State of Oregon
Department of Environmental Quality Memorandum

To: DEQ Water Quality Staff **Date:** November 28, 2014

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Subject: Implementation Instructions for Polychlorinated Biphenyls (PCBs) Water Quality Criteria (CAS #: 1336363)

This memo clarifies how PCB concentrations in effluent and surface water are measured to determine compliance with water quality criteria.

Criteria Summary

Oregon water quality standards include numeric criteria for PCB to protect human health and aquatic life (OAR 340-041-0033(3) and (4), and Tables 30 and 40). Both criteria are based on total PCBs. Table 1, below reflects the PBC criteria as published in the rule.

Table 1: Water Quality Criteria

Chemical	Human Health Criteria		Aquatic Life Criteria (Freshwater)		Aquatic Life Criteria (Saltwater)	
	Water + Org (µg/L)	Org Only (µg/L)	Acute (µg/L)	Chronic (µg/L)	Acute (µg/L)	Chronic (µg/L)
Polychlorinated Biphenyls (PCBs)	0.0000064 [K]	0.0000064 [K]	2 [K]	0.014 [K]	10 [K]	0.03 [K]
	[K] *This criterion applies to total PCBs (e.g. determined as Aroclors or congeners)*					

Key Issues

PCB criteria are expressed as total PCBs, determined as Aroclors or congeners[1]. Differences between analytical methods for Aroclors and congeners are discussed under the **Recommended Analytical Method** section below. Although the PCB footnote allow for Aroclor or congener analysis, federal monitoring requirements in 40 CFR 122 and additionally noted in EPA permit application forms require certain categories of industrial facilities to monitor for specific Aroclors.

An Aroclor[2] (one of the most commonly known trade names for PCB mixtures) is a PCB mixture that was produced in many commercial and industrial products, but was banned in the late

[1] Analysis for PCB Aroclors is currently the most commonly applied option in permit development and compliance purposes.

[2] There are many types of Aroclors and each has a distinguishing suffix number that indicates the degree of chlorination. The numbering standard for the different Aroclors is as follows: The first two digits

1970's due to its toxicity and persistence in the environment. In contrast, congeners are a variety of individual chlorinated biphenyls that form the chemical building blocks of Aroclors (e.g. 4,4'-dichlorobiphenyl). There are 209 PCB congeners.

Recommended Analytical Methods

40 CFR Part 136 methods for PCBs measure a mixture of congeners in seven Aroclors (i.e. PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, and PCB-1260). Because these methods measure Aroclors rather than individual congeners they are less sensitive than other analytical methods. Method reporting limits for the measurement of PCB Aroclors are in the µg/L (ppb) range, which is well above Oregon water quality criteria values for human health. In addition to high method reporting limits, Aroclor analysis is made by identification of specific ratios or patterns of congeners. This identification requires a significant amount of professional judgment in determining whether or not a pattern is an Aroclor, a mixture of Aroclors and/or a weathered (i.e. environmentally degraded) Aroclor. Aroclor analysis will often fail to identify the presence of PCBs if the Aroclor pattern in the analysis does not match a specific Aroclor pattern, particularly when the concentration is low enough to where some congener peaks are detected and some are not.

In September 2010, EPA proposed[3] to add EPA Method 1668C, "Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS" to its federally promulgated methods in 40 CFR Part 136. This method measures individual chlorinated biphenyl congeners in environmental samples by isotope dilution and internal standard high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS). Given the large number of public comments received on the proposed addition of this method, EPA decided to delay adoption of this method[4]. The DEQ lab currently uses EPA Method 1668C for its state-wide toxics monitoring program of surface waters. The current reporting limits for congeners in aqueous samples using HRGC/HRMS are 0.1-0.4 ng/L (ppt) and 20-50 ng/kg (ppt) for tissues. Although the specialized instrumentation and analysis required for this method (i.e. HRGC/HRMS) is substantially more expensive, there is a significant improvement in sensitivity and selectivity. As a result, measuring PCB congeners is a more accurate way of determining the potential presence of PCBs.

Any of the following methods for Aroclors are suitable provided they are adequately sensitive to meet the required limits: (1) EPA Method 608 – Organochlorine Pesticides and PCBs by GCECD; (2) EPA Method 617 – Organohalide pesticides and PCBs by GCECD; and (3) EPA Method 625 – Base, Neutrals and Acids by GCMS.

In some limited cases (see Implementation below), EPA Method 1668C may be used for PCB

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generally refer to the number of carbon atoms in the phenyl rings (for PCBs this is 12), the second two numbers reflect the percentage of chlorine by mass in the mixture. For example, Aroclor 1254 is a mixture containing approximately 54% chlorine by weight.

[3] Proposal originally opened for public comment on September 23, 2010. Comment period closed on December 22, 2010. See: http://www.gpo.gov/fdsys/pkg/FR-2010-09-23/pdf/2010-20018.pdf

[4] EPA. Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures; Final Rule. Federal Register Volume 77, Number 97 (Friday, May 18, 2012). See: http://www.gpo.gov/fdsys/pkg/FR-2012-05-18/html/2012-10210.htm

congener analysis. Permit holders may also use other methods designed to measure concentrations of PCB congeners for NPDES characterization or compliance purposes prior to EPA adoption of method1668C, as long as they receive written approval from DEQ[5].

To determine the applicable quantitation limits for individual permit holders, please refer to Schedule B of the relevant permit. For older permits without quantitation limits in Schedule B, please refer to Revision 3.0 of the Reasonable Potential Analysis for Toxic Pollutants IMD to determine applicable quantitation limits.

Implementation Instructions for NPDES Permits

State water quality criteria for PCBs are for *Total PCBs* and (per rule) may be evaluated using monitoring for Aroclors or Congeners. Because there are no EPA approved methods listed in 40 CFR 136 for *Total PCBs*, the Department has discretion as to which option (Aroclors or congeners) may be used for characterization and compliance monitoring activities. Using best professional judgment and a knowledge of existing PCB ambient or effluent data, the permit writer will indicate the appropriate analytical methods to be used for permit development and compliance purposes in the permit conditions (Schedule A & B).

Industrial Facilities: Federal regulations in 40 CFR 122 Appendix D, require certain categories of industrial facilities (e.g. pesticide manufacturing or certain types of pulp or paper mills) to characterize their effluent for specific PCB Aroclors. At a minimum, the facility will be required to monitor for the specified Aroclors using one of the EPA methods 625, 608 or 617. If indicated, the facility may also be required (or voluntarily opt) to monitor for congeners using EPA method 1668C. The preferred option is to use the required Aroclor monitoring data for Tier 1 effluent characterization and compliance purposes, unless additional congener monitoring is required in Tier 2.

Domestic Facilities: There are no specific federal regulations requiring domestic facilities to characterize their effluent for PCBs. In instances where it is determined that characterization for PCBs is required, the permit holder has the option of analyzing for either PCB Aroclors or congeners[6]. The preferred option is for facilities to monitor for Aroclors using EPA method 625, 608 or 617 as part of Tier 1 monitoring with the option of using the EPA method 1668C as part of the follow up Tier 2 monitoring. Depending upon the analytic range at which PCBs are found or an effluent limit is calculated, the permit writer has discretion of which EPA method to require as a permit condition for compliance monitoring.

For both industrial and domestic facilities, Total PCBs is determined by summing the results of any detected PCB Aroclor or congener and then comparing this result to the applicable criterion. Further guidance in the reporting and use of PCB analytical data is detailed in the various Internal Management Directives covering specific subject areas (e.g. Reasonable Potential

[5] Typically, a proposed method cannot be used for compliance purposes ahead of formal EPA adoption unless EPA approves it as an Alternate Test Procedure.

[6] When selecting which method to employ, permit holders should consider the form (Aroclor or congener) of any other data (e.g. ambient) to be used as part of a water quality analysis (e.g. Reasonable Potential Analysis, or meeting Waste Load Allocations, and/or benchmarks). In some circumstances, ambient PCB data may be available from DEQ or other agencies; however, this data can only be used in a reasonable potential analysis if it is in the same form as the analyzed effluent data. Otherwise, permit holders must collect and analyze the appropriate form of ambient PCB data to be compatible with the effluent data.

Analysis, Stormwater Program, and Environmental Cleanup Program).

Conclusion

The appropriate EPA method (Aroclor or congener) for the characterization of PCBs in effluent varies with the type of facility and the potential for PCBs to be present. Similarly, there is also permit writer discretion in method selection for compliance monitoring. Regardless of the EPA method selected, results for each Aroclor or congener are summed together and compared to the applicable criterion for PCBs.