




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

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OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Summary of Method Detection Limits for Ambient Lead Methods

FROM: Joann Rice 
Ambient Air Monitoring Group, OAQPS (C304-06)

TO: Lead NAAQS Review Docket (OAR-2006-0735) Memo

This memo presents findings for an analysis of method detection limits (MDLs) for current lead (Pb) FRMs (Federal Reference Methods)/FEMs (Federal Equivalent Methods).

Objective of Analysis

This analysis was done to investigate the capability of existing FRMs/FEMs to adequately measure Pb in TSP (Total Suspended Particulate) at the low concentrations considered in the Risk Assessment Report and Staff Paper.

Analysis

The MDL is an estimate of the lowest amount of Pb that can be detected by a measurement method. Ideally, the MDL reflects a combination of the sampling and analysis method sensitivity. The current FRM for Pb is based on the use of a high-volume (40-60 cubic feet per minute) TSP sampler to collect the sample and the use of atomic absorption for the analysis of Pb in the sample¹. There are 21 FEMs currently approved for Pb-TSP². All 21 FEMs are based on the use of high-volume TSP samplers with a variety of different analysis methods (e.g., XRF and ICP/MS).

Information was retrieved for FRM/FEM Pb MDLs reported to the EPA Air Quality System (AQS). The AQS is EPA's repository of ambient air quality data. AQS stores data from over 10,000 monitors, 5,000 of which are currently active. Based on data submitted to AQS, the

¹ 40 CFR 50 Appendix G; Reference Method for Determination of Lead in Suspended Particulate Matter Collected from Ambient Air.

² List of Designated Reference and Equivalent Methods, May 23, 2007 (<http://www.epa.gov/ttn/amtic/criteria.html>).

reported MDLs for these methods range from 0.01 $\mu\text{g}/\text{m}^3$ to 0.002 $\mu\text{g}/\text{m}^3$ for a variety of analytical methods.

In addition to AQS, the Inorganic (IO) Compendium of Methods Chapter IO-3, Chemical Species Analysis of Filter-Collected Suspended Particulate Matter (SPM)³, was reviewed for non-FRM/FEM MDLs for high-volume sampling and analysis methods for lead. The estimated MDLs range from 0.007 $\mu\text{g}/\text{m}^3$ for inductively coupled plasma spectroscopy to 0.00001 $\mu\text{g}/\text{m}^3$ for inductively coupled plasma mass spectrometry. Table 1 presents a summary of the information retrieved.

From these findings, the current methods available for Pb are adequate for use at the lowest alternative NAAQS levels considered in the Risk Assessment Report and Staff Paper.

Table 1. Estimated Method Detection Limits for Lead

Method	Estimated MDL ($\mu\text{g}/\text{m}^3$)	Sample Analysis Descriptions
FRM/FEM ^a	0.01 to 0.002	Atomic Absorption, Flameless Atomic Absorption, Emission Spectra ICAP, X-Ray Fluorescence, ICAP Spectra
IO – 3.2 ^b	0.0022	Flame Atomic Absorption
IO – 3.2 ^b	0.00005	Graphite Furnace Atomic Absorption
IO – 3.4 ^b	0.007	Inductively Coupled Plasma Spectroscopy
IO – 3.5 ^b	0.00001	inductively coupled plasma mass spectrometry
^a Estimated MDL retrieved from AQS ^b Estimated MDLs reported in the Inorganic (IO) Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, EPA/625/R-96/01a, July 1999		

³Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, EPA/625/R-96/01a, July 1999; IO Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, EPA/625/R-96/01a, July 1999; IO-3, Chemical Species Analysis of Filter-Collected Suspended Particulate Matter (SPM).