



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

EPA-SAB-CASAC-LTR-02-001

Honorable Christine Todd Whitman
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Subject: Review of the Agency's draft *Continuous Monitoring Implementation Plan*; a Review by the Clean Air Scientific Advisory Committee

Dear Governor Whitman:

The Subcommittee on Particle Monitoring (hereafter, the "Subcommittee") of the Clean Air Scientific Advisory Committee (CASAC) met at EPA's Environmental Research Center in Research Triangle Park, NC on Monday, January 28, 2002. The purpose of this meeting was to review the draft document *Continuous Monitoring Implementation Plan* prepared by EPA's Office of Air Quality Planning and Standards (OAQPS) and provide advice on implementation of EPA's continuous PM monitoring program. The CASAC was asked to respond to the following charge: a) program strengths; b) areas of concern; and c) any recommendations that might optimize implementation of the PM continuous mass program.

This meeting of the CASAC Subcommittee on Particulate Monitoring represents the next in a series of steps that began in April 2000 when the question of the use of continuous mass monitors in National Ambient Air Quality Standards (NAAQS) compliance measurements was first raised. On January 22, 2001, a workshop was held by the Subcommittee. The purpose of that workshop was to explore opportunities for accommodating emerging technologies into routine air monitoring networks. The workshop was advertised and convened to provide states and associations of states, vendors and manufacturers of monitoring equipment, and EPA staff with an opportunity to share information and discuss emerging technologies and the implications of considering continuous monitoring in EPA's regulatory monitoring program. The Subcommittee made a series of recommendations in their subsequent letter to you on May 28, 2001 (EPA-SAB-CASAC-COM-01-003). We had requested OAQPS to provide a written response to our report in which they would set forth an approach to move toward a substantial use of continuous monitoring techniques in the compliance monitoring network as a replacement and/or supplement for the current Federal Reference Method (FRM) samplers.

The problems with the FRM samplers are that they require considerable effort to operate even on an every third-day basis and on that every third-day basis, they are not providing sufficiently detailed data on airborne particle concentrations. The availability of continuous

hourly data would be extremely valuable in evaluating health effects of airborne particles as well as testing and applying the air quality models needed for air quality management strategy development. At the same time, the use of continuous monitors would reduce the cost and manpower needs to operate the current FRM network. We anticipate that such a shift to continuous monitors could be achieved without a loss of integrity of the compliance monitoring data that is needed to test attainment or non-attainment of the NAAQS for PM_{2.5}.

In response to our discussions of last year, OAQPS produced a draft “Continuous Monitoring Implementation Plan” for the Subcommittee’s review and comments. Thus, the focus of the current meeting was the discussion of this document and issues related to a process for incorporating continuous mass monitors into the monitoring program. The Subcommittee would like to compliment the OAQPS staff for their efforts in developing the present document. It is clear that we are all working at finding approaches that will permit the use of continuous monitors that will provide more detailed data while ensuring that we are continuing to provide rigorous tests of air quality with respect to attainment of the PM_{2.5} NAAQS.

The EPA draft document outlines two approaches for using continuous monitors, Regional Equivalency Method (REM), and Enhanced Correlated Acceptable Continuous Methods (CAC). The REM process would result in the use of the continuous monitoring data for compliance determinations, whereas the CAC process would be useable for all purposes except compliance testing. An important innovation is the Agency's use of data quality objectives (DQO) to design the equivalency rules. The Subcommittee strongly endorses the DQO approach to determine how flexible the requirements can be and yet meet the needs of the Agency for compliance determinations.

After discussion between the Subcommittee, the OAQPS staff, and others present at the meeting, we agreed that the document presented a reasonable framework for the use of continuous monitors. However, the Subcommittee is concerned that the process as currently outlined puts a heavy burden on the state or local air quality agencies to demonstrate REM. This effort may be more than can be mounted by many such organizations. Normally the burden for equivalency demonstration is the responsibility of the vendors of the equipment, and the REM approach shifts that effort to the agency wishing to qualify the sampler for their region. There are other key issues regarding the regional approach that are difficult to resolve, such as the definition on appropriate regional domains, and the potential for changes of such domains over time. In addition, the REM process only permits a simple model to convert the continuous monitor data into values that would be treated as equivalent to the FRM values. The model must be of the form

$$\text{FRM} = a \cdot \text{CM} + b$$

where FRM is the estimated FRM 24 hour mass concentration in $\mu\text{g}/\text{m}^3$, CM is the measured 24 hour mass concentration ($\mu\text{g}/\text{m}^3$) estimated from the 24 one-hour values, and a and b are empirical coefficients developed from measurements within a “region.” Preliminary results presented in the document show that such an approach could work in some areas of the country such as the southeastern and northwestern US. However, such a model would not adequately

reproduce the FRM values in much of the United States including the midwestern to the northeastern portions of the country. A prior study in Switzerland (J. Heldstab and M. Stampfli (2001) PM10 - Umrechnungsmodelle für Teom - und Betameter -Messreihen, INFRAS, Gerechtigkeitsgasse 20, Postfach, CH-8039 Zürich, Switzerland) found simple empirical relationships that provide good correlations for both beta gauges and TEOMs for PM10. These relationships account for the effects of temperature or day of year on mass concentration measurements. Similarly, Bortnick, Coutant, and Eberly, (Journal of the Air & Waste Management Association (2002), 52, 104-112) provides two examples of model development for TEOMs with PM_{2.5} FRMs. One of the models uses temperature to get a better fit. The Subcommittee expressed the hope that it may be possible to develop a similar semi-empirical model, based on physical/chemical principles, that would provide adequate fits to the FRM data. It will be necessary to establish appropriate Data Quality Objectives that would need to be satisfied in order to apply this model for compliance purposes. It is possible that the model would need to be tailored to specific locales. It would be worth exploring such approaches in order to provide the opportunity for a larger portion of the country to be able to utilize a REM approach.

The Subcommittee expressed the opinion that the current requirements for the REM designation are inadequate, in that they do not require a sufficient correlation between the FRM and CM data. We recommend that in addition to the requirements set out in the draft document, there be a requirement that the squared correlation coefficient (r^2) should be relatively high with the value to be set by an appropriate Data Quality Objectives (DQO) process. It also may be necessary to consider the concept of a "region" in a rather different manner. If one considers the Northeastern US, areas with high emissions of diesels such as New York City, Boston, or Philadelphia may have a different model than smaller cities such as Rochester, Worcester, and Harrisburg. Thus, there may be several REM models for geographical regions because of significant differences in the composition of the ambient PM.

The current document is a good step forward to achieving the goal of a substantial use of continuous monitors in the compliance monitoring network, however, there are a number of problems yet to be resolved. In addition to those already outlined, the issue of monitoring for attainment of the 24-hour standard has not yet been addressed. Although we understand that the annual average standard will be the controlling standard, it is necessary to ascertain attainment or non-attainment of the 24-hour standard. There will also need to be a reduction of the total number of FRM sites. It seems clear from the spatial analyses that have been done, that it will be possible to decrease the total number of sites without compromising the confidence in the attainment decisions that need to be made. However, it will be necessary to develop careful guidance to the state and local agency to ensure that the smaller network provides appropriate data for NAAQS decisions.

Because of some of the difficulties we anticipate in the implementation of the REM approach, the Subcommittee suggests the following interim approach in order to begin moving continuous monitors into the network while the details of the REM process are being developed and finalized.

- a) For sites that would be utilized for NAAQS determinations (as envisioned in the REM approach), co-locate a continuous monitor with an FRM and allow a 1-day-in-6 sampling frequency for the FRM. This compliance site would be an ongoing co-location. A best-fit function could be developed based on the dependent data set to which it is applied, assuring the potential for the best transformation function possible. Each year, the best-fit function would be updated for that year, preserving the ability to adjust the continuous data to the best FRM-like data. Assuming the transformed continuous data met the Data Quality Objectives (DQO's), (establishing what we might call a "site-specific equivalency"), the daily data could be used for both annual and 24-hr NAAQS determinations. If for some locations, a best-fit function falls short of DQO objectives, the available 1-in-6 FRM data are available for the purpose of making attainment/non-attainment decisions.
- b) For sites that would not be utilized for NAAQS determinations (as envisioned in the CAC approach), we suggest that continuous and FRM monitors, with the FRMs on a 1-day-in-6 schedule, be co-located for the first year to establish an appropriate transformation function. Thereafter, co-location would occur every third year to confirm or update the transformation function.

This approach could be implemented quickly and without the extensive regulatory review that would be required for the full REM/CAC approach. It potentially could be done within the context of the approval of non-designated PM_{2.5} methods at specific individual sites in 40 CFR 58, Appendix C, section 2.4. It would permit the accumulation of data and allow further testing of the broader approaches outlined in the document. Thus, we suggest that OAQPS consider this as an interim approach while the details of other broader scale approaches are being refined.

Given that we are looking at potential major revisions of the particulate matter NAAQS next year, we suggest that it is an appropriate time to reexamine the Federal Equivalent Method (FEM) designation approach that is currently in the regulations. It is the Subcommittee's understanding that the equivalency rules were not based on a data quality objectives (DQO) approach to determine how stringent the requirements needed to be and yet meet the needs of the Agency for compliance determinations. The Subcommittee recommends that EPA undertake a thorough DQO process to determine the needs for monitors so that the FEM requirements can be defined based on a clearly defined set of data quality needs. This process may result in regulations that are not seen as onerous as the current regulations and may encourage vendors to develop FEM monitors.

Finally as a way to continue to move the process along, we request that by the end of June 2002, OAQPS provide a revised draft of the document that would include the 24-hour standard analysis and consideration of the comments provided in this report. We look forward to continuing to work with the OAQPS staff on this important aspect of the PM NAAQS compliance monitoring.

The above Subcommittee report was reviewed and approved by the statutory CASAC at a public teleconference meeting on February 27, 2002.

Sincerely,

/ Signed /

Dr. Philip Hopke, Chair
Clean Air Scientific Advisory
Committee

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- b. SAB Consultants: Experts appointed by the SAB Staff Director to a one-year term to serve on ad hoc Panels formed to address a particular issue.

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