CASAC Ambient Air Monitoring & Methods Subcommittee Teleconference: Comments on the Lead NAAQS Indicator, Monitoring and Sampling Frequency

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In the January 22, 2008 letter to the EPA Administrator, the CASAC Lead Panel unanimously recommended that the Agency revises the indicator for lead sampling from TSP to PM_{10}. I continue to support this recommendation. The letter said:
"The agency should seize this opportunity to transition from TSP to PM_{10}, since the current review indicates a need for a substantial lowering of the lead NAAQS. If a standard is lowered by a factor of 10 to 100, it is unimportant if the indicator measures 10% or 15% less than the indicator selected 30 years ago.< .. > Rather than needing to arduously establish a large series of site-specific PM10-Pb to TSP-Pb ratios (which would, in essence, constitute "fitting good data to bad"), it would be well within the Agency's range of discretionary options to accept a slight loss of ultra-coarse lead at some monitoring sites by selecting an appropriately conservative level for the revised Pb NAAQS. Conversely, it would be a mistake to hold up the old TSP metric as the "gold standard" and only allow newer, better technology if it can reproduce the old, and seriously-flawed, sampler performance." I do agree with this reasoning.

Charge questions, Attachment 1, Options for Lead NAAQS Indicator: Monitoring Implications:

1. *Considering issues such as sampler performance, size cuts, operator maintenance, integration with other measurement systems, and usefulness as the measurement system for the indicator, please describe the advantages and disadvantages of sampling and analysis of Pb-TSP versus sampling and analysis of Pb-PM10.*

As depicted in the individual comments attached to the January 22, 2008, CASAC letter, the TSP monitor represents old, 1950s technology and its accuracy is questionable. Hi-Vol TSP is non-size specific and its 50% size cut point of 30 – 50 µm particles depends greatly on a wind speed and direction. Contrary to Pb-TSP, Pb-PM_{10} is inhalable and can travel longer distances from emission sources. Currently, TSP monitors are used only for Pb-TSP measurements. It is time that the EPA abandons this old technology and moves towards more precise PM_{10} measurements. The great advantage of this strategy is the existing PM_{10} network and thus a possibility of integration with other measurement systems.

2. *Is it appropriate to monitor for Pb-PM10 near Pb sources? And if so, under what conditions?*

Yes, it is. Pb-PM_{10} should be monitored near the major Pb sources to get the idea about Pb concentrations in this inhalable particle size range. Since Pb-containing larger than 10 µm particles may be important in the vicinity of large Pb point sources, such as Pb smelters or areas with considerable Pb tailings, Pb-TSP monitoring should be continued

in these areas. However, since the present TSP monitors are not accurate, the deployment of new, low-volume TSP samplers should be encouraged in these areas. There is certainly a need for getting a better understanding of Pb emissions in various particle sizes near the major Pb sources.

3. *One indicator option suggests using scaling Pb-PM10 monitoring data up to an equivalent Pb-TSP level in lieu of Pb-TSP monitoring data. Under what circumstances would it be appropriate to scale data (e.g., non-source oriented sites, low concentration sites) and when would it not be appropriate to scale data?*

I don't think scaling is a good idea. As emphasized in the CASAC's January 22, 2008 letter, a scaling is equivalent to fitting "good data to bad". Also, see my answer to charge question #4 below.

4. *We have limited data collocated Pb-P10 and Pb-TSP monitoring data. What types and "scaling factors" are appropriate to create using this data (e.g., non-source oriented, source oriented)? What levels are appropriate for the types of scaling factors identified in the white paper?*

Kevin Cavender's memo from March 3, 2008 emphasizes that all size Pb particles contribute to exposures and associated health effects. This is true, but it does not necessary mean that the Pb-PM_{10} standard has to be tied to Pb-TSP. As shown in this document, non-source oriented Pb-TSP and Pb-PM_{10} monitor data (Figure 1) show strong linear relationship and the ratio of Pb-PM_{10} to Pb- TSP close to unity. Rather than trying to decide if Pb-TSP = Pb-PM_{10}*1.014+0.028 or +0.017, the Pb-PM_{10} standard can be set at a slightly more conservative level. For source-oriented monitor data, Figure 2 indicates that the relationship between Pb-TSP and Pb-PM_{10} is driven by the highest Pb concentrations. If the standard is set at the level below 0.5 $\mu g/m^3$, it is unimportant if 1 $\mu g/m^3$ Pb-PM_{10} concentration corresponds to 1.39 or 2.2 $\mu g/m^3$ of Pb-TSP. These values are much above the standard anyway. Rather, the relationship for the concentrations in the range of expected Pb standard (below 0.5 $\mu g/m^3$) should be examined. This hasn't been done in this document; however, low accuracy of hi-Vol TSP samplers in this low concentration range, may make such a comparison not reliable.

Charge questions, Attachment 2, Draft FRM and FEM Criteria:

1. *ls it appropriate to use the low-volume PM10 FRM sampler as the Pb-PM10 FRM sampler?*

Yes, it is.

2. *What other PM10 samplers should be considered as either FRM or FEM for the Pb-PM10 FRM?*

Low-volume, sequential PM_{10} FRM sampler is the best candidate for the Pb_{10} FRM.

3. *Is XRF an appropriate Pb-PM10 FRM analysis method?*

I believe, yes, it is. XRF has an adequate sensitivity, is relatively inexpensive, non-destructive and allows for simultaneous measurements of other elements.

4. *What other analysis methods should be considered for FRM or FEM for the Pb-PM10 FRM?*

Modern analytical methods that can be used to quantify Pb include graphite furnace AA, ICP/atomic emission spectroscopy (ICP/AES), or ICP/mass spectrometry (ICP/MS).

5. *Have we selected appropriate precision, bias, and method detection limit requirements for FEM evaluation?*

The selected levels seem reasonable.

Charge questions, Attachment 3, Ambient Monitoring Network:

1. *What types of monitoring sites should be emphasized in the network design (e.g., source oriented monitors, population monitors, near roadway monitors)?*

All three types are useful, but in my opinion source oriented monitors should have the highest priority.

2. *We are considering proposing requirements for monitoring near sources exceeding an emissions threshold and discuss a number of options for determining this threshold in the white paper. What options should be considered in establishing an emissions threshold?*

All three options considered in this document appear to be reasonable. I favor the second option, which is based on the measurements near Pb sources. The maximum impact of 0.7 $\mu g/m^3$ per tpy is consistent with the results obtained by the screening model. After the Pb standard is established, it should be possible to estimate what level of Pb emissions may lead to non-attainment. As noted in the document, since these threshold estimates are on the conservative site, it would be appropriate to include an option for the monitoring agencies to request a waiver for monitoring requirements if it could be shown that the source is very unlikely to cause the ambient air Pb concentrations to exceed 70% of the NAAQ Pb standard.

3. *We are considering proposing requirements for non-source oriented monitoring in large urban areas to provide additional information on ambient air concentrations in urban areas. Considering other monitoring priorities and a potential requirement for Pb monitoring near sources, what size of a non-source oriented Pb network is appropriate?*

Presumably NCore sites will perform Pb measurements. I don't think there is a need for separate Pb monitors, if the existing PM_{10} monitoring network can be utilized for this purpose. The additional analysis cost for Pb is very reasonable, if XRF method is used. In addition, $PM_{2.5}$ monitoring network can provide some information regarding Pb concentrations in this PM size fraction.

4. *What factors should we base non-source oriented monitoring requirements on (e.g., population, design value)?*

I suspect that the proximity to Pb sources may be important. Pb is a primary pollutant and it can be transported significant distances if present in the inhalable PM fraction.

5. *We are considering proposing requirements for Pb monitoring near roadways and interstates. Is it appropriate to include separate monitoring requirements for near roadway monitoring, or should near roadway monitors be a part of the non-source oriented monitoring requirement?*

From data presented in this document (Table 7) it is not clear that the proximity to the roadway results in a higher Pb ambient concentration. Unless the NAQS is established at a very low level (<0.1 $\mu g/m^3$) these monitors should probably be part of the non-source oriented monitoring network.

6. *Under what conditions would it be appropriate to waive the monitoring requirements for either source or non-source oriented monitors?*

This subject is addressed in question #2 above and in charge questions for attachment 4.

Charge questions, Attachment 4: Sampling Frequency Options:

1. *What sampling frequency would be appropriate if the Pb NAAQS is based on a monthly average?*

I agree with the document that if the Pb NAAQS is based on a monthly average, the 1-in-6 day sampling schedule is not frequent enough. A 1-in-3 day sampling frequency would yield 10 samples at 100% completeness or 7 at 75%. If this is enough or not, it is difficult to say without having the actual data that would allow for the estimate of uncertainties associated with different sampling frequencies. According to the document, the EPA plans to evaluate every day, 1-in-3 day and 1-in-6 day sampling frequencies and provide a general margin of error about a mean monthly estimate, focusing on estimates close to the proposed NAAQS. After this task is completed, it would be more obvious which sampling frequency is sufficient. The appropriate sampling frequency depends also on the statistical form of the Pb standard.

2. *Is it appropriate to relax the sampling frequency in areas of low Pb concentration? If so, at what percent of the Pb NAAQS?*

I think yes, it is. The document proposes a reduction in sampling frequency to 1-in-6 day, if all 12 monthly averages in a calendar year are lower than 30% of the Pb NAAQS. This seems reasonable to me, although 50% is probably sufficient. If an area elects to stay with the higher sampling frequency, this should be allowed.

3. *Is it appropriate to relax the sampling frequency in areas considerably higher than the NAAQS? lf so, at what percent of the Pb NAAQS?*

No, these data are important for an adequate evaluation of potential health effects. In addition, if a source emits larger quantities of Pb periodically, more frequent monitoring may be considered.

One minor comment on Attachment 4: Figure 1 did not translate well in the pdf version of this document.