

Appendix B

Methodology

Air Quality Data Base

THE AMBIENT AIR quality data presented in Chapter 2 of this report are based on data retrieved from AIRS on July 3, 1997. These are direct measurements of pollutant concentrations at monitoring stations operated by state and local governments throughout the nation. The monitoring stations are generally located in larger urban areas. EPA and other federal agencies also operate some air quality monitoring sites on a temporary basis as a part of air pollution research studies. The national monitoring network conforms to uniform criteria for monitor siting, instrumentation, and quality assurance.^{1,2}

In 1996, 4,858 monitoring sites reported air quality data for one or more of the six NAAQS pollutants to AIRS, as seen in Table B-1. The geographic locations of these monitoring sites are displayed in Figures B-1 to B-6. The sites are identified as NAMS, State and Local Air Monitoring Stations (SLAMS), or "other." NAMS were established to ensure a long-term national network for urban area-oriented ambient monitoring and to provide a systematic, consistent data base for air quality comparisons and trends analysis. SLAMS allow state or local governments to develop networks tailored for their immediate monitoring needs. "Other" monitors may be Special Pur-

pose Monitors, industrial monitors, tribal monitors, etc.

Table B-1. Number of Ambient Monitors Reporting Data to AIRS

Pollutant	# of Sites Reporting Data to AIRS in 1996	# of Trend Sites 1987-1996
CO	554	345
Pb	428	208
NO ₂	415	214
O ₃	1,037	600
PM ₁₀	1,734	900
SO ₂	690	479
Total	4,858	2,746

Air quality monitoring sites are selected as national trends sites if they have complete data for at least eight of the 10 years between 1987 and 1996. The annual data completeness criteria are specific to each pollutant and measurement methodology. Table B-1 displays the number of sites meeting the 10-year trend completeness criteria. For the PM₁₀ standard which was established in 1987, the trend analyses are based on sites with data in seven of the nine years between 1988 and 1996. Because of the annual turnover of monitoring sites, the use of a moving 10-year window maximizes the number of sites available for trends and yields a data base that is consistent with the current monitoring network.

The air quality data are divided into two major groupings: daily (24-hour) measurements and continuous (1-hour) measurements. The daily measurements are obtained from monitoring instruments that produce one measurement per 24-hour period and typically operate on a systematic sampling schedule of once every six days, or 61 samples per year. Such instruments are used to measure PM₁₀ and lead. More frequent sampling of PM₁₀ (every other day or every day) is also common. Only PM₁₀ weighted (for each quarter to account for seasonality) annual arithmetic means that meet the AIRS annual summary criteria are selected as valid means for trends purposes.³ Only lead sites with at least six samples per quarter in three of the four calendar quarters qualify as trends sites. Monthly composite lead data are used if at least two monthly samples are available for at least three of the four calendar quarters.

Monitoring instruments that operate continuously produce a measurement every hour for a possible total of 8,760 hourly measurements in a year. For hourly data, only annual averages based on at least 4,380 hourly observations are considered as trends statistics. The SO₂ standard-related daily statistics require at least 183 daily values to be included in the analysis. Ozone sites meet the annual trends data complete-

ness requirement if they have at least 50 percent of the daily data available for the ozone season, which varies by state, but typically runs from May through September.⁴

Air Quality Trend Statistics

The air quality statistics presented in this report relate to the pollutant-specific NAAQS and comply with the recommendations of the Intra-Agency Task Force on Air Quality Indicators.⁵ A composite average of each trend statistic is used in the graphical presentations throughout this report. All sites were weighted equally in calculating the composite average trend statistic. Missing annual summary statistics for the second through ninth years for a site are estimated by linear interpolation from the surrounding years. Missing end points are replaced with the nearest valid year of data. The resulting data sets are statistically balanced, allowing simple statistical procedures and graphics to be easily applied. This procedure is conservative since endpoint rates of change are dampened by the interpolated estimates.

Emissions Estimates Methodology

Trends are presented for annual nationwide emissions of CO, lead, NO_x, VOCs, PM₁₀, and SO₂. These trends are estimates of the amount and kinds of pollution being emitted by automobiles, factories, and other sources based upon best available engineering calculations. Because of recent changes in the methodology used to obtain these emissions estimates, the estimates have been recomputed for each year. Thus, comparisons of the estimates for a given year in this report to the same year in previous reports may not be appropriate.



Figure B-1. Carbon monoxide monitoring network, 1996.



Figure B-2. Lead monitoring network, 1996.



Figure B-3. Nitrogen dioxide monitoring network, 1996.

The emissions estimates presented in this report reflect several major changes in methodologies. First, state-derived emissions estimates were included primarily for nonutility point and area sources. Also, 1985–1994 NO_x emission rates derived from test data from the Acid Rain Division, U.S. EPA, were utilized. The MOBILE5b model was run instead of MOBILE5a for 1995 and 1996, and state-derived VMT data were applied. The Office of Mobile Sources, U.S. EPA, provided new estimates for non-road diesel, railroad, and spark ignition marine engines, and lead emission estimates from aircraft gasoline consumption were added. Finally, additional improvements were made to the particulate matter fugitive dust categories.



Figure B-4. Ozone monitoring network, 1996.

In addition to the changes in methodology affecting most, if not all, source categories and pollutants, other changes were made to the emissions for specific pollutants, source categories, and/or individual sources. Activity data and correction parameters for agricultural crops, construction, and paved roads were included. State-supplied MOBILE model inputs for 1990, 1995, and 1996 were used, as well as state-supplied VMT data for 1990. Rule effectiveness from pre-1990 chemical and allied product emissions was removed. Lead content of unleaded and leaded gasoline for the on-road and non-road engine lead emission estimates was revised, and Alaska and Hawaii nonutility point and area source emissions from several sources were added. Also, this report incorporates data from CEMs collected between 1994 and 1996 for NO_x and SO₂ emissions at major electric utilities.

All of these changes are part of a broad effort to update and improve emissions estimates. Additional emis-

sions estimates and a more detailed description of the estimation methodology are available in a companion report, *National Air Pollutant Emission Trends, 1900–1996*.⁶

References

1. *Clean Air Act Amendments of 1990*, U.S. Code, volume 42, section 7403 (c)(2), 1990.
2. *Ambient Air Quality Surveillance*, 44 CFR 27558, May 10, 1979.
3. *Aerometric Information Retrieval System (AIRS)*, Volume 2, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, October, 1993.
4. *Ambient Air Quality Surveillance*, 51 FR 9597, March 19, 1986.
5. *U.S. Environmental Protection Agency Intra-Agency Task Force Report on Air Quality Indicators*, EPA-450/4-81-015, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, February 1981.
6. *National Air Pollutant Emission Trends, 1900–1996*, EPA-454/R-97-011, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, December 1997.

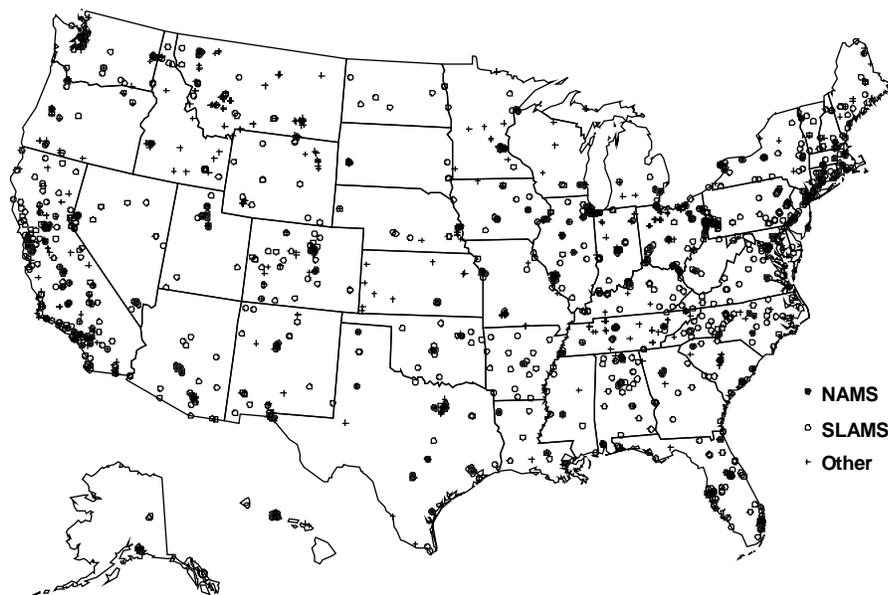


Figure B-5. PM₁₀ monitoring network, 1996.



Figure B-6. Sulfur dioxide monitoring network, 1996.