Dr. Lianne Sheppard

Overall this document is well-written and clear. I have some specific suggestions for the ISA (Chapter 4) and REA (Chapter 5) sections.

Comments on Chapter 4 – Science Assessment

I suggest that for evaluation of toxicological studies adherence to the ARRIVE guidelines also be considered.

The human exposure section is focusing on questions about human exposures with particular emphasis on epidemiological inference. The questions should be reviewed in the context of how relevant they are for epidemiology. This should be carried forward into the ISA itself (see my related comments on the ISA with respect to exposure assessment and exposure measurement error).

Regarding specific questions:

How have ambient models been merged with stochastic population exposure models recently to improve estimates of exposure?

Use of stochastic models is not appropriate for epidemiological inference. However, they are very valuable for risk assessment.

What new information exists regarding characterization of error in exposure assessment of oxides of nitrogen and how it influences personal-ambient exposure relationships?

I suggest that a very important consideration for error in exposure assessment is with respect to its adequacy for inference about epidemiological health effects. I think the question should be either rephrased or expanded to incorporate inference in epidemiological studies. (My related ISA comments may also help with rephrasing this question.)

What information is available regarding differences in exposure patterns for oxides of nitrogen and personal-ambient exposure relationships among various lifestages and populations?

I suggest the more relevant question is whether there are differences that might affect epidemiologic study inference or possibly risk assessment. Consideration of this question with respect to epidemiologic inference and risk assessment are distinct topics.

Comments on Chapter 5 – Quantitative Risk and Exposure Assessment

Scope and specific issues:

1. I agree overall with EPA's plan for the REA, specifically noting the plan to decide later how justified it is to conduct an exposure and risk assessment.

2. Dr. Sarnat's comments on sensitivity analysis and other approaches to uncertainty analysis are well taken and should be included in the REA.

Identification of most important uncertainties:

3. I agree that spatial heterogeneity of NOx remains an important uncertainty.

4. Exposure occurs both on roads and near roads. Is there a way to incorporate both into the characterization? See below for some summaries of AQS data that may contribute to this.

5. Would evaluation of AERMOD in conjunction with existing AQS sites that are near roads but in cities other than Atlanta help address the AERMOD uncertainties?

Additional information that should be considered:

6. The document states (p 5-6): "One of the most important uncertainties overall regards the spatial representation of the ambient monitors, …" The existing AQS data may be able to address this uncertainty better than is appreciated. I insert below some data summaries based on compilation of AQS monitoring data that has been done at the University of Washington as part of our work for the MESA Air and NPACT studies. This (and additional potential data/analyses that could be provided) may help inform some of the existing uncertainties related to the ambient monitoring network. The following table characterizes how two geographic features are associated with all NOx monitors in the US. Pasted below is a map of the locations. In separate research, we have recent on-road data from a mobile monitoring network that might help summarize NOx.

   Table: Characterization of 368 AQS monitoring locations that reported NOx in 2012 with respect to proximity to nearest road (A1, A2, A3) or nearest truck route. (Note: There are 30 additional locations that reported NO2 monitoring that are not included in this summary.)

Meters	To Road	To Truck Route
< 50	59 (16%)	5 (1%)
50 - 100	38 (10%)	7 (2%)
100 - 150	44 (12%)	6 (2%)
150 - 300	78 (21%)	18 (5%)
> 300	149 (40%)	332 (90%)

7. I think the use of APEX is a reasonable approach to estimating population exposures for risk assessment. Are there ways to use characterization of the current national network to address the biases identified in the past review from AERMOD? (p 5-16) Information is available that will help better characterize the existing national network (see above). Could this information be used to improve the AERMOD estimates?