August 7, 1996

EPA-SAB-CASAC-LTR-96-009

Honorable Carol M. Browner
Administrator
U.S. Environmental Protection Agency
401 M Street SW
Washington, DC 20460

Subject: Report of the Clean Air Scientific Advisory Committee (CASAC) Technical Subcommittee for Fine Particle Monitoring

Dear Ms. Browner:

Enclosed is a report of the (CASAC) Technical Subcommittee for Fine Particle Monitoring. The Subcommittee was formed following the December 14-15, 1995, CASAC public meeting on the particulate matter criteria document and staff paper. In discussions during that meeting it became clear that there were substantial concerns in the scientific community about the EPA's planned path for development of reference and equivalent methods for monitoring $PM_{2.5}$. In response to those discussions, EPA staff proposed formation of a CASAC subcommittee to provide technical input about fine particulate monitoring.

The Subcommittee and EPA staff held a public meeting with significant public input on March 1, 1996. At the meeting there was significant progress toward a consensus concerning a reasonable approach to fine particulate monitoring, but important questions and technical concerns remained. After clarifications from EPA staff and development of a new approach to setting priorities for monitoring to optimize protection of public health from excessive concentrations of fine particulate matter, the Subcommittee has reached a consensus on its recommendations contained in the enclosed report.

The membership of CASAC has reviewed the Subcommittee's report and endorses it. I want to join the Subcommittee in thanking the EPA staff for the openness with which they have reviewed $PM_{2.5}$ monitoring issues with the Subcommittee. I believe that EPA's responsiveness to the Subcommittee's review and continuing responsiveness to scientific review of proposals for fine particulate monitoring are important in development of possible new fine particulate standards.

Sincerely,

George T. Wolff

Dr. George T. Wolff, Chair
Clean Air Scientific Advisory Committee

Attachment

August 1, 1996

Dr. George T. Wolff, Chair
Clean Air Scientific Advisory Committee
Science Advisory Board
U.S. Environmental Protection Agency
401 M Street, SW
Washington. DC 20460

Subject: Report of the Clean Air Scientific Advisory Committee (CASAC) Technical Subcommittee for Fine Particle Monitoring

Dear Dr. Wolff:

A CASAC Technical Subcommittee for Fine Particulate Monitoring (the Subcommittee) was formed in response to discussion at the December 14-15, 1995 CASAC meeting to review the Particulate Matter Criteria Document. The Subcommittee was established to provide advice and comment to EPA on appropriate methods and network strategies for monitoring fine particles in the context of implementing a possible revised national ambient air quality standard (NAAQS) for particulate matter (PM). The Subcommittee held a public meeting March 1, 1996 in Chapel Hill, North Carolina. In response to discussions and input from the Subcommittee and the public at this meeting, EPA staff prepared and on March 19, 1996 provided to the Subcommittee a table titled Summary of Key Fine Particle Federal Reference Method Issues/Recommendations. In response to questions from a number of Subcommittee members the EPA staff revised and expanded the table and redistributed it to the members on April 14, 1996.

In a letter dated February 12, 1996, Mr. John Bachmann, Associate Director for Science/Policy in the Office of Air Quality Planning and Standards (OAQPS), asked for advice and comment on appropriate methods and network strategies for monitoring $PM_{2.5}$ and specifically listed a number of key issues:

a) the appropriateness of the overall approach taken for the federal reference method (FRM) [for fine particulate matter ($PM_{2.5}$)],

b) the efficacy of a hybrid-design approach for achieving precision and cost savings,

c) the relation of the measurement method to those that have been used in the key epidemiological studies,

d) the appropriateness of the recommended sampling frequency (i.e., daily as opposed to one-in-six day sampling for core fine particle monitoring sites and less frequently at supplementary monitors),

e) that appropriateness of using actual temperature conditions for reporting instead of standard temperature and pressure,

f) the appropriateness of the recommendations for monitor placement with an emphasis on community-wide exposure,

g) the extent to which the approach, as implemented by State and local agencies, would provide reliable information on the status of ambient fine particle concentrations with respect to a potential national ambient air quality standard (NAAQS) for fine particles, and

h) other technical issues such as the need to use a particular dichotomous sampler head for maintaining wind speed independence (aspiration efficiency), the desirability of sample heating, and the desirability of having a method that is within the public domain.

The Subcommittee started with the understanding that it was to assume that the size cut to be used to differentiate coarse-mode and fine-mode particulate matter was an aerodynamic diameter of 2.5 μm.

Concerning the appropriateness of the overall approach taken for the FRM, while several of the Subcommittee members would prefer to see a reference method that defined $PM_{2.5}$ as the in situ PM mass below a 2.5 μm pre-collector size cut, there are serious practical difficulties with attempting to measure that quantity. Under the circumstances, EPA has made an appropriate choice to establish a good practice standard for filter sampling and analysis technology. The Subcommittee expects that such a specified mass concentration can be measured reliably and reproducibly. The requirement for a monitoring method that produces an analyzable sample is appropriate. Analyzable samples will often be needed to deal with exceptional events, with identification of sources for designing control strategies, and for determining coarse mode intrusion into fine mode samples. Since the recent epidemiological studies have used a variety of methods with different performance characteristics, no one FRM can match them all; however, it matches most in the choice not to use a more complex design that includes denuding and backup filtration to improve the sampling of the ambient particulate nitrate compounds.

The Subcommittee understands the U.S. Environmental Protection Agency's (EPA's) frustration about the lack of agreement among the reference and equivalent methods for measuring particulate matter regulated under the current NAAQS for

particulate matter with an aerodynamic mass median diameter smaller than 10 μm (PM_{10}). We agree with EPA's desire to avoid the problems resulting from the current situation in which reference and equivalent methods do not produce comparable results. The Subcommittee understands that this frustration has led to EPA's plan to proceed with a hybrid design and performance specification for a reference method. We conclude that EPA's plan to designate a reference monitoring method for field use to evaluate the acceptability of other $PM_{2.5}$ monitoring methods under actual field conditions is appropriate.

The Subcommittee's recommendation for the most appropriate procedure for obtaining comparability of results from reference and equivalent method sampling for $PM_{2.5}$ would be the following sequence: a) development of an appropriate performance specification tight enough to limit comparability problems; b) an open competition to develop a reference method; c) testing in the laboratory and the field under a variety of geographic and meteorological conditions those prototypes that make a prima facie case that they have met the performance criteria; d) choice of a "reference sampler" from among the submitted prototypes that best meets the performance criteria, including evaluation of field use criteria; and e) designation of equivalent methods, with the possibility that some may be restricted geographically or otherwise to account for differing conditions.

If EPA rejects this recommendation and continues with the development of a hybrid design and performance reference method, we urge EPA first to demonstrate the repeatability and precision of the reference method by testing colocated samplers. Further, we urge EPA to build into the process enough time for independent agencies and interested parties to test the proposed reference method monitor in a variety of geographic and meteorological conditions before the final rule is issued. This Subcommittee would be an appropriate group to review and critique EPA's testing and evaluation program. In any case, the sharpening of the $PM_{2.5}$ size cut for the FRM to achieve $\delta_g < 1.2$ after accounting for losses is appropriate.

If, as the Subcommittee understands, EPA staff are working only on a single-day FRM sampler and any development of multi-day samplers will be left to the private sector, that arrangement is a reasonable choice. Only after there has been an opportunity for testing to determine the precision and field performance of the proposed FRM would there be a meaningful opportunity for public comment and for review by this Subcommittee of the proposed performance requirements for equivalent instruments. The proposed plan to certify geographically limited equivalency if a sampler or monitor performs acceptably in some areas but not in others is reasonable and appropriate.

The proposed requirement that the sampler be maintained between ambient temperature and 3° C above ambient temperature during sampling and until the sample is removed is a major step forward. It will preserve more of the semivolatile compounds

than most current gravimetric methods retain. We look forward to reviewing the proposed sample handling and quality assurance requirements that will be necessary to complement this requirement.

At the March 1, 1996 public meeting EPA's proposal was to require some daily sampling in all areas except ones with PM concentrations far below the standards. The argument has been made that daily FRM sampling provides additional protection of public health. Since the data from FRM sampling will not be available immediately, it cannot provide the basis for emergency emission controls or of timely public notification. Since EPA's analysis projects approximately a 5-to-7 year lag time between collection of FRM or equivalent method gravimetric data and implementation of source controls to reduce $PM_{2.5}$ concentrations, the public health advantage of daily FRM sampling appears minimal at best. The needs for public notification about excessive $PM_{2.5}$ concentrations and for managing episodes require real-time information about $PM_{2.5}$ concentrations, not daily filter samples.

An improved proposal that has been put forward since the March 1st meeting is that, where an appropriate continuous monitoring method or a method that reports data every hour or so is available, EPA allow the use of such a method supplemented by every nth. day gravimetric sampling. This proposal is a substantial improvement over requiring daily reference method sampling, which would consume large amounts of resources for samplers and sample handling. That drain on already limited state and local resources would strongly inhibit the use and further development of real-time monitoring technologies. The alternative proposal would save resources that would have had to go into daily gravimetric monitoring and would encourage development and application of improved monitoring technologies. It would also provide gravimetric data to which to compare the time-resolved data. If the continuous monitoring and the reference method agree within certain limits, the continuous monitoring method could be designated an equivalent method for the area. A less restrictive requirement would be appropriate for pollutant standard index (PSI) reporting and public notification about elevated $PM_{2.5}$ concentrations.

There have been suggestions that more frequent or daily sampling should be required when $PM_{2.5}$ concentrations are near either the annual average or the 24-hour standard. The rationale is that the increased sampling frequency will help resolve the question of whether the area is attainment or nonattainment by increasing the accuracy of the estimates of the annual average $PM_{2.5}$ concentration and the distribution of high 24-hour $PM_{2.5}$ concentrations. For areas that are near either an annual or a 24-hour standard, year to year variations in concentrations can easily cause the areas to flip into and out of attainment. The problems associated with such an area's flipping between attainment and nonattainment are primarily administrative problems that cannot be solved by improving the accuracy of estimating mean values and distributions.

At the May 17, 1996 CASAC public review of the OAQPS Staff Paper, the members of CASAC who spoke to the subject strongly recommended that the statistical form of a short-term fine particulate matter standard be a percentile standard or another similarly robust form, not an annual second-high standard. If EPA follows this recommendation, there will be less of a need for daily FRM sampling to determine whether an area is in attainment or nonattainment for the 24-hour $PM_{2.5}$ standard.

The question of reporting $PM_{2.5}$ concentrations using actual temperature and pressure rather than standard temperature and pressure involves a moderate change in the stringency of a standard at high altitude. The question of the theoretical appropriateness of the choice is related both to atmospheric physics and to physiological and toxicological considerations. Since the latter are outside this Subcommittee's areas of expertise, a larger panel would be needed to provide integrated advice on this matter. On the other hand, the wide range of opinion about the appropriate levels of the standards makes this consideration a comparatively small one that can be handled appropriately in EPA's proposing and setting a $PM_{2.5}$ standard.

The proposed requirement for monitoring to identify the contribution of transport and regional $PM_{2.5}$ levels to urban $PM_{2.5}$ is appropriate. The Subcommittee agrees that there can be a major fraction of $PM_{2.5}$ that is relatively uniform over regions, but a number of us are uncomfortable with the suggestion that $PM_{2.5}$ varies fairly smoothly and is relatively uniform over substantial parts of urban areas. The question of the appropriateness of monitor placement with an emphasis on community-wide exposure is difficult. It would be appropriate to base decisions that have community-wide impact on monitors that represent community-wide $PM_{2.5}$ and to base decisions that have region-wide impact on regionally representative monitors. That approach does not, however, deal with the problem of high public exposures that can be caused by some point sources and by some localized area sources. Data from monitors that measure localized public exposure to high $PM_{2.5}$ concentrations are inappropriate for making decisions about area or regional controls.

The Subcommittee encourages EPA to give careful consideration to harmonizing the definition of PM_{10} with internationally accepted definitions of thoracic particulate matter. Since some agencies and persons may choose to monitor for $PM_{2.5}$ and $PM_{10-2.5}$ using a single sampler, there is an advantage to accomplishing this harmonization before the samplers are designed and built. The decision whether to grandfather existing PM_{10} samplers is an appropriate one for EPA to make.

On behalf of the Subcommittee, I want to thank EPA staff for the openness with which they have reviewed $PM_{2.5}$ monitoring issues with us. We look forward to reviewing the detailed monitor siting guidance, the equivalency determination procedures and specifications, and the sample handling requirements when they are available.

Sincerely,

James H. Price, Jr., Ph.D., Chair
Technical Subcommittee for Fine
Particle Monitoring,
Clean Air Scientific Advisory Committee