Comments by Philip K. Hopke on Pb Monitoring Issues

The documents provided for review were well written and provided reasonable approaches to the monitoring issues. However, there needs to be a clearer tie between the exposure pathways and the monitoring approaches. It seems incongruous that if we believe a wide range of particle sizes are important, we then only measure a fraction of the particles when it might be possible to obtain a measure of a wider size range of particles. There is not yet a clear enough definition of the exposure pathways and using those definitions to provide the basis for why, where and how monitoring should be done to produce data relevant to protect the public health. In the case of lead, there is a clearly defined susceptible subpopulation, children, and the design of the monitoring program needs to address this issue. Exposure to the population as a whole is much less important than exposure of children to lead and thus, monitoring must be targeted in those areas most likely to produce exposure to children.

Considering issues such as sampler performance, size cuts, operator maintenance, integration with other measurement systems, and usefulness as the measurement system for the indicator, what are the advantages and disadvantages of sampling and analysis of Pb-TSP versus sampling and analysis of Pb-PM_{10}?

The main advantage I can see is that the PM10 would provide lower costs and ease of implementation. However, if there is real concern that large particle coarse particles are of concern, then it makes more sense to measure TSP. It is possible to measure TSP with much greater precision than is currently possible with the high volume sampler. One wants samplers that has good flow control, no wind speed and direction dependence and provides a filter that is appropriate for the analytical method of choice. It is certainly possible to do this with currently available technology that provide good flow control and insensitivity to wind direction. There remains a problem with wind speed, but I would suggest that this is of relatively limited concern since there would still be good sampler to sampler precision. Thus, I would suggest against switching to PM10 as the inlet since I think it is better to try to directly measure the indicator rather than a surrogate and guess at how to "correct" the result to provide an indirect measure of the indicator. You should look at Kenny L, Beaumont G, Gudmundsson A, Thorpe A, Koch W Source: JOURNAL OF ENVIRONMENTAL MONITORING Volume: 7 Issue: 5 Pages: 481-487 Published: 2005

Is it appropriate to monitor for Pb-PM_{10} near Pb sources? And if so, under what conditions?

Only if you are going to a PM10-based standard. If TSP is of concern, then TSP is what should be measured as well as it possibly can be measured.

One indicator option suggests scaling Pb-PM_{10} 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?

It is always risky to "scale" data when it is possible to directly measure a quantity of interest.

We have limited collocated Pb-PM_{10} 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?

If we set a stringent standard level, then the values will be so dominated by noise and the development of a scaling factor is then quite uncertain. Thus, I still believe it is best to monitor that which we think is the cause of the adverse health effects.

Is it appropriate to use the low-volume PM10c FRM sampler as the Pb-PM_{10} FRM sampler? What other PM_{10} samplers should be considered as either FRM or FEM for the Pb-PM_{10} FRM?

Sure. The PM10c sampler provides good precision for mass collection and thus, will provide good precision for Pb in PM10. The current FEM rules for the PM10 head are quite lax because the acceptance interval was made too wide in 1987. If you want FEM precision to be good, the acceptance window for the PM10 inlet performance should be reduced from $\pm$ 0.5 µm at 10 µm to something more like $\pm$ 0.1 to 0.2 µm. Then FEMs would have good precision in side by side comparisons with the PM10c sampler

Is XRF an appropriate Pb-PM_{10} FRM analysis method?

Yes, there can be problems in areas with significant As concentrations since there is an overlap in the As Kα with one of the Pb l-lines.

What other analysis methods should be considered for FRM or FEM for the Pb-PM_{10} FRM?

ICP/MS or GFAAS would both provide the sensitivity and precision. Electrochemical methods like anodic stripping voltammetry can be useful and should be considered.

Have we recommended appropriate precision, bias, and method detection limit requirements for FEM evaluation?

Yes

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

What are the exposure pathways that are being looked at to provide protection to the public? The key is whether lead is being transported to playgrounds, urban gardens, etc where ingestion hazards might become important. Is the primary monitoring interest in population exposure, source identification and assessment, etc? If it is population exposure, then the source areas are of less importance to monitor. Near minor roadways where children might play would be significant locations at which to make measurements.

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?

Emissions thresholds in what sizes? Ultra coarse particles will not be transported at significant distances whereas PM10 and smaller can be transported over sufficient distances to be important. Again, there is no simple answer here in the absence of a clearer definition of why the measurements are being made.

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?

The question here is how much ultra coarse is likely to be present and how uniform or non-uniform are the sources of these larger particles. More heterogenous the source locations leads to the need for more samplers. One suggestion would be to make some measurements using the Leith and Wagner passive monitor where they are sufficient low cost that many samples could be obtained across an urban area and the variability assessed. One could even consider a requirement to make an initial assessment of the heterogeneity of exposures with low cost sampling and use those results to plan an effective monitoring network tailored to the individual urban area rather than a one size fits all philosophy.

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

The design needs to include both the inhalation risk and the ingestion risk. The target population has to be children over adults and thus, areas where there could be significant exposure like schools, playgrounds, ball parks, etc. should be a priority. If there are designated urban garden area, then they should also be target areas. The key is that adults are not as affected by lead as children so the population at risk should drive the location plans.

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?

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

What sampling frequency would be appropriate if the Pb NAAQS is based on a monthly

average?

You need enough points to provide a meaningful average. At 1 in 6 sampling, we would only have 5 points per month and that would provide a measurement with lower power and a higher probability of type 1 errors than a 1 in 3 schedule. I would suggest that 1 in 3 would need to be required.

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

Once there is a good data base to support the attainment with low risk exists, it is certainly possible to relax the sampling schedule unless some new facility is built that has the potential for lead emissions. There would need to be a trigger to increase sampling if there is significant new development in the area.

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

Shouldn't the local agency want high confidence data on the lead concentrations if they are in non-attainment and there is a SIP in place to force reductions. This question does not make a lot of sense to me since if the area is in substantial non-attainment, one would have thought there would be action on-going to reduce the concentrations and thus, a desire to assess the improvements being made. Thus, I cannot see any reason why one would want to reduce the measurement frequency.