

Current Air Quality and Trends

in the South Coast Air Quality Management District

1996 AIR QUALITY AND TRENDS

In 1996, pollutant concentrations in Southern California's South Coast Air Basin (Basin) exceeded state and federal standards for ozone, carbon monoxide and particulate matter (PM10) in some or all areas. The state lead standard was exceeded at a special monitoring site in one localized area immediately adjacent to a lead source. In the desert areas of Los Angeles and Riverside counties downwind of the Basin, the standards were exceeded for ozone and PM10. Standards for nitrogen dioxide, sulfur dioxide and sulfate were not exceeded in 1996.

Number of Days Exceeding Standards in 1996

In recent years, the South Coast Air Basin has been the worst location in the U.S. in terms of the annual number of days exceeding the federal standards. Current air quality nevertheless represents substantial improvement over historical air quality. In 1996, the Basin exceeded the federal standards for ozone, carbon monoxide and PM10 on a total of 115 days, decreased 59% from 279 days in 1976. Figure 1 shows the change in exceedances of the federal standards in the Basin over the past two decades. Between 1976 and 1996, the number of days exceeding current 1-hour federal standard for ozone decreased from 194 days (53% of days) in 1976 to 90 days (25% of days) in 1996. Exceedances of the federal carbon monoxide standard decreased from 137 days (38% of days) in 1976 to 24 days (7% of days) in 1996. A comparison for the same period cannot be made for PM10 since the first full year of monitoring was performed in 1985. However, between 1986 and

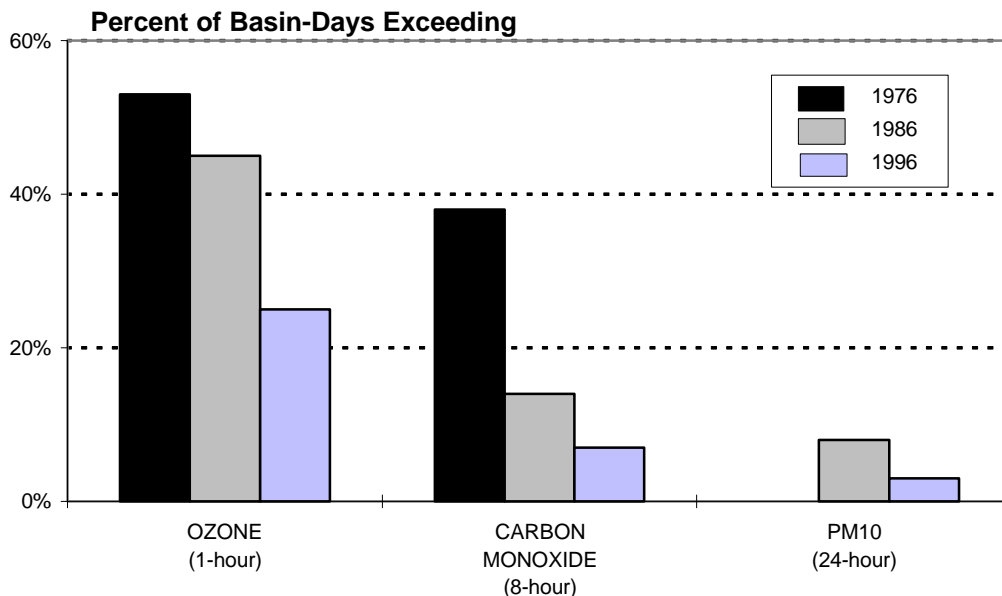


Figure 1
Percent of Days Exceeding Federal Standards in the Basin



South Coast Air Quality Management District
21865 E. Copley Drive, Diamond Bar, CA 91765-4182

Current Air Quality and Trends

in the South Coast Air Quality Management District

1996, number of sampling days¹ exceeding the federal 24-hour standard decreased from 8% of days sampled (5 of 61 days) to 3% of days sampled (2 of 61 days).

Maximum Pollutant Concentrations in 1996

Maximum pollutant concentrations in the Basin continued to exceed the standards for ozone, carbon monoxide and PM10 by a wide margin. In 1996, the maximum 1-hour average ozone concentration (0.24 ppm, recorded in the Central San Bernardino Valley area) was 185% of the federal standards². The highest 8-hour average carbon monoxide concentration of the year (17.3 ppm, recorded in the South Central Los Angeles County area) was 182% of the federal standard². Maximum 24-hour average and annual average PM10 concentrations (162 $\mu\text{g}/\text{m}^3$ and 61.1 $\mu\text{g}/\text{m}^3$, recorded in the Metropolitan Riverside County area) were 107% and 122% of the federal 24-hour and annual standards².

New Federal Ozone Standard

EPA has revised the National Ambient Air Quality Standards for ozone and particulate matter which will take effect September 16, 1997. The existing 1-hour standard for ozone will be phased out and replaced with a new 8-hour standard. The new federal ozone standard represents a tightening of the current 1-hour standard. The standard states that the 3-year average of the annual fourth-highest daily maximum 8-hour average concentration may not exceed 0.08 ppm. level. An analysis of the effect of the newly adopted federal ozone standard on ozone air quality in the Basin has shown that ozone concentrations exceed the new standard by a higher margin at most locations in the Basin, except for a few coastal locations with lower concentrations where the percent concentration exceeding the new standard is the same or lower than the percent concentration exceeding the current standard. The maximum 3-year mean of the fourth-high 8-hour average concentrations for the three years 1994-1996 (0.16 ppm in the Central San Bernardino Mountains area) was 192% of the new federal 8-hour average ozone standard².

Seasonal Variation in Pollutant Concentrations

Although concentrations of pollutants in the Basin exceeded the standards frequently in 1996, the number of exceedances recorded varied with time of year. The observed variations in pollutant concentrations are largely a result of seasonal differences in weather conditions. Generally, in the Basin, exceedances of the ozone standards peak during the summer, and exceedances of the carbon monoxide standards peak during the late fall and winter. Exceedances of the 24-hour PM10 standards can occur throughout the year, but occur most frequently in fall and winter. (A more detailed analysis of seasonal variation in pollutant concentrations in the Basin is available in Appendix II of the 1997 AQMP, "Current Air Quality.")

¹ PM10 concentrations are normally sampled every sixth day, and exceedances are accordingly reported in terms of percent of days sampled.

² The standard is exceeded at the concentration level of 100% and above.

Comparison of Air Quality in Different Areas

Ozone (O₃)

Figure 2 shows the average number of days exceeding the federal ozone standard at U.S. locations for the period 1994-1996. The Basin exceeded far more frequently than other areas of the U.S. In 1996, the six highest U.S. locations in terms of number of days over the federal ozone standard were located in the Basin. The 18 highest locations were in California. Other areas with the greatest number of exceedances outside California were located near or in Houston, Texas (maximum 15 days) and Atlanta, Georgia (5 days).

The number of days exceeding the federal standard also varies widely between different areas of the Basin. Figure 3 shows the number of days on which the federal ozone standard was exceeded in different areas of the Basin in 1996. The standard was exceeded most frequently in the Basin's inland valleys in an area extending from the East San Gabriel Valley eastward to the Riverside-San Bernardino area and into the adjacent mountains. The East San Bernardino Valley area recorded the greatest number of exceedances of the federal standard (65 days).

Figure 4 shows the 1994-1996 3-year average of the annual fourth-highest 8-hour average ozone concentrations at locations in the Basin (for comparison to the new federal ozone standard). The 8-hour average concentration was also lowest at the coastal areas, increasing to a peak in the Basin's inland valleys and adjacent mountains of the Riverside-San Bernardino areas.

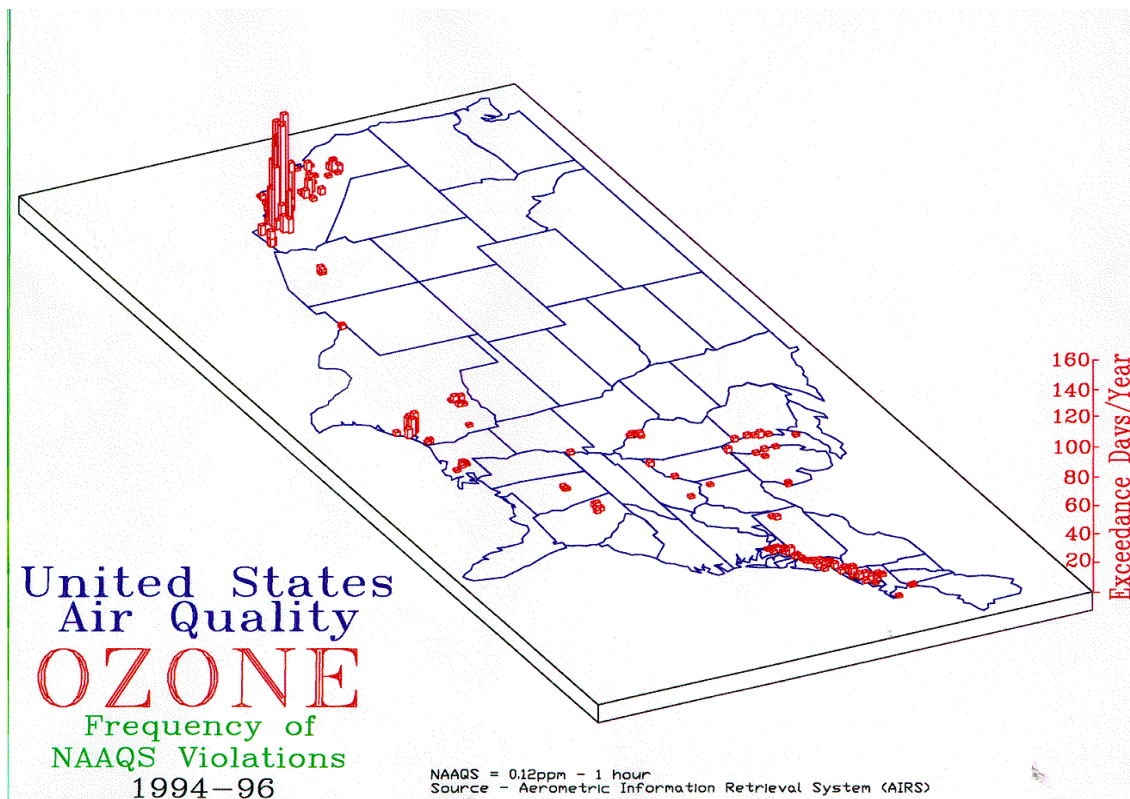


Figure 2

Current Air Quality and Trends
in the South Coast Air Quality Management District

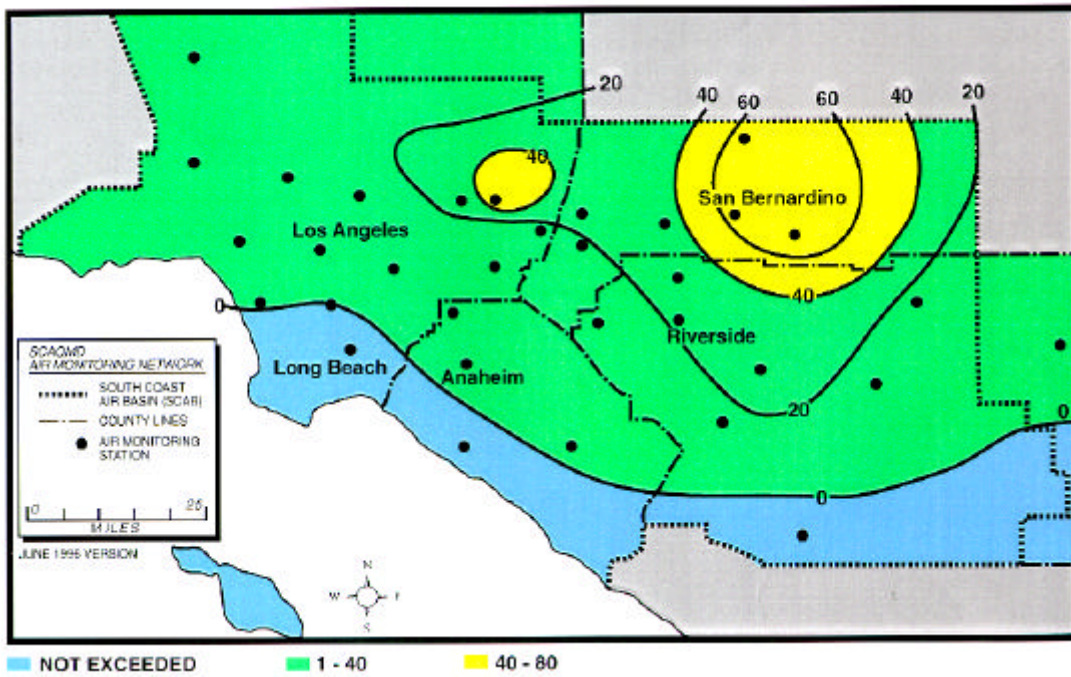


Figure 3
Ozone - 1996
Number of Days Exceeding the Federal Standard

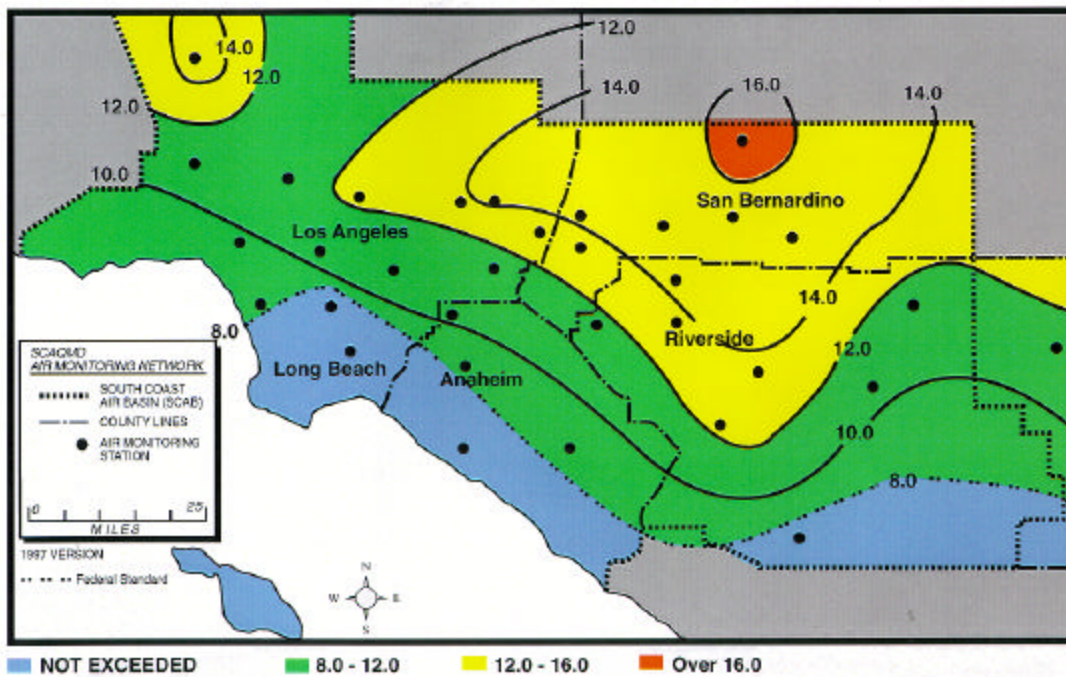


Figure 4
Ozone - 1994-1996
3-Year Average of the Fourth-Highest 8-Hour Average Concentration, pphm
(for comparison to the new federal 8-hour average ozone standard)

Current Air Quality and Trends

in the South Coast Air Quality Management District

Carbon Monoxide (CO)

Figure 5 shows the average number of days exceeding the federal 8-hour standard for carbon monoxide at U.S. locations in 1995-1996. The Basin was highest in number of exceedances of the carbon monoxide standard. Areas with the greatest number of exceedances outside the Basin (in 1996) were Calexico, California (9 days), Anchorage, Alaska and Las Vegas, Nevada (both recorded 3 days).

Figure 6 shows the number of days exceeding the federal CO standard in the various areas of the Basin in 1996. The standard was exceeded only in Los Angeles County areas, where vehicle traffic is most dense. The South Central Los Angeles County area exceeded the federal standard most frequently, with 20 days exceeding the federal standard.

Particulate Matter (PM10)

Figure 7 shows the U.S. locations with annual average PM10 concentrations exceeding the federal standard during the period 1994-1996. The height of the bar indicates the maximum annual average concentration for locations with annual averages over $50 \mu\text{g}/\text{m}^3$ during the period. The areas indicated by a triangle rather than a bar exceeded the 24-hour, but not the annual, standard. The Basin was among the few areas exceeding the annual PM10 standard and also the 24-hour standard.

Figure 8 shows the 1996 annual average PM10 concentrations at locations in the Basin. Exceedances of the annual PM10 standard were limited to the areas of Riverside and San Bernardino Counties in and around the Metropolitan Riverside County area. Most areas of the Basin, including all locations monitored in Los Angeles and Orange Counties, did not exceed the federal annual PM10 standard in 1996. However, the much more stringent state annual PM10 standard was exceeded in most areas of the Basin.

In 1996, the federal 24-hour standard was exceeded at one Basin location in the Metropolitan Riverside County area. The far more stringent state 24-hour standard was exceeded in almost all areas of the Basin, most frequently in the Metropolitan Riverside County area. In the desert areas of Riverside County, in the Coachella Valley area, 24-hour average PM10 concentrations exceeded the federal standard level on two days, both of which were attributed to a high wind event with windblown dust that can be categorized as a “natural event.” (In May of 1996 the U.S. EPA released its Natural Events Policy that permits exclusion of air quality data and exceedances affected by extraordinary natural events.)

Current Air Quality and Trends
in the South Coast Air Quality Management District

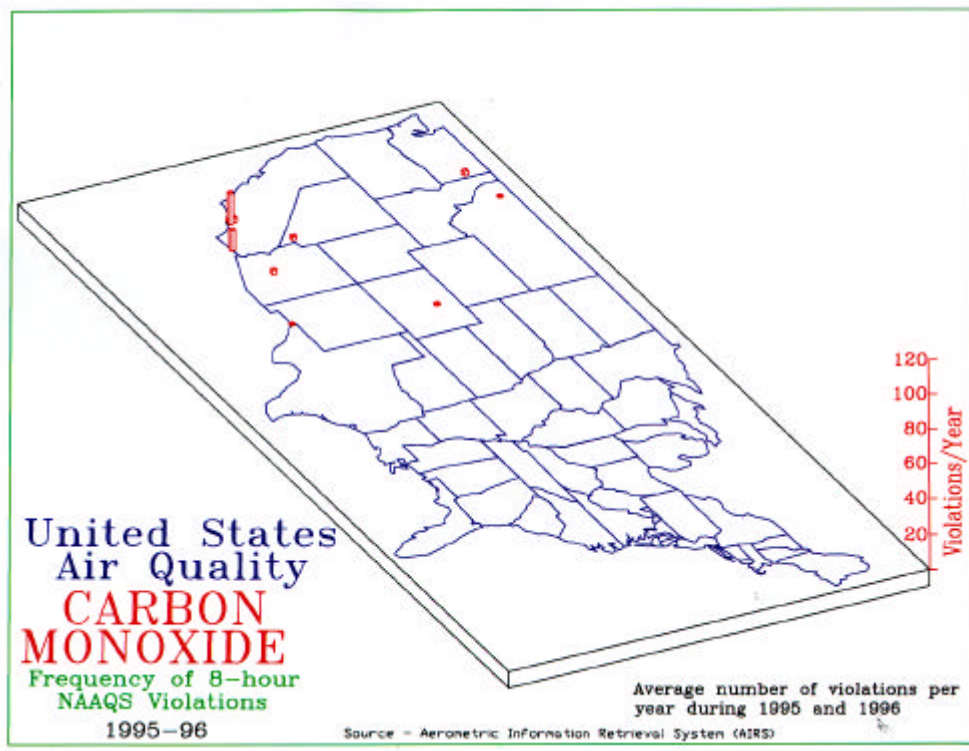


Figure 5

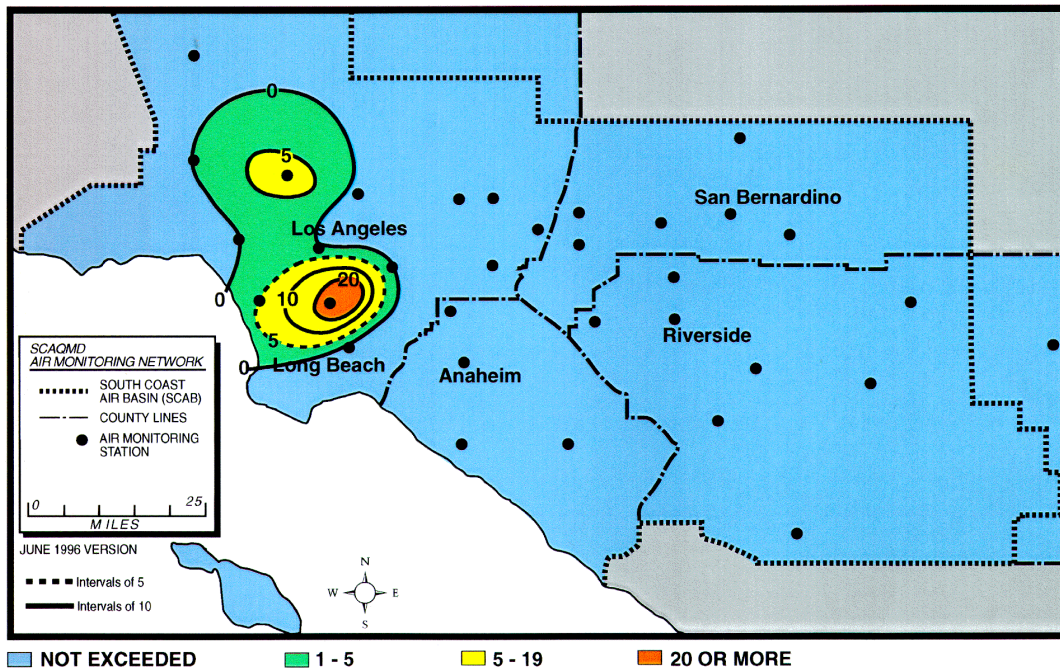


Figure 6
Carbon Monoxide - 1996
Number of Days Exceeding the Federal Standard

Current Air Quality and Trends
in the South Coast Air Quality Management District

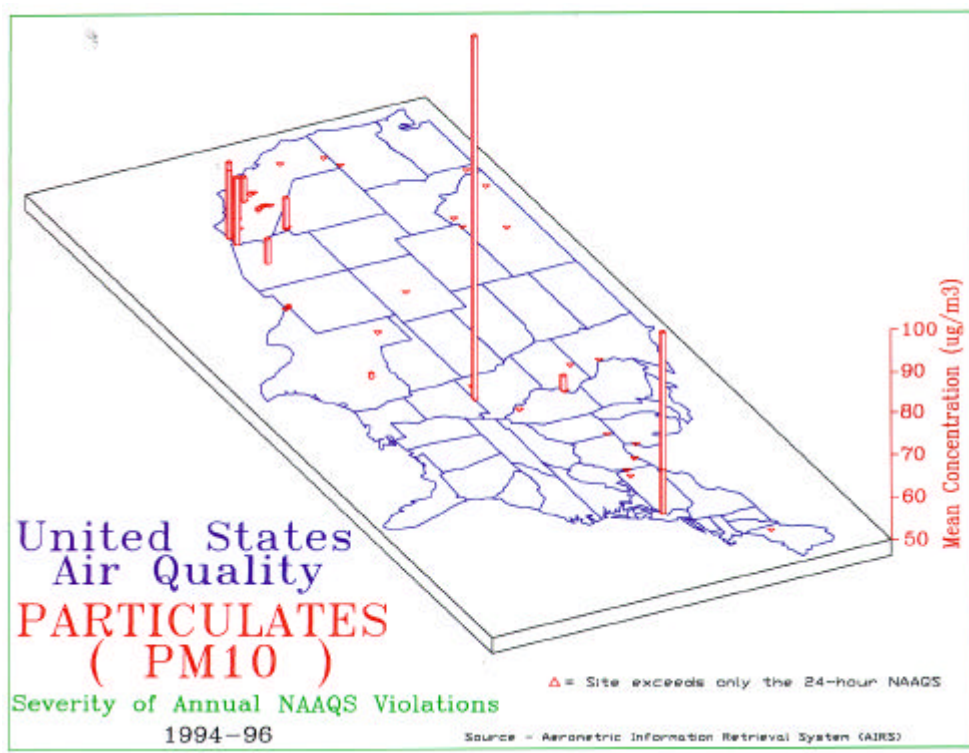


Figure 7

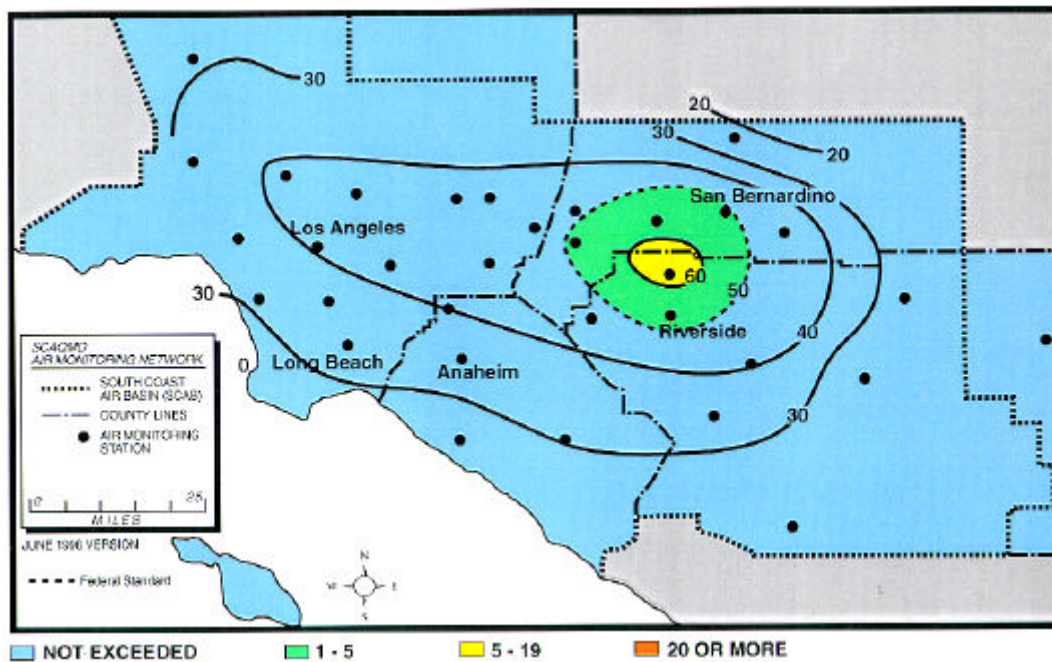


Figure 8
Suspended Particulate Matter (PM10) - 1996
Annual Arithmetic Mean, $\mu\text{g}/\text{m}^3$

Current Air Quality and Trends

in the South Coast Air Quality Management District

Nitrogen Dioxide (NO₂)

In 1996, no area of the Basin exceeded the federal standard for nitrogen dioxide. The maximum annual average nitrogen dioxide in 1996 was 86% of the federal standard. The state standard was also not exceeded in 1996. The maximum 1-hour average nitrogen dioxide concentration in 1996 was 96% of the state standard².

Although nitrogen dioxide concentrations are not currently exceeding the standards, nitrogen dioxide contributes to the formation of ozone and PM₁₀, and standards for both of these pollutants were exceeded in 1996.

Sulfur Dioxide (SO₂)

No area of the Basin has exceeded federal standards for sulfur dioxide since the 1960's and the state standard was last exceeded in 1990, prior to which there had been no exceedances since 1984. Although sulfur dioxide standards are currently being met, sulfur dioxide reacts in the air to form sulfuric acid, which contributes to acid precipitation. Sulfuric acid reacts with basic substances to form sulfates which are part of particulate matter or PM₁₀.

Sulfate (SO₄⁻)

In 1996, no area of the Basin exceeded the sulfate standard. The sulfate standard was exceeded at one Basin location in 1995 and at three locations in 1994. Sulfate concentrations did not exceed the state standard in the years 1991 to 1993.

Lead (Pb)

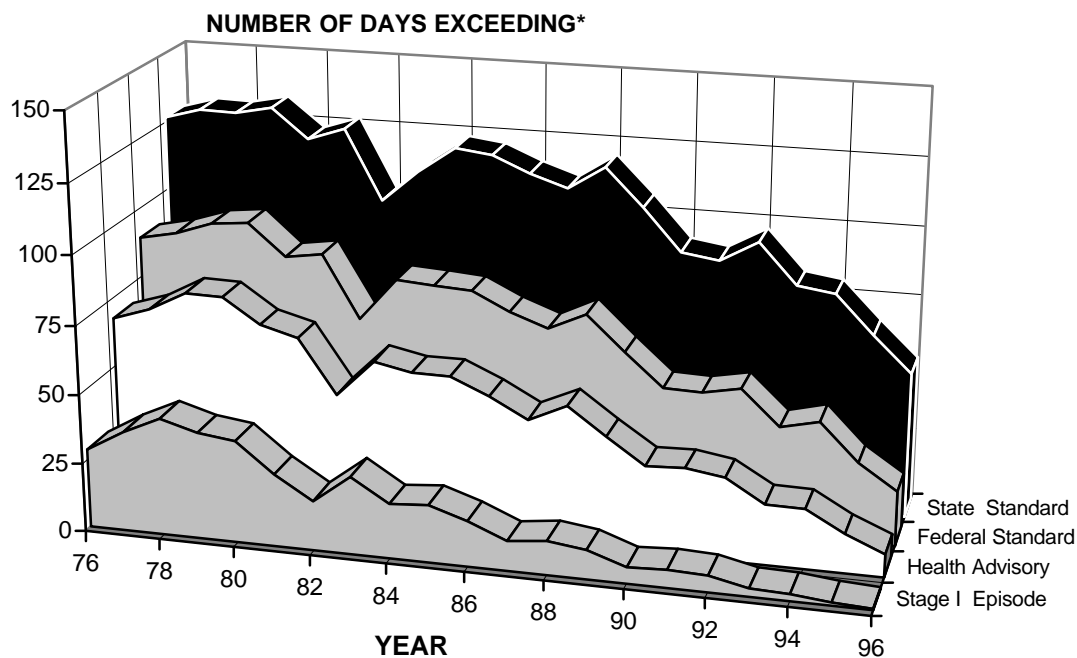
Lead concentrations ceased to exceed the state and federal standards at the District's regular monitoring stations after 1983 due to the phasing out of leaded gasoline. However, very localized violation of the state standard was recorded in the Basin in 1996 at one special monitoring site immediately adjacent to a stationary source of lead. No violation of the federal lead standard was recorded in 1996 in any area of the Basin.

Air Quality Trends Through 1996

Air quality trends through 1996 show that the concentrations and number of exceedances recorded in 1996 are consistent with a continuation of the downtrends reported in previous years³. The weather-adjusted ozone composite trend and the trend in 3-year average of the annual fourth-highest daily maximum concentration (for comparison to the new federal 8-hour average ozone standard) are also briefly discussed in this section.

Ozone

Figure 9 shows the average number of days exceeding state and federal ozone standards and health advisory and episode levels for the years 1976-1996 for 17 stations in the Basin with complete data throughout the period. There has been a significant decrease in the average number of exceedances at all levels (statistically significant at the 0.05 level). Between 1976-1978 and 1994-1996, stage I episodes decreased 96%, health advisories decreased 80%, federal standard exceedances decreased 67% and state standard exceedances decreased 49%. Trend analyses of the individual trend sites show that statistically significant decreases occurred at each and every one of the 17 trend locations.



*Average days for 17 sites with complete data throughout the period.

Figure 9
OZONE
Average* Days Exceeding Standards and Episode Levels, 1976-1996

³ Appendix II-B of the 1994 AQMP, "Air Quality Trends."

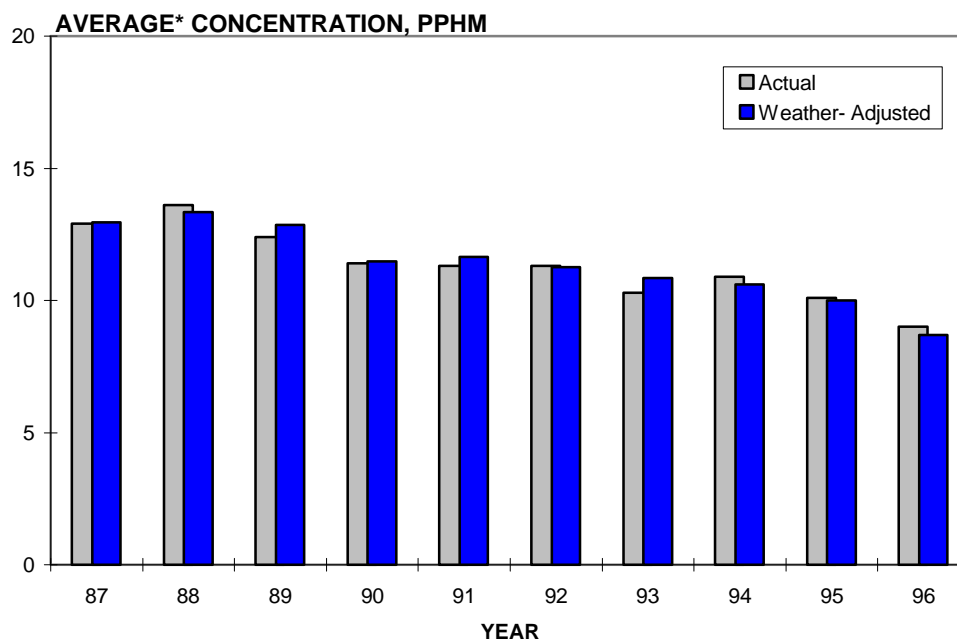
Current Air Quality and Trends

in the South Coast Air Quality Management District

Weather-Adjusted Ozone Trend

The observed ozone trends are affected by year-to-year changes in emissions combined with changes in meteorological conditions that are conducive to ozone formation. Past studies of the relationships between ozone and weather variables have shown that daily ozone concentrations during the summer (May-October) smog season are highly correlated with the temperature at standard elevations such as 5000 feet above sea level or at 850 millibars (T850). The temperature at 850 millibars acts as a surrogate description of inversion intensity, sunlight availability and general stagnation associated with regional high pressure systems. A methodology of weather-adjusting ozone concentrations using this relationship has been developed that attempts to factor out impact on ozone formation caused by year-to-year variations in meteorology³.

Figure 10 shows the observed (actual) and weather-adjusted May-October average daily maximum ozone concentrations for six sites located in the typically high ozone areas for the period 1987-1996. While the weather-adjusted concentrations differ from the observed concentrations for the individual years, the overall weather-adjusted ozone trend is not greatly different from that for observed ozone concentrations.



*Average for six stations located in the San Gabriel Valley, Pomona/Walnut Valley, Metropolitan Riverside County, and Central San Bernardino Valley areas.

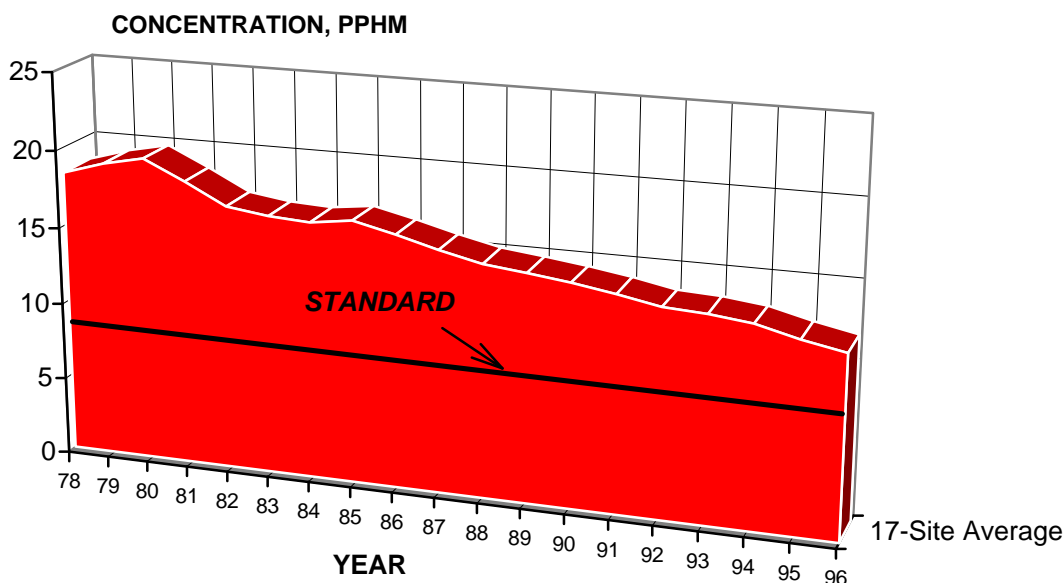
Figure 10
OZONE
Trends in Seasonal Average* Concentrations
May-October, 1987 - 1996

Current Air Quality and Trends

in the South Coast Air Quality Management District

New Federal Ozone Standard

Figure 11 shows the trend in ambient ozone concentrations, based on the 3-year running mean of the annual fourth-highest daily maximum 8-hour average ozone concentration between 1976 and 1996 for 17 ozone trend sites (shown at the last year to conform with the new federal standard). There was a statistically significant downtrend over the whole period in the composite 17-site average, as well as in the average at each individual location. The average concentration for the 17 trend sites decreased 36% between 1976-1978 and 1994-1996.

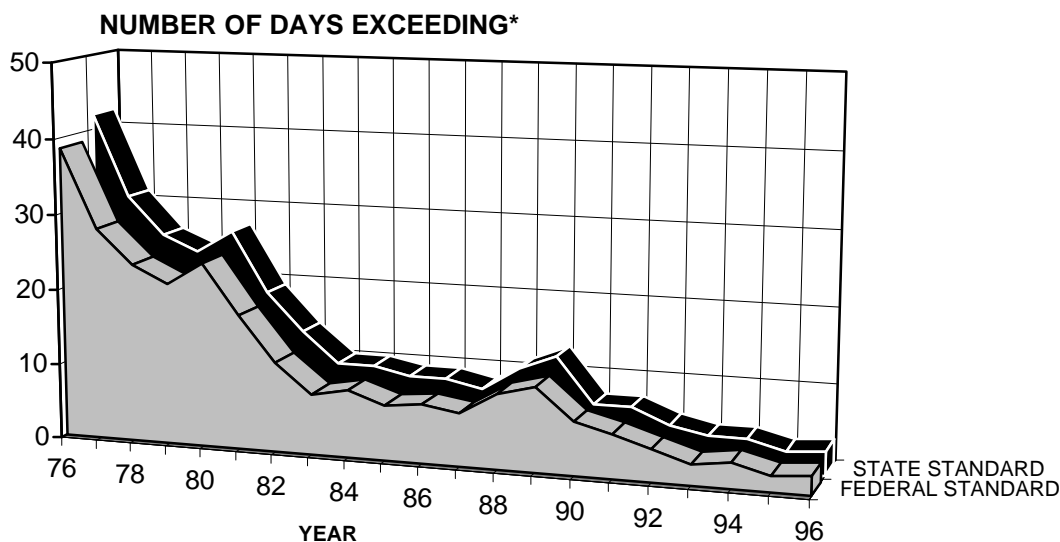


* 3-Year running mean concentrations (shown at the last year to conform with the form of the new standard) for 17 trend sites.

Figure 11
OZONE
3-Year Average* of the Fourth-Highest 8-Hour Average Concentration, pphm
(to be compared to the new federal 8-hour average ozone standard), 1976-1996

Carbon Monoxide

Figure 12 shows the average number of days exceeding the state and federal carbon monoxide standards for the years 1976-1996 for eight stations with complete data throughout the period. The average number of days decreased significantly over the period. Between 1976-78 and 1994-96, the three-year average number of exceedances decreased by 90% and 91% for the state and federal standards, respectively.



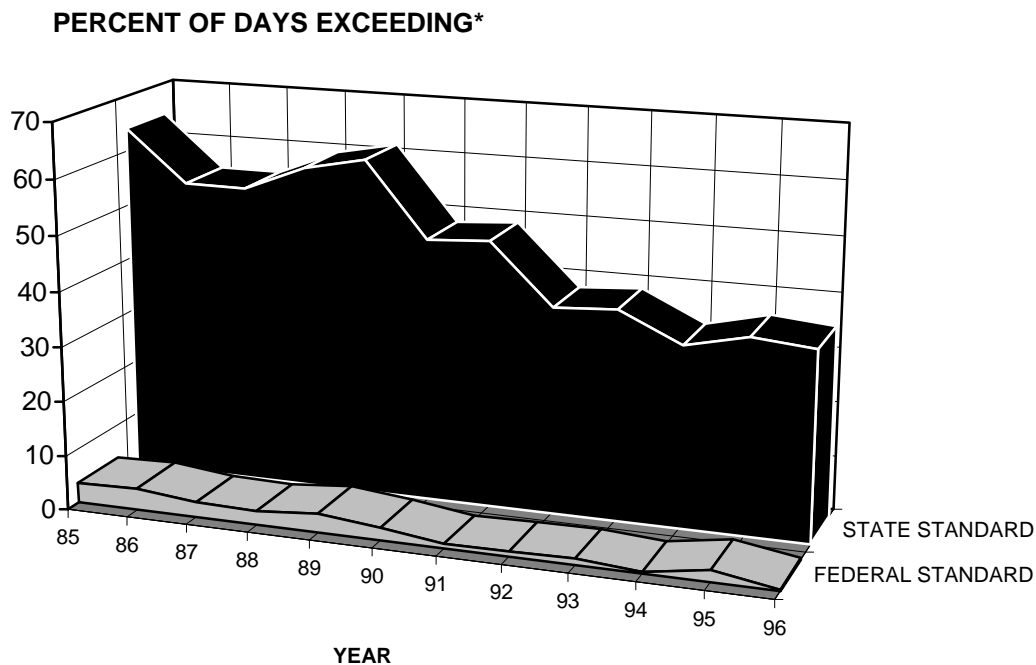
*Average days for 8 sites with complete data throughout the period.

Figure 12
CARBON MONOXIDE
Average * Days Exceeding 8-Hour Standards, 1976-1996

PM10

Figure 13 shows the average percent of days exceeding the state and federal 24-hour PM10 standards for the period 1985-1996 at six Basin air monitoring stations with complete data throughout the period. The three-year average percent of days exceeding decreased by 73% for the federal standard and 48% for the state standard between the years 1985-1987 and 1994-1996. Exceedances of both state and federal 24-hour PM10 standards show a statistically significant downtrend through 1996.

Current Air Quality and Trends in the South Coast Air Quality Management District



*Average percent days for 6 sites with complete data throughout the period.

Figure 13
PM10
Average* Percent of Days Exceeding 24-Hour Standards, 1985-1996

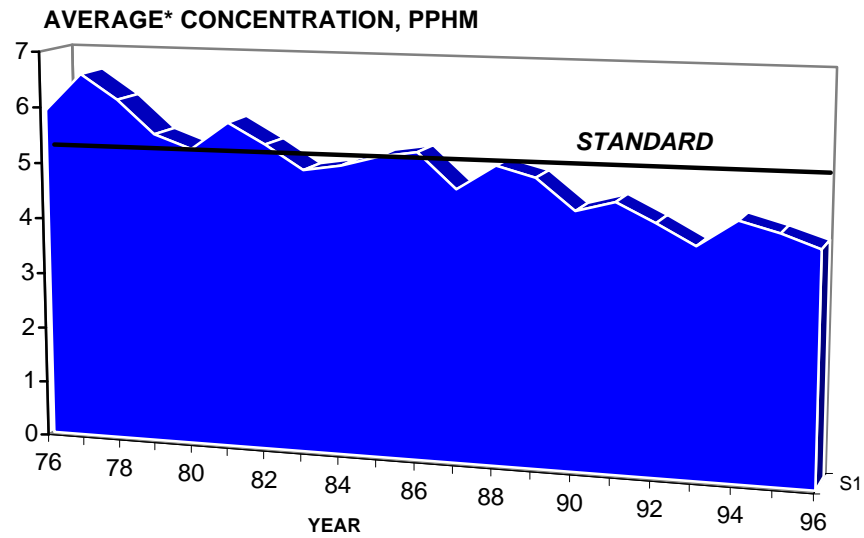
Nitrogen Dioxide

Figure 14 shows the trend in the Basin average arithmetic mean nitrogen dioxide concentrations for the period 1976-1996, based on seven sites with complete data throughout the period. There was a statistically significant downtrend in the average concentration over the period 1976 to 1996. The three-year mean of the average concentrations at the seven trend sites decreased by 31% between 1976-1978 and 1994-1996. There were no exceedances of the federal annual nitrogen dioxide standard in the Basin in 1996. The three-year average number of days exceeding the state standard at the seven trend sites between 1976 and 1996 decreased by 100%, from an average of 12 days in 1976-1978 to zero days in 1994-1996.

Sulfur Dioxide

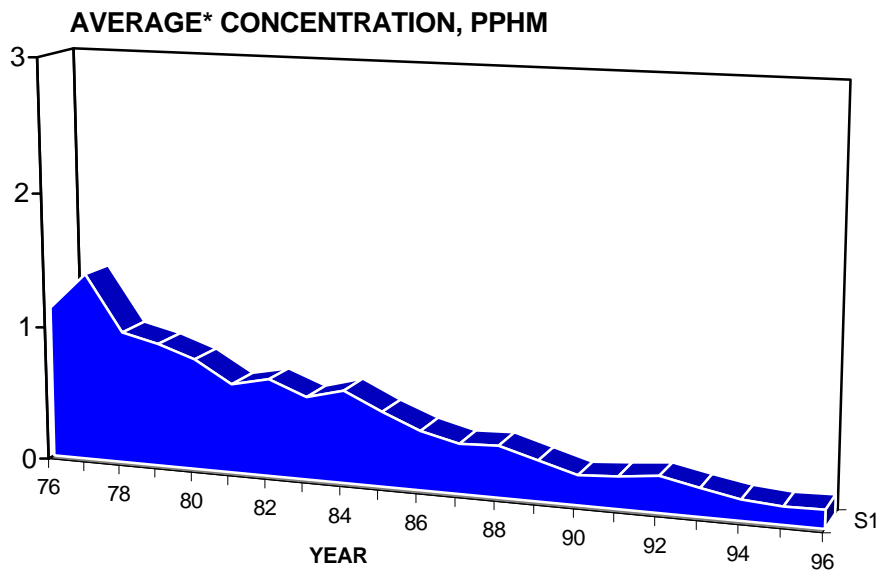
Sulfur dioxide concentrations continued to remain well below the state and federal standards in 1996. Figure 15 shows the average of the annual mean sulfur dioxide concentrations at four sites with complete data for the period 1976-1996. The average concentration at the four trend sites decreased 88% between 1976-1978 and 1994-1996.

Current Air Quality and Trends
in the South Coast Air Quality Management District



*Average concentration for 7 sites with complete data throughout the period.

Figure 14
NITROGEN DIOXIDE
Annual Average * Concentration (pphm), 1976-1996

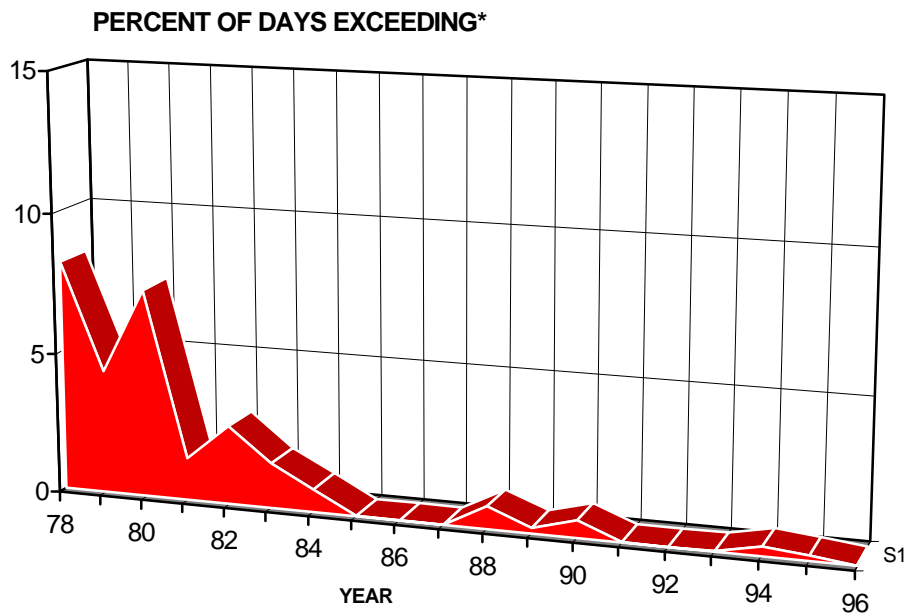


*Average of annual concentration at 4 sites with complete data throughout the period.

Figure 15
SULFUR DIOXIDE
Annual Average * Concentration (pphm), 1976-1996

Sulfate

Figure 16 shows the average percent of days exceeding the state sulfate standard for 10 sites with complete data for the years 1978-1996. No areas of the Basin exceeded the state sulfate standard in 1996. The three year average percent of days exceeding the state sulfate standard decreased by 98% between 1978-1980 and 1994-1996.



*Average percent of days sampled exceeding standard for 10 sites with complete data.

Figure 16
SULFATE
Average * Percent of Days Exceeding Standards, 1978-1996

FURTHER INFORMATION

The maximum concentrations and the number of exceedances in all areas of the District are given in the one page report “1996 Air Quality.” The location of the District’s air monitoring stations and cities that are in each area are shown in the map “South Coast Air Quality Management District and Air Monitoring Areas.” Both of these documents are available free of charge, and may be obtained by calling (800)242-4666 or by writing to the District, attention of the Public Advisor.

Subscriptions to the monthly “Air Quality Standards Compliance Report” which contains detailed information on the number of days and locations where state and federal ambient air quality standards are exceeded, are available by writing to the South Coast Air Quality Management District, attention of the Public Advisor, or by calling (800)242-4666. Subscription request forms for subscribing to the AQSCR may be obtained by calling (909)396-3720. The annual subscription fee for the calendar year 1997 is \$6.00.

Author:	Shoreh Cohanin
Reviewed by:	Laki Tisopulos Kathy Hsiao
Contributors: SCAQMD	Joe Cassmassi Dennis Delaney Curt Miller Steve Barbosa Solomon Teffera Sandra Ryan Leonard Edwards Aida Ganaden
U.S. EPA	Coe Owen

