

DMMP CLARIFICATION PAPER

BENZOFLUORANTHENES ANALYSIS AND REPORTING

Prepared by David Fox (U.S. Army Corps of Engineers) for the DMMP agencies

Introduction

Benzofluoranthenes are polycyclic aromatic hydrocarbons (PAHs) that occur in coal tar, soot, coke oven emissions and cigarette smoke. They are found ubiquitously in the environment as products of the incomplete combustion of fossil fuels (EPA, 1984, 1990; IARC, 1984). Benzo[b]fluoranthene and benzo[k]fluoranthene are considered known animal and probable human carcinogens by the U.S. Environmental Protection Agency (EPA, 1994). In addition to these two isomers, the World Health Organization also includes benzo[j]fluoranthene on its list of known animal and possible human carcinogens (IARC, 1983).

Problem Identification

Benzofluoranthenes were included on the original list of Puget Sound Dredged Disposal Analysis (PSDDA) chemicals of concern (COC). However, PSDDA restricted the definition of benzofluoranthenes to the sum of the b- and k- isomers (PSDDA, 1989).

In 1995 the Department of Ecology promulgated the Sediment Management Standards (SMS). Benzofluoranthenes were again placed on the COC list, but in addition to the b- and k- isomers, the j- isomer was also included (Ecology, 1995).

The DMMP guidelines are used to determine the suitability of dredged material for disposal at designated open-water sites. However, the DMMP agencies are often required to compare sediment analysis results to the SMS guidelines as well. Examples include the evaluation of dredged material for beneficial use and the characterization of post-dredge sediment quality at the dredging site. The problem is that the j- isomer is not typically reported for dredging projects since is not included in the DMMP definition of benzofluoranthenes.

Proposed Clarification

The DMMP agencies propose the adoption of the SMS definition of benzofluoranthenes. This means that the benzofluoranthenes will now include the summation of the b-, j- and k- isomers. The screening and maximum levels for total benzofluoranthenes remain unchanged at 3,200 and 9,900 ug/kg respectively.

EPA SW 8270 (gas chromatography/mass spectrometry) is the most commonly used method for the analysis of benzofluoranthenes. The b-, j- and k- isomers can all be analyzed using this method. The benzofluoranthenes tend to co-elute and can be difficult to quantify individually. However, this is not a problem under the proposed clarification since what is being quantified is total benzofluoranthenes, the sum of all three isomers. In the case of co-elution, total benzofluoranthenes would equal the total area under the composite peak on the chromatogram.

References

Ecology, 1995. *Sediment Management Standards (Chapter 173-204 WAC)*. Washington State Department of Ecology.

EPA, 1984. *Carcinogen Assessment of Coke Oven Emissions*. Office of Health and Environmental Assessment, Washington, DC. EPA 600/6-82-003F. NTIS PB84-170181. United States Environmental Protection Agency. Cincinnati, OH.

EPA, 1990. *Drinking Water Criteria Document for Polycyclic Aromatic Hydrocarbons (PAHs)*. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. Final Draft. ECAO-CIN-D010, September, 1990.

EPA, 1994. *Integrated Risk Information System (IRIS)*. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, United States Environmental Protection Agency.

IARC, 1983. *Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans. Polycyclic Aromatic Compounds, Part 1, Chemical, Environmental and Experimental Data. Vol 32*. International Agency for Research on Cancer, World Health Organization. Lyon, France.

IARC, 1984. *Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Polynuclear Aromatic Hydrocarbons. Part 3. Industrial*

Publication Date: 6/2/07

Exposures in Aluminum Production, Coal Gasification, Coke Production, and Iron and Steel Founding. Vol. 34. International Agency for Research on Cancer, World Health Organization. Lyon, France.

PSDDA, 1989. *Management Plan Report - Phase II*. U.S. Army Corps of Engineers - Seattle District; U.S. Environmental Protection Agency - Region X; Washington State Department of Natural Resources; Washington State Department of Ecology.