UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
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MEMORANDUM

Subject: CO Design Concentrations

From: John Vimont, Regional Meteorologist

To: Dean Wilson, OAQPS, Model Clearing House

We are once again faced with preparing a FIP for Phoenix, Arizona. The court has decided that it was unacceptable to approve the Arizona SIP in lieu of the final promulgation of the original FIP. In the original FIP/SIP modeling, the Urban Airshed Model (UAM) was run for establishing the area-wide contributions to the ambient CO levels and a modified version of CALINE-4 was run for the nearby line source contributions. These were both based on a 1985 design day which occurred in October. One of the criticisms of the FIP/SIP was the emission inventory used in the modeling. As you are aware, in generating a mobile source emission inventory, we are completely at the mercy of the local transportation departments to provide appropriate traffic data. The Arizona Department of Transportation (ADOT) decided that they wanted to change the traffic data that was used in the modeling as the SIP was being approved. (We were under a court ordered time schedule, so we had no choice but to proceed with approval or promulgation of the FIP, which was also based on this modeling.)

For this current FIP, we need a new attainment demonstration. A fundamental question in determining the emission reductions necessary for attaining the CO standard in Phoenix is the establishment of an appropriate design concentration. The current design value, as reaffirmed in the June 18, 1990 memorandum from William Laxton, is based on the second highest running 8-hour CO concentration in the most recent two years. In Phoenix, however, this is somewhat complicated by the implementation of an emission control program which, ostensibly, drastically reduced CO emissions during these most recent two years. It would seem logical to assume that drastic emission reductions would remove the ambient concentrations, commensurate with this emission reduction, from consideration in determination of the design concentration. However, in the case at hand, this is not the circumstance.

CO compliance, that is determination of the highest second high concentration, is based on the calendar year rather than on a given CO season. Therefore, CO emissions can change radically

Table I - CO concentrations at the highest neighborhood and micro-scale sites in Phoenix, AZ, 1988 & 1989.

	1988 Hi ppm date	1988 2nd ppm date	1989 Hi ppm date	1989 2nd ppm date
Neighborhood	12.4	11.0	13.9 1/1	12.6 1/17
Micro	12.1	12.0	13.1 2/25	12.2* 12/14

* Post oxy-fuel value

between the beginning and end of the year. This happened in 1989 in Phoenix with the implementation of their oxygenated fuels program. The ambient concentrations are also obviously affected by meteorology. For the previous two years, 1988 and 1989, the meteorology was such that 1989 turned out to yield higher ambient CO levels than did 1988. Also, the micro-scale monitor, which traditionally has measured the highest CO concentrations in Phoenix, was moved and/or out of service for much of 1988 and in January 1989. The result of these complications is that the highest-second-high concentration over the last two years occurs at a neighborhood-scale site during the time before an oxygenated fuels program was implemented while the highest-second-high concentration at the micro-scale site occurred after the oxy-fuels program was implemented. This is summarized in Table I.

Table II - Actual and Normalized CO concentrations, Phoenix - 1989

Quarter	1st Quarter		4th Quarter			
1st or 2nd High-Act/Nrm*	1st-hi Act	2nd-hi Act	1st-hi Act	1st-hi Nrm	2nd-hi Act	2nd-hi Nrm
Micro-scale	13.1	-	12.2**	14.7	11.2	13.5***
Neighborhood	15.6	12.6	11.0	13.2	10.6	12.7

* Act = Actual Concentration
Nrm = Normalized Concentration

** Design Concentration = 12.2 based on highest emission reduction requirements

*** Design Concentration = 13.5 based on normalized concentrations

Another approach would be to normalize the ambient CO concentrations in the last quarter of 1989, when the oxygenated fuel program was in effect, by the appropriate Mobile-4 oxygen content emission factors. The effect of this is shown in Table II. It must be emphasized that the "normalized" values are approximate and based on a national average vehicle mix rather than on Phoenix specific data. The relative effects of the normalization should not be drastically different, however.

Another option for determining the design concentration would be to use the 1985 design value from the original SIP/FIP modeling, and adjust it to reflect what would happen in 1989. The risk here is that the original modeling was based on the aforementioned suspect traffic data. Adjustments could be made to that data, the model could be re-evaluated, and then the projection of 1989 air quality could be made. The uncertainty of this approach would be high. If the result of this analysis differed greatly from what was observed in 1989, then there would be a great temptation to use either the actual or normalized design concentrations cited above.

Unfortunately, we have almost no time to do further analysis. The Court is requiring that we have the final FIP promulgated by December. It appears that we must put out a Notice of Proposed Rulemaking (NPRM) before we can produce a final notice. This NPRM must be out of our office by mid August so that it can go through all of the hoops at headquarters and OMB. (I think the signing date by the Administrator is September 17.)

Using some variant of the 1985 design value modeling seemed attractive at first, since much of the work has been done for that. After further analysis, however, I am not convinced that the 1985 modeling will hold up for developing a 1990 FIP. The modeling guidelines allow for the use of rollback if fleet turnover will bring the area into attainment. Assuming that the traffic projections don't radically increase the projected emissions and using the normalized concentration of 13.5 ppm (Table II) as the design value, fleet turnover should bring the concentrations down to 9.8 ppm by the 1991-92 season. We will be promulgating regulations calling for higher oxygen content in their fuel and fuel RVP restrictions. Rollback would indicate that this would bring the levels down to 9.0 ppm. (<u>These are only estimates based on national average Mobile-4 factors. They will change somewhat with more detailed analysis.</u>) Implementation of a fuel modification program has the same effect as fleet turnover, in that it uniformly changes emissions in the emission models. Therefore, we could argue that rollback is adequate in this case.

We could also attempt to put together a new modeling analysis based on the 1989 data. It would not be available for the NPRM but might be available for the final notice. It will be difficult to put together a newer detailed analysis in the time we have before the final notice is due; however, it is possible.

Just looking at the various design value options, from the 1988 and 1989 data, there are three possible approaches.

1. We can take the data at face value, which implies that the 12.6 ppm concentration at the neighborhood-scale site would be the design concentration.
2. We can normalize the concentrations before determining the design concentrations, which would yield a 13.5 ppm design concentration at the micro-scale site.
3. We could evaluate the controls necessary to bring the un-adjusted design concentrations down at each site, and define the appropriate design concentration as the one which requires the highest level of control. This would result in the 12.2 ppm concentration at the micro-scale site as the design concentration.

Choosing the third alternative would have a number of advantages. It is equivalent to using what would probably be the highest measured concentration. This would provide some margin for error if the micro-scale site is not actually recording the highest concentrations in the area, given potential questions over the micro-scale site's data capture rate and whether or not it is actually sited properly. We could also propose regulations in the NPRM based on the highest control estimates, and indicate that if further information becomes available (i.e. a better modeling analysis) that we might relax the requirements in the final proposal.

I am proposing, given the time-frames of concern, that we go with a rollback analysis for the NPRM, based on either the "normalized design concentration" or the un-adjusted micro-scale site design concentration, which yields the highest emission control estimate. Depending on the information I can get from the State of Arizona I can probably build in some information from the 1985 analysis, but the primary mechanism will be rollback. (It should be noted, that while the 1985 analysis used appropriate dispersion modeling, the final analysis essentially used rollback since the emission reduction assumptions behind an oxygenated fuels program provide for uniform proportional emission reductions, regardless of speed, VMT etc.) We will try to put together a more detailed analysis before the FIP goes final. Arizona has a relatively good meteorological data base for December 1989, when the normalized design concentration occurs. If we can get a firm, believable estimate of traffic from ADOT we should be able to put together a good analysis. Because of the time-frames, however, I am hesitant to explicitly put this into the NPRM, since the courts are requiring a final notice by December and there will be no room for error.

I would like your feedback on the use of rollback and on the choice of design concentration. We need something quickly. I want to emphasize again, that the "normalized concentrations" are approximations at this point, they would need to be corrected for actual Phoenix conditions. They are, however, probably pretty close.