



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

16 AUG 1989

Return to me

RECEIVED

AUG 22 1989

Air & Radiation Branch
U.S. EPA Region V

MEMORANDUM

SUBJECT: Review of the Utah PM₁₀ Draft SIP (your memo 8/1/89)

FROM: Joseph A. Tikvart, Chief *J. Tibbitts*
Source Receptor Analysis Branch, TSD (MD-14)

TO: Lee Hanley, Utah PM₁₀ SIP Coordinator
Air Programs Branch, Region VIII

In response to your memo to Dean Wilson and Quang Nguyen, attached are comments on: (1)"PM₁₀ Source Apportionment of Utah Valley Winter Episodes Before, During, and After Closure of The West Orem Steel Plant" (prepared by NEA, Inc.); (2)"Equivalency of Atmospheric Conditions on Chemical Mass Balance Study Days in Utah Valley"; and (3)"Description of Atmospheric Processes Leading to Sulfate, Nitrate, and Other Chemical Aerosol Formation During PM₁₀ Episodes in Utah Valley" (prepared by ENSR Consulting and Engineering).

In the NEA PM₁₀ source apportionment document, NEA reported that Geneva Steel was responsible for approximately 40 percent of PM₁₀. This estimate is lower than the State of Utah Bureau of Air Quality (UBAQ) estimates of 66 percent. The following comments are on NEA's work and the possible reasons for NEA's lower estimates.

1. NEA did not include several sources of PM₁₀ (i.e., powerhouse stack, rolling mill stack, slag pour and slag cooling) from Geneva Steel. These sources could conceivably have a significant impact on the NEA results in the CMB analyses. Powerhouse and rolling mill stack sources could be significant emission sources of SO₂ and NO_x gases, which may subsequently be converted to PM₁₀ particles (e.g., sulfate and nitrate) in the stack or shortly thereafter. Failure to include these source profiles in the analysis may result in incorrectly attributing the SO₄⁼ and NO₃⁻ in the profiles to secondary sulfate and nitrate rather than to the steel mill. As a result, the NEA analysis may underestimate the source contribution estimates of Geneva Steel.

2. Unlike the EPA CMB model (Version 6.0) used by UBAQ, the NEA source receptor model (QSASII) does not have adequate collinearity information. The source profiles which are similar enough to invalidate any estimate from each of the sources individually cannot be determined by QSASII model. Possibly many of the source profiles from Geneva Steel used by NEA might have similar profiles since they originate from the same location. As a result, the validity of the NEA source estimates cannot be determined.

3. In the preliminary CMB analysis study, UBAQ used a "single steel plant" source profile developed from ambient samples when the plant was in operation and when it was shutdown, instead of using a measured specific airshed emission source composition profile. This could lead to differences in the source apportionment results obtained by UBAQ and NEA for some of the meteorologically related reasons cited by NEA. However, it is our understanding that, subsequently, UBAQ used more direct source profile information developed by NEA to estimate source contributions to the ambient monitor site. Sources (i.e., powerhouse stack, rolling mill stack, slag pour and slag cooling), which were not taken into account in the NEA analyses, were also not included in the UBAQ analyses. However, the resulting UBAQ-calculated Geneva steel source contributions (50.3 percent) are, apparently, still greater than those estimated by NEA (40 percent). The difference between UBAQ and NEA estimates could conceivably be due to the inclusion of 2 additional day (i.e., 1/26 and 2/8/1988) estimates in NEA's average.

If direct source profile information is used, the NEA arguments about substantial meteorological differences on "up" and "down" days having significant impact on the chemical composition of a source profile are irrelevant. This follows from the way which the CMB model works. That is, an ambient profile is statistically matched with the mix of candidate source profiles such that the chemical composition of the ambient profile is best explained in terms of contributions from candidate source categories. The procedure implicitly accounts for orientation between sources and the receptor and the effects of meteorology. Thus, on meteorologically different days, the model would likely account for differences in the meteorology by reflecting different source category contributions at the receptor site.

In the "Equivalency of Atmospheric Conditions on Chemical Mass Balance Study Days in Utah Valley" document prepared by ENSR, evidence is presented to support the points that (1) the chemical composition of source profiles is a function of meteorology and (2) that use of Salt Lake County (SLC) data to test the equivalency of "up" and "down" days in Utah County is inappropriate. Both of these arguments are unconvincing. As already mentioned, in the most recent UBAQ analysis, chemical composition of a source profile is independent of meteorology. This analysis was based on the CMB basic assumption that the composition of chemical species in source emission profile is invariant with differing meteorology so far as is known.

The importance of the second point made by ENSR in the document is diminished by the fact that differences in the meteorology should not affect chemical composition of source profiles on the "up" and "down" days. In addition, the argument presented is unconvincing. It appears to hinge entirely on differences in CO concentrations observed on December 4, 1986 versus February 8, 1987. This is attributed to some additional "meteorological factor" not characterized by the available data. It is informative to note that February 8, 1987 was a Sunday while December 4, 1986 was a weekday. Hourly maximum CO concentrations often occur during rush hours which occur in the dark. However, traffic patterns are substantially different on Sundays and weekdays. Thus, the most likely reason for the observed difference in maximum CO on these days has nothing to do with meteorology.

Therefore, the report fails to identify any reason why the SLC data could not be used as a surrogate for Utah County data.

The ENSR report, "Description of Atmospheric Processes Leading to Sulfate, Nitrate, and Other Chemical Aerosol Formation During PM₁₀ Episodes in Utah Valley", presents a qualitative discussion of atmospheric chemistry leading to formation of SO₄⁼ and NO₃⁻ particulate matter. It contends that UBAQ should use deterministic modeling to assess effects of controlling sources contributing to secondary particulate matter rather than rely on receptor modeling. The recommendation is inappropriate for three reasons. First, it has already been determined through Model Clearinghouse deliberations that the wind data are not appropriate for use of "deterministic models". Second, complete models describing secondary formation of particulate matter and resulting dispersion/deposition are still in the research mode and are very data intensive. Hence, they are not commonly available regulatory tools. It is unreasonable to expect the UBAQ to use such a model at this time. Third, such an approach would attempt to ascribe PM₁₀ to remote, as well as nearby sources. It is true that deemphasizing controls of secondary SO₄⁼ and NO₃⁻ may exacerbate the controls necessary at Geneva Steel to meet the PM₁₀ NAAQS. However, it could result in a more convincing attainment demonstration than would some conjectures about the effects of attempting to control upwind, more remote, precursors of secondary particulate matter.

If you have any questions concerning the comments, please feel free to contact me at FTS 629-5562.

cc: J. Dicke, OAQPS, SRAB (MD-14)
D. Gillam, Region VIII
E. Meyer, OAQPS, SRAB (MD-14)
J. Notar, Region VIII
T. Pace, OAQPS, AQMD (MD-15)
D. Stonefield, OAQPS, AQMD (MD-15)
D. Well, Region VIII
D. Wilson, OAQPS, SRAB (MD-14)