DEPARTMENT OF ECOLOGY
State of Washington

When to Use EPA Method 1668 for PCB Congener Analyses

Implementation Memorandum #12

To: Interested Persons

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Date: July 22, 2015

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A standard analytical test method is used to analyze polychlorinated biphenyl (PCB) mixtures at contaminated site cleanups that are conducted under the Model Toxics Control Act (MTCA) and Sediment Management Standards (SMS) rules. This memo provides regulatory interpretation and guidance about when it is appropriate to use an alternative analytical test method for such cleanups.

Summary of Issue

Under what circumstances may Ecology require or allow the use of **EPA Method 1668** instead of the standard analytical method, **EPA Method 8082**, to analyze PCB mixtures at contaminated sites being cleaned up under:

- Chapter 173-340 WAC (MTCA rule), or
- Chapter 173-204 WAC (SMS rule)

Brief Answer

Ecology may require or allow the use of the most current accepted revision of EPA Method 1668 (USEPA, 2010) at contaminated sites, instead of the standard analytical method, EPA Method 8082 (USEPA, 2007b), to analyze PCB mixtures in soil, sediment, tissue, or water matrices. This may happen when one or more of the following applies:

- There is a need to test for PCB congeners that EPA Method 8082 does not test for (i.e., congeners other than Aroclors or the 19 PCB congeners listed in Table 1, below).
- There is a need to detect concentrations below what EPA Method 8082 is able to detect (i.e., ppt vs. ppm or ppb), such as when evaluating compliance with the current surface water cleanup level of 0.000064 ug/L.
- There is a need to test for coplanar dioxin-like PCB congeners and use the toxicity equivalency factors (TEF) specified in WAC 173-340-708(8)(f) or Section 6.3.2.3 of SCUM II (Ecology, 2015b) to calculate dioxin-like PCB toxicity equivalency quotient (TEQ).

Discussion

The MTCA and SMS rules specify standard analytical methods and under what circumstances Ecology may require or approve alternate methods. The following discussion: a) identifies the applicable sections of each rule; b) identifies the standard and alternate test methods for PCB mixtures; and c) explains when each of those methods is most appropriate.

Standard analytical methods

The **MTCA rule** specifies standard analytical methods and testing requirements for contaminated sites in WAC 173-340-830(3).

- For PCB mixtures, the standard analytical method is **EPA Method 8082**, which is included in EPA, SW-846 (WAC 173-340-830(3)(a)(i)).

The **SMS rule** specifies standard analytical methods and testing requirements for sediment at contaminated sites in WAC 173-204-600(3). The rule references the method and requirements in the Puget Sound Estuary Protocols (PSEP, 2015), which are defined in WAC 173-204-200(21).

- For PCB mixtures, the standard analytical method is **EPA Method 8082**, which replaced EPA Method 8081 in EPA, SW-846 (USEPA, 1997; USEPA, 2007a).
- For coplanar PCB congeners, the standard analytical method is **EPA Method 1668** (USEPA, 1997).

Alternate analytical methods

The **MTCA rule** provides that Ecology may require or approve alternate methods (WAC 173-340-830(3)(a)(vii)). The rule further provides that:

> *...[the] methods used for a particular hazardous substance at a site shall be selected in consideration of the factors in [WAC 173-340-830(2)]* (WAC 173-340-830(3)(b)).

In particular, MTCA requires that:

> *...samples ... be analyzed consistent with methods appropriate for the site, the media being analyzed, the hazardous substances being analyzed for, and the anticipated use of the data* (WAC 173-340-830(2)(d)).

Ecology may also:

> *...require or approve modifications to the standard analytical methods to provide lower quantitation limits, improved accuracy, greater precision, or to provide lower quantitation limits, improved accuracy, greater precision, or to address the factors in [WAC 173-340-830(2)(d)]* (WAC 173-340-830(2)(e)).

The **SMS rule** also provides that Ecology may require or approve alternate methods, particularly when Ecology determines the standard methods (i.e., the Puget Sound Estuary Protocols):

> *...are not applicable to, or appropriate for analysis of sediment chemical contamination in any given case* (WAC 173-204-600(3) and (4)(b)).

When implementing this rule,

> *[Ecology] shall use methods that accurately reflect the latest scientific knowledge consistent with the definitions contained in WAC 173-204-200 and 173-204-505* (WAC 173-240-130(1)).

In particular:

> *Any person or [Ecology] may propose an alternate technical method to replace or enhance the application of a specific technical method required under this chapter. ... Application and use of alternate technical method shall be allowed when [Ecology] determines that the technical merit of the resulting decisions will improve [Ecology's] ability to implement and meet the intent of this chapter as described in WAC 173-204-100(2), and will remain consistent with the scientific intent of definitions contained in WAC 173-204-200 and 173-204-505* (WAC 173-204-130(4)).

In accordance with the SMS rule, the *Sediment Cleanup Users Manual II (SCUM II)* (Ecology, 2015b) provides guidance on the appropriate methods for analyzing PCBs in sediment, which includes both EPA Methods 8082 and 1668 under specified circumstances.

Appropriate use of EPA Methods 8082 and 1668

EPA Method 8082 can be used to determine concentrations of PCBs as Aroclors or as individual PCB congeners in extracts from solid, tissue, and aqueous matrices. Method 8082 provides procedures for 19 of the 209 possible PCB congeners (see Table 1). The 19 PCB congeners are specific to the common Aroclor formations (USEPA, 2007b).

However, as reflected in the PSEP, Method 8082 is not appropriate for the determination of co-planar PCB congeners or the other PCBs of greatest toxicological significance measured at the very low (sub part per trillion) concentrations (USEPA, 2007b).

EPA Method 1668 can be used to determine concentrations of chlorinated biphenyl (CB) congeners for wastewater, surface water, soil, sediment, biosolids, and tissue matrices. The CB congeners that can be determined by this method are the twelve (12) polychlorinated biphenyls (PCBs) designated as toxic by the World Health Organization (WHO): congeners 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, and 189. Method 1668 also determines the remaining 197 CB congeners. Of these, approximately 125 are resolved adequately on an SPB-octyl gas chromatographic column to be determined as individual congeners. The remaining (approximately 70) CB congeners are determined as mixtures of isomers (co-elutions) (USEPA, 2010).

Method 1668 is appropriate for determining the concentrations of all 209 PCB congeners, including those co-planar PCB congeners or the other PCBs of greatest toxicological significance measured at the very low (sub part per trillion) concentrations, which are sometimes needed for specific risk assessment procedures.

Conclusion

The standard analytical method for PCB mixtures—EPA Method 8082—may be appropriate at contaminated sites when testing is only needed for total PCBs based on Aroclors.

However, given its limitations, EPA Method 8082 is not appropriate when:

- There is a need to test for PCB congeners that EPA Method 8082 does not test for (i.e., congeners other than Aroclors or the 19 listed PCB congeners).
- There is a need to detect concentrations below what EPA Method 8082 is able to detect (i.e., ppt vs. ppm or ppb), such as when evaluating compliance with the current surface water cleanup level of 0.000064 ug/L.

- There is a need to test for coplanar dioxin-like PCB congeners and use the TEFs specified in WAC 173-340-708(8)(f) or Section 6.3.2.3 of SCUM II (Ecology, 2015b) to calculate dioxin-like PCB TEQ.

Under these circumstances, it would be appropriate under the MTCA and SMS rules to use EPA Method 1668.

Table 1: The Aroclors and 19 PCB congeners tested for under EPA Method 8082.

Compound	CAS Registry No.	IUPAC #
Aroclor 1016	12674-11-2	-
Aroclor 1221	11104-28-2	-
Aroclor 1232	11141-16-5	-
Aroclor 1242	53469-21-9	-
Aroclor 1248	12672-29-6	-
Aroclor 1254	11097-69-1	-
Aroclor 1260	11096-82-5	-
2-Chlorobiphenyl	2051-60-7	1
2,3-Dichlorobiphenyl	16605-91-7	5
2,2',5-Trichlorobiphenyl	37680-65-2	18
2,4',5-Triclhorobiphenyl	16606-02-3	31
2,2',3,5'-Tetrachlorobiphenyl	41464-39-5	44
2,2',5,5'-Tetrachlorobiphenyl	35693-99-3	52
2,3',4,4'-Tetrachlorobiphenyl	32598-10-0	66
2,2',3,4,5'-Pentachlorobiphenyl	38380-02-8	87
2,2',4,5,5'-Pentachlorobiphenyl	37680-73-2	101
2,3,3',4',6-Pentachlorobiphenyl	38380-03-9	110
2,2',3,4,4',5'-Hexachlorobiphenyl	35065-28-2	138
2,2',3,4,5,5'-Hexachlorobiphenyl	52712-04-6	141
2,2',3,5,5',6-Hexachlorobiphenyl	52663-63-5	151
2,2',4,4',5,5'-Hexachlorobiphenyl	35065-27-1	153
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	170
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	180
2,2',3,4,4',5',6-Heptachlorobiphenyl	52663-69-1	183
2,2',3,4',5,5',6-Heptachlorobiphenyl	52663-68-0	187
2,2',3,3',4,4',5,5',6-Noachlorobiphenyl	40186-72-9	206

References

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USEPA. (2010). *Method 1668C: Chlorinated biphenyl congeners in water, soil, sediment, biosolids, and tissue by HRGC/HRMS.* EPA-820-R-10-005.