TECHNICAL SUPPORT DOCUMENT

PHOENIX CARBON MONOXIDE ATTAINMENT DETERMINATION

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AMBIENT AIR QUALITY SURVEILLANCE

Requirement:	Clean Air Act §107(d)(3) (E)(i) 40 CFR 50.8 (National primary ambient air quality standards for carbon monoxide) 40 CFR 58, Appendix D, "Network Design for State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Assessment Monitoring Stations (PAMS)
Proposed Action:	Finding of Attainment for the Carbon Monoxide National Ambient Air Quality Standard
Primary Guidance Documents:	Memorandum from William G. Laxton, Director, Technical Support Division, Office of Air Quality Planning and Standards to Regional Air Directors, "Ozone and Carbon Monoxide Design Value Calculations", June 18, 1990 "Selecting Sites For Carbon Monoxide Monitoring", September 1975 (EPA 450/3-75-077)
Primary Plan Cites:	NA

What are the statutory, regulatory and policy requirements?

40 CFR 50.8 establishes two National Ambient Air Quality Standards (NAAQS) for Carbon Monoxide (CO), an eight hour average concentration of nine parts per million (ppm) not to be exceeded more than once per year and a one hour average concentration of 35 ppm not to be exceeded more than once per year.

In order to make a valid assessment of an area's attainment status, the area needs to have a CO monitoring network in place that meets the design requirements of 40 CFR 58, Appendix D, the network needs to utilize CO monitoring equipment designated by U.S. EPA as reference or equivalent methods[1], and the agency or agencies operating the network must have a quality

[1]A reference method is an air sample collection and analysis method which follows the procedures detailed in the appendices to 40 CFR 50. An equivalent method is an air sampling collection and analysis method which does not follow the reference procedures in 40 CFR 50, but has been certified by the EPA as obtaining "equivalent" results.

assurance plan in place that meets the requirements of U.S. EPA regulations contained in 40 CFR 58, Appendix A. A final requirement for urbanized areas with populations greater than 500,000 is that at least two monitoring sites shall be designated as National Air Monitoring Stations (NAMS).

Does the CO Monitoring Network meet the statutory and regulatory requirements? Why or why not?

The Clean Air Act (CAA) requires States to establish and operate air monitoring networks to compile data on ambient air quality for all criteria pollutants. 40 CFR 58 establishes specific regulatory requirements for operating air quality surveillance networks to measure ambient concentrations of CO, including measurement method requirements, network design, quality assurance procedures, and in urbanized areas with populations greater than 500,000, the minimum number of monitoring sites designated as NAMS. EPA evaluates these four basic elements in determining the adequacy of an area's CO monitoring network.

CO in the ambient atmosphere is measured using methods designated by EPA under the requirements of 40 CFR 53. All of the CO methods used in the Phoenix Planning Area (PPA) are designated as either reference or equivalent methods. The majority of CO monitoring sites (13 sites) in the PPA are operated by the Maricopa County Environmental Services Department (MCESD). The Arizona Department of Environmental Quality (ADEQ) operated two CO monitoring sites in the PPA during the attainment period 1999 - 2000. Both the MCESD and the ADEQ have Quality Assurance Plans in place that have been approved by the EPA.

40 CFR 58, Appendix D details the requirements for designing an ambient monitoring network for CO. Six basic objectives need to be met when designing a monitoring network. They are: 1) to determine the highest concentrations expected to occur in the area covered by the network; 2) to determine representative concentrations in areas of high population density; 3) to determine the impact on ambient pollution levels of significant sources or source categories; 4) to determine general background concentration levels; 5) to determine the extent of regional pollution transport among populated areas and in support of secondary [National Ambient Air Quality] standards; and 6) to determine the welfare-related impacts in more rural and remote areas (such as visibility impairment and effects on vegetation).

Closely associated with the monitoring objectives is the concept of "spatial scale of representativeness". The goal in siting monitoring stations is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring objective of the station. Thus, spatial scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring station throughout which actual pollutant concentrations are reasonably similar. The six spatial scales defined in EPA regulations are as follows:

Microscale - defines an area up to 100 meters from the sampler.
Middle Scale - defines an area ranging from 100 meters to 0.5 kilometers from the sampler.
Neighborhood Scale - defines an area ranging from 0.5 to 4.0 kilometers from the

sampler.
Urban Scale - defines an area ranging from 4 to 50 kilometers from the sampler. This scale usually requires more than one site for definition.
Regional Scale - defines usually a rural area of reasonably homogenous geography and extends from tens to hundreds of kilometers.
National and Global Scales - these measurement scales represent concentrations characterizing the nation and the globe as a whole.

The relationship between the six monitoring objectives and the scales of representativeness that are generally most appropriate for that objective is summarized in Table 1.

Table 1 - Relationship Between Monitoring Objectives and Scale of Representativeness

MONITORING OBJECTIVE	APPROPRIATE SITING SCALES
Highest Concentration	Micro, Middle, Neighborhood
Representative Concentrations	Neighborhood, Urban
Source Impact	Micro Middle, Neighborhood
Background	Neighborhood, Urban, Regional
Regional Transport	Urban/regional
Welfare-related Impacts	Urban/regional

The final regulatory requirement concerns the number of monitors in a network. The ambient monitoring networks operated by State and local agencies are referred to as SLAMS (State and Local Air Monitoring Station) networks. A subset of the SLAMS sites are also designated as National Air Monitoring Stations (NAMS). NAMS sites are selected to provide data for national policy analyses and trends and for reporting to the public on air quality in major metropolitan areas. Emphasis is given to urban areas with populations of at least 500,000. Urbanized areas will generally require only two CO NAMS. One NAMS would be representative of maximum CO concentrations. The second NAMS should be representative of high population areas.

It is important to understand that while EPA regulations do require a minimum number of NAMS sites in certain urban areas, these same regulations contain no criteria for determining the total number of stations in SLAMS networks. The optimum size of a particular SLAMS network involves trade offs among data needs and available resources that EPA believes can best be resolved during the network design process.

The last type of monitoring site is referred to as a Special Purpose Monitor (SPM) site. SPMs are monitoring sites which may or may not meet all of EPA requirements. State and local agencies generally operate SPMs for special studies where the sites are intended to be temporary or when agencies are trying to determine the appropriateness of new monitoring locations. Data collected at SPM sites which meet all of EPA's siting and quality assurance regulations are valid

for use in regulatory actions with some exceptions[2].

Table 2 summarizes the CO monitoring network in the PPA:

Table 2: CO Monitoring Sites in the Phoenix Planning Area

SITE NAME	OPERATING AGENCY	SITE DESIGNATION	MONITORING OBJECTIVE	SPATIAL SCALE
W. Indian School Rd.	MCESD	NAMS	Maximum Concentration/Source Impact	Microscale
West Phoenix	MCESD	NAMS	Population Exposure	Neighborhood
Mesa	MCESD	SLAMS	Population Exposure	Neighborhood
North Phoenix	MCESD	SLAMS	Population Exposure	Neighborhood
Glendale	MCESD	SLAMS	Population Exposure	Neighborhood
Central Phoenix	MCESD	NAMS	Population Exposure	Neighborhood
South Scottsdale	MCESD	SLAMS	Population Exposure	Urban/Neighborhood
Gilbert	MCESD	SLAMS	Population Exposure	Neighborhood
Maryvale	MCESD	SLAMS	Population Exposure	Neighborhood
West Chandler	MCESD	SLAMS	Population Exposure	Neighborhood
Greenwood	MCESD	SLAMS	Population Exposure	Middle
South Phoenix	MCESD	SLAMS	Population Exposure	Neighborhood
Tempe	MCESD	SPM	Population Exposure	Neighborhood
Grand Ave.	ADEQ	SPM	Maximum Concentration/Source Impact	Microscale
JLG Supersite	ADEQ	SPM	Population Exposure	Neighborhood

The CO monitoring network in the PPA meets the network design requirements in terms of the density of the network, the monitoring objectives and the use of appropriate spatial scales. The MCESD operates three sites designated as NAMS, which exceeds the minimum requirement of two sites.

EPA regulations state that monitoring networks should be designed to meet six monitoring objectives. As seen in Table 2, the CO monitoring network in the PPA meets only three of the six objectives. It should be understood that EPA regulations apply nationwide and for all criteria pollutants. Urban areas in various parts of the country will have different geographic characteristics and the various criteria pollutants also behave differently and have

[2]See the memorandum "Agency Policy on the Use of Special Purpose Monitoring Data", August 22, 1997 from John S. Seitz, Director, Office of Air Quality Planning and Standards to Regional Air Directors.

different emission sources. Therefore, in evaluating whether a particular pollutant network design meets the requirements in 40 CFR 58, Appendix D, we need to consider the unique qualities of both the area and the pollutant of concern.

The fourth and fifth monitoring objectives, determining background concentrations and the extent of regional pollutant transport between populated areas, are not important objectives in the PPA. Geographically speaking, the Phoenix metropolitan area is relatively isolated. The nearest major cities are Casa Grande and Tucson, both to the southeast of Phoenix, and about 35 and 100 miles away, respectively. There is no major urban area nearby that would require measuring background concentrations of CO. Outside the PPA, the CO concentrations would be negligible and there is no issue of CO drifting into the PPA from another location. Neither Casa Grande nor Tucson is in line with the prevailing wind direction, which is from the south/southwest into the PPA, and transport of CO air pollution from the PPA is not appreciable enough to cause any exceedances of the NAAQS in these other cities. Nevertheless, CO monitors in the south and southeast portions of the PPA, even though their stated objective is to monitor for representative population exposure, can provide information on CO transport out of the PPA in this direction. The sixth monitoring objective, monitoring for welfare effects[3], is not applicable to CO air pollution.

One final point regarding the CO monitoring network in the PPA is that a portion of the CO SLAMS sites only operate on a seasonal basis. Seven of the nine SLAMS sites operated by the MCESD operate only between September 1 and April 1. The three NAMS sites and two of the highest reading SLAMS sites continue to operate on an annual schedule. Maricopa County requested this waiver from EPA regulations in order to allow them to upgrade instruments, perform preventative maintenance, expand the life expectancy of the CO monitoring equipment, reduce replacement costs, and better utilize their quality assurance and quality control resources. EPA Region 9 approved this waiver for two primary reasons. First, exceedances of the CO NAAQS occurring during the period of April 1 through September 1 in the PPA are extremely rare and any exceedances that did occur during the late spring and summer months would more than likely be captured by one or more of the five annually operating sites. Second, with monitoring resources not expected to increase, EPA believes it is appropriate to allow agencies to reasonably deviate from the monitoring regulations in order to conserve scarce resources as long as the quality of the data collected does not suffer. In fact, since the MCESD will be able to perform more extensive maintenance on the monitoring equipment during the summer months, there is less chance that equipment will fail during the fall and winter months, when collecting ambient CO data is more critical. The seven sites operating on a seasonal schedule are Mesa, North Phoenix, Glendale, South Scottsdale, Maryvale, West Chandler, and South Phoenix. The SPM site at Tempe is also operated on the same seasonal schedule.

Based on the fact that the CO monitoring network meets all of the relevant EPA requirements regarding network design, monitoring methods, and quality assurance, the ambient CO data collected by the MCESD and ADEQ is valid for determining the CO attainment status

[3]Welfare effects are defined as non-health related effects of air pollution. Visibility impairment from fine particle pollution is an example of a welfare effect.

of the PPA.

Is the Phoenix Planning Area attaining the 1 hour and 8 hour CO National Ambient Air Quality Standards?

As discussed previously in this document, EPA regulations state that the NAAQS for CO are attained when there is no more than one exceedance of either NAAQS each year. We usually focus our attention on the eight hour NAAQS since that is the standard that is typically of concern. Exceedances of the one hour 35 ppm NAAQS are extremely rare. When determining an area's attainment status, we look at two consecutive calender years of data. For this action, the relevant years are 1999 and 2000. Table 3 lists the CO monitoring sites in the PPA and the first and second highest daily 8 hour CO concentrations for each during the period 1999 through 2000.

TABLE 3: 1st & 2nd Highest 8 Hour CO Concentrations 1999 - 2000
(All values in ppm)

MONITOR SITE	1999		2000	
	1st HIGHEST CONCENTRATION	2nd HIGHEST CONCENTRATION	1st HIGHEST CONCENTRATION	2nd HIGHEST CONCENTRATION
W. Indian School Rd.	7.7	7.6	6.9	6.8
West Phoenix	7.7	7.5	7.4	7.2
Mesa	4.5	4.0	4.4	3.2
North Phoenix	3.5	3.5	3.2	3.1
Glendale	3.9	3.5	3.6	3.2
Central Phoenix	6.0	6.0	5.3	5.2
South Scottsdale	4.3	4.1	3.3	3.1
Gilbert	2.5	2.4	2.0	2.0
Maryvale	7.4	6.7	7.1	7.0
West Chandler	2.8	2.8	2.4	2.3
Greenwood	6.7	6.7	5.7	5.6
South Phoenix	4.6	4.4	5.9	4.8
Tempe	No Data	No Data	3.8	3.2
Grand Ave.	**10.6**	8.1	6.0	6.0
JLG Supersite	7.0	6.5	6.9	6.5

Source: U.S. EPA's Air Quality System

As can be seen from Table 3, there was only one exceedance of the eight hour CO NAAQS in 1999 at the Grand Ave site. Therefore the PPA meets the requirements of 40 CFR 50.8 and is currently in attainment of the one hour and eight hour CO NAAQS. The PPA continues to remain in attainment of the CO NAAQS with no exceedances of either standard at any site in the years 2001 and 2002.

DESIGN VALUE DETERMINATION

Guidance on calculating design values is provided in the memorandum "Ozone and Carbon Monoxide Design Value Calculations", June 18, 1990, from William G. Laxton, Director, Technical Support Division, Office of Air Quality Planning and Standards, to the Regional Air Directors.

The first step in developing the design value for a nonattainment area is to calculate the design value for each monitoring site. The highest of these site-specific design values then becomes the design value for the area. The Laxton memo provides a procedure to calculate which observed value should be used as the design value. For eight hour CO, we simply look at the maximum and second maximum eight hour values for the two year period of interest (1999 - 2000). Then we choose the highest of the second maximum values and that becomes the design value for that site. The highest design value of all the sites becomes the design value for the area.

Table 4 provides the design values for the 15 CO monitoring sites operating in the PPA.

Table 4 - Design Values for Co Monitoring Sites in the PPA

MONITORING SITE	1999		2000		DESIGN VALUE (ppm)
	1st Max Value	2nd Max Value	1st Max Value	2nd MaxValue	
W. Indian School Rd.	7.7	7.6	6.9	6.8	7.6
West Phoenix	7.7	7.5	7.4	7.2	7.5
Mesa	4.5	4.0	4.4	3.2	4.0
North Phoenix	3.5	3.5	3.2	3.1	3.5
Glendale	3.9	3.5	3.6	3.2	3.5
Central Phoenix	6.0	6.0	5.3	5.2	6.0
South Scottsdale	4.3	4.1	3.3	3.1	4.1
Gilbert	2.5	2.4	2.0	2.0	2.4
Maryvale	7.4	6.7	7.1	7.0	7.0
West Chandler	2.8	2.8	2.4	2.3	2.8
Greenwood	6.7	6.7	5.7	5.6	6.7
South Phoenix	4.6	4.4	5.9	4.8	4.8

Tempe	No Data	No Data	3.8	3.2	NA
Grand Ave.	10.6	8.1	6.0	6.0	8.1
JLG Supersite	7.0	6.5	6.9	6.5	6.5

Source: U.S. EPA's Aerometric Information Retrieval System/Air Quality Subsystem

Based on Table 4, the monitoring site with the highest design value is Grand Ave., which has a design values of 8.1 ppm. Therefore, the CO design value for the PPA, based on CO air quality data collected during the period 1999 - 2000, is 8.1 ppm.

CONCLUSIONS

Based on a review of the monitoring data from the area's SLAMS/NAMS network, the Phoenix area clearly attained the CO standard by the attainment date of December 31, 2000. The standard is attained at a particular monitoring site when no more than one exceedance of either the one hour (35 ppm) or eight hour (9 ppm) NAAQS is observed in a particular year. There was only one observed exceedance of the eight hour NAAQS in 1999 at the Grand Avenue site. No exceedances were observed in 2000.