DRAFT

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EF3

ACCURACY OF THE LMOS EMISSIONS INVENTORY

Issue: As noted in the recent National Research Council (NRC) report ("Rethinking the Ozone Problem in Urban and Regional Air Pollution"), anthropogenic emissions inventories significantly underestimate anthropogenic VOC emissions. To support this finding, the NRC cited: (1) ambient VOC:NOx ratios in several large urban areas exceed the inventory VOC:NOx ratios, (2) VOC measurements from tunnel and roadway studies show that motor vehicle emissions are underestimated by a factor of two to four.

Furthermore, the NRC noted that biogenic emissions, which may be of comparable magnitiude to anthropogenic emissions over large areas (such as the LMOS region) and which tend to be highly reactive, have received less attention than anthropogenic emissions in state inventories.

Implications: As a result of these deficiencies, the NRC claimed that the previous estimates of emission reductions are overly optimistic, and that the relative benefits of VOC and NOx may not be properly understood.

NRC Recommendations/LMOS Actions: The four specific recommendations offered by the NRC to address these inventory problems, and the specific actions being taken as part of the LMOS in response to these recommendations, are summarized below.

(1) the methods/protocols used to develop emissions inventories should be reviewed and revised

LMOS Action: The regional anthropogenic and biogenic emissions inventory for the LMOS was developed using current, detailed emissions information and state-of-the-science, USEPA-approved methodologies. As such, the LMOS inventory is considerably more advanced than previous, traditional emissions inventories. In particular, the LMOS inventory will be resolved spatially (within 4 km grid cells), temporally (hourly), and by individual classes of VOC (and NOx) species. Recent LANDSAT satellite imagery have been used to develop updated information on land use/land cover to aid in spatially disaggregating emissions and to improve the characterization of biogenic emissions. Day-specific emissions information have been incorporated for all major stationary point sources and for motor vehicles. To ensure that the biogenic emissions

are accurately represented, a special measurement program is being undertaken to establish the appropriate emission factor and speciation for corn, a dominant agricultural crop in the midwest and an apparently significant source of biogenic VOC emissions. Other research programs, such as SARMAP in California and the SOS in the Southeast, are also being monitored for the latest emissions information.

(2) independent tests, including monitoring of VOCs, should be used to identify, and correct for, errors

LMOS Action: During the 1991 field program, VOC measurements were taken at 13 different surface locations throughout the LMOS region and on five separate aircraft on seven intensive sampling days. (NOx was measured continuously during the summer.) The VOC samples were speciated so individual compounds could be identified. In addition, AIRTRAK monitors were operated during the summer at four key locations in the region. These special monitors provide a continuous measurement of both VOCs and NOx. The LMOS Data Analysis Contractor will peform a series of tests using all of these data to evaluate the consistency of the inventory with the ambient measurements.

If this information indicates a quantifiable "bias" in the emission estimates, then the following steps should be taken:

(1) Short-term: (a) attempt to quantify the bias either across-the-board or, preferably, for various source categories using the ambient measurement, remote sensing (Stedman) data, or other relevant data, (b) develop parameterization based on this quantification, and (c) apply parameterization to "correct" emission estimates.

(2) Long-term: attempt to determine the source or cause of the bias for each source category

(3) apply models that use ambient data (receptor models) to identify important precursor sources, to verify emission algorithms, and to determine ozone precursor relationships

LMOS Action: The LMOS Data Analysis Contractor will apply receptor modeling to the 1991 field program data base. It is expected that this analysis will address source culpability, and provide a semi-quantitative assessment of the reasonableness of emission estimates. In addition, Dr. Peter Scheff, who has performed several VOC receptor modeling

analyses in the Chicago area and is a member of the LMOS Advisory Committee, will be consulted on the application of receptor modeling in the Lake Michigan region.

(4) continued monitoring of precursor concentrations should be done to verify the effectiveness of emission controls

LMOS Action: The true measure of control strategy effectiveness will be the ambient ozone levels. The States will maintain and, in some areas, enhance their routine surface ozone monitoring networks to track progress towards attainment. In addition, the implementation of the Photochemical Assessment Monitoring Stations (PAMS) pursuant to the section 182(c)(1) of the Clean Air Act Amendments of 1990, will provide on-going future sampling of ozone precursor emissions across the Lake Michigan region.

Conclusion: The Lake Michigan States recognize the importance of a comprehensive and accurate emissions inventory in implementing the Clean Air Act Amendments of 1990, and being able to attain the air quality standard for ozone. Ambient measurements have been (and will continue to be) used, to the extent possible, to improve on calculated emission estimates. Additional resources have been committed to maintaining and improving the inventories over the next few years and beyond.