River winter-run Chinook salmon, Snake River fall-run Chinook salmon, Snake River spring/summer-run Chinook salmon, Upper Willamette River Chinook salmon, Columbia River chum salmon, Hood Canal summer-run chum salmon, Central California Coast coho salmon, Lower Columbia River

coho salmon, Southern Oregon and Northern California Coast coho salmon, Oregon Coast coho salmon, southern green sturgeon, shortnose sturgeon, Lake Ozette sockeye salmon, Snake River sockeye salmon, Central California Coast steelhead, California Central Valley steelhead, Lower Columbia River steelhead, Middle Columbia River steelhead, Northern California steelhead, Puget Sound steelhead, Snake River steelhead, South-Central California Coast steelhead, Southern California coast steelhead, Upper Columbia river steelhead, and Upper Willamette River steelhead.

Finally, a reduction in Puget Sound Chinook salmon would in turn significantly reduce the forage base of southern-resident killer whales. Therefore, while we agree that southern resident killer whales are not likely to respond physically, physiological, or behaviorally to their direct exposure to cyanide at the CCC or the CMC, we expect that the action, through indirect effects to their primary prey, Pacific salmon, is likely to appreciably reduce the likelihood of southern-resident killer whales surviving and recovering in the wild. Similarly, a reduction in Chinook, coho, sockeye, and chum salmon would in turn significantly reduce the forage base of Cook Inlet beluga whales.

NMFS, DRAFT Endangered Species Act Section 7 Consultation Biological Opinion & Conference Opinion On the U.S. Environmental Protection Agency's Approval of State or Tribal, or Federal Numeric Water Quality Standards for Cyanide Based on EPA's Recommended 304(a) Aquatic Life Criteria (undated) at 270-271. While NMFS found no jeopardy—based on insufficient data—to marine species based on the EPA recommended criteria, it did not consult on and did not find that Washington's much higher marine criteria in footnote mm are protective. See id. at 31-32.

Last, there is other information in the aborted national consultation on cyanide that should inform Ecology's choice of proposed criteria. For example, the Draft NMFS Cyanide BiOp discusses the relationship between cyanide and low temperatures on coldwater species, such as salmon. Id. at 267. Ecology should also review and rely on the related FWS BiOp, which found for example jeopardy to ESA-listed bull trout. See FWS, Draft Biological Opinion On EPA's Proposed Program of Continuing Approval or Promulgation of New Cyanide Criteria in State and Tribal Water Quality Standards (Jan. 15, 2010). Again, the information on the effects of cyanide criteria on ESA-listed species is not limited to evaluating only ESA-listed designated uses in Washington.

Ecology might be interested to know that neither Idaho nor EPA has timely met the reasonable and prudent alternatives for cyanide criteria in Idaho. See, e.g., NWEA Idaho RPA Petition (EPA has failed to promulgate aquatic life criteria for Idaho waters for acute and chronic cyanide to meet the reasonable and prudent alternatives in the Idaho BiOp and avoid jeopardy to numerous ESA-listed species).

- Northwest Environmental Advocates

Response to 6.10.A

Thank you for your comment. We did review the draft nationwide cyanide Biological Opinion and found the following excerpt in relation to the statewide marine cyanide criteria:

> "In the interim, until further investigations that establish threshold responses are available, current information suggests that the effects of cyanide at the salt water CMC

> and CCC values of 1.015 µg CN/L on listed marine species and their designated critical habitat, and proposed marine species are extremely unlikely to occur and thus discountable. Our conclusion is based on available data on the responses of marine species relative to the saltwater aquatic life criteria thresholds. The recommended saltwater CMC and CCC are set at very low levels, 1.015 µg CN/L. The CMC value for cyanide was driven by data on the eastern rock crab, Cancer irroratus. The species mean acute value for eastern rock crab is 4.893 µg CN/L making the crab six times more sensitive than the next most sensitive marine species, the calanoid copepod, Acartia tonsa (EPA 1985). Data were available on the chronic effects of cyanide to only two marine species when EPA established the recommended aquatic life criteria, the mysid, Mysidopsis bahia, and the sheepshead minnow, Cyprinodon variegatus. Recognizing that these species are relatively resistant to cyanide, EPA set the CCC equal to the CMC because doing so was probably more indicative of the chronic sensitivity of the rock crab than obtained using chronic response data from other species and using other derivation methods (ACR). We found no data to suggest that listed marine species would respond to cyanide exposures at or below 1.015 µg CN/L."

This BiOp was unfortunately never finalized and therefore was not considered in this rulemaking. We recognize that Washington does have a site-specific criterion for marine cyanide in Puget Sound. We went through the process outlined by EPA to develop a site-specific criterion, and the project was published in a peer-reviewed journal. We aren't aware of any data that suggests toxic effects are occurring as a result of this site-specific criterion. Unfortunately, there are limited data on marine cyanide that is useful for criteria development. We will continue to track any developments and new scientific studies for cyanide.

6.11. Not in proposal – Endosulfan

6.11.A Comment Summary – Ecology's ignorance notwithstanding, there is information from the Services on the hazards of endosulfan to some ESA-listed species, and therefore potentially to ESA-listed species and other sensitive designated uses in Washington waters. For example, jeopardy determinations were made by the FWS in its 1989 Pesticide BiOp, notably for suckers and mussels. See id. at II-89–II-91. NMFS in its Oregon BiOp did not make a jeopardy determination but it raised significant concerns about the protectiveness of the EPA recommended criteria:

Based on the direct mortality population modeling results, juvenile salmon and steelhead exposed to aluminum, ammonia, arsenic, lindane, cadmium, chromium (III), chromium (VI), copper, dieldrin, endosulfan-alpha, endosulfan-beta, endrin, heptachlor epoxide, lead, nickel, pentachlorophenol, selenium, silver, tributyltin, and zinc is predicted to result in mortality at the population level—relative to the baseline population model.

NMFS Oregon BiOp at 486 (emphasis added). How does this not constitute "endangered species protection issues with EPA recommendations"?

- Northwest Environmental Advocates

Response to 6.11.A

We do not intend to develop state-specific criteria for endosulfan criteria at this time based on our rule approach but may consider additional toxicity data in future rulemakings. Deviating from EPA's recommended criteria would require toxicity data regarding aquatic species growth, reproduction, or survival demonstrating EPA's recommendations are not protective. Special attention to the quality of scientific studies and the toxic effects being examined are necessary to determine if toxicity data can be incorporated into criteria development. To our knowledge, the EPA recommended criteria are protective.

We have changed the wording in regard to awareness of endangered species protection. We now state that we do not have knowledge that aquatic life effects occur specific to EPA recommended criteria for endosulfan.

6.12. Not in proposal – Heptachlor

6.12.A Comment Summary – Heptachlor has not been the subject of any ESA consultations on species found in Washington because Idaho and Oregon had already adopted criteria for this 1980 recommended criteria. In California, EPA declined to engage in ESA consultation for this pollutant, thereby avoiding it. It is unlikely that 44-year old criteria are sufficient to protect designated uses including but not limited to ESA-listed species. Heptachlor is one of multiple pesticides covered by the NMFS Biological Opinion on EPA Pesticides General Permit for Discharge of Pollutants into U.S. Waters (Oct. 17, 2016) that concluded:

The species jeopardy and designated critical habitat adverse modification determinations in prior NMFS opinions for pesticide re-registrations and the analyses in EPA's BE indicate that pesticide discharges under these use patterns will result in exposures to toxicants that will affect the survival and fitness of individuals through direct mortality, reduced growth, altered behavior, and reduced fecundity of salmonids, sea turtles, rockfish, sturgeon, coral, and Nassau grouper. Further, discharges under these use patterns are expected to result in exposures to toxicants that will affect the survival and fitness of individuals through reduction in extent of inhabitable area/avoidance and reduction in prey species, affecting the prey component of designated critical habitat essential features for the following species: leatherback sea turtle, southern resident killer whale, green sturgeon, eulachon, bocaccio, yelloweye rockfish, steelhead, and chum, sockeye, chinook, and coho salmon. Id. at 95 (emphasis added).

The findings of this biological opinion apply to Washington State. Id. at 117 (the reasonable and prudent alternatives apply in Washington). Putting aside the EPA action underlying the consultation, Ecology is required to use the data and analysis provided therein.

- Northwest Environmental Advocates

Response to 6.12.A

Thank you for the information. The Biological Opinion (BiOp) referenced is not specific to protectiveness of EPA nationally recommended aquatic life criteria but evaluate the application of pesticides in relation to label requirements. The scope of BiOps for the EPA pesticide general permit is different than adoption of state aquatic life criteria. We aren't positive on how this information can be used in relation to criteria development because it reviews use patterns in

accordance with label requirements. We will continue to track any movement on EPA recommended criteria related to heptachlor.

6.13. Not in proposal - Heptachlor epoxide

6.13.A Comment Summary –Ecology does not have the option foregoing the adoption of numeric criteria with a wave to using its narrative toxics criteria "when needed," which it utterly fails to explain. In addition, heptachlor epoxide is "predicted to result in mortality at the population level" by NMFS. NMFS Oregon BiOp at 486. Washington has nearly 1,000 waterbody segments that it has identified as either Category 3 or 5 for heptachlor and heptachlor epoxide combined, demonstrating that the pollutant is of significant concern in the state. It is nonsensical to concurrently state that heptachlor epoxide is a metabolite that "can result in toxicity greater or less than a parent compound" and that Ecology is not going to adopt any numeric criterion for heptachlor epoxide.

- Northwest Environmental Advocates

6.13.B Comment Summary – We do not believe that Washington's decision not to adopt EPA's recommended criteria for heptachlor epoxide is adequately supported. Heptachlor epoxide is a priority pollutant, and as such the State does not provide adequate rationale for not adopting numeric criteria for this pollutant as required by the Clean Water Act.

- Northwest Indian Fisheries Commission
- Suquamish Indian Tribe of the Port Madison Reservation

6.13.C Comment Summary – The state should adopt the nationally recommended criteria for this toxic. As a degradation product of heptachlor, which was widely used as an insecticide historically, shows up in many NPL sites and is toxic to fish at very low concentrations, we believe it is the most protective approach.

- Puyallup Tribe

6.13.D Comment Summary – We suggest that Ecology consider alternative methods for developing heptachlor epoxide criteria. The technical support document cites that this metabolite may behave differently than its parent component though there is documentation that their toxicity effects are very similar1 but with heptachlor epoxide being more stable in the environment for a longer period of time. While the use of heptachlor has been largely curtailed in the U.S., its limited use and potential concentration in waste disposal sites can still pose a hazard to aquatic life.

- Jamestown S'Klallam Tribe

6.13.E Comment Summary – PGST opposes Ecology's proposal not to adopt the 304(a) recommendation for heptachlor epoxide, which is a priority pollutant and is highly toxic to finfish, shellfish, waterfowl, and aquatic plants. Please review the Ridolfi memorandum at pages 2 and 4 for the reasons for which Ecology's explanation of why it chose not to adopt the 304(a) national recommendation or any other numeric criteria for heptachlor epoxide is unsupportable. The Tribe urges Ecology in the strongest of terms to adopt each of the federally recommended criteria for this extremely hazardous pollutant: 0.52 µg/L (freshwater acute); 0.0038 µg/L (freshwater chronic); 0.053 µg/L (saltwater acute); 0.0036 µg/L (saltwater chronic). We note that Oregon submitted these same proposed criteria to EPA in 2004. The Oregon Biological Opinion

stated: "Based on the direct mortality population modeling results, juvenile salmon and steelhead exposed to . . . heptachlor epoxide . . . is predicted to result in mortality at the population level—relative to the baseline population model." The Tribe fails to see any conceivable basis for not regulating this lethal toxic pollutant through numeric criteria, particularly when EPA has a 304(a) recommendation in place. Failure to so regulate will harm Treaty-protected resources, and the Tribe highly recommends that the State at least adopt the current 304(a) nationally recommended criteria.

- Port Gamble S'Klallam Tribe

Response to 6.13.A, 6.13.B, 6.13.C, 6.13.D, and 6.13.E

Heptachlor epoxide has limited and uncertain toxicity data. It is not prudent to develop criteria without the appropriate and adequate toxicity data because criteria have meaningful implications in regulations. It is our duty to ensure they are protective and not unnecessarily burdening. EPA makes several assumptions in prescribing criteria for heptachlor epoxide from data on heptachlor. We support further research into heptachlor epoxide criteria in Washington. We encourage further dialogue regarding heptachlor epoxide in the upcoming triennial review.

6.14. Not in proposal - hydrogen sulfide

6.14.A Comment Summary – We agree with Washington's decision not to adopt EPA's recommended criterion for hydrogen sulfide. The biological evaluation results for the Swinomish Tribe's aquatic life toxics criteria concluded that the EPA's recommended value for hydrogen sulfide is likely to adversely affect (LAA) biological resources. The TSD should explain why the LAA determination for hydrogen sulfide did not trigger a review of alternative approaches for the development of criteria.

- Northwest Indian Fisheries Commission
- Suquamish Indian Tribe of the Port Madison Reservation
- Puyallup Tribe

6.14.B Comment Summary – The Tribe appreciates the reasons for which Ecology might have chosen not to adopt the federal recommendation, especially due to the impact on listed species (e.g., steelhead, Chinook salmon, chum salmon, bull trout) and critical habitat (Chinook salmon, bull trout, bocaccio and yelloweye rockfish). See, e.g., Biological Evaluation of EPA's Proposed Approval Action on the Swinomish Tribe's Water Quality Standards Aquatic Life Criteria at 1-7, 1-10, 1-13, 5-84 to 5-5-85 (2022). However, in the absence of useful federal recommendations, we believe that Ecology should instead have endeavored to determine what appropriate hydrogen sulfide criteria would be that would protect vulnerable aquatic species in the State—species that are, again, important both to the Tribe and the State of Washington. Moreover, hydrogen sulfide exceeds the Washington Sediment Management Standards, id. at 4-71, which is another reason for Ecology to prioritize setting numeric water quality criteria. We adopt the Ridolfi recommendation (page 2):

The TSD should explain why the LAA determination for hydrogen sulfide did not trigger a review of alternative approaches for the development of criteria

While the Tribe does not request that Ecology hold off on finalization of the proposed rule to develop its own alternative approaches for the establishment of criteria if Ecology cannot find an existing alternative approach, the Tribe would like further clarification as to why the approach used by the North Carolina Division of Water Resources (which, in 2007, set an aquatic life criterion for hydrogen sulfide nearly ten times lower than EPA's 1986 recommendation) cannot be used in this rulemaking. If it cannot be used for scientifically credible reasons, the Tribe urges Ecology to develop the necessary approaches and adopt hydrogen sulfide aquatic life criteria in the next triennial review rather than continue to rely solely on narrative criteria. Hydrogen sulfide can have lethal effects on fish, and sublethal effects include reduced appetite and erratic swim behavior. Consequently, regulation of this contaminant is important to protect Treaty-protected resources.

- Port Gamble S'Klallam Tribe

6.14.C Comment Summary – Ecology should adopt EPA's recommended criteria for hydrogen sulfide. Hydrogen sulfide can have lethal effects on fish. Sublethal effects include reduced appetite and erratic swim behavior.

- Squaxin Island Tribe

6.14.D Comment Summary – Narrative criteria for hydrogen sulfide should continue to be used until minimum data requirements can be met.

- Jamestown S'Klallam Tribe

6.14.E Comment Summary – Northwest Environmental Advocates proposes that Ecology adopt the EPA recommended criteria. To the extent that Ecology suggests that it will use its toxic narrative criteria to address "any issues," it is required to establish precisely how it will do so, as described above. Ecology has an abysmal track record on using its toxic narrative criteria.

- Northwest Environmental Advocates

Response to 6.14.A, 6.14.B, 6.14.C, 6.14.D, and 6.14.E

Hydrogen sulfide has limited and uncertain toxicity data associated with the EPA recommended criteria. It is not prudent to develop criteria without the appropriate and adequate toxicity data because criteria have meaningful implications in regulations. It is our duty to ensure criteria are protective and not unnecessarily burdensome. We support further research into hydrogen sulfide criteria in Washington and encourage further dialogue regarding hydrogen sulfide criteria in the upcoming triennial review.

6.15. Not in proposal – Iron

6.15.A Comment Summary – Please provide citations to Ecology's compliance with 40 C.F.R. § 131.11(a)(2) ("Where a State adopts narrative criteria for toxic pollutants to protect designated uses, the State must provide information identifying the method by which the State intends to regulate point source discharges of toxic pollutants on water quality limited segments based on such narrative criteria."); (b)(iii)("In establishing criteria, States should: (1) Establish numerical values based on: . . . [o]ther scientifically defensible methods"); and (b)(2) ("Establish narrative criteria or criteria based upon biomonitoring methods where numerical criteria cannot be established or to supplement numerical criteria."). Simply stating that "Washington will continue

to use their narrative criteria to protect against toxic and aesthetic effects of iron" is not complying with the requirements of the law.

- Northwest Environmental Advocates

Response to 6.15.A

When it is necessary to implement our narrative water quality criteria in permits for iron or other toxic chemicals, the most appropriate best management or treatment technologies will be implemented to address the impaired water. The implementation practices will be dependent on the permit type. Many of the best management practices used for one metal is applicable to other metals.

6.15.B Comment Summary – We agree with Washington's decision not to adopt the Environmental Protection Agency's (EPA's) recommended criterion for iron. This criterion has not been adopted by Oregon or Idaho; however, the biological evaluation results for the Swinomish Tribe's aquatic life toxics criteria concluded that the EPA's recommended value for iron is likely to adversely affect (LAA) biological resources. We recommended that additional detail be added to the technical support document (TSD) detailing whether new aquatic studies available in the EcoTox database were reviewed and why the LAA determination for iron did not trigger a review of alternative approaches for the development of criteria.

- Northwest Indian Fisheries Commission
- Puyallup Tribe
- Suquamish Indian Tribe of the Port Madison Reservation

6.15.C Comment Summary – Ecology chose not to adopt the 1986 EPA national recommended 304(a) freshwater chronic criteria for iron in this rulemaking. The Tribe appreciates the reasons for which Ecology might choose not to adopt the federal recommendation, especially due to the impact on listed species (e.g., steelhead, Chinook salmon, bull trout) and likelihood that State adoption of it would not survive ESA Section 7 consultation. See, e.g., Biological Evaluation of EPA's Proposed Approval Action on the Swinomish Tribe's Water Quality Standards Aquatic Life Criteria at 5-86 to 5-87 (2022). However, in the absence of useful federal recommendations, we believe that Ecology should instead have endeavored to determine what appropriate iron criteria would be that would protect vulnerable aquatic species in the State—species that are important both to the Tribe and the State of Washington and its citizens. We adopt the Ridolfi recommendation (page 1):

We recommended that additional detail be added to the technical support document (TSD) detailing whether new aquatic studies available in the EcoTox database were reviewed and why the LAA determination for iron did not trigger a review of alternative approaches for the development of criteria.

The Tribe does not request that Ecology hold off on finalization of the proposed rule to develop its own alternative approaches for the establishment of criteria if Ecology determines that the CCME 2019 and Cadmus 2018 cited in the Ridolfi memorandum (or other available literature) cannot be employed. However, if this is the case, the Tribe urges Ecology to develop such approaches and adopt iron aquatic life criteria in the next triennial review rather than rely solely

on narrative criteria. The presence of iron particles can irritate gill tissue in salmonids, leading to gill damage and bacterial infection. Exposure to iron has been shown to reduce the immune response of salmonids. Consequently, regulation of this contaminant is important to protect Treaty-protected resources.

- Port Gamble S'Klallam Tribe

Response to 6.15.B and 6.15.C

The 1 mg/L iron chronic criterion for aquatic life is based on minimal studies, many that are 35 to 50 years old. Iron levels in WA water bodies vary significantly in their natural concentration. In water bodies where iron is an issue, we can apply our narrative or aesthetic criteria (taste and smell). We did a cursory review of iron toxicity data available but primarily found acute toxicity data rather than chronic toxicity data. EPA's 1 mg/L iron criterion is chronic based. A recent publication by Brix et al. (2023)[26] developed an iron based multiple linear regression model that indicates toxicity is dependent on other water quality factors such as hardness and dissolved organic carbon. We believe that more research and data are needed to develop a defensible iron criterion. Brix et al. (2023) sets the foundation for a bioavailability model for iron and should be considered in the future. Because we are proposing no changes to iron from current Washington aquatic life criteria, we are not including an analysis of our preliminary review because more detailed evaluation is warranted on individual studies. We will continue to track any new iron data and may consider future criteria development as data availability and modeling tools become more robust.

6.15.D Comment Summary – Ecology should not adopt EPA recommended criteria for iron. The presence of iron particles can irritate gill tissue in salmonids, leading to gill damage and bacterial infection. Exposure to iron has been shown to reduce the immune response of salmonids.

- Squaxin Island Tribe

6.15.E Comment Summary – Narrative criteria for iron should continue to be used until minimum data requirements can be met.

- Jamestown S'Klallam Tribe

Response to 6.15.D and 6.15.E

Thank you for your support. We support further research into iron criteria in Washington and encourage further dialogue in the upcoming triennial review.

[26] Brix, K.V., Tear, L., DeForest, D.K. and Adams, W.J., 2023. Development of multiple linear regression models for predicting chronic iron toxicity to aquatic organisms. Environmental toxicology and chemistry, 42(6), pp.1386-1400.

6.15.F Comment Summary – We support Ecology's approach for iron, heptachlor epoxide and hydrogen sulfide. We support the decision to not adapt EPA's recommended values for iron, heptachlor epoxide and hydrogen sulfide because of insufficient toxicity data.

- King County

Response to 6.15.F

Thank you for your comment.

6.16. Not in proposal – Lead

6.16.A Comment Summary – Ecology is misleading when it states that "there were no jeopardy calls" for lead in the State of Oregon. First, lead is "predicted to result in mortality at the population level" by NMFS. NMFS Oregon BiOp at 486. Second, there was a jeopardy call in Idaho for lead, which Ecology conveniently ignores because the ESA-listed Banbury Springs Lanx is not present in Washington waters. In fact, the FWS made a jeopardy determination for chronic lead "[d]ue to the extraordinary sensitivity of snails in the genus Lymnaea or family Lymnaeidae to lead toxicity, significant adverse effects in the form of reduced growth and egg production are likely to be caused by implementation of the proposed chronic lead criterion[.]" FWS, Biological Opinion for the Idaho Water Quality Standards for Numeric Water Quality Criteria for Toxic Pollutants (June 25, 2015) (hereinafter "FWS Idaho BiOp") at 264 (emphasis added). So, the question is not whether the Banbury Springs Lanx is present in Washington waters but whether other snails in the genus Lymnaea or family Lymnaeidae are present in Washington waters. Not only are they present, they have been identified by WDFW as "uncommon/declining" as described above. See also Dave C. Campbell, et al., Phylogenetic analysis of the Lancinae (Gastropoda, Lymnaeidae) with a description of the U.S. federally endangered Banbury Springs lanx, 663 ZooKeys 107–132 (2017), available at https://www.ncbi.nlm.nih.gov/pmc/articles/ PMC5523177/pdf/zookeys-663-107.pdf ("Fisherola nuttallii (Haldeman, 1841) which occurs in the Snake River and other major tributaries of, as well as the main stem of the Columbia River. Coutant and Becker (1970) observed Fisherola nuttallii laying transparent, suboval gelatinous egg masses containing between 1–12 eggs laid from April to June in the Washington, U.S.A. portion of the Columbia River."); Celeste Mazzacano, The Xerces Society for Invertebrate Conservation, Fisherola nuttalli (Haldeman 1841) Giant Columbia River limpet; shortface lanx Gastropoda: Lymnaeidae, available at https://www.xerces.org/sites/ default/files/2019- 10/fisherola_nuttalli.pdf ("Currently, large populations of F. nuttalli persist in only four streams: . . . the Okanogan River and the Hanford Reach of the Columbia River in Washington[.] Additional small populations are found in . . . the lower Columbia River near Bonneville Dam; the Methow River, Washington; and the Grande Ronde River, Washington and Oregon.").

A quick search of Washington's 303(d) list for lead shows that even with the current criteria, there are 30 Category 5 listings and an additional 1,030 Category 3 listings for insufficient data. Many of these are in the Puget Sound area with some in and about the Columbia River. Two Category 3 listings are in the Methow River, noted above as the location of a small population of F. nuttalli. See Listing ID Nos. 76355, 97499.

Ecology might be interested to know that neither Idaho nor EPA has timely met the reasonable and prudent alternatives for chronic lead criteria in Idaho. See, e.g., NWEA Idaho RPA Petition

(EPA has failed to promulgate aquatic life criteria for Idaho waters for chronic lead to meet the reasonable and prudent alternatives in the Idaho BiOp and avoid jeopardy to numerous ESAlisted species).

- Northwest Environmental Advocates

Response to 6.16.A

We are aware of the jeopardy determination in Idaho for Banbury Springs Lanx. As mentioned, we do not have this species listed in Washington. We reviewed new scientific studies for lead, but the new data led to a higher criterion value. We did not find a higher criterion value appropriate at this time because of the effects outlined in the Biological Opinions. We anticipate that EPA is going to update the lead criteria in the near future through the Cooperative Research and Development Agreement (CRADA) project. The CRADA project report indicates that a multiple linear regression (MLR) model is being developed for lead and will be a future EPA recommendation. We intend to review the lead MLR model for incorporation into Washington's aquatic life criteria once released.

6.17. Not in proposal – Mercury

6.17.A Comment Summary – Washington's Existing Mercury Water Quality Criteria are Not Adequately Protective of Listed Species or Critical Habitats and Must be Updated

Washington should learn from Idaho's mistakes and move forward with updating its water quality criteria for mercury.35 In Idaho, which Ecology cites as a reason for not proceeding with amended mercury criteria at this time, EPA recently issued a proposed rule providing for both tissue and water column criteria for mercury.36 The proposed chronic total mercury criteria are 0.225 µg/kg wet weight for muscle fish tissue, 0.162 µg/kg wet weight for whole body fish tissue, and 0.0021 µg/L for water column values.37 In so doing, EPA asserted that these results were consistent with reasonable and prudent alternatives in the Services' biological opinions, and explained that it is important to include both a tissue and water column value in mercury and methylmercury criteria.

In contrast, Washington is not only proposing to neglect updating its mercury criteria through this rulemaking but, in doing so, it is continuing to rely on an outdated freshwater chronic criterion which measures the proposed water column value at 0.012 µg/L. That is insufficient. First, "[b]ecause tissue measurements provide a more direct measure of toxicity for bioaccumulative pollutants such as mercury, . . . it appropriate to establish tissue criteria for these pollutants. However, criteria expressed as organism tissue concentrations can prove challenging to implement in CWA programs such as NPDES permitting and Total Maximum Daily Loads (TMDLs) because these programs typically demonstrate that water quality standards are met by using a water column concentration to calculate a load-based effluent limit or daily load, respectively." Both are needed.

Second, per Idaho's earlier FWS biological opinion, which Ecology quotes in its TSD at 82, "[b]ased on the above information, implementation of the proposed chronic criterion for mercury is likely to adversely affect growth, reproduction, and behavior in the bull trout throughout its distribution in Idaho." Idaho's proposed freshwater chronic criterion was 0.012 µg/L or the same

as Washington's current criterion. This means that Washingtons mercury criteria are, a minimum, likely not to be sufficiently protective of bull trout.

- Center for Biological Diversity

Response to 6.17.A

The development of tissue-based aquatic life criteria is relatively new and very time and resource intensive. We found it in our best interest to evaluate new EPA recommendations for mercury and the novel methods used to develop the tissue-based criteria and then determine if a state-specific mercury criterion is most appropriate. Idaho's mercury criteria were released as we are nearing the deadline for the aquatic life toxics rulemaking. To begin mercury criteria updates would upend the process and further delay aquatic life updates for other pollutants. To our knowledge, Idaho specific mercury data was used to develop Idaho's mercury criteria. Thus, adopting the same mercury criteria for Idaho may not be appropriate until a formal analysis can be completed using Washington specific datasets.

6.17.B Comment Summary – It's amusing to read that "EPA has indicated that they are working on updating their aquatic life toxics national recommendations for mercury. We have decided to wait until EPA's new recommendations to revise chronic criteria for mercury." On what legal basis does Ecology rest this decision to further delay updating its 1997 criteria? As discussed above, EPA has proposed new freshwater tissue and water column criteria for Idaho. Given Ecology's excuse for not updating its criteria because criteria were being developed in Idaho and Oregon, why is EPA's work for Idaho not a sufficient basis for Ecology to proceed? In proposing its Idaho promulgation, EPA discusses how its proposal meets the requirements of the 2015 FWS Idaho BiOp that Ecology quotes in its TSD at 82 ("Based on the above information, implementation of the proposed chronic criterion for mercury is likely to adversely affect growth, reproduction, and behavior in the bull trout throughout its distribution in Idaho."). Idaho's proposed freshwater chronic criterion was 0.012 µg/L or the same as Washington's current criterion. Leaving it in place is not an option. See further discussion of mercury/methylmercury above.

It is worth noting that on May 25, 2023—after a decade of litigation—EPA issued an Administrator's Determination that new and revised water quality standards are necessary to meet the requirements of the CWA for Washington, including specifically for mercury. See Letter from Radhika Fox, EPA Assistant Administrator, to Laura Watson, Ecology (May 25, 2023). While EPA is anticipating an update to its 304(a) recommended criteria, there is no basis for Washington's waiting around for that to be completed, and EPA has no rationale either to wait, having made its Administrator's Determination a little under a year ago.

- Northwest Environmental Advocates

Response to 6.17.B

The development of tissue-based aquatic life criteria is relatively new and very time and resource intensive. We found it in our best interest to evaluate new EPA recommendations for mercury and the novel methods used to develop the tissue-based criteria and then determine if a state-specific mercury criterion is most appropriate. Idaho's mercury criteria were released as we are nearing the deadline for the aquatic life toxics rulemaking. To begin mercury criteria updates

would upend the process and further delay aquatic life updates for other pollutants. To our knowledge, Idaho specific mercury data was used to develop Idaho's mercury criteria. Thus, adopting the same mercury criteria for Idaho may not be appropriate until a formal analysis can be completed using Washington specific datasets.

6.17.C Comment Summary – The EPA understands Ecology's hesitation in adopting chronic mercury criteria until new national 304(a) recommendations are finalized. In the meantime, please see the EPA's recent proposed mercury water quality criterion for Idaho https://www.epa.gov/wqs-tech/mercurycriterion-protect-aquatic-life-idaho.

- U.S. EPA

Response to 6.17.C

Thank you for the information. We may consider a similar approach in the future.

6.18. Not in proposal – microplastics

6.18.A Comment Summary – Microplastics are everywhere, and we are slowly learning about their effects on the environment and our own health. Intentional addition of microplastics to cosmetic products should be restricted or banned completely before their accumulation becomes a global issue.

- Glaskova, Lena

Response to 6.18.A

EPA does not have microplastic aquatic life criteria at this time. Thank you for your comment but this is beyond the scope of the current rulemaking.

6.19. Not in proposal - Nickel saltwater criterion

6.19.A Comment Summary – Again, Ecology relies on an entirely flawed basis for not even evaluating the saltwater criteria. TSD at 83 ("No changes were necessary for saltwater criteria because Washington's saltwater nickel criteria are identical to EPA recommendations and there are no endangered species protection issues highlighted in previous ESA consultations in other Region 10 states."). This is illogical as neither Oregon nor Idaho have the waters of Puget Sound nor do they have the ESAlisted marine species present in Washington.

- Northwest Environmental Advocates

Response to 6.19.A

We do not have any evidence that the EPA recommended saltwater nickel criteria are not protective of aquatic life. If there are new toxicity values available pertinent to criteria development that could drive the criteria lower and indicates aquatic life protection concerns, we encourage the commenter to provide those references.

6.20. Not in proposal – Parathion

6.20.A Comment Summary – NMFS has found that "[m]ixtures containing malathion resulted in additive effects (when mixed with DDT, toxaphene), synergistic effects (when mixed with Baytex, parathion, carbaryl, perthane) and antagonistic effects (when mixed with copper sulfate) (Macek, 1975). Mixtures of diazinon and parathion killed more bluegill sunfish than predicted." NMFS EPA Pesticide General Permit BiOp at 86. FWS found that parathion jeopardized numerous ESA-listed species including darters, salamanders, suckers, and mussels, as well as aquatic dependent birds. See FWS Pesticide BiOp at II-100–II-102. This is sufficient information upon which Ecology should conduct a full evaluation of whether the EPA recommended criteria are sufficiently protective for Washington's designated uses.

- Northwest Environmental Advocates

Response to 6.20.A

Thank you for the information. The Biological Opinion (BiOp) referenced is not specific to protectiveness of EPA nationally recommended aquatic life criteria but evaluate the application of pesticides in relation to label requirements. The scope of BiOps for the EPA pesticide general permit is different than adoption of state aquatic life criteria under the federal Clean Water Act. We aren't positive how this information can be used in relation to criteria development because it reviews pesticide use patterns in accordance with label requirements. Mixtures are not current evaluated for aquatic life criteria by EPA. We will continue to track any movement on EPA recommended criteria related to parathion and are interested in exploring options to address mixtures for chemical classes.

6.21. Not in proposal – Polybrominated diether (PBDE)

6.21.A Comment Summary – While we strongly support the proposed Aquatic Life Toxics Criteria, we note that the criteria currently omit polybrominated diethers (PBDEs). We understand that adding new PBDE criteria would require significant time investment from Ecology. However, the Toxics Biological Observation System (TBiOS) at WDFW continues to document PBDEs in aquatic species at levels associated with sublethal effects in species listed under the Endangered Species Act, such as Puget Sound juvenile Chinook salmon. We believe state action is still needed to address PBDE contamination in surface waters in Washington.

We believe there is sufficient data in the scientific literature to support the development of tissuebased criteria for these chemical classes, as was done by EPA for PFOA and PFOS. 2 To reduce the impact of these toxic contaminants on aquatic species, we encourage Ecology to consider adopting tissue-based values for these contaminants in the Aquatic Life Toxics Criteria.

Footnote: 2 We recommend Ecology consider the laboratory PBDEs exposure studies conducted by Mary Arkoosh from the National Oceanic and Atmospheric Administration as a resource on the disease susceptibility of juvenile Chinook salmon. These papers can be found as: Arkoosh et al. Disease susceptibility of salmon exposed to polybrominated diphenyl ethers (PBDEs). Aquat Toxicol. 2010. 98:51-59. doi: 10.1016/j.aquatox.2010.01.013 and Arkoosh et al. Dietary exposure to a binary mixture of polybrominated diphenyl ethers alters innate immunity and disease susceptibility in juvenile Chinook salmon (Oncorhynchus tshawytscha). Ecotoxicol Environ Saf. 2018, 163:96-103. doi: 10.1016/j.ecoenv.2018.07.052.

Comments on toxic chemicals not included in proposed rule: Not in proposal – Polychlorinated biphenyls (PCBs)

- Washington Department of Fish and Wildlife

Response to 6.21.A

Thank you for your comment. EPA only recently started developing tissue-based criteria for aquatic life criteria. As more tissue-based criteria are released, we have more tools and methods to potentially use for the development of state-specific criteria for bioaccumulative pollutants. Another complicating factor for PBDEs is that they occur as mixtures and that toxicity data for individual congeners may not be available. Developing aquatic life toxics criteria using EPA guidelines requires a specific type of toxicity data for specific effect endpoints and robust information on species sensitivity. We understand that PBDEs are a chemical of concern in Washington. We are interested in future evaluations of PBDE datasets and exploring options that can establish mixture-based criteria for complex chemical classes such as PBDEs. In the meantime, we can continue to use our narrative criteria of "no toxics in toxic amounts" and best management practices to limit discharges of PBDEs into waterways.

6.22. Not in proposal – Polychlorinated biphenyls (PCBs)

6.22.A Comment Summary – Ecology offers an especially thin excuse for not evaluating whether its PCB criteria are sufficiently protective: "We do not intend to modify our freshwater and saltwater acute PCB criteria because of existing protections the criteria provides [sic] for aquatic life." We suggest that Ecology consider these findings from NMFS: " In this report, we focus on three persistent organic pollutants (POPs): polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and dichlorodiphenyltrichloroethane (DDT) and its metabolites. We focus on these three POPs because they are found at relatively high levels in the whales and may cause adverse health effects." NMFS, Exposure to a Mixture of Toxic Chemicals: Implications for the Health of Endangered Southern Resident Killer Whales (Nov. 2016) at vii; see also id. at 69 ("Southern Resident killer whales frequent marine waterways where relatively high levels of PCBs, PBDEs, and DDTs are found. Adverse effects from exposure to these persistent pollutants are known to impact reproduction, immune function, and neurodevelopment, and to disrupt the endocrine system, in multiple mammalian species. Exposure to a mixture of these contaminants can heighten these detrimental biological effects and may hinder recovery of the Southern Resident killer whale population. . . . Ultimately, longterm monitoring, reducing exposure, and determining the risks posed by PCBs, PBDEs, and DDTs in the killer whales are essential for the effective protection of this endangered species."). There are innumerable studies and reports on the risks posed by PCBs to marine mammals and particularly the endangered orcas.

Regardless of whether there has been a consultation on PCB criteria that addresses marine mammals, Ecology is still obligated to ensure that its numeric criteria protect the most sensitive designated uses in its waters. Ecology would be hard pressed to come up with a population of threatened or endangered species in its waters that is more under threat of extinction than the Southern resident killer whales.

- Northwest Environmental Advocates

Comments on toxic chemicals not included in proposed rule: Not in proposal - Selenium saltwater criterion

Response to 6.22.A

Washington's current aquatic life criteria for PCBs and DDT are consistent with the Clean Water Act. The commenter should encourage EPA to update their national recommendations for states to evaluate. It is not known at what levels adverse effects may occur to whales from exposure to PCBs, PBDEs, and DDTs because toxicity testing cannot occur on these animals, there are mixtures of contaminants in the environment, and the effects referenced (e.g., immune function, neurodevelopment, endocrine disruption) in this comment are not evaluated when developing aquatic life toxics criteria per EPA guidelines. It is difficult to isolate or attribute effects to whales from a single contaminant. To understand how individual or mixtures of toxic chemicals affect aquatic life, testing is needed under controlled environments to isolate variables. We understand there are legacy contaminants that continue to be recirculated in the environment and bioaccumulate in tissues. Often bioaccumulative toxics for higher trophic organisms are evaluated based on pollutant concentrations in their prey such as salmon. EPA only recently began developing tissue-based criteria for aquatic life toxics criteria. We will continue to track these methods and may evaluate state-specific options in the future.

6.22.B Comment Summary – We recommend Ecology revise the polychlorinated biphenyl (PCB) criteria to add tissue values for salt and freshwater exposures. Monitoring studies, such as those used to inform the Toxics in Aquatic Life vital sign reported by the Puget Sound Partnership, show PCB concentrations in the tissues of aquatic organisms, including threatened Chinook salmon, continue to exceed concentrations associated with significant mortality in many parts of the Puget Sound. Since PCBs are lipophilic and therefore accumulate in sediment, surface water monitoring alone may not identify areas with significant PCB contamination. We suggest Ecology add tissue values to the Aquatic Life Toxics Criteria for PCBs to address this issue.1

We recommend the meta-analysis of PCB threshold responses published by Berninger and Tillitt from the United States Geological Survey as a resource. This paper can be found as: Berninger JP, Tillitt DE. Polychlorinated biphenyl tissue-concentration thresholds for survival, growth, and reproduction in fish. Environ Toxicol Chem. 2019 Apr;38(4):712-736. doi: 10.1002/etc.4335.

- Washington Department of Fish and Wildlife

Response to 6.22.B

Thank you for the information. EPA only recently began developing tissue-based criteria for aquatic life toxics criteria. We will continue to track these methods and may evaluate state-specific options in the future.

6.23. Not in proposal - Selenium saltwater criterion

6.23.A Comment Summary – Ecology should also evaluate the need to update the saltwater selenium criteria.

- Northwest Environmental Advocates

Response to 6.23.A

Washington's current saltwater selenium criteria are consistent with EPA national recommendations. We aren't aware of any data that suggests aquatic life are not protected. We support adopting the existing saltwater selenium criteria.

6.24. Not in proposal – Toxaphene

6.24.A Comment Summary – Toxaphene is another pollutant that EPA chose to not consult on for the CTR promulgation. While the Services found no jeopardy for the Idaho criteria, Idaho is an inland state without marine waters. The toxaphene criteria date to 1986, an indication of why they are likely not protective. We suggest that Ecology make at least a half-hearted effort to see if there is "new" literature on the effects of toxaphene in the intervening 38 years since EPA derived its criteria. Even with these old criteria, there is sufficient evidence that toxaphene pollution is affecting Washington waters, with 20 waterbody segments on the Category 5 list and 261 on the Category 3 list.

- Northwest Environmental Advocates

Response to 6.24.A

We do not have any evidence that the EPA recommended toxaphene criteria are not protective of aquatic life. If there are new toxicity values pertinent to criteria development available that could drive the criteria lower and indicates aquatic life protection concerns, we encourage the commenter to provide those references.

6.25. Not in proposal - Zinc saltwater criterion

6.25.A Comment Summary – Ecology's rationale for not updating its saltwater criteria—because "there are no endangered species protection issues highlighted in previous ESA consultations in other Region 10 states"— is not logical for the reasons explained above. In particular, there is no indication that NMFS's past concerns about industrial and municipal stormwater discharges of metals, including zinc, applied only to freshwater.

- Northwest Environmental Advocates

Response to 6.25.A

We do not have any evidence that the EPA recommended saltwater criteria are not protective of aquatic life. If there are new toxicity values available pertinent to criteria development that could drive the criteria lower and indicates aquatic life protection concerns, we encourage the commenter to provide those references.

Appendix A: Citation List

Chapter 173-201A WAC

Water Quality Standards for Surface Waters of the State of Washington

AO # 22 – 04

Aquatic Life Toxics Criteria

This citation list contains references for data, factual information, studies, or reports on which the agency relied in the adoption for this rule making (RCW 34.05.370(f)).

At the end of each citation is a number in brackets identifying which of the citation categories below the sources of information belongs. (RCW 34.05.272).

Table 3 Citation Categories

Citation Categories	
1	Peer review is overseen by an independent third party.
2	Review is by staff internal to Department of Ecology.
3	Review is by persons that are external to and selected by the Department of Ecology.
4	Documented open public review process that is not limited to invited organizations or individuals.
5	Federal and state statutes.
6	Court and hearings board decisions.
7	Federal and state administrative rules and regulations.
8	Policy and regulatory documents adopted by local governments.
9	Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under other processes.
10	Records of best professional judgment of Department of Ecology employees or other individuals.
11	Sources of information that do not fit into one of the other categories listed.

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