June 18, 2004

MEMORANDUM

SUBJECT: CASAC Consultation on PM Coarse Methods Evaluation

FROM: Richard D. Scheffe, Leader /s/ Richard D. Scheffe
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Office of Air Quality Planning and Standards (C339-02)

TO: Fred Butterfield
Designated Federal Officer
Clean Air Scientific Advisory Committee
EPA Science Advisory Board Staff Office (1400F)

Attached are materials for information and review by the newly formed Ambient Air Monitoring and Methods (AAMM) Subcommittee of the Clean Air Scientific Advisory Committee (CASAC). These materials will be the subject of a consultation by the AAMM Subcommittee, tentatively scheduled for a public meeting to be held at the Environmental Protection Agency (EPA) Main Auditorium in Research Triangle Park, NC, on July 22, 2004. The consultation will focus on methods for measuring coarse-fraction particulate matter (PMc) in ambient air, based upon performance evaluation field studies conducted by the EPA. I am requesting that you forward these materials to the AAMM Subcommittee to prepare for the consultation.

This project, entitled *PM Coarse Methods Evaluation*, has been requested by EPA's Office of Air Quality Planning and Standards (OAQPS), within EPA's Office of Air and Radiation, in anticipation of the potential need for reference and equivalent methods for PMc measurement, should new PMc standards be established as a result of EPA's ongoing review of the national ambient air quality standards (NAAQS) for particulate matter (PM). Measurement of PMc is intended to focus on those particles in the ambient air with a nominal diameter in the range of 2.5 to 10 micrometers (i.e., the coarse fraction of PM_{10}).

The upcoming consultation will support discussion of PMc air quality monitoring to be included in the next draft of the OAQPS Staff Paper for PM, a policy assessment of scientific and technical information prepared as part of our ongoing review of the PM NAAQS. This draft Staff Paper is now planned for review by the CASAC PM NAAQS Review Panel in early 2005.

Following completion of the OAQPS Staff Paper, the Agency will issue proposed rulemaking with regard to our review of the PM NAAQS, together with proposed rulemaking on a federal reference method (FRM) for PMc, should the Agency propose new PMc standards. Further consultation and/or review of PMc measurement methods by the AAMM Subcommittee may be appropriate for future consideration, taking into account the outcome of the upcoming consultation and the PM Panel's review of the next draft Staff Paper.

Documents for Review

- **Attachment 1** - Summary of prior CASAC involvement of PMc measurement methods

- **Attachment 2** - EPA's written report of the PM coarse field study, entitled: *Multi-Site Evaluation of Candidate Methodologies for Determining Coarse Particulate Matter (PMc) Concentrations*

Background and Summary: Consistent with previous CASAC recommendations, EPA has conducted comprehensive multi-city field studies to evaluate the performance of various methods for the mass measurement of PMc in the ambient air, including filter-based and continuous monitoring technologies. Several previously-developed PMc measurement methods were tested and are described in detail in this attachment. Tests were conducted for 30 days in each of the following locations: Gary, IN (March and April 2003); Phoenix, AZ (May and June 2003); and Riverside, CA (July and August 2003). A follow-up study was conducted for 15 days in Phoenix, AZ (January 2004). As the primary basis of comparison, a discrete difference method was used (employing $PM_{2.5}$ and PM_{10} FRMs of the same make and model, with PMc calculated by subtraction). A second filter-based, time-integrated method was tested that involved the use of a sequential dichotomous sampler. Three continuous PMc samplers, with a time resolution of 1 hour or less, also were tested: a commercially available system based on beta attenuation, a sampler using tapered element oscillating microbalance (TEOM) technology, and an aerodynamic particle sizer (APS). In addition, a limited set of PMc speciation samples were collected for diagnostic purposes. The results provide an examination of these methods under varying aerosol concentrations, particle size distributions, and composition, across various seasons.

- **Attachment 3** - Provides Data Quality Objective Development for a Coarse Particulate Standard, entitled: *Use of a Performance Based Approach to Determine Data Quality Needs for the PM-Coarse (PMc) Standard*

Background and Summary: Beyond these field studies, EPA staff have developed a software tool to evaluate uncertainties in the use of various PMc measurement methods in conjunction with possible new PMc standards, based on EPA's data quality objective (DQO) process. This tool can provide decision makers with an understanding of how attributes of a potential PMc monitoring network (e.g., sampling frequency, data

completeness, precision and bias) can affect measurement uncertainties relative to determining attainment with possible alternative PMc standards. Application of this tool, using input parameters based on preliminary data from the field studies and from existing monitoring sites around the country, can provide insights into how DQOs could be developed for PMc. This attachment provides an example of how this tool can be used to develop a performance-based approach to determining data quality needs for the PMc standard. Appendix 3-A to Attachment 3 provides a technical report, titled: *Estimating Parameters for the PM_{coarse} DQO Tool.* At the end of this report is Appendix A, which provides the mathematical model used for the simulation of PMc observations in the DQO tool. Appendix 3-B provides the precision and bias estimates used in the PMc Data Quality Objective Report.

- **Attachment 4** - General characterization of PMc as found in the U.S., based upon data from current network of PM_{10} and $PM_{2.5}$ monitors

Background and Summary: A general characterization (regional, seasonal, and temporal patterns) of PMc, as found in the United States, based upon data available from our current network of PM_{10} and $PM_{2.5}$ monitors, is presented in this attachment as background information. These data were taken from available monitoring data in the Air Quality System (AQS) for sites with collocated PM_{10} and $PM_{2.5}$ monitors. These analyses are the same as those presented in the first draft of the OAQPS Staff Paper for PM (August 2003); however, additional analyses are presented showing the seasonal, temporal characterization of PMc for several sites with available collocated PM_{10} and $PM_{2.5}$ continuous data.

Charge to the AAMM Subcommittee

The purpose of the upcoming Subcommittee meeting is to provide a consultation on EPA's evaluation of PMc sampling and monitoring methods, including development of DQOs for PMc measurement, that will help inform the Agency's possible selection of PMc measurement methods as part of its ongoing review of the PM NAAQS. This consultation is to include an assessment of the relative strengths and weaknesses of each of the measurement methods tested in the field studies, with consideration of the Agency's need for methods that can meet multiple monitoring objectives.

In specifying methods for a potential PMc standard, the Agency needs to consider how detailed the methods are to be described, which method will be used as the basis for approval of candidate reference or equivalent methods, and the performance criteria for approval of these methods. For instance, reference methods are described in detail for some criteria pollutants such as SO_2, PM_{10}, and $PM_{2.5}$. These reference methods rely on design criteria specified by regulation as part of the standard in 40 CFR Part 50. Approval of these PM methods are based upon adherence to specified design criteria, performance criteria of applicable method components, such as flow rate, and acceptable precision of multiple candidate methods in field studies. Alternatively, the Agency could describe a "Measurement Principle." A measurement

principle provides the scientific technique for how the measurement is made, without comprehensive design details usually found in a prescribed reference method. Measurement principles and performance standards are described for other criteria pollutants including O_3, CO, and NO_2. If the monitoring technology specified as part of a potential PMc standard is described as a "measurement principle" then the Agency will need to specify a performance standard and associated method to use as the basis for evaluation of candidate reference and equivalent methods. Regardless of the level of detail prescribed in the PMc monitoring technology selected as either a reference method or a measurement principle, the Agency expects to use a DQO-type process for determining the appropriate bounds for approval of these methods and candidate equivalent methods.

Questions that we ask the Subcommittee to focus on in their consultation include the following:

1. What are the strengths and weaknesses of each method tested in the ORD study for purposes of using it as a reference method, a measurement principle, and as a method that would provide the basis for approval of candidate reference and equivalent methods?

2. What are the strengths and weaknesses of each method tested to meet multiple monitoring objectives such as comparison to potential PMc standards, public reporting, trends, chemical speciation, and characterization of short-term episodes and diurnal variation?

3. For the PMc DQOs, is the process the Agency took to develop the estimates of uncertainty appropriate? Are there factors the Agency has included that should not be considered or are there other inputs that should be included?

We appreciate the efforts of you and the the Subcommittee to prepare for the upcoming meeting and look forward to discussing this project in detail on July 22. General questions regarding the enclosed materials should be directed to Mr. Tim Hanley, EPA-OAQPS (phone: 919-541-4417; e-mail: hanley.tim@epa.gov); specific questions regarding the PMc measurement methods evaluation study should be directed to Dr. Robert Vanderpool, National Exposure Research Laboratory, within EPA's Office of Research and Development (phone: 919-541-7877; e-mail: vanderpool.robert@epa.gov).

Attachments

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