UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

August 12, 2008

EPA-CASAC-08-018

The Honorable Stephen L. Johnson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Subject: CASAC Ambient Air Monitoring & Methods (AAMM) Subcommittee Consultation on Approaches for Developing a Low-Volume Ambient Air Monitor for Lead in Total Suspended Particulate (Pb-TSP) Federal Reference Method (FRM) or Federal Equivalent Method (FEM)

Dear Administrator Johnson:

EPA's Office of Air Quality Planning and Standards (OAQPS), within the Office of Air and Radiation, requested that the Agency's Clean Air Scientific Advisory Committee (CASAC) Ambient Air Monitoring & Methods (AAMM) Subcommittee (CASAC Subcommittee) conduct a consultation concerning the need and approaches for the development of a low-volume ambient air monitor for Lead in total suspended particulate (Pb-TSP) Federal Reference Method (FRM) or Federal Equivalent Method (FEM). On July 14, 2008, the CASAC Subcommittee conducted this consultation with Agency staff via a public advisory teleconference.

The SAB Staff Office has developed the consultation as a mechanism to advise EPA on technical issues that should be considered in the development of regulations, guidelines, or technical guidance before the Agency has taken a position. A consultation is conducted under the normal requirements of the Federal Advisory Committee Act (FACA), as amended (5 U.S.C., App.), which include advance notice of the public meeting in the *Federal Register*.

As is our customary practice, there will be no consensus report from the CASAC as a result of this consultation, nor does the Committee expect any formal response from the Agency. The CASAC Subcommittee roster is enclosed as Enclosure A to this letter, Subcommittee members' individual written comments are found in Enclosure B, and the Agency's background and charge memorandum to the Subcommittee is provided in Enclosure C.

Sincerely,

/Signed/

Armistead (Ted) Russell, Chair
CASAC AAMM Subcommittee

cc: Dr. Rogene Henderson, CASAC Chair

Enclosures

NOTICE

This report has been written as part of the activities of the EPA's Clean Air Scientific Advisory Committee (CASAC), a Federal advisory committee independently chartered to provide extramural scientific information and advice to the Administrator and other officials of the EPA. The CASAC provides balanced, expert assessment of scientific matters related to issues and problems facing the Agency. This report has not been reviewed for approval by the Agency and, hence, the contents of this report do not necessarily represent the views and policies of the EPA, nor of other agencies within the Executive Branch of the Federal government. In addition, any mention of trade names or commercial products does not constitute a recommendation for use. CASAC reports are posted on the EPA Web site at: http://www.epa.gov/casac.

Enclosure A – Roster of the CASAC Ambient Air Monitoring & Methods (AAMM) Subcommittee

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U.S. Environmental Protection Agency
Clean Air Scientific Advisory Committee (CASAC)
CASAC Ambient Air Monitoring & Methods (AAMM) Subcommittee

CASAC MEMBERS

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Dr. Donna Kenski, Director of Data Analysis, Lake Michigan Air Directors Consortium (LADCO), Rosemont, IL

SUBCOMMITTEE MEMBERS

Mr. George Allen, Senior Scientist, Northeast States for Coordinated Air Use Management (NESCAUM), Boston, MA

Dr. Judith Chow, Research Professor, Desert Research Institute, Air Resources Laboratory, University of Nevada, Reno, NV

Mr. Bart Croes, Chief, Research Division, California Air Resources Board, Sacramento, CA

Dr. Kenneth Demerjian, Professor and Director, Atmospheric Sciences Research Center, State University of New York, Albany, NY

Dr. Delbert Eatough, Professor of Chemistry, Emeritus, Chemistry and Biochemistry Department, Brigham Young University, Provo, UT

Mr. Eric Edgerton, President, Atmospheric Research & Analysis, Inc., Cary, NC

Mr. Henry (Dirk) Felton, Research Scientist, Division of Air Resources, Bureau of Air Quality Surveillance, New York State Department of Environmental Conservation, Albany, NY

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Dr. Thomas Lumley,* Associate Professor, Biostatistics, School of Public Health and Community Medicine, University of Washington, Seattle, WA

Dr. Peter McMurry, Professor, Department of Mechanical Engineering, Institute of Technology, University of Minnesota, Minneapolis, MN

Mr. Richard L. Poirot, Environmental Analyst, Air Pollution Control Division, Department of Environmental Conservation, Vermont Agency of Natural Resources, Waterbury, VT

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Dr. Jay Turner, Visiting Professor, Crocker Nuclear Laboratory, University of California - Davis, Davis, CA

Dr. Warren H. White, Research Professor, Crocker Nuclear Laboratory, University of California - Davis, Davis, CA

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Mr. Fred Butterfield, Designated Federal Officer, 1200 Pennsylvania Avenue, N.W., Washington, DC, 20460, Phone: 202-343-9994, Fax: 202-233-0643 (butterfield.fred@epa.gov) (Physical/Courier/FedEx Address: Fred A. Butterfield, III, EPA Science Advisory Board Staff Office (Mail Code 1400F), Woodies Building, 1025 F Street, N.W., Room 3604, Washington, DC 20004, Telephone: 202-343-9994)

*Dr. Lumley and Dr. Prather did not participate in this CASAC AAMM Subcommittee activity.

Enclosure B – Comments from Individual CASAC AAMM Subcommittee Members

This appendix contains the written comments of individual members of the Clean Air Scientific Advisory Committee (CASAC) Ambient Air Monitoring & Methods (AAMM) Subcommittee. The comments are included here to provide both a full perspective and a range of individual views expressed by Subcommittee members during the review process. These comments do not represent the views of the CASAC AAMM Subcommittee, the CASAC, the EPA Science Advisory Board, or the EPA itself. Subcommittee members providing written comments are listed on the next page, and their individual comments follow.

Panelist **Page #**

Mr. George Allen

The following are written comments based on the Charge Questions in the EPA OAQPS memo to the SAB dated June 15, 2008. These comments also reflect discussion during the July 14 teleconference AAMM meeting on a Consultation on "Options for the Development of a Low Volume Lead in Total Suspended Particulate (Pb-TSP) Sampler". A copy of these comments is also being sent to Dr. Ted Russell, CASAC AAMM Subcommittee Chair.

Consultation Charge Questions in **Bold**:

1. Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume Pb-TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?

Yes, a low-volume Pb-TSP sampler that is properly characterized would be an improvement over the existing high-volume TSP sampler. There are few or no relative disadvantages to a low-volume TSP sampler for lead. Depending on the design and wind conditions, the low-volume TSP sampler may or may not collect less Pb than the existing high-volume TSP sampler. Normally, a low-volume TSP inlet would need rigorous wind tunnel testing per CFR 53 subpart D. But it may be possible to proceed with the low-volume TSP inlet and do testing later, since the existing high volume TSP Pb FRM sampler has never undergone any formal size characterization testing. I do not see any substantial issues with disruption of Pb trends when changing the FRM; Pb levels are likely to violate any NAAQS only near sources, and it is not a major concern to introduce a modest change in measured levels for near-source sites. It should also be noted that health effect studies do not use air lead measurements as the exposure indicator; they use blood lead levels. Thus, there is no concern with trend issues with regard to health effects.

2. What inlet designs would be best suited for a low volume Pb-TSP sampler? What designs are not appropriate for a low-volume Pb-TSP sampler?

Assuming we are limited to existing low volume designs and designs that are practical for wide deployment in state and local agency monitoring networks, there are only two choices: a modified version of the existing PM10 FRM low-volume inlet without the PM10 nozzles but with some way to trap water, or the Loo and Cork (LBL) "Bell" PM-15 design from the 1970's that was used in the early dichotomous samplers (see photo below). Limited characterization of this inlet is in Wedding et al. (EST 11-4, April 1977). Neither of these inlets has undergone rigorous inlet aspiration efficiency tests; thus I see no obvious advantage to simply going with the existing PM10 FRM inlet. It should be noted that it is very difficult to design a low-volume TSP inlet that has reasonably consistent performance up to 24 km/h wind speeds. For practical purposes, the upper bound of any inlet that might pass the wind speed tests is no more than about 15 um aerodynamic diameter. An inlet that has a 15 um D50 cut-point at low and moderate wind speeds may be acceptable even if the cut-point drops somewhat at 24 km/h. But before proceeding with any low-volume TSP inlet design or tests, input from the health effects research

community should be sought to determine if an inlet with the potential characteristics described above is acceptable as a lead in air NAAQS indicator.

Photo of disassembled 15 um Loo and Cork Dichot inlet (courtesy Tom Merrifield, BGI).

3. What is your preferred approach for the development of a low-volume Pb-TSP sampler, and why?

There are two preferred approaches. First, evaluate the performance of the inlets noted above by collocation with high-volume TSP and PM10 under a range of wind conditions and Pb levels. Second, evaluate the inlet performance in an appropriate wind tunnel, along the lines of CFR 53 subpart D. Unfortunately, EPA does not have a suitable wind tunnel at this time, which is why the first approach above is included here. CFR 53 subpart D is very outdated and in need of major revisions to allow more modern measurement technologies. It may or may not be possible to identify a wind tunnel elsewhere that meets the needs of TSP inlet evaluation.

4. If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling capture efficiency be characterized for varying particle sizes?

It is very important that the sampling capture efficiency be characterized for coarse mode and larger particles at different wind speeds up to 24 km/h, even if that can not be done before the method is promulgated.

5. If the EPA were to develop a low-volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?

The low-volume Pb-TSP FRM should replace the existing high-volume Pb FRM sampler. The high-volume sampler is unlikely to be able to pass any reasonable FEM tests when compared to a low-volume TSP sampler, but the method should be maintained for possible use near sources of very large Pb particles as a diagnostic tool, not a regulatory tool.

6. Is it appropriate to accept alternative sampler and inlet designs as FEM?

Yes, if rigorous FEM acceptance testing criteria are developed. An example here would be the dichotomous sampler; it is highly desirable that this sampler be able to be used as an FEM when used with the same inlet as the FRM.

7. Are the proposed FEM testing criteria for Pb methods adequate to ensure equivalence of alternative sampler and inlet designs? If not, what additional testing requirements should be considered?

I do not recommend using the existing high-volume TSP FRM as the sole reference method for evaluation of an FEM TSP sampler, since the existing TSP FRM collects an indefinable size range of particles in real-world use; it is a poor “gold standard” for any use. A reasonable FEM inlet may fail because of the highly variable performance of the TSP high-volume sampler. Assuming a low-volume TSP sampler is promulgated as the FRM, any FEM sampler candidate should be compared to the low-volume TSP FRM sampler. It may be useful to include the high-volume TSP sampler in the tests as an additional comparison, but these data should not be used to determine FEM status.

Dr. Judith Chow

This memo addresses the twelve questions on which the Subcommittee members were asked to comment regarding Attachment 1, "Draft Federal Reference Method (FRM) for Lead in PM_{10} (Pb-PM_{10}), and Attachment 2, "Approaches for the Development of a Low-Volume Ambient Air Monitor for Lead in Total Suspended Particulate (Pb-TSP) Sampler." This supplements prior comments to the first set of questions that was appended to the April 14, 2008 letter from Dr. Russell to Administrator Johnson.

Questions for Attachment 2 [Approaches for the Development of a Low-Volume Ambient Air Monitor for Lead in Total Suspended Particulate (Pb-TSP) Sampler]

As noted several times before, TSP is defined by the dimensions and flow rates of the high-volume sampler, and even these vary substantially from sampler to sampler. We now have a better understanding of the inlets, flow controls, filter media, passive deposition, and wind speed/direction dependencies (McKee et al., 1971; Clements et al., 1972; Smith and Nelson, Jr., 1973; Chahal and Hunter, 1976; Benarie, 1977; Wedding et al., 1977; Blanchard and Romano, 1978; U.S.EPA, 1982; 1983; van der Meulen et al., 1984; Watson et al., 1989; Code of Federal Regulations, 2007a). A true TSP sampler (i.e., one that collects all of the suspended particles), would look like Figure 2, which is unlikely to be practical for most situations.

Question 1. Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume Pb-TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?

No, because a low-volume sampler is unlikely to represent high-volume TSP. A low-volume TSP inlet would probably be symmetrically designed (e.g., a round cap on top of a round pipe). This would remove the inherent bias with respect to wind direction that is present in the asymmetric peaked roof high-volume TSP inlet. One must also decide on the roof dimensions and the gap between the peaked roof and the sampler body. Code of Federal Regulations (2007a) states: "The absolute accuracy of the method is undefined because of the complex nature of atmospheric particulate matter and the difficulty in determining the 'true' particulate matter concentration." The inlet is defined as follows: "The sampler cover or roof shall overhang the sampler housing somewhat…and shall be mounted so as to form an air inlet gap between the cover and the sampler housing walls. This sample air inlet should be approximately uniform on all sides of the sampler. The area of the sample air inlet must be sized to provide an effective particle capture air velocity of between 20 and 35 cm/sec at the recommended operational flow rate." With respect to flow rate, the specification is 1,100 to 1,700 L/min. How is anyone going to define, let alone duplicate, the size collection properties of such a poorly defined inlet?

Figure 3 compares collocated measurements from TSP high-volume samples with medium-volume samples acquired with a sequential filter sampler (SFS; U.S.EPA, 1989). To emulate TSP, the SFS plenum and inlet were removed and each 47 mm filter holder was covered with a PVC end-cap to emulate the air velocity through the gap between the high-volume peaked roof

and sampler body (20 to 35 cm/sec, as noted above). Average efficiencies ranged from 66% to 106% with most of them being ~80%. This is the only test I am aware of that tried to emulate the peaked roof high-volume sampler inlet with another device.

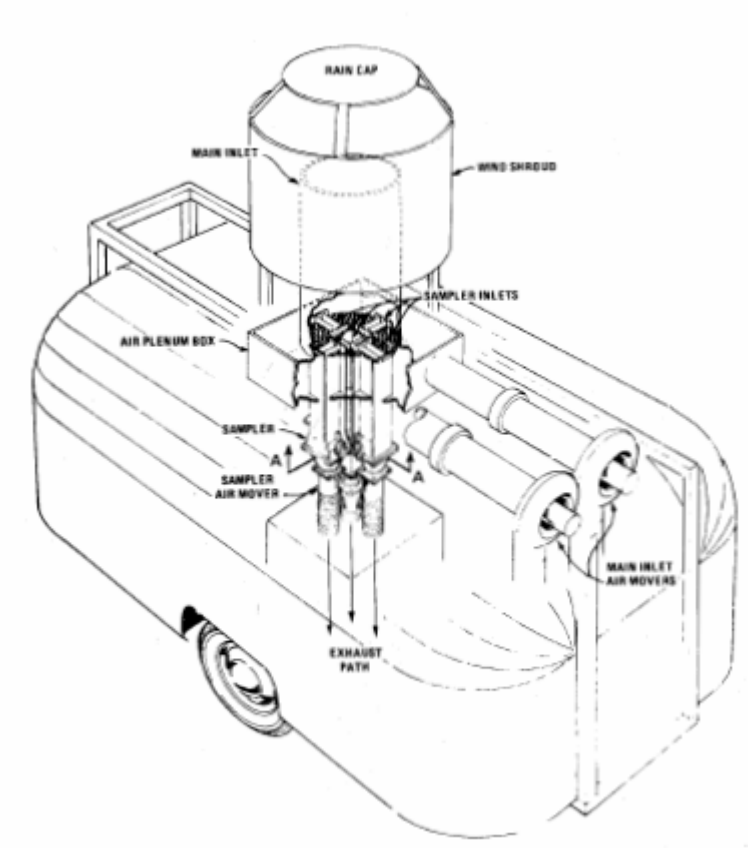

Figure 2. Schematic of the Wide Range Aerosol Classifier (Burton and Lundgren, 1987) designed to sample total suspended particulate, as opposed to TSP which is imprecisely defined by an imprecisely specified high-volume sampler with a peaked roof inlet.

Table 4.4.1 Average Collection Efficiencies of ERT Samplers with Respect to Hi-Vol Measurements

Season	Site	Total HiVol $\mu g/m^3$	Total ERT % of Total HiVol	Fine ERT % of Total HiVol	Fine HiVol % of HiVol
SUMMER	1	52	83	23	41
	2	65	75	39	44
	3	60	74	30	37
	4	76	75	28	35
	5	56	86	31	34
	6	36	82	41	41
AUTUMN	1	38	89	47	44
	2	88	72	33	37
	3	76	79	32	42
	4	100	81	29	34
	5	66	96	39	40
	6	39	80	45	49
WINTER	1	28	93	49	49
	2	79	78	34	36
	3	69	92	39	43
	4	85	83	31	37
	5	63	93	38	85*
	6	19	79	44	42
SPRING	1	40	79	49	39
	2	102	66	28	38
	3	92	86	26	36
	4	158	84	20	29
	5	87	106	34	38
	6	55	92	34	34
AVERAGE			83	35	39

*Outlier not included in Average

Figure 3. Column 4 compares medium-volume sequential filter sampler TSP (113 L/min) with peaked roof high-volume (1130 L/min) TSP for six sites in Portland, OR during 1977 (Watson, 1979).

Question 2. What inlet designs would be best suited for a low volume Pb-TSP sampler? What designs are not appropriate for a low-volume Pb-TSP sampler?

Replacing the current inlet with a non-symmetric (rectangular?) cap that attempts to emulate the 20 to 35 cm/sec flow rate through the annulus is the most logical approach, but I don't expect it to emulate a collocated high-volume measurement any better than the results of Figure 3. Computational Fluid Dynamics (CFD) models could be applied to the peaked roof high-volume sampler, as they have been to other inlets (Anthony and Flynn, 2006; Hu et al., 2007), to figure out what is going on and how to emulate properties at lower flow rates, but I don't think it's worth it.

Question 3. What is your preferred approach for the development of a low-volume Pb-TSP sampler, and why?

My preferred approach is to abandon TSP as an indicator of Pb inhalability and to stick with PM_{10}. Add sampling and analysis of deposits in soil or house dust if one is concerned about the ingestion of toxic dust.

Question 4. If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling capture efficiency be characterized for varying particle sizes?

EPA would need to determine the 50% cut-point and slope for the inlet and define how it varies for different wind speeds and directions, meeting the same testing requirements that are in place for PM_{10} and $PM_{2.5}$ inlets with current technology.

Question 5. If the EPA were to develop a low-volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?

A better designed and characterized low-volume sampler should replace the existing high-volume Pb-TSP FRM. At the very least, the inlet should be symmetrical so that wind direction is not an issue. It would be better to have a consistent inlet and have comparable data than to continue with the 1950s high-volume technology that was developed before we understood the importance of particle size cuts.

EPA set the precedent when it switched from high-volume defined TSP to performance-defined PM_{10} in the late 1980s, so this issue shouldn't be all that controversial. With respect to health impacts, one should separate ingestion from inhalable particles. For areas with heavy deposition of Pb-contaminated dust, special studies should be conducted. This is not the case in most compliance networks, however.

Question 6. Is it appropriate to accept alternative sampler and inlet designs as FEM?

Yes, as well as laboratory analysis methods mated to sampler designs. Performance criteria and ways to verify compliance with them should be specified in the method, not specific pieces of hardware (Chow, 1995a; Chow and Watson, 2008)

Question 7. Are the proposed FEM testing criteria for Pb methods adequate to ensure equivalence of alternative sampler and inlet designs? If not, what additional testing requirements should be considered?

Even though the criteria are less stringent for FEMs as compared to FRMs, I don't agree with EPA's notion that "there is no need to perform wind tunnel tests to characterize sampler capture efficiency." One might change the word "sampler" to "inlet", as this is the key component when defining the size fraction. Since high-volume TSP is ill-defined, low-volume TSP needs to be better defined.

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Mr. Bart Croes

Overall, the documents provided to the Subcommittee continue the impressive responsiveness by U.S. EPA staff to CASAC and our Subcommittee's comments. Staff should be commended for taking a systematic approach towards implementation of a likely revised lead (Pb) National Ambient Air Quality Standard (NAAQS). I appreciate the opportunity to comment during several stages of the process, and agree with the basic approach taken by U.S. EPA. My comments address the consultation questions posed by Lewis Weinstock in his June 15, 2008 memo to Fred Butterfield. These comments also reflect input from California Air Resources Board (ARB) staff responsible for implementing U.S. EPA monitoring requirements and using the data in source apportionment and health studies.

Charge Questions:

Attachment 2 – Approaches for the Development of a Low Volume Lead in Total Suspended Particulate (Pb-TSP) Sampler

1. *Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume Pb-TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?*

   I am not aware of any disadvantages of a low-volume Pb-TSP sampler over the existing high-volume TSP sampler.

2. *What inlet designs would be best suited for a low volume Pb-TSP sampler? What designs are not appropriate for a low-volume Pb-TSP sampler?*

   Not my area of expertise.

3. *What is your preferred approach for the development of a low-volume Pb-TSP sampler, and why?*

   If possible, evaluate inlet performance in a wind tunnel. Then collocate with high-volume TSP and PM10 samplers under a range of atmospheric conditions (wind, humidity, Pb levels).

4. *If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling capture efficiency be characterized for varying particle sizes?*

   Very important.

5. *If the EPA were to develop a low-volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?*

   The low-volume Pb-TSP FRM should replace the existing high-volume Pb FRM sampler.

6. *Is it appropriate to accept alternative sampler and inlet designs as FEM?*

   Yes, leaving the door open to potential FEMs is desired. For example, the ARB Toxics network (Xontech 924, low volume TSP, Teflon filter, ICP-MS) should be able to be tested for equivalency.

7. *Are the proposed FEM testing criteria for Pb methods adequate to ensure equivalence of alternative sampler and inlet designs? If not, what additional testing requirements should be considered?*

   Yes, to my knowledge.

Dr. Delbert Eatough

Comments on proposed Pb-TSP FEM.

Scientific Basis for Use of a Low Volume TSP Sampler for Pb.

I do not believe that the scientific evidence is in place to justify developing a new low volume TSP sampler and basing the standard on the use of that instrument. While the arguments for the need to measure all PM Pb have been given by both members of the committee and in the EPA documents, I do not believe we have the evidence to base the standard on a, as yet, unknown method. The whole crux of the matter is how important Pb in particles larger than 10 microns is. The great bulk of the data suggest that PM_{10} measurements are completely adequate in most situations and that the fraction of lead in particles larger than 10 microns is of the order of 25% in most cases. I have earlier outlined my concerns about the use of the East Helena smelter study where a factor of 2 was seen and will repeat those comments here.

An examination of the document provided to the AAMM subcommittee by Fred Butterfield on April 8 suggests this is a very weak hat to hang the decision of developing a completely new Pb TSP measurement. I have the following serious concerns with the study:

1. The study does not carry the weight of a peer reviewed publication.
2. The samples were collected about ½-mile from the fence line of the ASARCO smelter. At this distance, one would expect to see some variation in the mix of <10 and >10 micron particles present as a function of wind direction and wind speed as the import of large particle fugitive dust versus small particle emissions impacts varies. In fact, this is not the case, but the study is amazingly consistent for all collected data.
3. One would also expect to see a variation in the fraction of the particles present as Pb as the above factors change the relative amount of various sources from the smelter. In fact, this fraction is constant (as well as the ratio of PM_{10} and TSP) for all data points.
4. No details are given on the filter media on which samples were collected, the methods of data analysis, blank corrections, etc.

In short, the study is not consistent with know and expected variations in large versus small particle concentrations and composition from a near-by smelter source. In addition, insufficient detail is given to determine whether this unexpected result is due to a most fortuitous combination of meteorological factors, or to a fundamental flaw in the study design and sample analysis. I therefore conclude that established something as important as the direction of the future Pb standard and the associated sampling protocol essentially on this study is unwise.

Based on the above, I strongly support moving to a Pb-PM_{10} protocol. Furthermore, I believe attempting to use factors in setting the standard would not be based on firm data. If it is believed that the TSP standard should be maintained, I would think the current sampling method should be used until additional data are available to justify a new sampler development. Neither cost nor the current science justifies it in my opinion.

There should be data available which would help to shed further light on this question. Several samplers (MOUDI, Battelle impactor, 8 stage rotating DRUM, etc.) have been used to measure the particle size distribution of Pb in previously reported studies. Those results should be examined to see if they support the existence of a substantial fraction of airborne Pb being present in particles larger than 10 microns. Alternatively, a study which can stand the light of peer review should be mounted to see if the results obtained in East Helena can be replicated near existing Pb smelter facilities, such as those near St. Louis. These efforts would prevent establishing a whole new sampler technology for FRM sampling which is not based on solid peer reviewed evidence.

Development of a Low Volume TSP Sampler for Pb.

A new low volume sampler for the FRM measurement of TSP Pb should not be deployed until it has been well characterized. While such samplers are currently available from manufactures, they have not been scientifically validated. The particle collection efficiency as a function of size and the effect of wind on this efficiency is not known. Until these data are available, we do not know to what extent the Low Volume sampler will provide better results than the current High Vol TSP.

Mr. Dirk Felton

Document Associated with Subcommittee's Consultation on Approaches for the Development of a Low-Volume Ambient Air Monitor for Pb in Total Suspended Particulate (TSP) FRM or Federal Equivalent Method (FEM):

Attachment 2 - Options for the Development of a Low Volume Lead in Total Suspended Particulate (Pb-TSP) Sampler

Background and Summary: Problems with the current high-volume Pb-TSP sampler have been highlighted as part of the on-going Pb NAAQS review. As part of the NAAQS review, EPA proposed network design requirements that could result in the need for a significant expansion and/or reallocation of Pb monitors. Due to the concerns over the existing high-volume Pb-TSP sampler, EPA requested comments on the need for a FRM or FEM low-volume Pb-TSP sampler. The attached document discusses options for the development of a low-volume Pb-TSP sampler for use in the Pb network.

Charge Questions:

Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume Pb-TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?

> Yes, low volume sampling is always preferred because it is intended to represent the air and associated pollutants a typical human is exposed to through breathing. Pb-TSP data collected at 16.7 l/m is more useful for health researchers because it more accurately reflects the Pb exposure from air sources and it minimizes the potential bias due to sampling at other flow rates.
>
> Low volume sampling has many advantages over high volume sampling. The low volume samplers have volumetric flow control, are available in sequential versions and provide data that is more compatible with other national monitoring datasets.

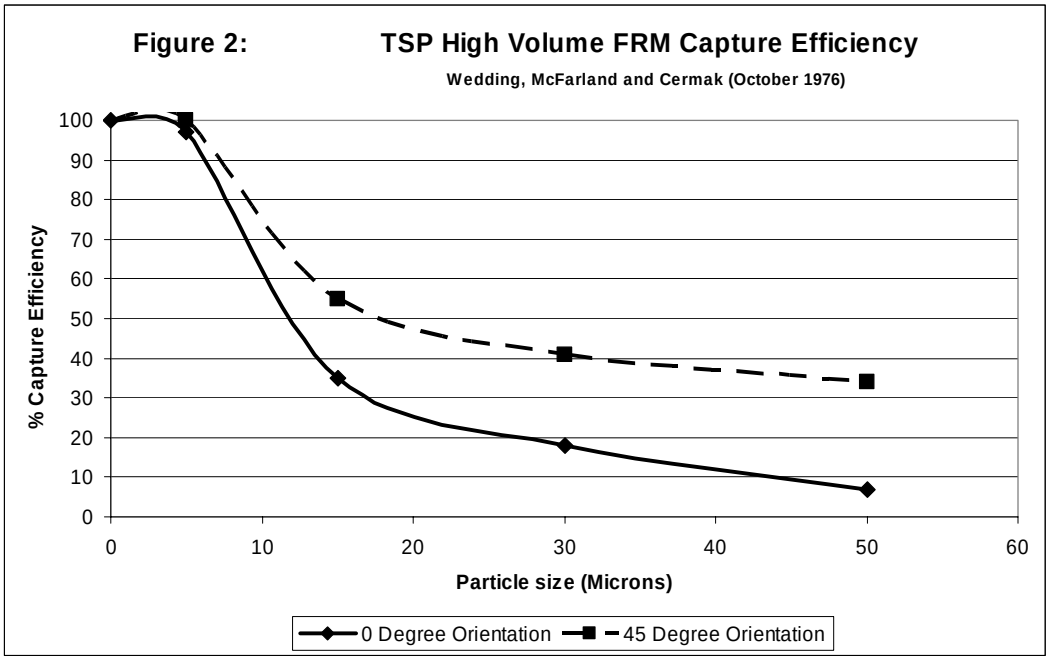
What inlet designs would be best suited for a low volume Pb-TSP sampler? What designs are not appropriate for a low-volume Pb-TSP sampler?

> There is no currently available inlet that is suitable for a low volume TSP sampler. The low volume PM_{10} inlet with the size fractionator removed is not appropriate because it does not have a water trap and it may not capture large enough particles to ensure that TSP is fully characterized.

What is your preferred approach for the development of a low-volume Pb-TSP sampler, and why?

The health community should provide the target upper bound of particle size necessary for a TSP measurement as well as the acceptable inlet efficiency at that particle size. It is likely that if particle sizes above 20 microns are necessary for characterization of TSP then it will be necessary to accept lower collection efficiencies for the larger particle sizes. The inlet design specifications should also include requirements for directional sensitivity, collection efficiencies at smaller particle sizes, water and snow rejection, ease of maintenance and cost. EPA ORD should then design or provide a competitive mechanism in order to have a low volume inlet designed that can meet the needs of the health community and the specifications of the regulators and the monitoring community.

I realize that it is difficult for the health community to come to a consensus on the issue of determining the appropriate size of particles that must be captured in a future TSP measurement since many researchers investigate different exposure paths. In the absence of a consensus from the health community, collection efficiencies for the particle sizes required to be collected in a future TSP sampler should at a minimum be equal to or better than the existing TSP FRM. Wedding, McFarland and Cermak evaluated several samplers including the high volume TSP FRM sampler in a wind tunnel in October 1976. They found that the high volume TSP only collected 18% of 30 micron particles when the sampler roof was parallel to the wind direction and 41% of the 30 micron particles when the sampler roof was oriented 45^0 to the wind direction. Their data is presented in Figure 2 below:



Design specifications for a future low volume TSP inlet should require that the inlet capture efficiency curve be higher than the Hi-Volume sampler (oriented at 0^0) curve (solid line). This will be a vast improvement over the existing FRM sampler since the resulting data will not be wind direction dependent and yet the magnitude of the data will still be as comparable as possible to existing TSP FRM datasets.

If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling capture efficiency be characterized for varying particle sizes?

It is very important to characterize the capture efficiency of sampling inlets for different particle sizes, particle shapes and densities. It will not be possible to design one inlet that has the same capture efficiencies for all particles in the TSP class and it is very likely that the capture efficiency will drop off for the larger particles. This is acceptable as long as the relationship between the particle size and density and the inlet capture efficiency are well documented and there is enough particulate matter collected in each size fraction. In fact, it is preferable to have a predictable relationship between particle size and collection efficiency with a new inlet than the current situation where the TSP concentration varies tremendously with wind direction in addition to wind speed and particle size. The current FRM's sensitivity to wind direction causes much of the method's uncertainty and makes it more difficult to use the data for source attribution.

It is acceptable for a potential new TSP inlet to have decreased capture efficiencies for larger particles. The new Pb monitoring network is primarily source oriented and most of the monitoring locations will be positioned at the point of maximum expected impact from the emissions from a single source. At these locations, the samplers will be exposed to the full range of particle sizes emitted from the source because the largest particles have not yet been lost significantly to surface deposition. The largest particles which tend to be emitted non-uniformly also weigh a great deal more than the smallest particles. These heavier, larger particles will still be accounted for in gravimetric measurements even if their capture efficiency is well below the capture efficiency of the smaller particles.

If the EPA were to develop a low-volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?

A new low volume Pb-TSP FRM should replace the existing high volume Pb-TSP FRM. Since the biggest drawback of the existing FRM is its directional sensitivity which cannot easily or reliably be accounted for in data analysis, the use of the old FRM should be discontinued.

Is it appropriate to accept alternative sampler and inlet designs as FEM?

Yes, there is the possibility that continuous or semi-continuous Pb samplers could be available in the future. The FEM specifications need to be written with performance based criteria that permit the use of different technologies, inlets, averaging times etc.

Are the proposed FEM testing criteria for Pb methods adequate to ensure equivalence of alternative sampler and inlet designs? If not, what additional testing requirements should be considered?

No, since the existing Pb-FRM does not provide data that is wind direction independent, a candidate sampler cannot be expected to compare favorably to the existing FRM. The EPA should develop performance based inlet and sampler specifications for candidate FRM and FEMs. The specifications should be evaluated in wind tunnels using state of the art particle generation and measurement techniques.

Dr. Philip Hopke

It should be noted that it is difficult to accurately specify a measurement system when the target concentrations are not well defined. Given the wide potential range of the concentration that may be chosen for the Pb NAAQS, it is difficult to fully specify the monitoring system.

In general the proposed FRM sampler for Pb in PM_{10} is quite reasonable IF one believes the appropriate indicator is PM_{10}. I would suggest that is still an open scientific question and thus, is likely to need to be decided as a matter of policy and not science. The PM_{10c} sampler is well understood in terms of its sampling characteristics and would already be deployed in the network. However, ease of implementation should not be the basis for making this decision. Protection of the health of children who are particularly sensitive to lead must be the driving consideration and thus, concern remains that PM_{10} may not be adequately protective as an indicator.

In terms of the analytical methods, I would suggest that it would be better to make ICP/MS the FRM since that eliminates all of the issues of sample inhomogeneities on the filter. Since XRF is typically looking at a 1 cm diameter spot, variability in the deposit across the filter represents a potential problem with respect to the lead determination by XRF. XRF could serve as an FEM and it might be useful to require replicate analyses of a relatively large proportion of the samples (say 25 to 33%) with the samples reoriented between runs. The FRM documents indicate two vendors of XRF, but there is a third, Spectro. In our Spectro, the filter is measured off-center so it is easy to examine two different areas of the filter by reorienting it. I am not aware of the spot location in the other two instruments. If they examine the center of the filter, then reorientation is difficult. If not, then it is easy to do and replicate analyses of a reasonable fraction of the filters would provide additional confidence in the values.

Dr. Donna Kenski

Comments on Options for Development of a Low-Volume TSP Sampler

1. Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?

Clearly a low-volume sampler would be preferred for many reasons; if modeled on the current low-volume samplers, it would be operated at the same flow as $PM_{2.5}$ and PM_{10} samplers in the national networks, it could be operated sequentially, its flow characteristics could be more precisely controlled, and it would be a better simulation of actual human exposure through breathing. The biggest disadvantage is that we don't currently have a low-volume TSP sampler that has been fully characterized and vetted in any large scale monitoring efforts.

2. **What inlet designs would be best suited for a low volume Pb-TSP sampler? What designs are not appropriate for a low-volume Pb-TSP sampler**?

I don't think the data yet exist to enable us to make a decision on this.

3. What is your preferred approach for the development of a low-volume Pb-TSP sampler, and why?

4. If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling efficiency be characterized for varying particle sizes?

5. If the EPA were to develop a low volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?

6. Is it appropriate to accept alternative sampler and inlet designs as FEM?

The most critical aspect is accurately characterizing the performance of any new low-volume TSP inlet in terms of the particles captured at various wind speeds. Efficiency curves should be developed for each candidate inlet for particles of varying sizes, densities, and shapes. While it is not possible to capture 100% of ultra-coarse particles with any inlet, we must understand the performance of whatever FRM we choose. The current TSP FRM is inadequate (primarily because of its highly variable particle capture at differing wind directions) and I see no compelling reason to continue its use as an FRM given its identified flaws. Given the very short timeline that EPA has to publish the Pb NAAQS, I think it is acceptable to designate a low-volume TSP sampler (using one or all of the existing inlets) as the FRM before this comprehensive testing is completed, with the understanding that full characterization of the inlets take place expeditiously and that the FRM might be revised as a result. I also continue to believe that a PM_{10} indicator would be preferable, if the level of the NAAQS is set at the lower end of CASAC's recommendations, and that that option would eliminate the rush to designate an untested inlet as an FRM. And finally, I think that requiring a new FRM or FEM to be consistent

with the existing high-vol TSP is a probably a self-defeating goal, since its varying response in different wind conditions will make it a moving target and hence very difficult to duplicate with a more consistent inlet. However, it will be necessary to have some means to compare data from any new FRM with older data, so EPA should develop this comparison data at the same time as any new inlets are tested (despite the inherent flaws).

Dr. Peter McMurry

Comments regarding measurement methods for particulate lead in atmospheric aerosols — Thoughts on proposed Pb-TSP FEM.

I do not support the adoption of a design-based sampler for Pb-TSP unless its performance is first reasonably well understood. My reasons are outlined below.

It was pointed out in our telephone conference call that this is the approach that was originally used for TSP. I agree. That decision was made in an earlier era, when we'd had much less experience with aerosol sampling. After several decades of progress it would be inadvisable to endorse a method that we believe likely to fail.

I am especially concerned about the dependence of sampling efficiencies on wind speed. Local obstacles that cause updrafts or downdrafts are also likely to affect efficiencies. Such effects need to be studied. Repeatability for side-by-side measurements might not provide meaningful information on true sampling precision if these effects are significant.

I would only use "TSP" for measurements made using the Hi-Vol. Extending that terminology to a different instrument would add ambiguity to an already ambiguous concept. TSP is what the Hi-Vol collects, and is not related in any straightforward way to mass concentrations of particles in the atmosphere. "TSP" measured using a different sampler would be subject to different measurement errors. If we were to adopt a design-based lo-vol sampler, at the very least we should give it another designation, such as TSP2 (T2 for short).

I would not deploy a new low volume coarse particle Pb sampler until it has been characterized. I agree that there are inherent difficulties in working with coarse particles that make such work difficult. If laboratory evaluations are impractical, other approaches (such as computational modeling) should be considered.

If a case can be made that coarse particles ought to be measured (Phil Hopke has made persuasive arguments that they should be), then an effort should be made to devise measurement methods that provide meaningful data.

Mr. Richard Poirot

Comments on "Approaches for development of a low-vol TSP sampler"

Although the hi-vol TSP sampler can and does collect particles larger than 10 microns which can become ingested and contribute to Pb body burdens, and which are emitted by some Pb source categories, the fundamental problem with the current hi-vol TSP sampler is that the particle cut size characteristics are not well characterized and can be highly variable as a function of wind speed and direction. If it is considered important to include Pb contributions from particles larger than 10 microns, the Agency should devote appropriate resources toward development of a sampler which efficiently captures larger particles, but which has less variable and more clearly characterized cut size characteristics. The ability to collect multiple sequential samples between periods of sample collection would also be desirable. It is likely that such a sampler would also have value in characterizing concentration (& deposition) of other metals or aquatic nutrients, for example.

It should be clearly recognized in advance that there are practical limits to the upper particle cut sizes that can be captured (especially by low volume samplers) with reasonable precision (I would guess an upper bound of about 20 microns). It should also be easier to reduce/eliminate wind directional biases than wind speed biases. Some advance consideration — and discussion with dosimetry experts — would be useful to guide (& perhaps further justify — or not) the planned development efforts. In any event, consistency of results with the current TSP hi-vol should be considered a necessary or desirable design criterion.

Dr. Jay Turner

Consultation: Options for the Development of a Low Volume Lead in Total Suspended Particulate (Pb-TSP) Sampler

My response to the following charge questions is based on the presumption that Pb-TSP (or a similar metric) is the desired NAAQS indicator. If the primary route of exposure is ingestion, then perhaps a more relevant indicator would be a measurement of Pb deposition. Furthermore, any method which includes coarse particles (air volume sampling or deposition monitoring) could have significant contributions from resuspended dust from historical deposition which again confounds the relationship between "source-oriented atmospheric burdens" and soil/surface loading. These introductory comments aside, I offer the following responses to the charge questions.

Charge Questions

1. *Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume Pb-TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?* A low-volume TSP sampler would be an improvement of the existing high-volume TSP sampler if it is well characterized. Slide 14 of the Cavender and Rice presentation[1] clearly articulates the operational advantages of a low-volume TSP sampler, especially if the sampler is based on the existing $PM_{2.5}$ and PM_{10} sampler platforms. These advantages are indeed real and important.

2. *What inlet designs would be best suited for a low volume Pb-TSP sampler? What designs are not appropriate for a low-volume Pb-TSP sampler?* The crux is the inlet design characterization. One suggestion in the Cavender and Rice presentation is to use the existing PM_{10} inlet without the PM_{10} size fractionator. This might be a viable option, but a detailed characterization of this precise configuration would be important.

3. *What is your preferred approach to the development of a low-volume Pb-TSP sampler and why?* If the facilities and resources are available, a detailed characterization is desired before designation as an FRM. While a performance based approach would be preferred to allow for various inlet designs, this might not be feasible given the testing requirements for characterizing a coarse particle sampler.

4. *If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling capture efficiency be characterized for varying particle sizes?* It is very important that the collection efficiency be characterized as a function of particle size.

5. *If the EPA were to develop a low-volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?* I see no reason to maintain the existing Pb-TSP FRM if a low-volume design is developed. While

[1] "Overview and Status of Lead NAAQS Review and overview of Agency Technical Documents on Lead NAAQS Monitoring Issues", K. Cavender and J. Rice, presented to the Clean Air Scientific Advisory Committee's Ambient Air Monitoring and Methods subcommittee, Public Teleconference, July 14, 2008.

this change would likely disrupt the trends analysis by introducing a discontinuity in the time series for long-term monitoring sites, the advantages of a low-volume Pb-TSP FRM outweigh the disadvantages.

6. *Is it appropriate to accept alternative sampler and inlet designs as the FEM?* In principle it is appropriate to accept alternative designs, but the equivalency testing criteria should include a detailed characterization of the inlet performance and not just rely on modest field comparisons (see below).

7. *Are the proposed FEM testing criteria for Pb methods adequate to ensure equivalence of alternative sampler and inlet designs? If not, what additional testing requirements should be considered?* I am concerned that modest field measurement campaigns will be insufficient to demonstrate equivalency under a range of operating conditions if there are differences in inlet designs. Differences in the remaining components of the sampler might be adequately tested through field sampling, but alternative inlet designs should be subjected to detailed performance characterization (size-dependent collection efficiencies)..

Dr. Yousheng Zeng

General Comments

I have some general comments that affect my responses to this set of charge questions. I am presenting these general comments first.

The main reason for Pb-TSP (as opposed to Pb-PM_{10}) is to capture and include the portion of Pb that is associated with ultra-coarse particles (d>10 μ) in ambient air. Sources for the ultra-coarse particles include stationary industrial sources and resuspended particles that have settled on the ground in the past. Industrial sources may emit both Pb-PM_{10} (mainly associated with combustion or high temperature processes) and Pb-TSP (mainly associated with mechanical processes such as material handling), but their emissions of Pb associated with ultra-coarse particles are becoming less and less. With promulgation and implementation of the MACT standards for Primary Lead Smelter (40 CFR 63 Subpart TTT), Secondary Lead Smelter (40 CFR 63 Subpart X), and Lead Acid Battery Manufacturing Area Sources (40 CFR 63 Subpart PPPPPP) from late 1990s to 2007 (in addition to NSPS standards promulgated earlier for the same source categories), Pb-TSP emissions points at these industrial facilities are controlled by fabric filters or scrubbers.

Process areas that were previously fugitive emission sources (such as material transfer, charging/discharging, etc.) are now required to be enclosed and controlled. Exhaust streams controlled by fabric filters and scrubbers have very little ultra-coarse particles. In addition, outdoor material piles and in-plant roads are subject to work practice standards (e.g., water spray) to minimize wind induced emissions, which without these work practice standards would contain more ultra-coarse particles. Stationary sources in other source categories that involve handling of Pb containing materials (e.g., copper smelter) are also subject to similar MACT regulations. With all of these controls, the ultra-coarse particles from stationary sources are (or will be) very minimal. The primary sources of the ultra-coarse Pb-bearing particles are becoming resuspended dust in regions that have high Pb level due to past activities. Ultra-coarse particles become resuspended in ambient air due to mechanical disturbance (e.g., vehicle traffic and wind) and they are not just from inside of industrial facilities. A large portion of ultra-coarse particles are (or will be, upon full implementation and enforcement of the abovementioned MACT standards) from dust outside of stationary sources.

As required by the Clean Air Act, EPA is conducting residual risk assessment for these Pb stationary sources after the applicable MACT standards are implemented. According to the information posted on the EPA Air Toxics Website, the information on residual risk for Primary and Secondary Lead Smelters will be available this summer. These residual risk assessments should offer some insight on air quality impacts of these stationary Pb sources.

With this backdrop, I wonder why EPA would want to direct its resources to develop a better method for monitoring Pb-TSP. It probably will not significantly improve agency's ability to further control ultra-coarse Pb-bearing particles from stationary sources. For the contribution

from resuspended dust, it is more effective to manage it through programs outside of air programs, such as remediation, land-based stabilization, changes in land use and landscaping, etc.

Pb-TSP is a more relevant parameter to the Pb ingestion pathway than the inhalation pathway. The main technical issue surrounding the Pb-TSP samplers is the inlet designs that primarily affect collection of ultra-coarse particles. However, the ultra-coarse particles do not affect the inhalation pathway. They affect particles' deposition flux and eventually link to ingestion pathway. It would be more direct and effective to monitor Pb deposition rate rather than coming up with an arbitrary sampler to capture some portion of ultra-coarse particles. Even monitoring Pb deposition rate does not seem necessary if the main source is resuspended dust. With stationary sources becoming less and less significant active origins in the chain that lead to Pb ingestion, the Pb environmental issue not associated with inhalation pathway should be managed through other environmental programs. Only the inhalation pathway should be the focus of the air programs.

Unlike Pb-PM_{10} which can be directly linked to an environmental regulatory endpoint, Pb-TSP is related to, but is not directly linked to an environmental endpoint (ingestion risk). Monitoring Pb-TSP may be useful in terms of assessing how much Pb is still supplied by controllable stationary sources. The Pb-TSP data can feed to the other media or pathways that lead to an environmental endpoint, which should be managed through other media program. When active stationary sources are no longer injecting significant Pb-TSP into an airshed, the importance of monitoring Pb-TSP diminishes. It will be more effective to start from the next point in the chain, which should be the Pb content in the dust that can cause ingestion exposure.

Charge Question 1: Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume Pb-TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?

EPA has presented some advantages and disadvantages of a low-volume Pb-TSP sampler and I agree with EPA's assessment on these advantages and disadvantages. However, based on my general comments above, I would not recommend EPA to develop a low-volume Pb-TSP FRM sampler.

Charge Question 2: What inlet designs would be best suited for a low volume sampler? What designs are not appropriate for a low-volume Pb-TSP sampler?

There is really no good solution to this because the purpose of the Pb-TSP sampler is not clearly linked to an environmental regulatory endpoint. If EPA really wants to do this, the inlet should be designed to capture as much PM as the sampler can to represent the PM that can settle and become a source for ingestion pathway.

Charge Question 3: What is your preferred approach for the development of a low-volume Pb-TSP sampler, and why?

For reasons described in the General Comments section above, my preferred approach is for EPA to evaluate/confirm the contributions from resuspended ultra-coarse particles vs. active stationary sources using the data that represent the conditions *after MACT standards are fully implemented and enforced*. If active stationary sources are no longer a significant contributor, it will be unnecessary for EPA to develop a low-volume Pb-TSP sampler. If EPA or state agencies would like to monitor Pb-TSP as a sunset parameter, the existing Pb-TSP FRM can satisfy that need. It does not make a lot of sense to me to pursue a better monitoring method while we don't know how to use the monitoring results to assess environmental impact. The Pb risk associated with ingestion pathway can be assessed through proper exposure assessment supported with Pb concentration data from each media.

If EPA cannot confirm diminishing contributions to Pb-TSP by active stationary sources due to time constraint, it should be fine to continue to use the existing Pb-TSP until next review cycle.

Charge Question 4: If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling capture efficiency be characterized for varying particle sizes?

It would be important to understand the sampler capture efficiency with respect to particle sizes. In this case, all particle sizes should be captured for the purpose of assessing ingestion. Again, for reasons stated above, I don't see the importance of developing this FRM. If ingestion risk is a concern, it better to monitor deposition flux or Pb level in the dust that can be exposed to sensitive sup-population.

Charge Question 5: If the EPA were to develop a low-volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?

Again, I don't recommend this path. If EPA insists, EPA should develop a sampler that can provide consistent, reproducible results (even the capture curve is somewhat arbitrary). The newly developed low-volume Pb-TSP FRM is at least expected to minimize the variation of monitoring results with changing wind directions, be better characterized for its particle capture efficiency curve with respect to particle sizes, and have some operational advantages than the bulky high-volume sampler. Therefore, it should replace the existing high-volume sampler. There may be an issue with data comparability with historical data. However, if we gave too much consideration to historical data, we would never correct deficiency and move forward. Plus, this issue of data comparability with historical data should be manageable and not disruptive.

Charge Question 6: Is it appropriate to accept alternative sampler and inlet designs as FEM?

Yes, as long as the procedures in 40 CFR 53 for equivalency are followed. I assume that this question is about establishing FEM using the newly developed low-volume Pb-TSP FRM as the reference. Please note that I don't support this idea (see above responses).

If the question is about establishing a low-volume FEM to match the existing hi-volume FRM, I would not recommend it because the reference method is not well characterized. It will be like shooting a moving target. It would be better to just continue to use the high-volume FRM.

Charge Question 7: Are the proposed FEM testing criteria for Pb methods adequate to ensure equivalence of alternative sampler and inlet designs? If not, what additional testing requirements should be considered?

See my response to Question 6.

Dr. Barbara Zielinska

Comments regarding low-volume ambient air monitor for Pb-TSP

I am not sure if a low-volume Pb-TSP sampler would be an improvement over the existing high-volume Pb-TSP sampler. "TSP" is a very imprecise term and depending on the method of sampling may correspond to different particle sizes. In other words, Pb-TSP sampled with a high-volume sampler may not be the same as Pb-TSP sampled with a low-volume sampler. If we really need Pb-TSP measurements (and I'm not sure that we do), thorough characterization of any proposed low-volume sampler should be done before its deployment.

I think that the "alternative approach" proposed by Dick Felton (to measure Pb-TSP next to sources that are known to emit large Pb particles and to monitor Pb-PM10 in a proximity of sources that potentially emit Pb in particles smaller than PM10 and for a general urban population) makes a lot of sense. The same Pb concentration standard could be used for each particle size fraction, but the network design would be flexible, as proposed by Dick.

Enclosure C – Agency's Background and Charge Memorandum to the CASAC AAMM Subcommittee

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

June 15, 2008

MEMORANDUM

SUBJECT: CASAC Peer Review and Consultation on Monitoring Issues for Lead National Ambient Air Quality Standard (NAAQS)

FROM: Lewis Weinstock
Acting Group Leader
Ambient Air Monitoring Group
Office of Air Quality Planning and Standards (C304-06)

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

Attached are materials for review by the Clean Air Scientific Advisory Committee's (CASAC) Ambient Air Monitoring and Methods (AAMM) Subcommittee. These materials will be the subjects of a peer review and consultation by the AAMM Subcommittee, scheduled for a teleconference to be held on July 14, 2008. I am requesting that you forward these materials to the AAMM Subcommittee to prepare for the peer review and consultation.

This project, entitled *Lead (Pb) National Ambient Air Quality Standards (NAAQS) Review: Monitoring Issues*, 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 potential revisions to the Pb NAAQS. The peer review will cover the proposed Federal Reference Method (FRM) for the measurement of Pb in particulate mater less than 10 micrometers in diameter (Pb-PM_{10}). The consultation will cover the need and approach for development of a low-volume Pb in total suspended particulate (Pb-TSP) method as an FRM or Federal Equivalent Method (FEM). Charge questions associated with both the peer review and the consultation are provided below.

The upcoming consultation will support the EPA by providing scientific advice as the EPA Administrator considers potential revisions to the Pb NAAQS; a notice of final rulemaking

is to be signed by September 15, 2008. We are requesting an expedited schedule to assist EPA in meeting the September 15, 2008 deadline for finalizing the Pb NAAQS review.

We appreciate the efforts of you and the Subcommittee to prepare for the upcoming meeting and look forward to discussing this project in detail on July 14, 2008. Questions regarding the enclosed materials should be directed to Mr. Kevin Cavender, EPA-OAQPS (phone: 919-541-2364; e-mail: cavender.kevin@epa.gov).

Document Associated with Subcommittee's Peer Review:

- **Attachment 1** – ***Draft Federal Reference Method (FRM) Lead in PM10 (Pb-PM10)***

  Background and Summary: In order for monitoring data to be used in determination of attainment with the NAAQS, the data must be collected with a FRM or FEM. A number of options under consideration for the Pb NAAQS indicator would require the EPA to develop a FRM and FEM criteria for the measurement of Pb in PM_{10}. The EPA has proposed language for a FRM for Pb-PM_{10} based on the existing FRM sampler for low volume PM_{10c} in Appendix O to Part 50 of the Code of Federal Regulations (CFR) coupled with analysis by x-ray fluorescence (XRF). The attached document includes the proposed regulatory text for the FRM for Pb in PM_{10}.

  Charge Questions:

  What are your comments on the use of the low-volume PM_{10c} FRM sampler as the Pb-PM_{10} FRM sampler?

  What are your comments on the use of XRF as the Pb-PM_{10} FRM analysis method?

  What are your comments on the specific analysis details of the XRF analysis method contained in the proposed Pb-PM_{10} FRM analysis method description?

  Do you think the precision, bias and MDL of the XRF method for the proposed Pb range will be adequate?

  Are there any method interferences that we have not considered?

Document Associated with Subcommittee's Consultation:

- **Attachment 2 –** ***Options for the Development of a Low Volume Lead in Total Suspended Particulate (Pb-TSP) Sampler***

  Background and Summary: Problems with the current high-volume Pb-TSP sampler have been highlighted as part of the on-going Pb NAAQS review. As part of the NAAQS review, EPA proposed network design requirements that could result in the need for a significant expansion and/or reallocation of Pb monitors. Due to the concerns over the existing high-volume Pb-TSP sampler, EPA requested comments on the need for a FRM or FEM low-

volume Pb-TSP sampler. The attached document discusses options for the development of a low-volume Pb-TSP sampler for use in the Pb network.

Charge Questions:

Would a low-volume Pb-TSP sampler be an improvement over the existing high-volume Pb-TSP sampler? What advantages and disadvantages do you see associated with a low-volume Pb-TSP sampler?

What inlet designs would be best suited for a low volume Pb-TSP sampler? What designs are not appropriate for a low-volume Pb-TSP sampler?

What is your preferred approach for the development of a low-volume Pb-TSP sampler, and why?

If the EPA were to develop a low-volume Pb-TSP FRM, how important is it that the sampling capture efficiency be characterized for varying particle sizes?

If the EPA were to develop a low-volume Pb-TSP FRM, should the new FRM replace the existing high-volume Pb-TSP FRM, or should the EPA maintain the existing FRM?

Is it appropriate to accept alternative sampler and inlet designs as FEM?

Are the proposed FEM testing criteria for Pb methods adequate to ensure equivalence of alternative sampler and inlet designs? If not, what additional testing requirements should be considered?

Attachments

cc: Fred Dimmick, OAQPS/NERL
Robert Vanderpool, ORD/NERL
Karen Martin, OAQPS/HEID
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