ASSOCIATION OF WASHINGTON BUSINESS, NORTHWEST PULP & PAPER ASSOCIATION, WESTERN STATES PETROLEUM ASSOCIATION, WASHINGTON FARM BUREAU, FOOD NORTHWEST, WESTERN WOOD PRESERVERS INSTITUTE, and WASHINGTON STATE WATER RESOURCES ASSOCIATION

COMMENTS ON DRAFT

AQUATIC LIFE TOXICS WATER QUALITY CRITERIA

FOR THE

STATE OF WASHINGTON

May 6, 2024

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The Association of Washington Business, Northwest Pulp & Paper Association, Western States Petroleum Association, Washington Farm Bureau, Food Northwest, Western Wood Preservers Institute, and Washington State Water Resources Association (hereafter "AWB") submit the following comments on the Department of Ecology proposed amendment to WAC 173-201A to update aquatic life toxics criteria. AWB requests that these comments and the documents referenced in and submitted with these comments be included in the administrative record for the rulemaking.

Introduction

AWB appreciates the opportunity to submit these comments on the proposed water quality aquatic life toxics criteria. In general, AWB recommends that Ecology undertake additional work to better explain the basis and the methodologies used to derive some of the criteria. Ecology should also improve the reasonableness of the cost estimates presented in the cost-benefit analysis and develop an appropriate implementation plan that considers the impact on individual and general permits based on the terms of an actual implementation plan. Ecology should likewise defer action on fish tissue-based criteria until it has developed more specific information regarding how these standards will be implemented. AWB requests that these comments and the documents submitted herewith be included in the administrative record for this rulemaking. These comments are substantially based on the technical memoranda provided by the National Council for Air and Stream Improvement and Geosyntec Consultants which are attached, and incorporated herein, as Appendix A and B.

Rulemaking Requirements

Comment No. 1: 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[1]:

- 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

[1] In addition to these elements, the SLR also requires determinations that the rule does not require actions that violate the requirements of other state or federal laws, RCW 34.05.328 (1)(f), and that the rule does not impose more stringent requirements on private entities than on public entities unless required by federal law. RCW 34.05.328(1)(g).

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.

Proposed Standards

Comment No. 2: Aspects of the methodology used by Ecology to derive standards are not scientifically justified.

The proposed revisions to Washington aquatic life toxics criteria aim to align current criteria with latest scientific data and updated EPA recommendations, ensuring adequate protection of aquatic biota within state waters. The criteria were developed using different substance-specific approaches, depending on the likelihood of a substance to adversely affect species that are federally listed as endangered and threatened in Washington. In some cases, the derivation method outlined by Stephen et al. (1985) was adopted in which the 5th percentile of the species sensitivity distribution (SSD) toxicity data was used, following EPA recommendations. Additionally, Ecology reviewed and evaluated toxicity data published after the last EPA criteria update ("new science") and used the 5th percentile of the SSD to derive criteria. Finally, Ecology considered Biological Opinions (BiOps) issued by the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to Idaho (2014-2015) and Oregon (2004) during their toxics criteria review, which indicated when endangered species were vulnerable to extinction at toxic concentrations equal to EPA national recommendations. In these instances, protection levels were set to the 1st percentile of the SSD or the 20th percentile using a single species to selectively align with substance concentrations identified in BiOps.

This methodological change is 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.

Comment No. 3: 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.

Comment No. 4: 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.

Comment No. 5: 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).

Comment No. 6: The rulemaking documentation should be subject to peer review prior to publication of the draft rule.

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.

Comment No. 7: 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.

Comment No. 8: 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 5^{th} 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.

Comment No. 9: 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.

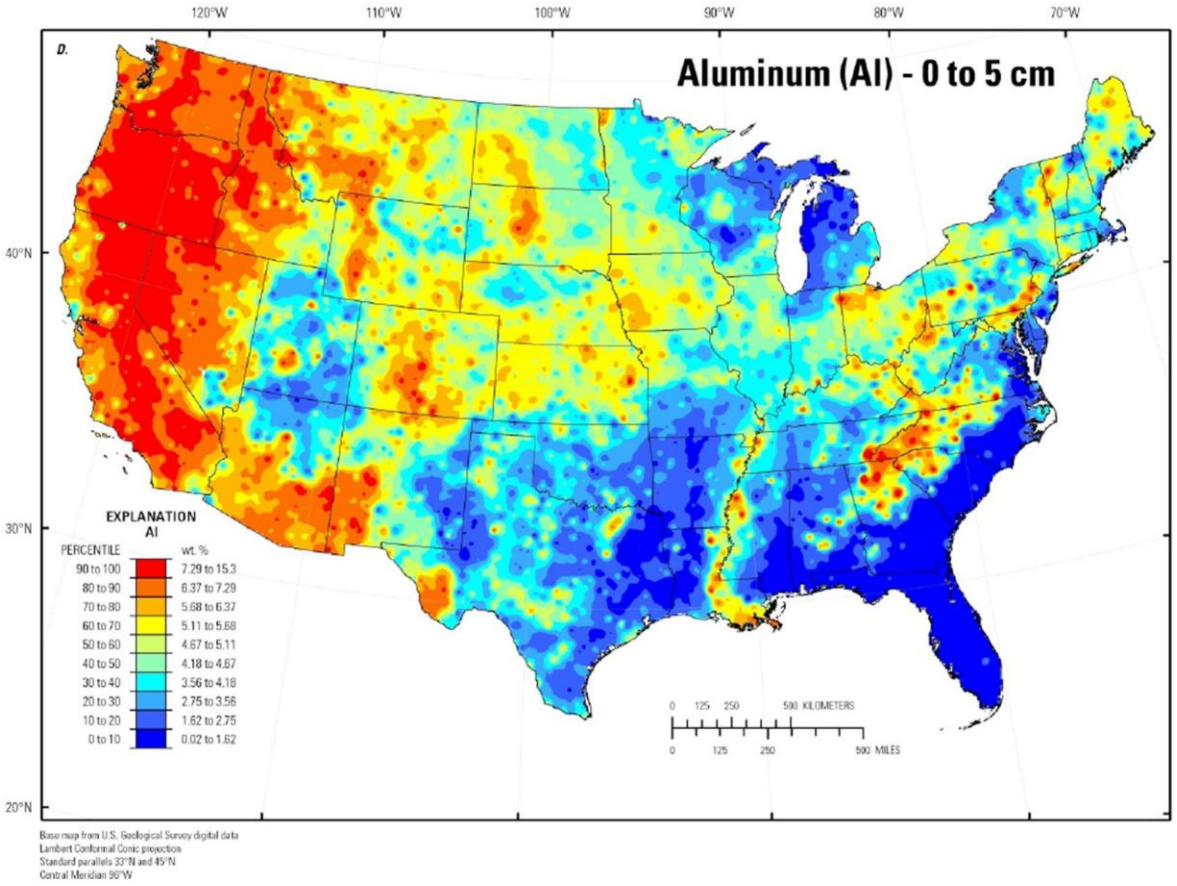

Figure 1. Distribution of aluminum (Al) in surface soils collected from a depth of 0 to 5 centimeters, conterminous United States (USGS, 2014).

The International Stormwater Best Management Practice (BMP) Database contains influent and effluent stormwater data for many stormwater BMP types that can be analyzed using an online statistical analysis tool (https://bmpdatabase.org/bmp-statistical-analysis-tool). For BMP studies located in Washington, Oregon, and California (EPA Rain Zones 6 & 7) the median influent aluminum concentration is 2640 µg/L. These studies include a variety of land uses and therefore can be considered indicative of typical magnitude of aluminum concentrations that

could be found in stormwater in Washington. If aluminum becomes regulated in stormwater permits and benchmarks are set close to or near the proposed default water quality criteria, there is a high likelihood that exceedances will be commonplace. Therefore, aluminum may become a challenging pollutant for industrial stormwater permittees with serious implications for treatability and compliance. 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 (i.e., species inhabiting water bodies with naturally high aluminum concentrations are absent or exhibiting toxic effects). Ecology should also consider the costs of NPDES compliance if aluminum becomes a regulated pollutant in stormwater permits.

Comment No. 10: 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).

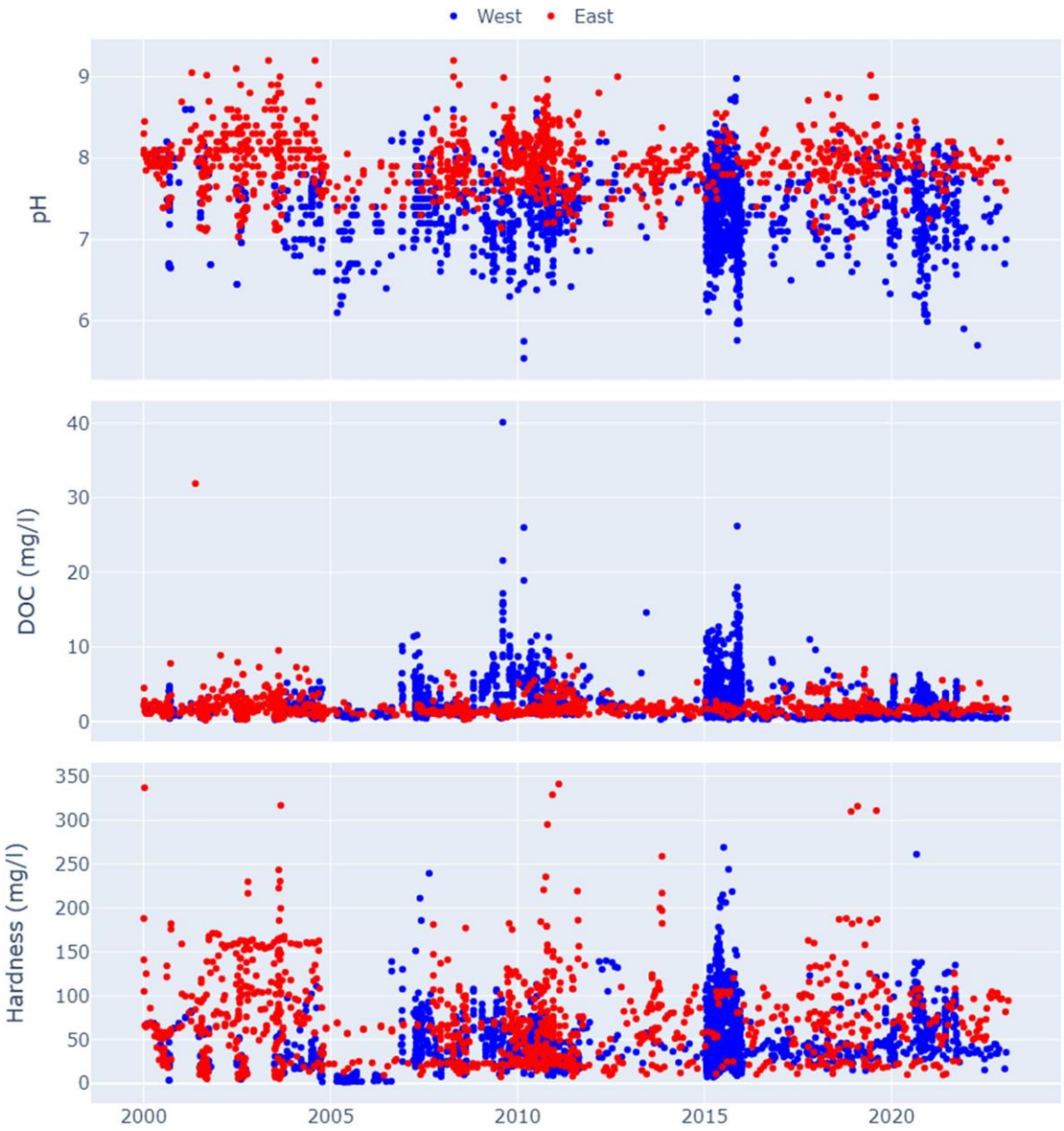

Figure 2. pH, Dissolved Organic Carbon, and Hardness Values used for Calculating Statewide Aluminum and Copper Criteria.

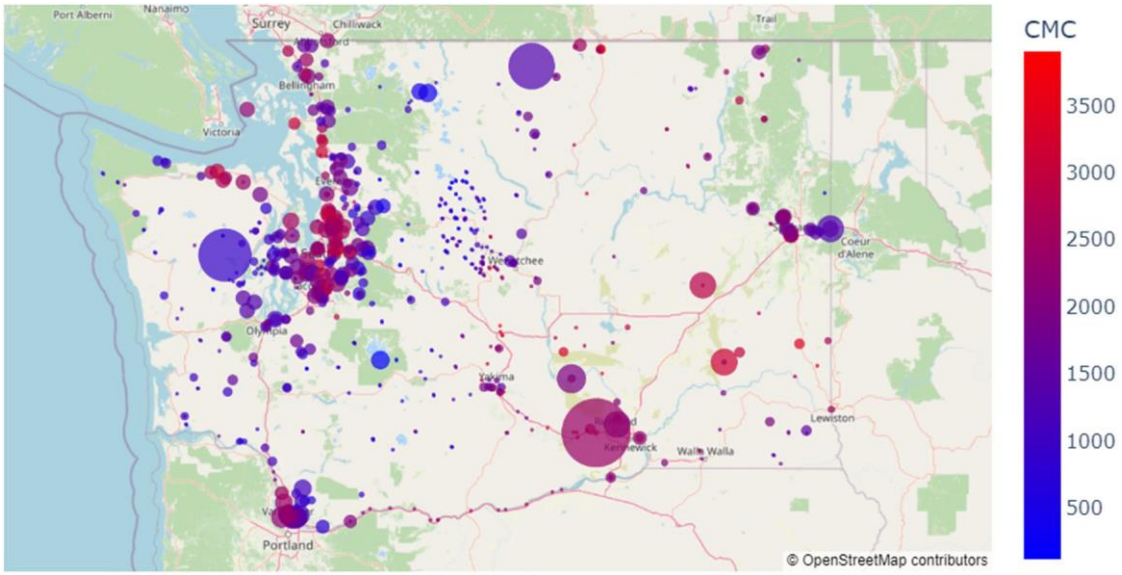

Figure 3. Fresh Water Criterion Maximum Concentration (CMC) for Aluminum Using Multiple Linear Regression Model.

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.

Comment No. 11: 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.

Comment No. 12: 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.

Comment No. 13: 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.

Comment No. 14: 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).

Comment No. 15: 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.

Comment No. 16: 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.

Comment No. 17: 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.

Comment No. 18: 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.

Comment No. 19: 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.

ODEQ 2004b, at 37.

Comment No 20: 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-PPD-quinone, 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 6PPD-quinone 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.

The proposed freshwater acute criterion is based on development of a species sensitivity distribution (SSD) and selection of the effective concentration at 5%. The species included (with the most sensitive listed first) in the SSD were: coho salmon (Tian et al. 2022; Lo et al. 2023; Greer et al. 2023), white spotted char (Hiki et al. 2022), brook trout (Brinkman et al. 2022), rainbow trout (Brinkman et al. 2022; Di et al. 2022), and zebra fish (Varshney et al. 2022). The resulting 5th percentile of the SSD produced the value of 8 ng/L which coincidentally aligns with the LC5 value in Lo et al. 2023 (~7 to 8 ng/L) (the study with the lowest estimated LC50 value). Ecology excluded relevant data from the reviewed toxicity studies. For example, Greer et al. 2023 includes an LC50 value for chinook salmon (81,100 ng/L) and Lo et al. 2023 did not observe an LC50 for sockeye salmon in their investigation. If the SSD methodology is used, it is

appropriate to include LC50 values from other salmonids. At a minimum, the sensitivity of the proposed acute freshwater criteria should be clearly investigated, and appropriate rationale should be provided as to why a datapoint was excluded. The lack of data and approved testing methods indicate that it is premature to establish a 6PPD-quinone criterion in Washington.

Comment No. 21: Ecology should defer action on freshwater acrolein criteria.

Ecology should reconsider the proposed acute and chronic toxicity criteria for acrolein at 3.0 µg/L (or ppb). Many irrigation districts and water companies in the State of Washington rely on the usage of this chemical tool for aquatic vegetation management in irrigation conveyance systems. There is major concern that the establishment of these criteria standards will have an enormous impact on the current discharge effluent limit allowed under the general permit for Irrigation System Aquatic Weed Control (ISAWC). 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 water 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 systems efficiently and economically as possible. By setting very low surface water quality standards for acrolein, it will cause major disruption in the sustainability of designated agricultural water uses and the continued viability of agricultural production in the State of Washington.

The proposed criteria do not align with the practicable usage of the EPA and Washington State Department of Agriculture registered herbicide product and labels for Magnacide H™ (EPA Reg. No. I 0707-9 and EPA SLN WA-040017) which contains the active ingredient acrolein. Many best management and operational practices, such as closing spillway gates or rediverting treated irrigation water, are implemented by irrigation districts to contain acrolein within the conveyance system and protect the water quality of receiving waterbodies. Ecology should consider the amount of current and past operational and compliance efforts performed by irrigation districts which have resulted in positive impacts on the water quality and aquatic life throughout the State of Washington. Establishing a 3.0 µg/L standard for acrolein will only lead to additional economic and operational costs for managing the aquatic vegetation within an irrigation district's vast irrigation conveyance system.

Comment No. 22: 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.

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.

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.

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. 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. However, 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).

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.

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Appendix A

NCASI
IMPACT. SCIENCE. SOLUTIONS.

April 24, 2024

TO: Chris McCabe, Executive Director, NWPPA

FROM: Brad Barnhart, Senior Research Scientist, NCASI
Camille Flinders, Program Director, NCASI

SUBJECT: Comments on WA Department of Ecology's Proposed Aquatic Life Toxics Criteria Revisions

Upon your request, NCASI has evaluated Washington Department of Ecology's (hereafter Ecology) proposed revisions to chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington, and provided comments below. NCASI is an independent, non-profit research organization that focuses on environmental topics of interest to the forest products industry. NCASI conducts research and technical studies on behalf of forest products companies across the US, and its members represent over 80% of the pulp and paper production and two-thirds of wood panels produced nationwide. In its capacity as a research organization, NCASI has a long history of working to inform the science needed to address numerous environmental topics related to the forest products industry including effluent regulation, water quality management, and relationships between human and natural stressors on aquatic ecosystems. The following comments are provided to help ensure important scientific aspects of Ecology's approach for revising the water quality toxics criteria for the protection of aquatic life in Washington's surface waters, including species federally listed as threatened and endangered in Washington.

1. *It is not clear that Ecology's decision-making process and approach to criteria derivation is justified by empirical data*

Ecology's proposed revisions to Washington's aquatic life toxics criteria aim to align current criteria with latest scientific data and updated EPA recommendations, ensuring adequate protection of aquatic biota within state waters. The criteria were developed using different substance-specific approaches, depending on the likelihood of a substance to adversely affect species that are federally listed as endangered and threatened in Washington. In some cases, the derivation method outlined by Stephens et al. (1985) was adopted in which the 5th percentile of the species sensitivity distribution (SSD) toxicity data was used, following EPA recommendations. Additionally, Ecology reviewed and evaluated toxicity data published after EPA's last criteria update ("new science"), and used the 5th percentile of the SSD to derive criteria. Finally, Ecology considered Biological Opinions (BiOps) issued by the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to Idaho (2014-2015) and Oregon (2004) during their toxics criteria review, which indicated when endangered species were vulnerable to extinction at toxic concentrations equal to EPA's national recommendations. In these instances, protection levels were set to the 1st percentile of the

SSD or the 20th percentile using a single species to approximate substance concentrations identified in BiOps.

This methodological change is not reflective of the scientific approach described by EPA's 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, in order 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's 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 this guidance needs to be transparent, and the scientific underpinning clearly expressed.

Additionally, there is not 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 EPA's established recommendations (utilizing the 5th percentile; Stephan 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.

2. The term 'invasive' requires clarification and consistency of use

The definition of 'invasive species' for the basis of inclusion of species in toxicity sensitivity distributions is unclear. Specifically, Ecology indicates that "test species must be a non-invasive North American species", but continues 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 jurisdiction 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 149/249). However, 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). Similarly, *Orconectes rusticus* (current taxonomic name, *Faxonius rusticus*) was included in the derivation calculations for the freshwater acute chromium VI criterion despite being a prolifically

invasive species with established populations in 20 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's existing definition of invasive species should be clarified, and the basis for identifying species as invasive evaluated to ensure that the species included in criteria derivation align with Ecology's definition.

3. Default aluminum criteria should leverage existing, 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.

4. Default copper criteria should leverage existing, more spatially explicit data

As in the aluminum criteria calculations, Ecology's proposed copper criteria also use multiple linear regressions that require local data, leveraging 3,337 concurrent sampling events across 646 unique locations (page 73/249). 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). Aligned with our previous comment, we appreciate that Ecology is prioritizing the use of site-specific chemistry data from permittees when available. We also suggest ecoregional defaults be calculated when possible and that eastern/western defaults only be used for those ecoregions that do not have sufficient local data.

5. Implementation guidance for fish tissue criteria is lacking and incomplete

Information describing Ecology's analysis of EPA's fish tissue standards (e.g., selenium, PFOS, PFOA) is lacking, and there does not appear to be sufficient guidance to clarify the implementation of these criteria in Washington waters. 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. Such an approach would align with previous Ecology decision-making regarding fish tissue concentrations and water quality criteria given the need for a state-specific approach that addresses questions related to mixing zones, variances, field sampling recommendations, assessing non-attainment of fish tissue criterion, TMDL development, and NPDES permit limits (e.g., Washington Department of Ecology 2016).

6. 6-PPD-quinone criteria are premature due to insufficient data

EPA's minimum data requirements for deriving aquatic life criteria (Stephan et al. 1985) for 6-PPD-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-PPD-quinone, but also regarding its mechanisms of toxicity and interaction with environmental stressors. The extent to which 6-PPD-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 6-PPD-quinone 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.

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Appendix B

Geosyntec consultants

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18 April 2024

James Tupper
Marten Law
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Re: Technical Review of the Proposed Updates to the Aquatic Life Toxics Criteria in Washington State

Dear Mr. Tupper:

Upon your request, Geosyntec Consultants, Inc. (Geosyntec) has reviewed the documents related to the Washington Aquatic Life Toxics Criteria (ALTC) update that will be used to amend chapter 173-201A Washington Administrative Code (WAC) Water Quality Standards for surface waters of the State of Washington. We attended the workshop and public hearing events offered by the Washington State Department of Ecology (Ecology). In addition, we analyzed the data provided by Ecology that was used to develop the proposed criteria for some pollutants. Our comments below describe some of the major issues that we feel should be addressed by Ecology before moving forward with the rulemaking process. If you have additional questions about our comments or analysis, please do not hesitate to contact us.

BACKGROUND

The Washington Department of Ecology (Ecology) published its proposed rule for Aquatic Life Toxics Criteria (ALTC) on February 15, 2024. Washington has aquatic life criteria for 28 toxic chemicals and Ecology is proposing updates for 16 of those. In addition, Ecology is also adding 14 new toxic chemicals in the proposed rule. Ecology is inviting comments from the general public and affected businesses in the current comment period. Ecology expects to review and respond to the comments received and adopt the new rules in summer 2024. In the proposed list of toxics, Ecology has included PFOA/PFOS as dependent upon the acceptance of draft recommendations by US Environmental Protection Agency (EPA). However, in one of the public meetings, Ecology clarified that it may not be included in the final list of the toxics due to the delays in adopting draft recommendations by USEPA.

Public comments on the proposed criteria are due on May 7, 2024. Ecology held a public workshop on March 26, 2024, and Bryson Finch from Ecology answered multiple questions during that workshop. In addition, Ecology held two formal public hearings on the rulemaking in April. In both hearings, no one submitted oral comments.

The ALTC, once approved by the EPA, will be used as the basis to update applicable pollutant benchmarks and numeric effluent limits in individual and general National Pollutant Discharge Elimination System (NPDES) permits issued by Ecology. Many industries in Washington are

regulated under the Industrial Stormwater General Permit (ISGP). The current ISGP expires on December 31, 2024, and Ecology has started the permit reissuance process. The formal public comment period on ISGP permit reissuance will start in summer 2024 and a final decision will be made in December 2024. Due to the current rulemaking and ISGP reissuance timelines, Ecology has clarified that the proposed ALTC will not be part of the new ISGP issued in 2025.

Once finalized, the new ALTC will be used in future Water Quality Assessments (WQAs) to determine the water quality status of all waters of the state. This process informs updates to the 303(d) list. The WQA process includes the public comment period before it is finalized and submitted to USEPA for approval of the 303(d) list. This means that there will be an opportunity to provide comments on how the ALTC are implemented in the WQA.

GENERAL REVIEW OF THE PROPOSED CRITERIA

In general, Ecology has been transparent and forthcoming in their approach in the development of these criteria. The technical support documents provided by the Ecology described the processes, science, and assumptions behind the development of these criteria. However, we noted some issues and concerns in the technical documentation and the cost/benefit analysis. Some of these are noted below.

1. The rule making 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.
2. Ecology is deviating from EPA's recommended criteria for several toxics on the premise that EPA's criteria are not adequately protective of aquatic species that are listed as threatened or endangered in Washington in accordance with the Endangered Species Act

(ESA). However, the ESA-listed species are not present in all the waters covered by said 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 proposed 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 (in this case, the aquatic life uses) of Washington's surface waters to the water quality criteria used to evaluate whether those uses are adequately protected.

3. Ecology is inconsistently deviating from EPA's 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's methods aim to protect 95% of the aquatic genera with the use of 5th percentile of the genus sensitivity distribution (GSD) divided by 2. 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 use the 1st percentile of the GSD for pollutants that have been determined in previous biological opinions as being more harmful to Washington's 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's when the datasets are the same. Ecology expressed in an email communication on 17 April 2024 that they have changed the intercepts of some hardness-based metals equations to "accurately predict the criteria from hardness" based on new studies (Finch, 2024). 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 EPA's model and Ecology's model.
4. The derivation of criteria relies on toxicological studies of sufficient quality be available for development of a representative average value for a species. As discussed in the

previous comment, 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).

5. For the metals that use the multi-linear regression (MLR) model to derive criteria (aluminum and copper), the default criteria have been calculated using the 5th percentile of the data from the western and the eastern part of the state. However, 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.
6. The MLR criteria are dependent on the ambient water quality (e.g. pH, hardness, dissolved organic carbon). The technical support document 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 have not been included in the regulatory analysis.
7. The cost/benefit analysis did not include many additional costs that will be incurred by the permit holders to comply with new or revised permit conditions based on the proposed rule. For example, Ecology's cost/benefit 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 is about $150/hour.

   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. 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 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 likely 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. However, 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 its rulemaking process.

PARAMETER SPECIFIC REVIEWS

Geosyntec focused on some specific parameters that will be affected by this rulemaking as described below.

Aluminum

Currently Washington does not have aluminum 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.

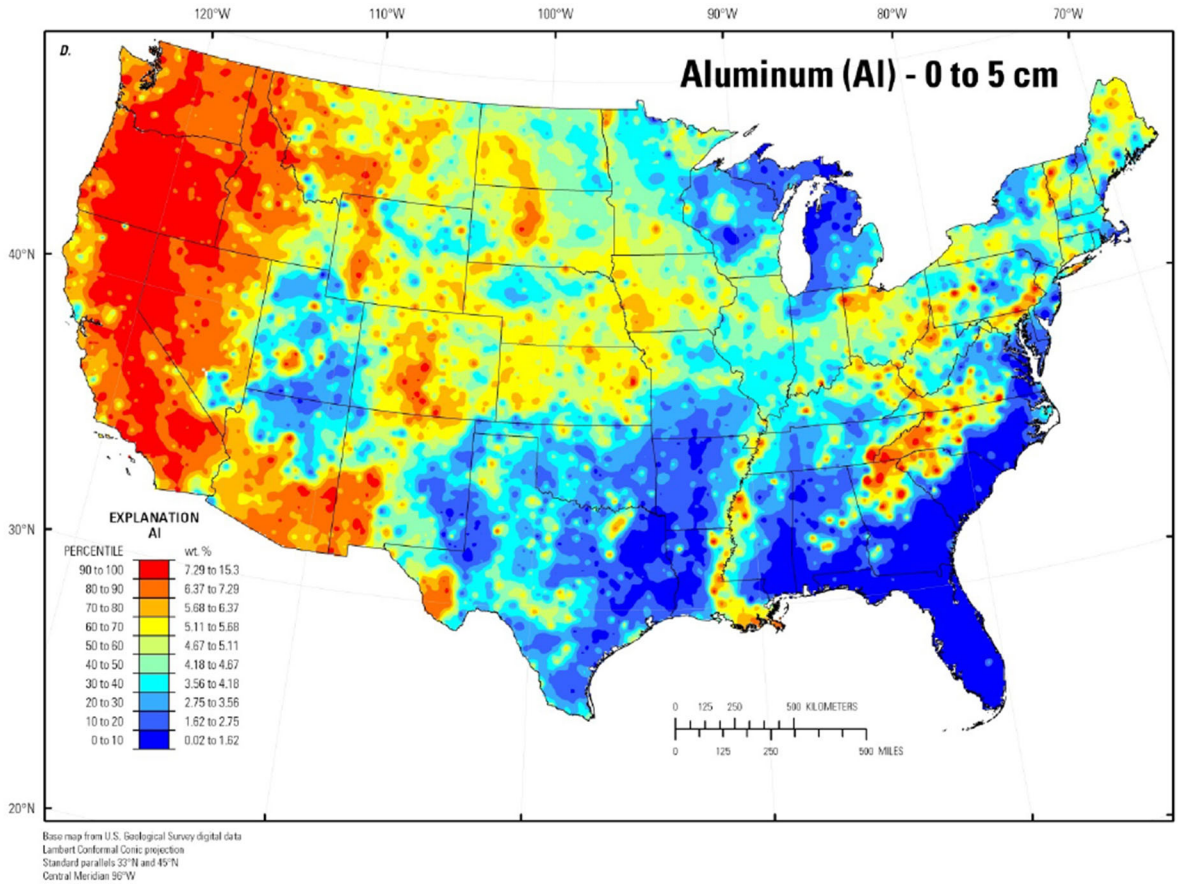

Figure 1. Distribution of aluminum (Al) in surface soils collected from a depth of 0 to 5 centimeters, conterminous United States (USGS, 2014).

The International Stormwater BMP Database contains influent and effluent stormwater data for many stormwater BMP types that can be analyzed using an online statistical analysis tool (https://bmpdatabase.org/bmp-statistical-analysis-tool). For BMP studies located in Washington, Oregon, and California (EPA Rain Zones 6 & 7) the median influent aluminum concentration is 2640 ug/L. These studies include a variety of land uses and therefore can be considered indicative of typical magnitude of aluminum concentrations that could be found in stormwater in Washington. If aluminum becomes regulated in stormwater permits and benchmarks are set close to or near the proposed default water quality criteria, there is a high likelihood that exceedances will be commonplace. Therefore, aluminum may become a challenging pollutant for industrial stormwater permittees with serious implications for treatability and compliance. 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 (i.e., species inhabiting water bodies with naturally high aluminum concentrations are absent or exhibiting toxic effects). Ecology should also consider the costs of NPDES compliance.

Ecology has followed EPA recommendations and proposed a multiple linear regression (MLR)-based criterion (Table 1). This criterion is calculated based on concurrently collected hardness, dissolved organic carbon (DOC), and pH. In absence of the concurrent data, a default criterion is applicable for western and eastern Washington. To calculate the default criterion, 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 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).

Table 1. 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. Recreated from Technical Support Document (TSD) Table 12 (Ecology, 2024).

	FW Acute (µg/L)	FW Chronic (µg/L)	SW Acute (µg/L)	SW Chronic(µg/L)
Washington	-	-	-	-
EPA	Multiple Linear Regression Model	Multiple Linear Regression Model	-	-
Proposed	West: 510[1] East: 820[1] (Multiple Linear Regression Model; 1-hour)	West: 270[1] East: 480[1] (Multiple Linear Regression Model; 4-day)	-	-

[1] Represents the 5th percentile default criteria. The boundary between east and west designations is found in WAC 222-16-010.

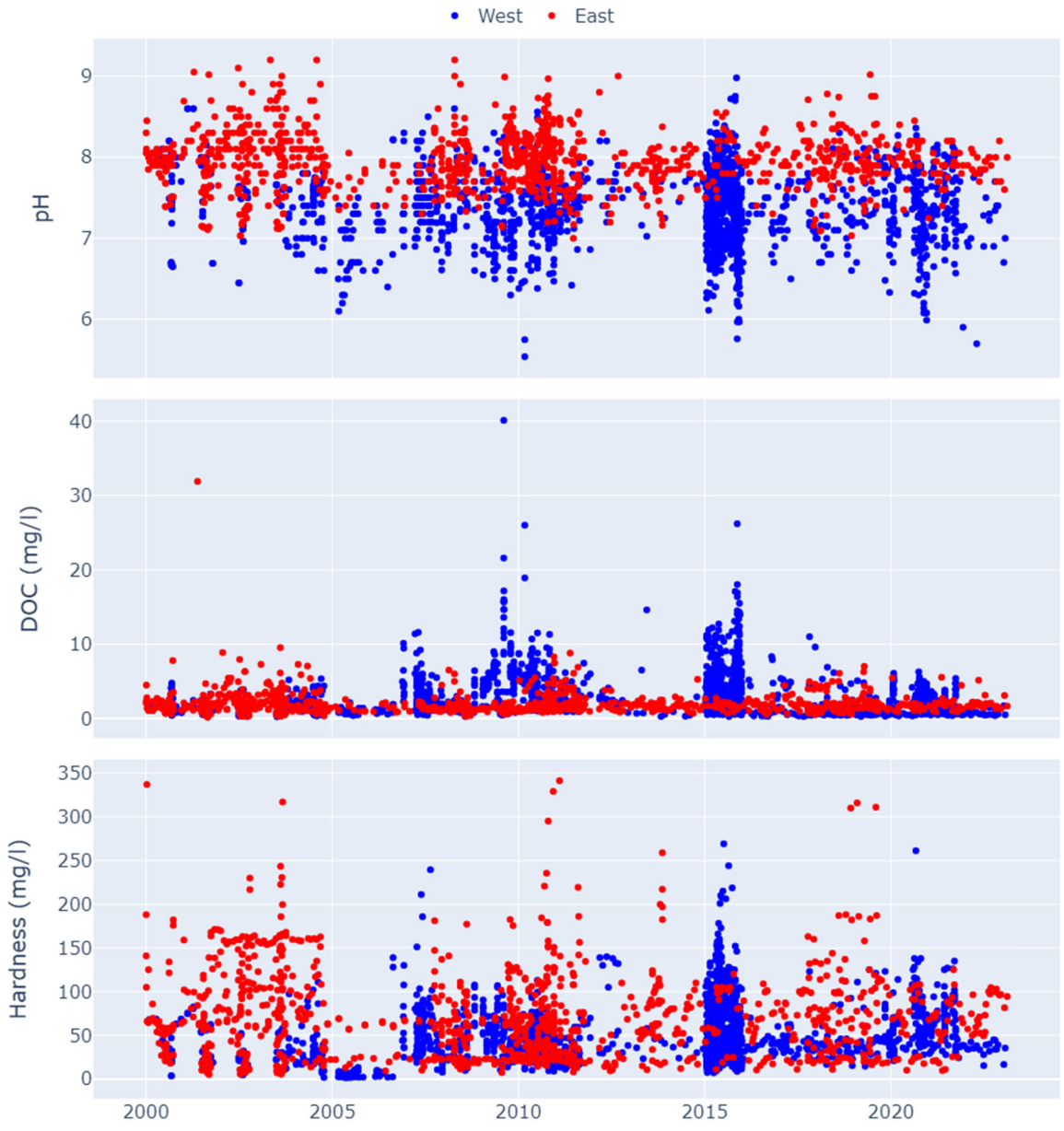

Figure 2. pH, Dissolved Organic Carbon, and Hardness Values used for Calculating Statewide Aluminum and Copper Criteria.

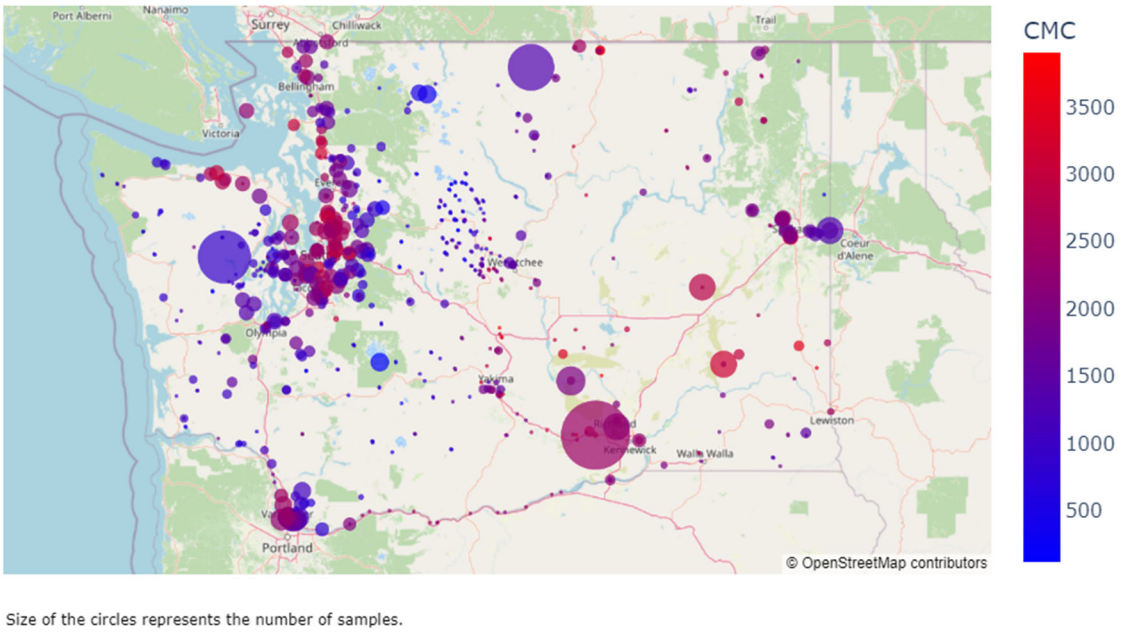

Figure 3. Fresh Water Criterion Maximum Concentration for (CMC) Aluminum Using Multiple Linear Regression Model.

A review of the default criterion calculations using this method 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.

An initial review suggests that the measurement of concurrent pH, hardness, and DOC data in the receiving water will result in a site-specific criterion that may be greater than the default criteria for most locations. Permittees will have the opportunity to collect their own site-specific data to

calculate site-specific criteria. It is however not clear if the site-specific concurrent data means the receiving water during ambient conditions, near the discharge location when discharge is occurring, or from the discharge. The collection of additional concurrent data will also increase the overall cost to permittee that Ecology has not accounted for in its economic impact analysis.

Copper

Copper is currently regulated in Washington based on a hardness-based calculation for freshwater (Table 2). Ecology is proposing to move from hardness-based criteria to MLR model, similar to aluminum, which uses pH, hardness and DOC as input parameters (Figure 4). However, EPA recommends using a Biotic Ligand Model (BLM) that depends on at least twelve water quality parameters. Ecology has not demonstrated that the MLR model is as protective as the BLM model for the state of Washington. The model proposed by Ecology is based on Brix et al. (2021). However, it appears that the published study had misprint and the correction will be issued later this year (personal communication, April 16, 2024). 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. We believe that until the correction is published, and peer reviewed, it should not be used for developing the copper criterion.

Table 2. 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. Recreated from TSD Table 27 (Ecology, 2024).

	FW Acute (µg/L)	FW Chronic (µg/L)	SW Acute (µg/L)	SW Chronic(µg/L)
Washington	Hardness-based (1-hour)	Hardness-based (4-day)	4.8 (1-hour)	3.1 (4-day)
EPA	Biotic Ligand Model (1-hour)	Biotic Ligand Model (4-day)	4.8 (1-hour)	3.1 (4-day)
Proposed	West: 2.0[1] East: 2.5[1] (Multiple Linear Regression Model; 1-hour)	West: 1.6[1] East: 1.8[1] (Multiple Linear Regression Model; 4-day)	No change	No change

[1] Represent 5th percentile default criteria values. The boundary between east and west designations is defined in WAC 222-16-010.

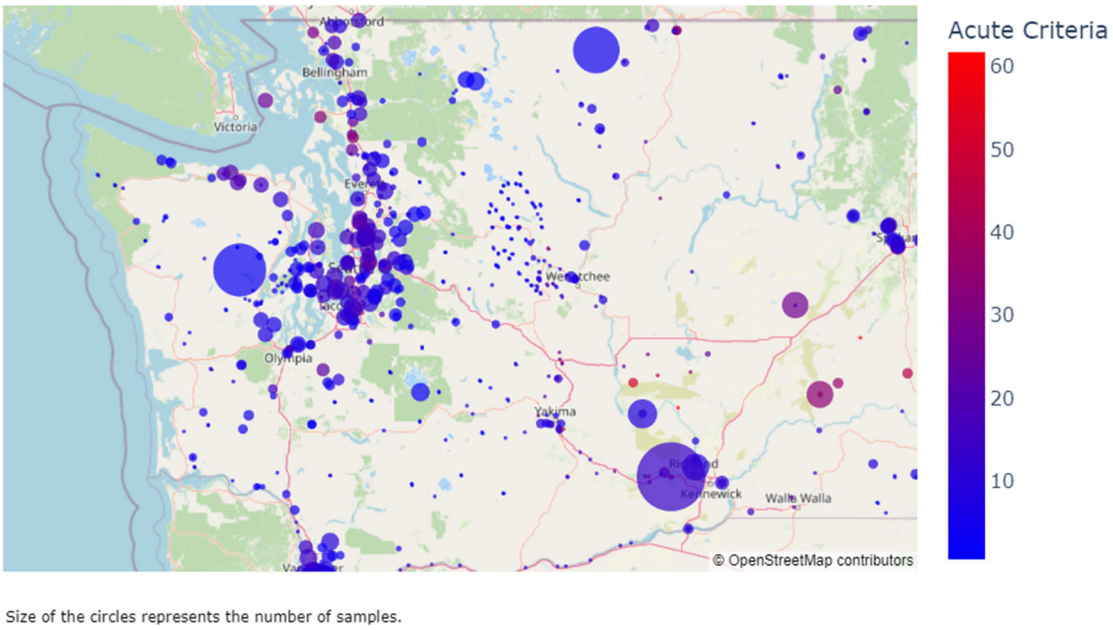

Figure 4. Fresh Water Acute Criteria for Copper Using Multiple Linear Regression Model.

Ecology used the same dataset and method (but different equations) as aluminum to calculate the default criteria for the eastern and western Washington. The issues related to the spatial and temporal distribution of the input data for aluminum are true for copper as well (i.e., western Washington biased by the high number of samples collected in the Olympic National Forest and Mount Rainier National Park where the hardness and DOC concentrations are naturally low).

The proposed copper criteria are lower than the current hardness-based criteria, under average hardness, pH, and DOC conditions. As described in the Preliminary Regulatory Assessment document, the current baseline acute criterion for copper is 12 µg/L based on a mean statewide hardness value (70.2 mg/L). The ISGP benchmark value for total copper is 14 µg/L for western Washington, and 32 µg/L for eastern Washington. Due to the much lower proposed copper criteria (reduced by approximately a factor of 6 for western Washington and a factor of 10 for eastern Washington), it is anticipated that the ISGP copper benchmarks will be commensurately lowered when the ALTC are implemented in the ISGP. These lower benchmarks will be extremely challenging to consistently achieve using conventional stormwater treatment measures, such as bioretention, media filtration, and detention basins. The best performing stormwater best management practices (BMPs) included in the International Stormwater BMP Database (www.bmpdatabase.org) have been shown to achieve median effluent concentrations of 3 to 5 µg/L (Clary et al., 2020). Since these are median concentrations, about half of the time these BMPs will likely have effluent concentrations higher than this range. This indicates that more advanced or active treatment may be required at many industrial facilities. Ecology should revise

their economic impact assumptions to reflect the much higher treatment costs associated with complying with the potentially much lower benchmarks for copper.

Similar to aluminum, 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.

Cadmium

Current cadmium criteria in Washington are above EPA's recommendations (Table 3). EPA's recommendations, updated in 2016, have not undergone Endangered Species Act (ESA) consultation in any Pacific Northwest states. However, a jeopardy call was issued for EPA's 2001 freshwater acute criterion, and a likely to adversely affect (LAA) determination was reported for the chronic criterion, in the Oregon Biological Opinions (BiOps) in 2012. Because of these ESA concerns, Ecology is proposing to make the freshwater cadmium criteria even more stringent than EPA's recommendations. Unlike copper, cadmium tends to be lower in stormwater runoff and conventional passive treatment such as bioretention can typically achieve effluent concentrations lower than the proposed criteria.

The cadmium freshwater criterion maximum concentration (CMC) and the freshwater criterion continuous concentration (CCC) equations slopes match those from previously presented EPA equations (EPA, 2016). However, the intercepts of Ecology's equations do not match EPA's 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.

Table 3. Comparison of Washington's current freshwater (FW) and saltwater (SW) acute and chronic cadmium criteria (duration in parentheses) with EPA recommendations and the newly proposed criteria. Recreated from TSD Table 19 (Ecology, 2024).

	FW Acute (µg/L)	FW Chronic (µg/L)	SW Acute (µg/L)	SW Chronic(µg/L)
Washington	3.7[1,2] (1-hour)	1.0[1,2] (4-day)	42[2] (1-hour)	9.3[2] (4-day)
EPA	1.8[1,2] (1-hour)	0.72[1,2 (vacated)] (4-day)	33[2] (1-hour)	7.9[2] (4-day)
Proposed	1.3[1,2] (1-hour)	0.41[1,2] (4-day)	33[2] (1-hour)	7.9[2] (4-day)

[1]Hardness based criteria (numeric value shown based on 100 mg/L)
[2] Presented as the dissolved fraction

According to the technical support document - *"The freshwater acute cadmium criterion is based upon the commercially important rainbow trout (Oncorhynchus mykiss). EPA found that the rainbow trout SMAV was less than the 5th percentile of the GMAV toxicity distribution for the*

freshwater acute data set, necessitating the use of rainbow trout SMAV to derive criteria. Rather than using the geometric mean of acute toxicity values for rainbow trout to derive the acute criterion, we used the 20th percentile of available acute toxicity data for rainbow trout to add increased protection for endangered species. We sought to align our proposed freshwater acute cadmium criterion with Idaho's and Swinomish approved criterion of 1.3 µg/L to ensure protection of endangered species."

It appears as if Ecology selected the number to match with the Idaho and Swinomish approved criterion 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).

Nickel

Similar to cadmium, Washington's freshwater nickel criteria are currently higher than EPA's recommendations (Table 4). LAA determinations were made for EPA's recommended criteria when they were proposed in Idaho and Oregon. Therefore, Ecology is proposing new criteria much lower than EPA's recommendations. Based on data contained in the International Stormwater BMP Database (Clary et al., 2020), bioretention and media filters appear capable of achieving effluent concentrations below the proposed criteria. However, it is important to note that the influent concentrations for the studies in the database are also lower than the criteria.

The derivation of the final acute value (FAV), the basis of the acute criteria and by extension the chronic criteria, is based on four 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.

Table 4. 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. Recreated from TSD Table 33 (Ecology, 2024).

	FW Acute (µg/L)	FW Chronic (µg/L)	SW Acute (µg/L)	SW Chronic(µg/L)
Washington	1415[1,2] (1-hour)	157[1,2] (4-day)	74[2] (1-hour)	8.2[2] (4-day)
EPA	470[1] (1-hour)	52[1] (4-day)	74[2] (1-hour)	8.2[2] (4-day)
Proposed	34[1,2] (1-hour)	5.6[1,2] (4-day)	No change	No change

[1] Hardness based criteria (numeric value shown based on 100 mg/L)

[2] Presented as the dissolved fraction

Silver

Currently, only acute criterion are established for freshwater and saltwater silver in Washington (Table 5). The current freshwater acute criterion is similar to, but slightly above, EPA's recommendation. Due to LAA determinations in Oregon, Ecology is proposing a new freshwater acute criterion that is much lower than EPA's recommendation. Additionally, Ecology has developed proposed freshwater and saltwater chronic criteria, while EPA does not have established recommendations. Silver is rarely detected in urban stormwater, so these lower criteria are not expected to impact many permittees if silver becomes a benchmark. For studies in the International Stormwater BMP Database (www.bmpdatabase.org) where silver has been detected in the influent, effluent concentrations are generally below the proposed acute criteria.

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.

Table 5. Comparison of Washington's current freshwater (FW) and saltwater (SW) acute and chronic silver criteria (duration in parentheses) with EPA recommendations and the newly proposed criteria. Recreated from TSD Table 39 (Ecology, 2024).

	FW Acute (µg/L)	FW Chronic (µg/L)	SW Acute (µg/L)	SW Chronic(µg/L)
Washington	3.4[1,2] (1-hour)	-	1.9[2] (instantaneous)	-
EPA	3.2[1,2] (instantaneous)	-	1.9[2] (instantaneous)	-
Proposed	0.52[1,2] (1-hour)	0.21[1,2] (4-day)	2.2 (1-hour)	0.87 (4-day)

[1] Hardness based criteria (numeric value shown based on 100 mg/L)
[2] Presented as the dissolved fraction

Zinc

Washington's current freshwater acute and chronic criteria for zinc are lower than EPA's current recommendations (Table 6). LAA determinations were made for EPA's recommendations in Oregon, and jeopardy calls were made for these recommendations in Idaho. Ecology is proposing much lower freshwater criteria based on these ESA concerns. Zinc is also included in the ISGP, with a benchmark value of 117 µg/L. Based on the notable decrease in proposed criteria, it is anticipated that the ISGP zinc benchmark may be lowered when the ALTC are implemented in the ISGP. While the International Stormwater BMP Database data indicates common BMPs such as bioretention and media filters can achieve median effluent concentrations below the proposed criteria (Clary et al., 2020), it is suspected that many ISGP permit holders will experience

challenges meeting a benchmark that is 50% lower than the current benchmark. Ecology's economic analysis reflects this with its estimate of 259 existing permittees predicted to have Level 1 exceedance and 149 existing permittees predicted to have Level 3 exceedance. While the economic analysis does not attempt to predict the number of new facilities that may be required to apply for permit coverage in the future, there likely will be more permittees than there currently are today due to Ecology broadening the scope of industries covered under the permit, either by adding new sectors or by tightening criteria for determining which industries require permitting.

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 *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 will have low confidence.

Table 6. 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. Recreated from TSD Table 47 (Ecology, 2024).

	FW Acute (µg/L)	FW Chronic (µg/L)	SW Acute (µg/L)	SW Chronic(µg/L)
Washington	114[1,2] (1-hour)	105[1,2] (4-day)	90[2] (1-hour)	81[2] (4-day)
EPA	120[1,2] (1-hour)	120[1,2] (4-day)	90[2]	81[2]
Proposed	57[1,2] (1-hour)	39[2] (4-day)	No change	No change

[1] Hardness based criteria (numeric value shown based on 100 mg/L)
[2] Presented as the dissolved fraction

6PPD-quinone

6PPD-quinone is an emerging contaminant that is not currently regulated in Washington. There is no EPA-approved method of testing for 6PPD-quinone, no EPA recommendation for 6PPD-quinone criteria, and existing data regarding 6PPD-quinone in Washington is limited. However, juvenile coho salmon have been shown to be the most susceptible species to exposure to 6PPD-quinone. Therefore, Ecology is proposing a freshwater acute 6PPD-quinone criterion (Table 7).

Table 7. Comparison of Washington's current freshwater (FW) and saltwater (SW) acute and chronic 6PPD-quinone criteria (duration in parentheses) with EPA recommendations and the newly proposed criteria. Recreated from TSD Table 54 (Ecology, 2024).

	FW Acute (µg/L)	FW Chronic (µg/L)	SW Acute (µg/L)	SW Chronic(µg/L)
Washington	-	-	-	-
EPA	-	-	-	-
Proposed	0.008 (1-hour)	-	-	-

The proposed criterion is based on development of a species sensitivity distribution (SSD) and selection of the effective concentration at 5%. The species included (with the most sensitive listed first) in the SSD were: coho salmon (Tian et al. 2022; Lo et al. 2023; Greer et al. 2023), white spotted char (Hiki et al. 2022), brook trout (Brinkman et al. 2022), rainbow trout (Brinkman et al. 2022; Di et al. 2022), and zebra fish (Varshney et al. 2022). The resulting fifth percentile of the SSD produced the value of 8 ng/L which coincidentally aligns with the LC5 value in the Lo et al. 2023 (~7 to 8 ng/L) (the study with the lowest estimated LC50 value). Ecology excluded relevant data from the reviewed toxicity studies. For example, Greer et al. 2023 includes an LC50 value for chinook salmon (81,100 ng/L) and Lo et al. 2023 did not observe an LC50 for sockeye salmon in their investigation. If the SSD methodology is used, it is appropriate to include LC50 values from other salmonids. At a minimum, the sensitivity of the proposed acute freshwater criteria should be clearly investigated, and appropriate rationale should be provided as to why a datapoint was excluded. The lack of data and approved testing methods indicate that it is premature to establish a 6PPD-quinone criterion in Washington.

CONCLUSIONS

Geosyntec reviewed the proposed aquatic life toxics criteria and the additional supporting documents. Ecology has been transparent and forthcoming in the process. They provided the requested data and any additional information that was used for developing the criteria, upon request. However, we noted that there are some shortcomings in the process and reliance on data that may be biasing the statewide defaults that together may result in unrealistic criteria for some toxics and cause significant burden to the business community. We believe that Ecology should address these issues before moving ahead with the rulemaking process.

Very truly yours,

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