State of Oregon
Department of Environmental Quality **Memorandum**

To: DEQ Water Quality Staff **Date:** September 4, 2013

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Subject: Implementation Instructions for Dissolved Metals Water Quality Criteria in Reasonable Potential Analysis and Water Quality-based Effluent Limits Calculations

This memorandum describes the procedure for determining whether a discharge has a reasonable potential to cause or contribute to an excursion above state water quality criteria for dissolved metals. Additionally, the memorandum provides information on the development of water quality-based effluent limits (WQBELs).

Applicable Water Quality Standards for Dissolved Metals

The following table lists Oregon's aquatic life criteria (see table below) that are expressed in terms of dissolved metals (with some exceptions) that are effective as of January 31, 2013. Some of the criteria (as as indicated by "*Calculation*" and footnote in **Table 1**) are also hardness dependent and must be calculated on a site-specific basis.

Table 1
Water Quality Criteria Expressed in Dissolved Metals

Chemical	Aquatic Life Criteria (Freshwater)		Aquatic Life Criteria (Saltwater)	
	Acute (µg/L)	Chronic (µg/L)	Acute (µg/L)	Chronic (µg/L)
Cadmium	Calculation[1,2]	Calculation[1]	40	8.8
Chromium III	Calculation[1]	Calculation[1]	--	--
Chromium VI	16	11	1100[2]	50[2]
Copper	Calculation[1,2]	Calculation[1,2]	4.8	3.1
Lead	Calculation[1]	Calculation[1]	210	8.1
Nickel	Calculation[1]	Calculation[1]	74	8.2
Selenium	260[2]	35[2]	290	71
Silver	Calculation[1]	0.10	1.9	--
Zinc	Calculation[1]	Calculation[1]	90	81

[1]Critierion is calculated based on hardness.
[2]Indicates a criterion that is expressed in terms of "Total Recoverable" metals

Background Information

In 2004, Oregon adopted the majority of the aquatic life toxics criteria for metals based on the dissolved fraction in water as recommended by EPA in a 1993 guidance memo[1]. The EPA determined the dissolved fraction of metal in water more closely approximates the bio-available or "toxic" fraction of metal in the water column than does "total recoverable". EPA approved Oregon's dissolved metals criteria on Jan. 31, 2013.

Even though many of the metals criteria are in terms of "dissolved" concentration, current federal and state regulations[2] require that dischargers conduct the initial characterization (priority pollutant scan) of their effluent for all metals in terms of "total recoverable" concentrations. Federal regulations[3] also specify that in cases where a reasonable potential is indicated, a WQBEL in terms of "total recoverable" should be calculated and included in the permit. This requirement exists because chemical differences between the effluent discharge and the receiving waterbody can result in changes in the partitioning between dissolved and particulate forms of metal. Since dischargers collect the majority of characterization metals data as total recoverable and partitioning factors for dissolved metals are not readily available, DEQ staff should follow the implementation instructions below for establishing reasonable potential for dissolved metals water quality criteria.

Implementation Instructions for NPDES Permits

In keeping with both the monitoring requirements in 40 CFR 122.45(c) and various other DEQ Toxics Implementation Memoranda, Tier 1 (priority pollutant scan) monitoring will generally be conducted in terms of "total recoverable." In the event where a dissolved metal is identified as a "pollutant of concern" (i.e., reasonable potential at the "end of pipe"), the permit writer and permittee will need to develop a strategy for completing the Reasonable Potential Analysis (RPA) and include the necessary monitoring requirements into the Tier 2 monitoring plan.

The challenge in conducting an RPA for dissolved water quality criteria is the nature of the data (both characterization and ambient), the availability of site-specific translators and the relevancy of conservative default conversion factors. As a result, the recommended approach is to use the Tier 1 "total recoverable" monitoring data for the RPA and compare the results to the dissolved criterion without a translator (this equates to using a translator value of "1"). If the maximum effluent concentration exceeds the water quality criterion at the "end of pipe", the permittee would then have the following options to complete the RPA[4]:

1. Conduct the RPA using "total recoverable" data. This is equivalent to assuming that all of the metals are present in the dissolved form. This is the most conservative approach for conducting the RPA.

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[1] EPA. Martha G. Prothro. Memo: Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria. October 1, 1993.

[2] 40 CFR, 122 App. D and App. J, and EPA Applications Form 2A and 2C. Some additional parameters are described in OAR 340-41-0033 Toxics Water Quality Criteria Tables.

[3] 40 CFR 122.45(c)

[4] The option(s) must be selected and the necessary supporting data collected as part of the Tier 2 monitoring so that the full (end of pipe and in-stream) RPA can be completed.

2. Use the default conversion factors published in the Oregon Administrative Rules[5] to translate the "dissolved metals" criteria to "total recoverable". This method presumes that the metal is dissolved to the same extent as it was during EPA's criteria development for metals[6]. The conversion factors are published in the state Aquatic Life Water Quality Criteria Table and will be consolidated into the RPA Spreadsheets.
3. Conduct a site-specific study to determine the dissolved fraction of the total recoverable metals in the fully mixed receiving water body[7]. The study may directly determine a translator factor using in-stream monitoring data or a partition coefficient according to EPA protocols[8]. In order to properly document the basis of the subsequent permits effluent limits, a summary of the study must be included in the Permit Evaluation Report.

Although resource intensive, option No. 3 (site-specific study) is the most relevant of the three options due to the use of temporally and geographically relevant data to make the determination. Options No. 1 and 2, are more conservative, potentially resulting in false positives. Once the permit writer and permittee agree upon a preferred option, the appropriate monitoring should be included in the Tier 2 Monitoring Plan for implementation during the third year of the permit term.

Per EPA regulations, WQBELs for the dissolved metals must be expressed in terms of "total recoverable". Accordingly, compliance monitoring will also be in terms of "total recoverable".

Conclusion

For most permitting situations, the permit writer will use "total recoverable" effluent data to conduct an "end of pipe" analysis (Tier 1) and compare the results to dissolved water quality criteria. In cases where a pollutant of concern is identified, three options exist for completing the RPA after the Tier 2 monitoring. This allows for an iterative approach that is both environmentally and fiscally conservative. In the event where a translator or conversion factor (Option 2 or 3) is necessary, the permittee will typically need to implement a monitoring plan to collect characterization data and calculate their factors. The permit writer should consult the appropriate EPA guidance or seek technical assistance from the Surface Water Management Section when reviewing the permittee's monitoring plan.

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[5] OAR 340-41-0033 Toxics Water Quality Criteria Tables

[6] National dissolved metals criteria are based on the same data set as the original total recoverable criteria. The original toxicity tests that these standards were based on measured total recoverable metals. In order to modify the criteria to represent only the dissolved fraction of the metals, EPA needed to determine what the percentage of dissolved metals was in the original laboratory tests. EPA conservatively estimated these percentages for each metal and issued "conversion factors".

[7] It is also possible to conduct a study to use existing dissolved effluent data and conducting an equilibrium calculation reflecting the fully-mixed receiving waterbody.

[8] See June, 1996 EPA Translator Guidance Document. The most direct procedure for determining a site-specific translator is by measuring dissolved and total recoverable metal concentrations in water samples taken from the effluent and receiving water.