# Chapter 4

# Air Basin Trends and Forecasts -- Criteria Pollutants

# *Introduction*

This chapter includes information about criteria pollutant emission and air quality trends in California's five most populated air basins: the South Coast Air Basin, the San Francisco Bay Area Air Basin, the San Joaquin Valley Air Basin, the San Diego Air Basin, and the Sacramento Valley Air Basin. The primary focus of the chapter is ozone, particulate matter ($PM_{10}$ and $PM_{2.5}$), and carbon monoxide (CO). However, information on nitrogen dioxide ($NO_2$) is included for the South Coast Air Basin and San Diego Air Basin. Although these areas were once designated as nonattainment for $NO_2$, both areas now attain the nitrogen dioxide standards

The introduction section for each air basin includes a description of the area, a discussion of the emission trends and forecasts for each pollutant, and a description of the changes in population and the number of vehicle miles traveled each day in the air basin. This introduction is followed by more detailed discussions of trends and forecasts in emissions by major source categories and trends in ambient air quality, organized by pollutant.

The emissions discussion for each air basin includes information on both $PM_{10}$ and $PM_{2.5}$. In contrast, the air quality discussion includes only $PM_{10}$. At this time, air quality information for $PM_{2.5}$ is limited, and not yet sufficient for trends analysis. However, those $PM_{2.5}$ data that are available are summarized in Chapter 2.

# *South Coast Air Basin*

## Introduction - Area Description

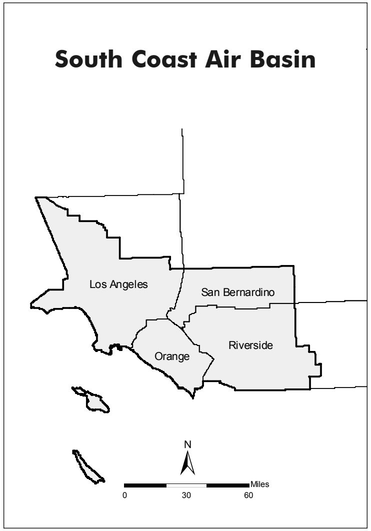


Figure 4-1

The South Coast Air Basin is California's largest metropolitan region. The area includes the southern two-thirds of Los Angeles County, all of Orange County, and the western urbanized portions of Riverside and San Bernardino counties. It covers a total of 6,729 square miles, is home to more than 40 percent of California's population, and generates about 29 percent of the State's total criteria pollutant emissions.

The South Coast Air Basin generally forms a lowland plain, bounded by the Pacific Ocean on the west and by mountains on the other three sides. In terms of air pollution potential, there are probably few areas less suited for urban development. The warm sunny weather associated with a persistent high pressure system is conducive to the formation of ozone, commonly referred to as "smog." The problem is further aggravated by the surrounding mountains, frequent low inversion heights, and stagnant air conditions. All of these factors act together to trap pollutants in the air basin.

Pollutant concentrations in parts of the South Coast Air Basin are among the highest in California. As a result, controlling the contributing emission sources poses a great challenge to State and local air pollution control agencies.

# *South Coast Air Basin*

## Emission Trends and Forecasts

Overall, since 1975 the emission levels for CO and the ozone precursors $NO_x$ and ROG have been decreasing in the South Coast Air Basin and are projected to continue decreasing through 2010. The decreases are predominantly due to motor vehicle controls and reductions in evaporative emissions. In the South Coast Air Basin, on-road motor vehicles are the largest contributors to CO, $NO_x$, and ROG emissions. Other mobile sources are also significant contributors to CO and $NO_x$ emissions. State Implementation Plan (SIP) and conformity inventory forecasts may differ from the forecasts presented in this almanac. For more information on these forecasts, please see the ARB SIP web page at *www.arb.ca.gov/planning/sip/sip.htm*.

# *South Coast Air Basin*

## Population and VMT

Both population and the daily number of vehicle miles traveled, or VMT, grew at high rates in the South Coast Air Basin from 1982 to 2001. The population increased 36 percent -- from about 11 million in 1982 to almost 15 million in 2001. During the same general period, the number of vehicle miles traveled each day increased 90 percent -- from 168 million miles per day in 1982 to almost 322 million miles per day in 2001. While high growth rates are often associated with corresponding increases in emissions and pollutant concentrations, aggressive emission control programs in the South Coast Air Basin have resulted in emission decreases and a continuing improvement in air quality.

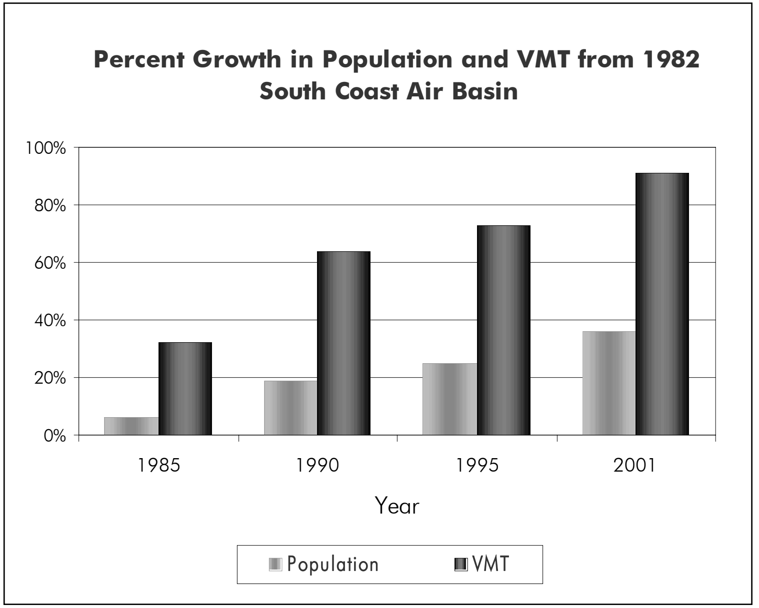


Figure 4-2

# *South Coast Air Basin*

## Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursors $NO_x$ and ROG in the South Coast Air Basin are generally following the statewide downward trend. Motor vehicle miles traveled in the basin are increasing, but $NO_x$ and ROG emissions from on-road vehicles are dropping as more stringent vehicle emission standards have been adopted. These decreases in $NO_x$ and ROG emissions are projected to continue between 2000 and 2010, as even more stringent motor vehicle standards are implemented and as newer, lower-emitting vehicles become a larger percentage of the fleet. $NO_x$ emissions from electric utilities in the air basin have declined substantially since 1975, despite a nationwide increase in emissions from electric utilities in the same time period. These large reductions are primarily due to increased use of natural gas as the principal fuel for power plants, and control rules that limit $NO_x$ emissions.

| NOx Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***1765*** | ***1677*** | ***1770*** | ***1660*** | ***1362*** | ***1165*** | ***927*** | ***730*** |
| **Stationary Sources** | 358 | 319 | 280 | 195 | 153 | 110 | 84 | 80 |
| **Area-wide Sources** | 31 | 34 | 35 | 28 | 27 | 30 | 32 | 27 |
| **On-Road Mobile** | 1026 | 954 | 1094 | 1065 | 874 | 727 | 535 | 389 |
| **Gasoline Vehicles** | 921 | 768 | 788 | 702 | 591 | 428 | 266 | 183 |
| **Diesel Vehicles** | 105 | 186 | 306 | 363 | 283 | 299 | 269 | 206 |
| **Other Mobile** | 350 | 370 | 362 | 374 | 308 | 298 | 275 | 234 |

Table 4-1

| ROG Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***2492*** | ***2162*** | ***2133*** | ***1624*** | ***1171*** | ***918*** | ***671*** | ***572*** |
| **Stationary Sources** | 472 | 413 | 419 | 378 | 201 | 163 | 126 | 134 |
| **Area-wide Sources** | 201 | 217 | 240 | 210 | 184 | 192 | 169 | 159 |
| **On-Road Mobile** | 1684 | 1387 | 1317 | 864 | 614 | 408 | 271 | 193 |
| **Gasoline Vehicles** | 1678 | 1376 | 1299 | 847 | 601 | 398 | 261 | 185 |
| **Diesel Vehicles** | 6 | 12 | 18 | 17 | 13 | 10 | 9 | 8 |
| **Other Mobile** | 136 | 145 | 156 | 172 | 171 | 155 | 106 | 86 |

Table 4-2

# *South Coast Air Basin*
## Ozone Precursor Emission Trends and Forecasts

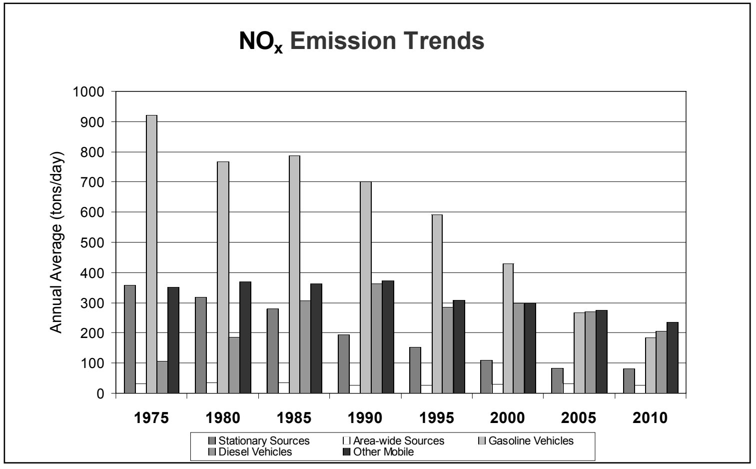


Figure 4-3

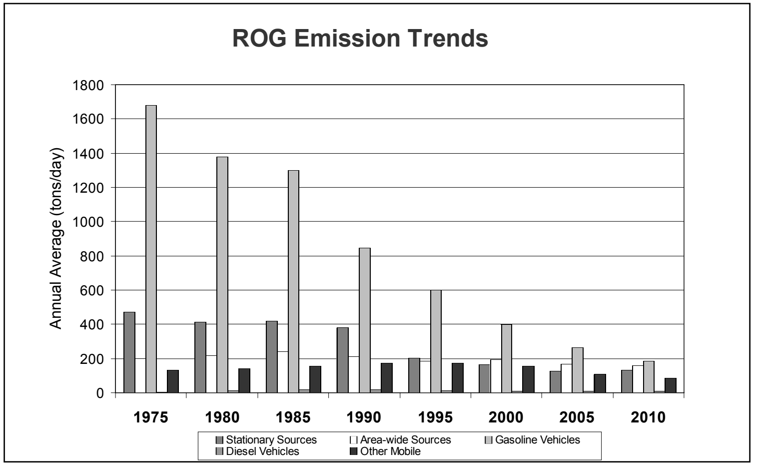


Figure 4-4

# *South Coast Air Basin*

## Ozone Air Quality Trend

Air quality as it relates to ozone in the South Coast Air Basin has improved substantially over the last 30 years. During the 1960s, maximum 1-hour concentrations were above 0.60 parts per million. Today, the maximum measured concentrations are less than one-third of that. All of the ozone statistics show an overall, steady decline. The 2001 peak 1-hour indicator value is more than 50 percent lower than the 1982 value. The maximum 1-hour concentration has also decreased more than 50 percent. The number of days above the standards has declined dramatically, as have the number of Stage I and Stage II episode days.

The ARB has identified the South CoastAir Basin as a transport contributor to several downwind areas -- the Mojave Desert Air Basin, the Salton Sea Air Basin, the San Diego Air Basin, and the South Central Coast Air Basin. As ozone concentrations in the South Coast Air Basin decline further, the transport impact on the downwind areas should also decrease.

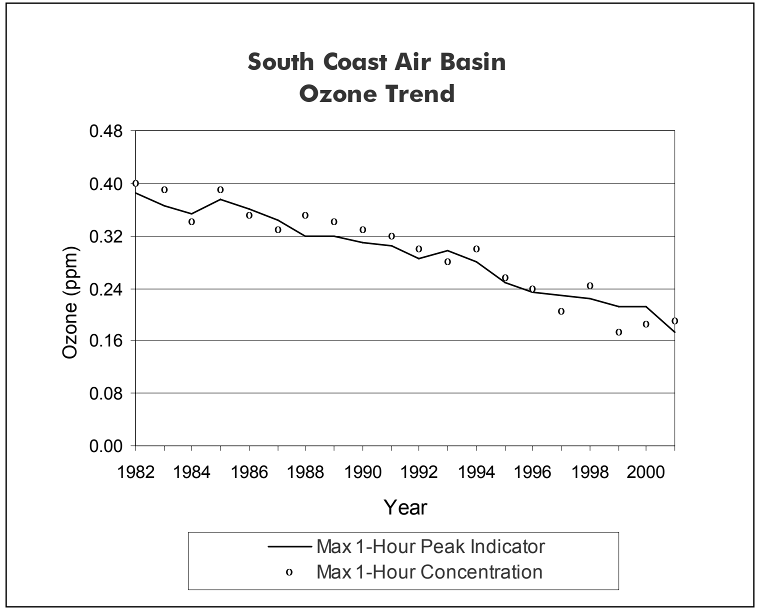


Figure 4-5

# *South Coast Air Basin*

## Ozone Air Quality Table

| OZONE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hour Indicator | 0.385 | 0.365 | 0.354 | 0.375 | 0.360 | 0.344 | 0.319 | 0.320 | 0.310 | 0.304 | 0.286 | 0.297 | 0.279 | 0.249 | 0.233 | 0.229 | 0.224 | 0.211 | 0.213 | 0.172 |
| 4th High 1-Hr in 3 Yrs | 0.390 | 0.360 | 0.360 | 0.360 | 0.350 | 0.350 | 0.340 | 0.330 | 0.330 | 0.310 | 0.300 | 0.300 | 0.280 | 0.250 | 0.231 | 0.215 | 0.217 | 0.211 | 0.211 | 0.170 |
| Avg of 4th Hi 8-Hr in 3 Yrs | 0.233 | 0.229 | 0.225 | 0.226 | 0.222 | 0.217 | 0.205 | 0.192 | 0.186 | 0.182 | 0.180 | 0.177 | 0.171 | 0.165 | 0.161 | 0.148 | 0.154 | 0.147 | 0.146 | 0.129 |
| Maximum 1-Hr. Concentration | 0.400 | 0.390 | 0.340 | 0.390 | 0.350 | 0.330 | 0.350 | 0.340 | 0.330 | 0.320 | 0.300 | 0.280 | 0.300 | 0.256 | 0.239 | 0.205 | 0.244 | 0.174 | 0.184 | 0.190 |
| Max. 8-Hr. Concentration | 0.265 | 0.258 | 0.248 | 0.288 | 0.251 | 0.210 | 0.258 | 0.252 | 0.193 | 0.203 | 0.218 | 0.195 | 0.208 | 0.203 | 0.173 | 0.148 | 0.206 | 0.142 | 0.149 | 0.144 |
| Days Above State Standard | 198 | 192 | 209 | 207 | 217 | 196 | 216 | 211 | 185 | 184 | 190 | 185 | 165 | 153 | 141 | 144 | 107 | 111 | 115 | 121 |
| Days Above Nat. 1-Hr. Std. | 151 | 153 | 175 | 158 | 167 | 161 | 178 | 157 | 131 | 130 | 142 | 124 | 118 | 98 | 85 | 64 | 60 | 39 | 33 | 36 |
| Days Above Nat. 8-Hr. Std. | 166 | 169 | 190 | 181 | 191 | 179 | 194 | 181 | 161 | 160 | 173 | 161 | 148 | 120 | 115 | 118 | 93 | 93 | 94 | 92 |

Table 4-3

# South Coast Air Basin

## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ have been increasing in the South Coast Air Basin since 1975. A decrease in emissions would have been observed, if not for growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads and other sources. The increase in activity of these area-wide sources reflects the increased growth and vehicle miles traveled (VMT) in the air basin.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 35 percent of the ambient $PM_{10}$ in the South Coast Air Basin.

| Directly Emitted $PM_{10}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***239*** | ***250*** | ***277*** | ***345*** | ***322*** | ***291*** | ***292*** | ***299*** |
| **Stationary Sources** | 57 | 40 | 27 | 27 | 16 | 16 | 16 | 17 |
| **Area-wide Sources** | 145 | 168 | 203 | 269 | 268 | 237 | 239 | 246 |
| **On-Road Mobile** | 15 | 17 | 24 | 25 | 20 | 18 | 18 | 18 |
| Gasoline Vehicles | 10 | 8 | 9 | 10 | 11 | 12 | 13 | 15 |
| Diesel Vehicles | 5 | 9 | 15 | 15 | 9 | 6 | 5 | 4 |
| **Other Mobile** | 23 | 24 | 23 | 25 | 19 | 19 | 19 | 18 |

Table 4-4

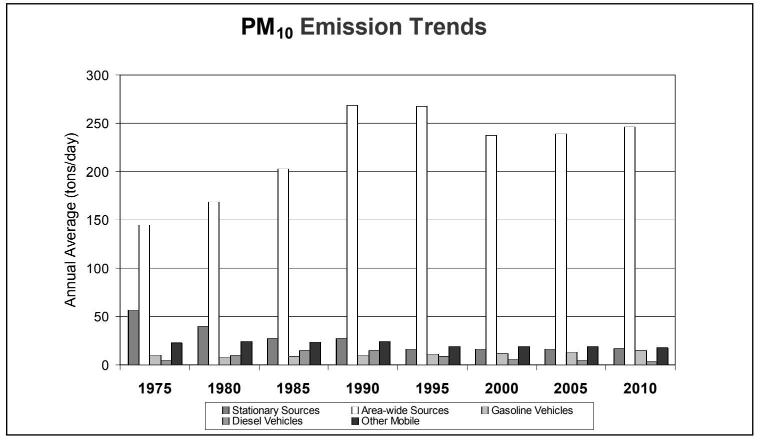


Figure 4-6

# *South Coast Air Basin*

## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ have been relatively steady in the South Coast Air Basin since 1975. Stationary source emissions have been decreasing, while area-wide emissions have been increasing. A decrease in emissions would have been observed, if not for growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads and other sources. The increase in activity of these area-wide sources reflects the increased growth and vehicle miles traveled (VMT) in the air basin.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 60 percent of the ambient $PM_{2.5}$ in the South Coast Air Basin.

| Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***125*** | ***116*** | ***118*** | ***130*** | ***110*** | ***108*** | ***110*** | ***111*** |
| **Stationary Sources** | 53 | 34 | 22 | 24 | 14 | 13 | 13 | 14 |
| **Area-wide Sources** | 41 | 47 | 56 | 65 | 65 | 66 | 68 | 69 |
| **On-Road Mobile** | 11 | 13 | 19 | 19 | 14 | 12 | 12 | 12 |
| **Gasoline Vehicles** | 6 | 5 | 5 | 6 | 6 | 7 | 8 | 9 |
| **Diesel Vehicles** | 5 | 9 | 14 | 13 | 8 | 6 | 5 | 4 |
| **Other Mobile** | 21 | 22 | 21 | 22 | 17 | 17 | 17 | 16 |

Table 4-5

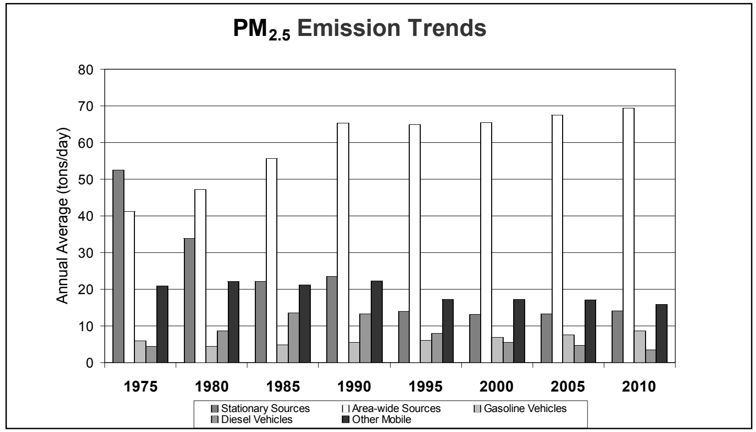


Figure 4-7

# *South Coast Air Basin*

## $PM_{10}$ Air Quality Trend

As with other pollutants, the $PM_{10}$ statistics also show overall improvement. During the period for which data are available, the maximum annual average of quarters decreased about 33 percent. Although the values for the last several years show some variability, this is probably due to meteorology rather than a change in emissions. Despite the overall decrease, ambient concentrations still exceed the State annual and 24-hour $PM_{10}$ standards. Similar to the ambient concentrations, the calculated number of days above the 24-hour $PM_{10}$ standards has also shown an overall drop. During 1988, there were 345 calculated days above the State standard and 44 calculated days above the national standard. By 2001, there were still 278 calculated State standard exceedance days. In contrast, there were only 5 calculated national standard exceedance days.

Despite these decreases, $PM_{10}$ continues to pose a significant problem in the South Coast Air Basin. While emission controls implemented for ozone will also benefit $PM_{10}$, more controls aimed specifically at reducing $PM_{10}$ will be needed to reach attainment.

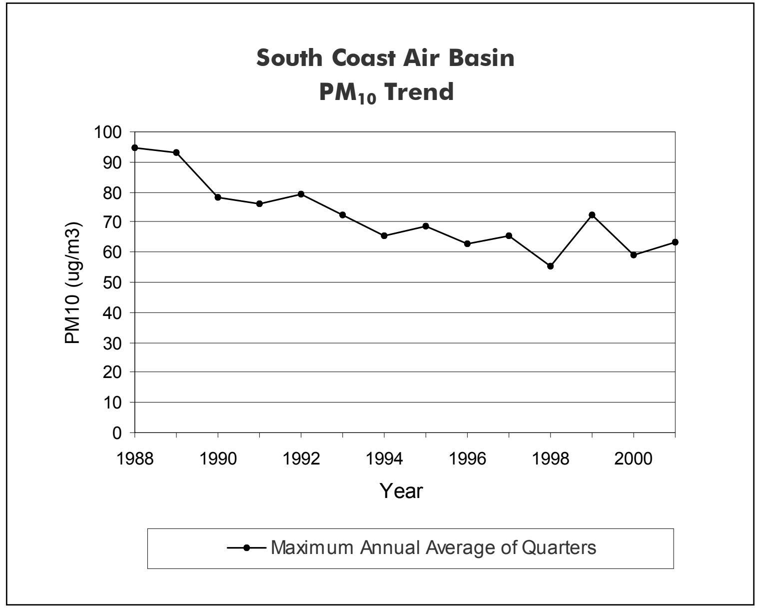


Figure 4-8

# *South Coast Air Basin*

## $PM_{10}$ Air Quality Table

| $PM_{10}$ (ug/m3) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hour Concentration | | | | | | | 289 | 271 | 475 | 179 | 649 | 231 | 161 | 219 | 162 | 208 | 116 | 183 | 139 | 219 |
| Max. Avg. of Quarters | | | | | | | 94.5 | 93.0 | 78.2 | 76.1 | 79.0 | 72.5 | 65.5 | 68.8 | 62.8 | 65.6 | 55.3 | 72.2 | 59.1 | 63.3 |
| Calc Days Above State 24-Hr Std | | | | | | | 345 | 338 | 301 | 294 | 282 | 293 | 276 | 252 | 276 | 290 | 238 | 288 | 300 | 278 |
| Calc Days Above Nat 24-Hr Std | | | | | | | 44 | 32 | 33 | 15 | 24 | 12 | 3 | 31 | 6 | 17 | 0 | 6 | 0 | 5 |

Table 4-6

# *South Coast Air Basin*
## Carbon Monoxide Emission Trends and Forecasts

Emissions of CO have been trending downward since 1975 in the South Coast Air Basin even though motor vehicle miles traveled have increased and industrial activity has grown. On-road motor vehicle controls are primarily responsible for this decline in emissions of CO. Stationary source emissions decreased during the 1970s and 1980s as a result of a decline in the manufacture of carbon black (a material used in the manufacture of tires) and steel in the South Coast Air Basin. CO emissions from other mobile sources are projected to decrease as more stringent emission standards are adopted.

| CO Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***15849*** | ***13068*** | ***12813*** | ***10051*** | ***7306*** | ***5281*** | ***3736*** | ***2883*** |
| **Stationary Sources** | 315 | 306 | 94 | 120 | 97 | 78 | 78 | 79 |
| **Area-wide Sources** | 54 | 51 | 82 | 70 | 87 | 142 | 158 | 161 |
| **On-Road Mobile** | 14571 | 11754 | 11622 | 8750 | 6116 | 4168 | 2670 | 1861 |
| **Gasoline Vehicles** | 14546 | 11708 | 11545 | 8670 | 6055 | 4119 | 2626 | 1823 |
| **Diesel Vehicles** | 25 | 47 | 78 | 81 | 61 | 49 | 44 | 38 |
| **Other Mobile** | 909 | 956 | 1015 | 1111 | 1006 | 892 | 831 | 782 |

Table 4-7

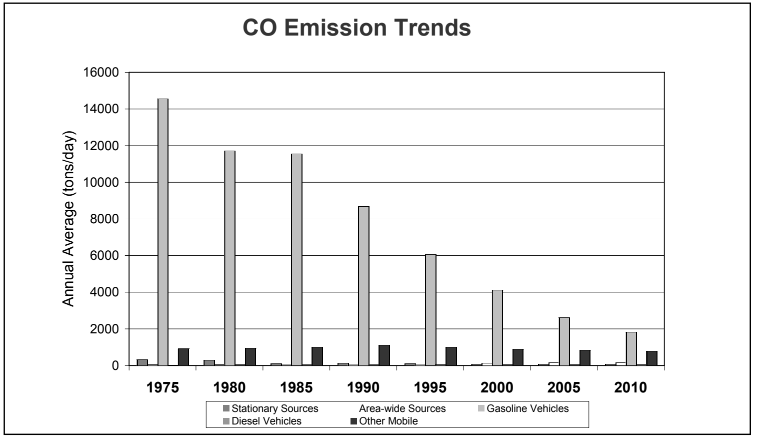


Figure 4-9

# *South Coast Air Basin*
## Carbon Monoxide Air Quality Trend

Carbon monoxide concentrations in the South Coast Air Basin have decreased markedly -- a total decrease of 54 percent in the maximum peak 8-hour indicator since 1982. The number of standard exceedance days has also declined. There were 79 days above the State standard and 68 days above the national standard during 1982. However, during 2001, there were no exceedances of either standard. This marks the first year with no exceedances. However, additional years of data are needed to confirm whether this trend will continue.

While the entire South Coast Air Basin is designated as nonattainment for the national CO standards and Los Angeles County is designated as nonattainment for the State standards, CO violations have been limited to a small portion of Los Angeles County. No violations have occurred in the other three counties since 1992. Continuing reductions in motor vehicle emissions should continue reducing ambient CO concentrations.

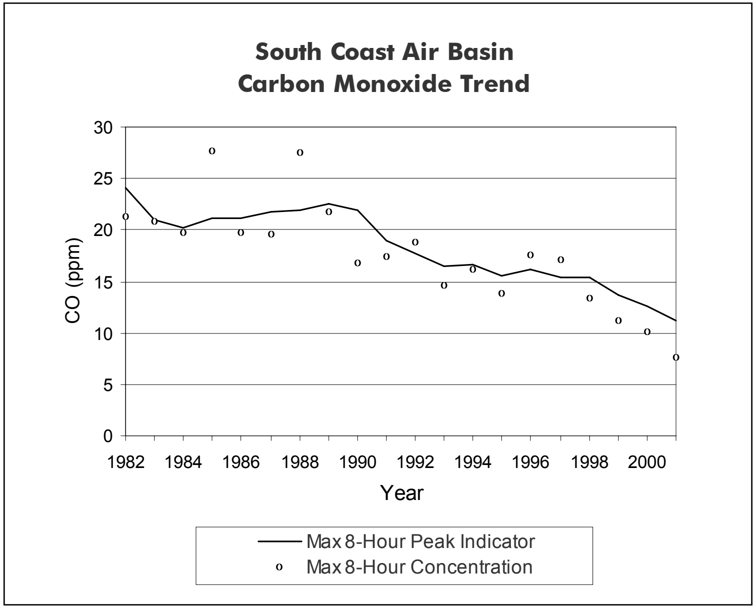


Figure 4-10

# *South Coast Air Basin*

## Carbon Monoxide Air Quality Table

| CARBON MONOXIDE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator | 24.1 | 21.0 | 20.2 | 21.1 | 21.1 | 21.7 | 21.9 | 22.5 | 21.9 | 19.0 | 17.7 | 16.5 | 16.7 | 15.6 | 16.1 | 15.4 | 15.4 | 13.7 | 12.6 | 11.2 |
| Max. 1-Hr. Concentration | 27.0 | 31.0 | 29.0 | 33.0 | 27.0 | 26.0 | 32.0 | 31.0 | 24.0 | 30.0 | 28.0 | 21.0 | 24.9 | 16.8 | 22.5 | 19.2 | 17.0 | 19.0 | 13.8 | 11.7 |
| Max. 8-Hr. Concentration | 21.3 | 20.9 | 19.7 | 27.7 | 19.7 | 19.6 | 27.5 | 21.8 | 16.8 | 17.4 | 18.8 | 14.6 | 16.1 | 13.8 | 17.5 | 17.1 | 13.3 | 11.2 | 10.1 | 7.6 |
| Days Above State 8-Hr. Std. | 79 | 67 | 79 | 64 | 58 | 50 | 73 | 71 | 50 | 51 | 39 | 29 | 27 | 17 | 26 | 18 | 13 | 11 | 6 | 0 |
| Days Above Nat. 8-Hr. Std. | 68 | 57 | 66 | 54 | 49 | 40 | 65 | 67 | 42 | 41 | 34 | 19 | 19 | 14 | 19 | 13 | 10 | 7 | 3 | 0 |

Table 4-8

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# *South Coast Air Basin*

## Nitrogen Dioxide

### Oxides of Nitrogen Emission Trends and Forecasts

$NO_x$ (and nitrogen dioxide) emissions in the South Coast Air Basin have been trending downward since 1985. This decline should continue as more stringent motor vehicle and stationary source emission standards are adopted and implemented.

| NOx Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***1765*** | ***1677*** | ***1770*** | ***1660*** | ***1362*** | ***1165*** | ***927*** | ***730*** |
| **Stationary Sources** | 358 | 319 | 280 | 195 | 153 | 110 | 84 | 80 |
| **Area-wide Sources** | 31 | 34 | 35 | 28 | 27 | 30 | 32 | 27 |
| **On-Road Mobile** | 1026 | 954 | 1094 | 1065 | 874 | 727 | 535 | 389 |
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| **Diesel Vehicles** | 105 | 186 | 306 | 363 | 283 | 299 | 269 | 206 |
| **Other Mobile** | 350 | 370 | 362 | 374 | 308 | 298 | 275 | 234 |

Table 4-9

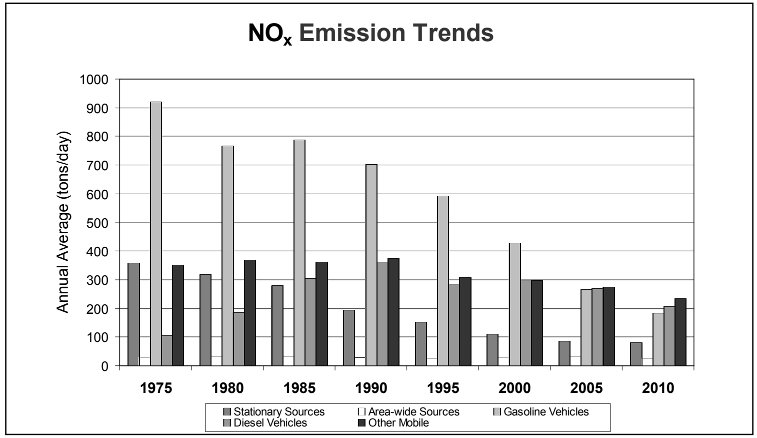


Figure 4-11

# *South Coast Air Basin*

## Nitrogen Dioxide Air Quality Trend

The South Coast Air Basin is one of only a few areas in California where nitrogen dioxide has been a problem. However, over the last 20 years, there has been a fairly steady decline in $NO_2$ values. The maximum peak 1-hour indicator for 2001 was nearly half what it was during 1982. Nitrogen dioxide concentrations in the South Coast area no longer violate the State and national standards. Furthermore, the downward trend should continue in the future.

Nitrogen dioxide is formed from emissions of oxides of nitrogen, which also contribute to ozone. As a result, the majority of the future emission control measures will be implemented as part of the overall ozone control strategy. Many of these control measures will target mobile sources, which account for more than three-quarters of California's oxides of nitrogen emissions.

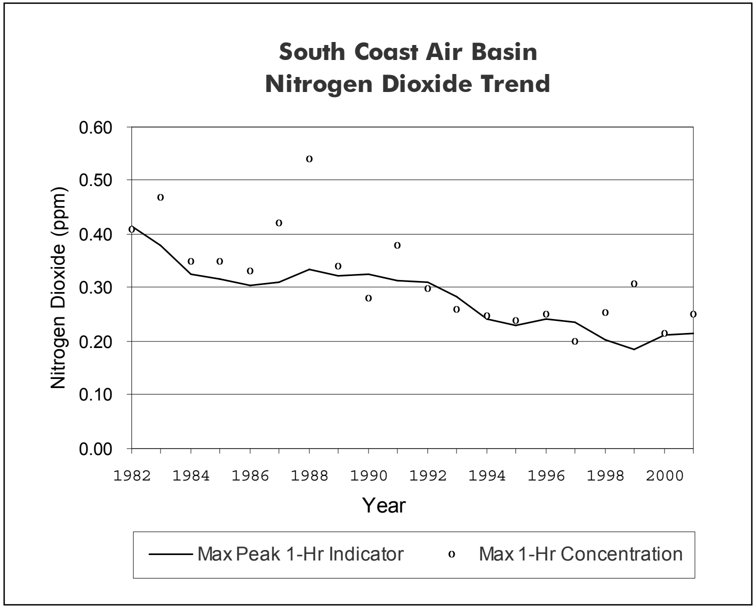


Figure 4-12

# *South Coast Air Basin*

## Nitrogen Dioxide Air Quality Table

| NITROGEN DIOXIDE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hr. Indicator | 0.414 | 0.378 | 0.325 | 0.317 | 0.303 | 0.311 | 0.335 | 0.322 | 0.324 | 0.312 | 0.311 | 0.285 | 0.241 | 0.229 | 0.242 | 0.237 | 0.203 | 0.185 | 0.213 | 0.216 |
| Max. 1-Hr. Concentration | 0.410 | 0.470 | 0.350 | 0.350 | 0.330 | 0.420 | 0.540 | 0.340 | 0.280 | 0.380 | 0.300 | 0.260 | 0.247 | 0.239 | 0.250 | 0.200 | 0.255 | 0.307 | 0.214 | 0.251 |
| Max. Annual Average | 0.062 | 0.059 | 0.057 | 0.060 | 0.061 | 0.055 | 0.061 | 0.057 | 0.055 | 0.055 | 0.051 | 0.050 | 0.050 | 0.046 | 0.042 | 0.043 | 0.043 | 0.051 | 0.044 | 0.041 |

Table 4-10

# *San Francisco Bay Area Air Basin*

## Introduction - Area Description


Figure 4-13

The San Francisco Bay Area is California's second largest metropolitan area and is the focal point of northern California. The nine county area comprises all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties, the southern half of Sonoma County, and the southwestern portion of Solano County. The unifying feature of the area is the Bay itself, which is oriented north-south and covers about 400 square miles of the area's total 5,545 square miles. Close to 20 percent of California's population resides in the San Francisco Bay Area, and pollution sources in the region account for about 16 percent of the total statewide criteria pollutant emissions. The climate in the San Francisco Bay Area varies from one location to the next. Along the coast, temperatures are mild year-round. However, as one moves inland, temperatures show larger diurnal and seasonal variations. Overall air quality in the San Francisco Bay Area Air Basin is better than in the South Coast Air Basin. This is due to a more favorable climate, with cooler temperatures and better ventilation. However, exceedances of the ozone standards continue to occur in the San Francisco Bay Area Air Basin, and still pose challenges to State and local air pollution control agencies.

# *San Francisco Bay Area Air Basin*
## Emission Trends and Forecasts

The emission levels for the ozone precursors $NO_x$ and ROG have been trending downward in the San Francisco Bay Area Air Basin since 1990 and 1980, respectively. CO emissions have also been trending downward since 1985. On-road motor vehicles are the largest contributors to CO, ROG, and $NO_x$ emissions in the air basin. The implementation of stricter mobile source (both on-road and other) emission standards will continue to decrease vehicle emissions in this air basin. Controls on stationary source solvent evaporation and fugitive emissions will also continue to impact ROG emissions.

# *San Francisco Bay Area Air Basin*

## Population and VMT

Compared with the statewide totals, population and the number of vehicle miles traveled each day grew at a slower rate in the San Francisco Bay Area Air Basin from 1982 to 2001. During that 20-year period, the population increased about 29 percent, from about 5.2 million in 1982 to more than 6.7 million in 2001. During the same period, the daily VMT increased 71 percent: from 95 million miles per day in 1982 to over 162 million miles per day in 2001. While these growth rates are lower than the growth rates seen in other areas, they still represent substantial increases.

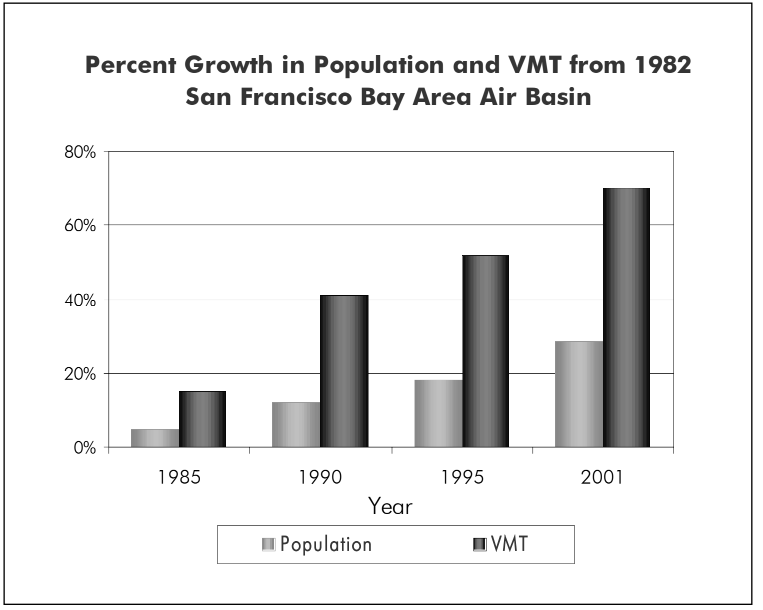


Figure 4-14

# *San Francisco Bay Area Air Basin*

## Ozone Precursor Emission Trends and Forecasts

Emissions of ozone precursors have decreased in the San Francisco Bay Area Air Basin since the 1980s and are projected to continue declining through 2010. The Bay Area has a significant motor vehicle population, and the implementation of stricter motor vehicle controls has resulted in significant emissions reductions for $NO_x$ and ROG. Stationary source emissions of ROG have declined over the last 20 years due to new controls for oil refinery fugitive emissions and new rules for control of ROG from various industrial coatings and solvent operations.

| NOx Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***999*** | ***990*** | ***928*** | ***898*** | ***759*** | ***668*** | ***542*** | ***453*** |
| **Stationary Sources** | 247 | 224 | 154 | 152 | 120 | 121 | 74 | 75 |
| **Area-wide Sources** | 16 | 17 | 18 | 22 | 23 | 22 | 22 | 22 |
| **On-Road Mobile** | 552 | 570 | 566 | 524 | 437 | 352 | 286 | 217 |
| Gasoline Vehicles | 497 | 478 | 417 | 348 | 294 | 208 | 155 | 114 |
| Diesel Vehicles | 55 | 92 | 149 | 176 | 142 | 144 | 131 | 103 |
| **Other Mobile** | 183 | 179 | 190 | 200 | 179 | 173 | 160 | 138 |

Table 4-11

| ROG Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***1461*** | ***1375*** | ***1106*** | ***781*** | ***635*** | ***494*** | ***394*** | ***344*** |
| **Stationary Sources** | 365 | 333 | 229 | 136 | 137 | 116 | 100 | 98 |
| **Area-wide Sources** | 144 | 137 | 129 | 128 | 97 | 91 | 86 | 85 |
| **On-Road Mobile** | 873 | 822 | 658 | 421 | 309 | 208 | 152 | 113 |
| Gasoline Vehicles | 869 | 816 | 649 | 413 | 303 | 202 | 146 | 108 |
| Diesel Vehicles | 3 | 6 | 9 | 8 | 6 | 6 | 6 | 5 |
| **Other Mobile** | 80 | 83 | 90 | 97 | 91 | 78 | 57 | 47 |

Table 4-12

# *San Francisco Bay Area Air Basin*
## Ozone Precursor Emission Trends and Forecasts

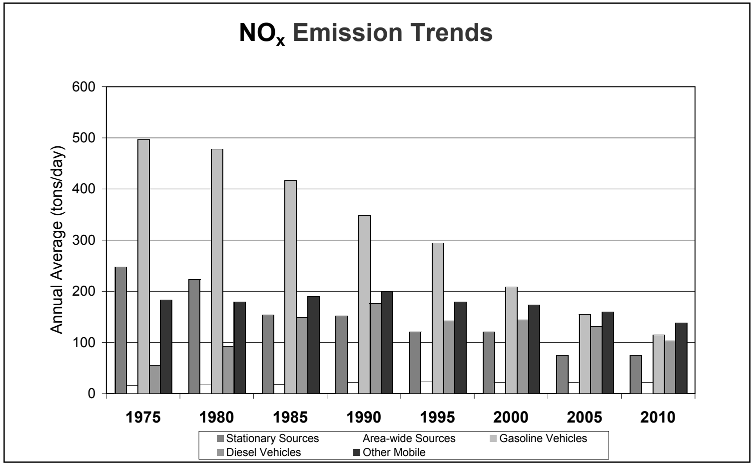


Figure 4-15

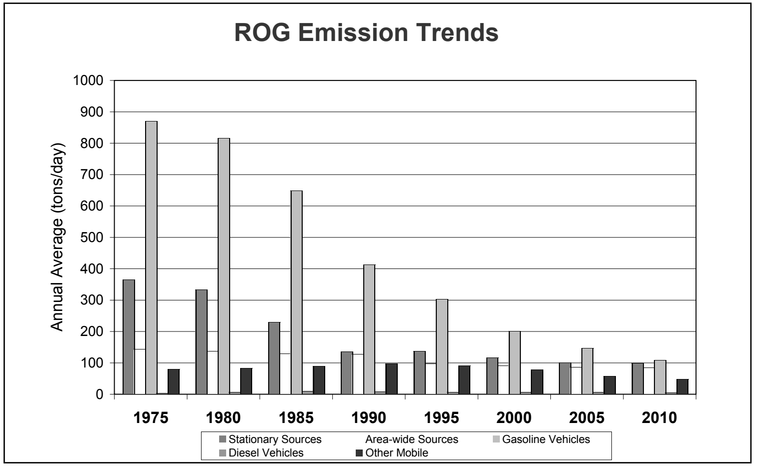


Figure 4-16

# *San Francisco Bay Area Air Basin*

## Ozone Air Quality Trend

Ozone concentrations in the San Francisco Bay Area are much lower than in the South Coast Air Basin. The peak 1-hour indicator declined about 21 percent from 1982 to 2001. Although the trend has not been consistently downward, the ambient concentrations generally declined from 1982 to 1994. Since 1994, the peak indicator values have been somewhat higher. However, it is not yet clear whether these data represent a significant change in the overall trend. Data for 1999 through 2001 are lower than values during the prior few years. The number of days above the State and national 1-hour standards show a similar trend.

Bacause of meteorology, ozone and ozone precursor emissions can be transported from one air basin to another. The ARB has identified the San Francisco Bay Area Air Basin as a transport contributor to the following six areas: the Broader Sacramento Area, the Mountain Counties Air Basin, the North Central Coast Air Basin, the North Coast Air Basin, the San Joaquin Valley Air Basin, and the South Central Coast Air Basin. The amount of transport impact varies from day to day, depending in large part on meteorology. To the extent that the Bay Area continues to reduce ozone precursor emissions, the transport impact on downwind areas should also decrease.

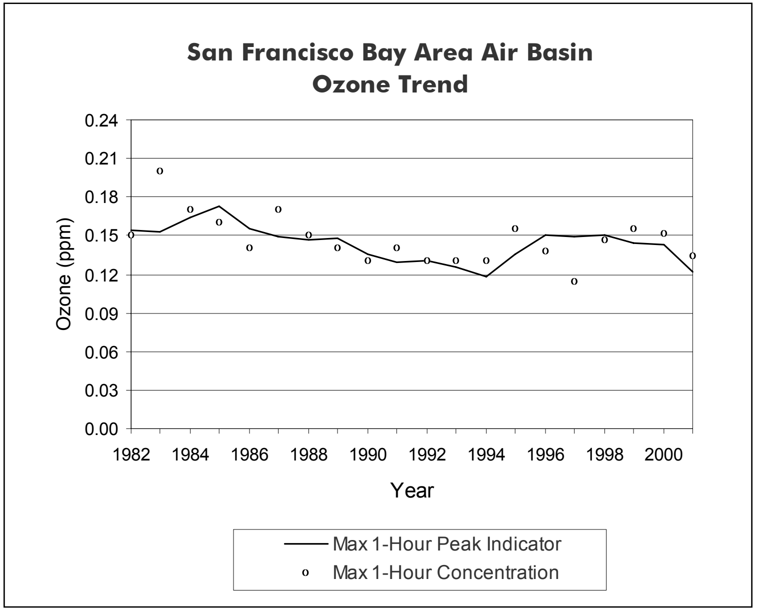


Figure 4-17

# *San Francisco Bay Area Air Basin*

## Ozone Air Quality Table

| OZONE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hour Indicator | 0.154 | 0.153 | 0.164 | 0.173 | 0.155 | 0.149 | 0.147 | 0.148 | 0.136 | 0.129 | 0.130 | 0.126 | 0.118 | 0.135 | 0.151 | 0.149 | 0.151 | 0.144 | 0.143 | 0.122 |
| 4th High 1-Hr in 3 Yrs | 0.180 | 0.160 | 0.160 | 0.160 | 0.150 | 0.140 | 0.140 | 0.140 | 0.130 | 0.130 | 0.120 | 0.120 | 0.121 | 0.138 | 0.138 | 0.138 | 0.138 | 0.139 | 0.139 | 0.126 |
| Avg of 4th Hi 8-Hr in 3 Yrs | 0.094 | 0.095 | 0.100 | 0.103 | 0.097 | 0.092 | 0.092 | 0.097 | 0.088 | 0.084 | 0.082 | 0.081 | 0.082 | 0.087 | 0.093 | 0.090 | 0.089 | 0.086 | 0.087 | 0.082 |
| Maximum 1-Hr. Concentration | 0.150 | 0.200 | 0.170 | 0.160 | 0.140 | 0.170 | 0.150 | 0.140 | 0.130 | 0.140 | 0.130 | 0.130 | 0.130 | 0.155 | 0.138 | 0.114 | 0.147 | 0.156 | 0.152 | 0.134 |
| Max. 8-Hr. Concentration | 0.108 | 0.150 | 0.124 | 0.127 | 0.106 | 0.116 | 0.101 | 0.102 | 0.105 | 0.108 | 0.101 | 0.112 | 0.097 | 0.115 | 0.112 | 0.084 | 0.111 | 0.122 | 0.114 | 0.102 |
| Days Above State Standard | 36 | 53 | 55 | 45 | 39 | 46 | 41 | 22 | 14 | 23 | 23 | 19 | 13 | 28 | 34 | 8 | 29 | 20 | 12 | 15 |
| Days Above Nat. 1-Hr. Std. | 5 | 21 | 22 | 9 | 5 | 14 | 5 | 4 | 2 | 2 | 2 | 3 | 2 | 11 | 8 | 0 | 8 | 3 | 3 | 1 |
| Days Above Nat. 8-Hr. Std. | 13 | 26 | 32 | 17 | 13 | 29 | 20 | 13 | 7 | 6 | 6 | 5 | 4 | 18 | 14 | 0 | 16 | 9 | 4 | 7 |

Table 4-13

# San Francisco Bay Area Air Basin

## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ increase slightly in the San Francisco Bay Area Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust sources. Emissions of directly emitted $PM_{10}$ from diesel motor vehicles have been decreasing since 1990 even though population and vehicle miles traveled (VMT) are growing, due to adoption of more stringent emission standards.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 25 percent of the ambient $PM_{10}$ in the San Francisco Bay Area Air Basin.

| Directly Emitted $PM_{10}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***171*** | ***173*** | ***188*** | ***190*** | ***177*** | ***191*** | ***202*** | ***205*** |
| **Stationary Sources** | 36 | 25 | 21 | 18 | 19 | 16 | 17 | 18 |
| **Area-wide Sources** | 112 | 124 | 138 | 142 | 136 | 153 | 163 | 165 |
| **On-Road Mobile** | 7 | 9 | 12 | 12 | 9 | 9 | 10 | 10 |
| **Gasoline Vehicles** | 5 | 4 | 4 | 5 | 5 | 6 | 7 | 8 |
| **Diesel Vehicles** | 2 | 5 | 7 | 7 | 4 | 3 | 3 | 2 |
| **Other Mobile** | 15 | 15 | 17 | 18 | 14 | 13 | 13 | 12 |

Table 4-14

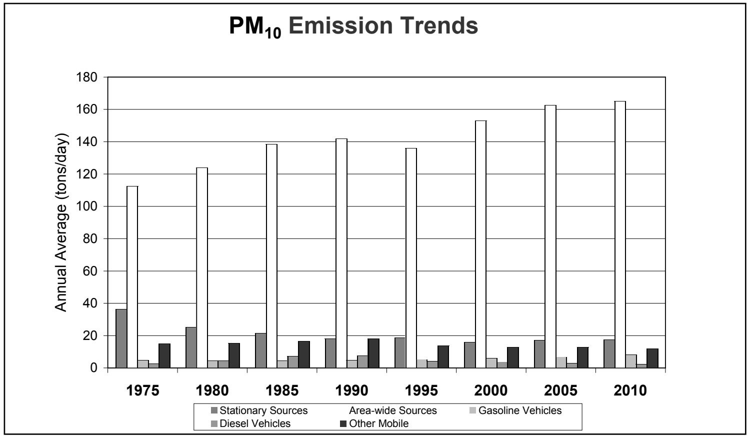


Figure 4-18

# *San Francisco Bay Area Air Basin*

## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ are relatively steady in the San Francisco Bay Area Air Basin between 1975 and 2010. Emissions from stationary sources declines slightly, while area-wide sources increase. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust sources. Emissions of directly emitted $PM_{10}$ from diesel motor vehicles have been decreasing since 1990 even though population and vehicle miles traveled (VMT) are growing, due to adoption of more stringent emission standards.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 40 percent of the ambient $PM_{2.5}$ in the San Francisco Bay Area Air Basin.

| Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***87*** | ***85*** | ***86*** | ***87*** | ***78*** | ***78*** | ***81*** | ***81*** |
| **Stationary Sources** | 27 | 21 | 15 | 13 | 14 | 12 | 13 | 13 |
| **Area-wide Sources** | 41 | 43 | 46 | 48 | 44 | 48 | 50 | 50 |
| **On-Road Mobile** | 5 | 7 | 9 | 9 | 7 | 6 | 7 | 7 |
| **Gasoline Vehicles** | 3 | 3 | 2 | 3 | 3 | 3 | 4 | 5 |
| **Diesel Vehicles** | 2 | 4 | 7 | 7 | 4 | 3 | 3 | 2 |
| **Other Mobile** | 14 | 14 | 16 | 17 | 13 | 12 | 12 | 11 |

Table 4-15

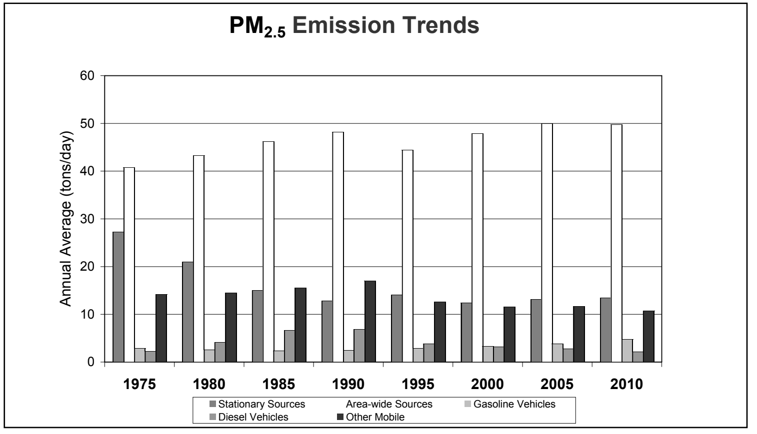


Figure 4-19

# *San Francisco Bay Area Air Basin*

## $PM_{10}$ Air Quality Trend

$PM_{10}$ is generally sampled only once every six days. As a result, there are fewer data on which to base historical trends. However, based on the data that are available, the annual mean concentration declined about 25 percent from 1988 to 2001.

Calculated exceedance days for the State 24-hour standard dropped from a high of 137 days during 1989 to 51 days during 2001. The national 24-hour standard was last exceeded in 1991. Because many of the same sources contribute to both ozone and $PM_{10}$, future ozone precursor emission controls should help ensure continued $PM_{10}$ improvements.

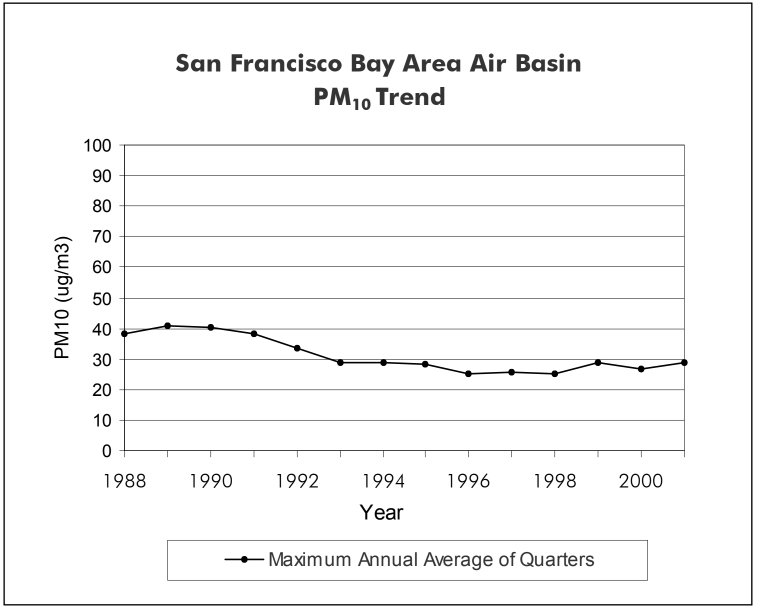


Figure 4-20

# *San Francisco Bay Area Air Basin*

## $PM_{10}$ Air Quality Table

| PM10 (ug/m3) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hour Concentration | | | | | | | 146 | 150 | 173 | 155 | 112 | 101 | 97 | 74 | 76 | 95 | 92 | 114 | 76 | 109 |
| Max. Avg. of Quarters | | | | | | | 38.3 | 40.8 | 40.4 | 38.3 | 33.7 | 28.8 | 28.6 | 28.4 | 24.9 | 25.8 | 25.1 | 28.7 | 26.8 | 28.9 |
| Calc Days Above State 24-Hr Std | | | | | | | 123 | 137 | 93 | 125 | 108 | 59 | 54 | 42 | 18 | 20 | 25 | 63 | 42 | 51 |
| Calc Days Above Nat 24-Hr Std | | | | | | | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-16

# *San Francisco Bay Area Air Basin*

## Carbon Monoxide Emission Trends and Forecasts

Emissions of CO have been declining in the San Francisco Bay Area Air Basin since 1975. Motor vehicles and other mobile sources are the largest sources of CO emissions in the air basin. Emissions from motor vehicles have been declining, with the introduction of new automotive emission controls, despite increases in vehicle miles traveled (VMT). Oil refineries, manufacturing, and electric generation contribute a significant portion of the stationary source CO emissions. Area-wide CO emissions are primarily from residential fuel combustion (including wood), waste burning, and fires.

| CO Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***8842*** | ***8178*** | ***6955*** | ***5106*** | ***3723*** | ***2692*** | ***2135*** | ***1718*** |
| **Stationary Sources** | 56 | 64 | 84 | 78 | 68 | 47 | 52 | 53 |
| **Area-wide Sources** | 174 | 175 | 177 | 175 | 164 | 169 | 175 | 171 |
| **On-Road Mobile** | 8155 | 7477 | 6190 | 4310 | 2965 | 2029 | 1496 | 1105 |
| Gasoline Vehicles | 8142 | 7454 | 6152 | 4270 | 2934 | 2001 | 1470 | 1082 |
| Diesel Vehicles | 13 | 23 | 38 | 39 | 31 | 27 | 26 | 23 |
| **Other Mobile** | 458 | 461 | 504 | 544 | 526 | 447 | 413 | 389 |

Table 4-17

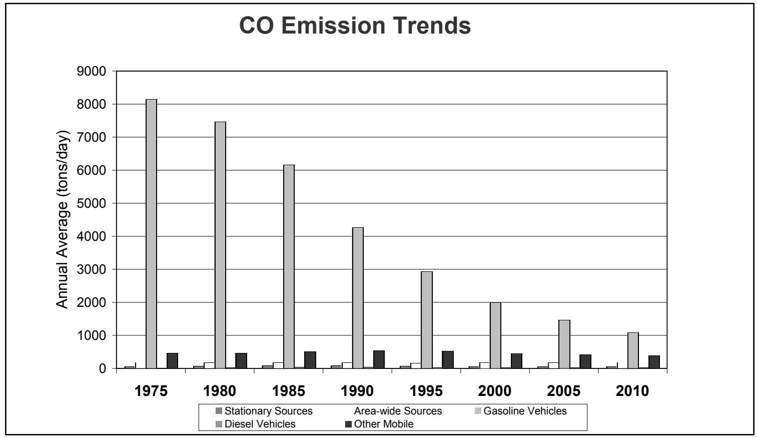


Figure 4-21

# *San Francisco Bay Area Air Basin*

## Carbon Monoxide Air Quality Trend

As in other areas of the State, carbon monoxide concentrations in the San Francisco Bay Area Air Basin have declined substantially over the last 20 years. The peak 8-hour indicator value during 2001 was half what it was during 1982 and is now well below the level of the standards. In fact, neither the State nor the national standards have been exceeded in this area since 1991.

Much of the decline in ambient carbon monoxide concentrations can be attributed to the introduction of clean fuels and newer, cleaner motor vehicles. The San Francisco Bay Area Air Basin is currently designated as attainment for both the State and national CO standards. Based on emission projections, the area is expected to maintain its attainment status in the coming years.

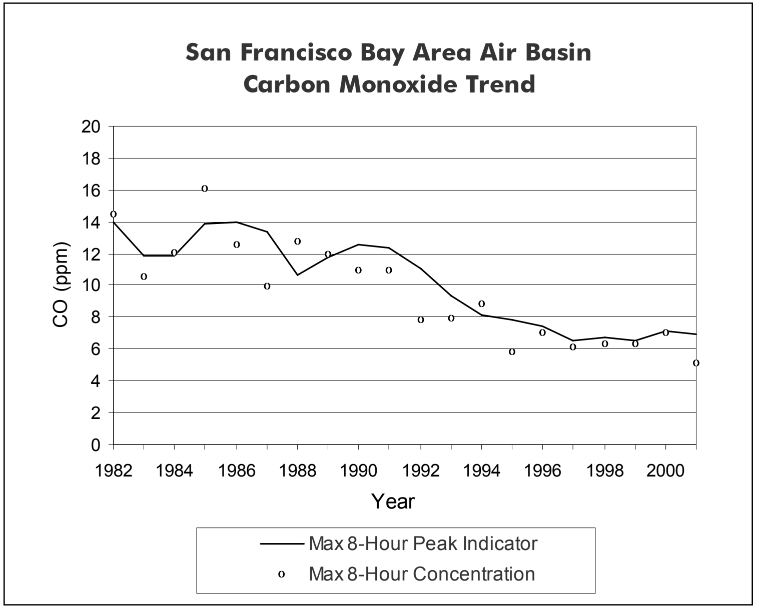


Figure 4-22

# *San Francisco Bay Area Air Basin*

## Carbon Monoxide Air Quality Table

| CARBON MONOXIDE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator | 14.0 | 11.9 | 11.9 | 13.9 | 14.0 | 13.4 | 10.7 | 11.8 | 12.6 | 12.4 | 11.1 | 9.3 | 8.1 | 7.8 | 7.4 | 6.5 | 6.7 | 6.5 | 7.1 | 6.9 |
| Max. 1-Hr. Concentration | 18.0 | 17.0 | 20.0 | 21.0 | 20.0 | 17.0 | 15.0 | 19.0 | 18.0 | 15.0 | 12.0 | 14.0 | 12.0 | 10.1 | 8.8 | 10.7 | 8.7 | 9.0 | 9.8 | 7.6 |
| Max. 8-Hr. Concentration | 14.5 | 10.6 | 12.1 | 16.1 | 12.6 | 10.0 | 12.8 | 12.0 | 11.0 | 11.0 | 7.8 | 7.9 | 8.8 | 5.8 | 7.0 | 6.1 | 6.3 | 6.3 | 7.0 | 5.1 |
| Days Above State 8-Hr. Std. | 15 | 4 | 8 | 24 | 8 | 2 | 4 | 10 | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 12 | 4 | 7 | 21 | 8 | 1 | 4 | 9 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-18

# *San Joaquin Valley Air Basin*

## Introduction - Area Description

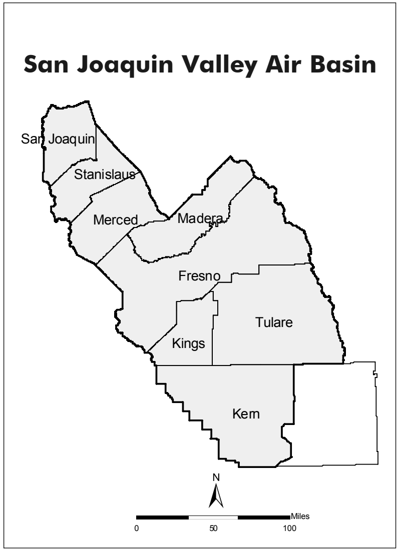


Figure 4-23

The San Joaquin Valley Air Basin occupies the southern two-thirds of California's Central Valley. The eight-county area comprises Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties and the western portion of Kern County. The Valley covers nearly 25,000 square miles. With very few exceptions, the San Joaquin Valley is flat and unbroken, with most of the area lying below 400 feet in elevation. The Valley floor slopes downward from east to west, and the San Joaquin River winds its way along the western side from south to north.

Similar to other inland areas, the San Joaquin Valley has cool wet winters and hot dry summers. Generally, the temperature increases and rainfall decreases from north to south.

In contrast to other California areas, air quality in the San Joaquin Valley is not dominated by emissions from one large urban area. Instead, there are a number of moderately sized urban areas spread along the main axis of the Valley. This wide distribution of emissions complicates the challenge faced by air quality control agencies. Overall, about 9 percent of California's population lives in the San Joaquin Valley, and pollution sources in the region account for about 14 percent of the total statewide criteria pollutant emissions.

# *San Joaquin Valley Air Basin*

## Emission Trends and Forecasts

Overall, the emission levels in the San Joaquin Valley Air Basin have been decreasing since 1990. The decreases are predominantly due to motor vehicle controls and reductions in evaporative and fugitive emissions. On-road motor vehicles are the largest contributors to CO emissions in the San Joaquin Valley. On-road motor vehicles, other mobile sources, and stationary sources are all significant contributors to $NO_x$ emissions. A significant portion of the stationary source ROG emissions is fugitive emissions from the extensive oil and gas production operations in the lower San Joaquin Valley. $PM_{10}$ emissions are mostly fugitive dust from paved and unpaved roads, agricultural operations, and waste burning.

# *San Joaquin Valley Air Basin*

## Population and VMT

Compared to California's other urban areas, the population and number of vehicle miles traveled each day in the San Joaquin Valley Air Basin grew at a much faster rate during the 1982 to 2001 time period. The population increased about 58 percent, from nearly 2.1 million in 1982 to nearly 3.3 million in 2001. During the same period, the daily VMT more than doubled, from about 35 million miles per day in 1982 to over 83 million miles per day in 2001. This represents a 139 percent increase. Because these growth rates are so much higher than the growth rates in other areas, there has not been the same level of air quality improvement in the San Joaquin Valley Air Basin, especially with respect to ozone.

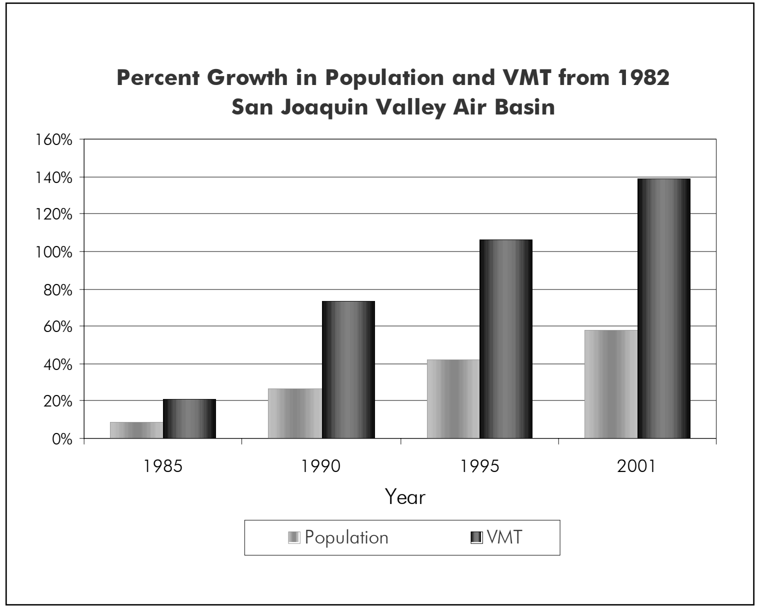


Figure 4-24

# *San Joaquin Valley Air Basin*

## Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursors $NO_x$ and ROG are decreasing in the San Joaquin Valley Air Basin. Both stationary source and motor vehicle $NO_x$ emissions have been reduced by the adoption of more stringent emission standards. Stricter standards have reduced ROG emissions from motor vehicles since 1985, even though vehicle miles traveled (VMT) have been increasing. Stationary and area-wide sources of ROG include petroleum production operations and the use of solvents. Stricter emission standards and new controls have reduced the ROG emissions from these sources. Also, declining crude oil prices have resulted in cutbacks in oil production activities and an attendant decrease in ROG fugitive emissions. Future increases in oil prices could result in higher levels of production, which could again increase emissions.

| NOx Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***685*** | ***840*** | ***816*** | ***793*** | ***674*** | ***563*** | ***485*** | ***414*** |
| **Stationary Sources** | 246 | 332 | 319 | 277 | 222 | 169 | 157 | 160 |
| **Area-wide Sources** | 14 | 14 | 14 | 12 | 12 | 11 | 11 | 11 |
| **On-Road Mobile** | 219 | 252 | 292 | 320 | 288 | 239 | 196 | 145 |
| Gasoline Vehicles | 169 | 171 | 168 | 174 | 161 | 121 | 83 | 58 |
| Diesel Vehicles | 50 | 81 | 124 | 145 | 127 | 118 | 113 | 87 |
| **Other Mobile** | 207 | 243 | 192 | 184 | 152 | 144 | 122 | 98 |

Table 4-19

| ROG Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***1161*** | ***1234*** | ***1068*** | ***641*** | ***508*** | ***446*** | ***399*** | ***385*** |
| **Stationary Sources** | 674 | 739 | 586 | 197 | 105 | 100 | 97 | 103 |
| **Area-wide Sources** | 140 | 148 | 156 | 162 | 169 | 169 | 170 | 181 |
| **On-Road Mobile** | 292 | 286 | 268 | 224 | 174 | 119 | 84 | 59 |
| Gasoline Vehicles | 289 | 281 | 260 | 216 | 168 | 114 | 79 | 55 |
| Diesel Vehicles | 3 | 5 | 8 | 8 | 6 | 5 | 5 | 5 |
| **Other Mobile** | 55 | 62 | 57 | 59 | 60 | 58 | 48 | 42 |

Table 4-20

# *San Joaquin Valley Air Basin*
## Ozone Precursor Emission Trends and Forecasts

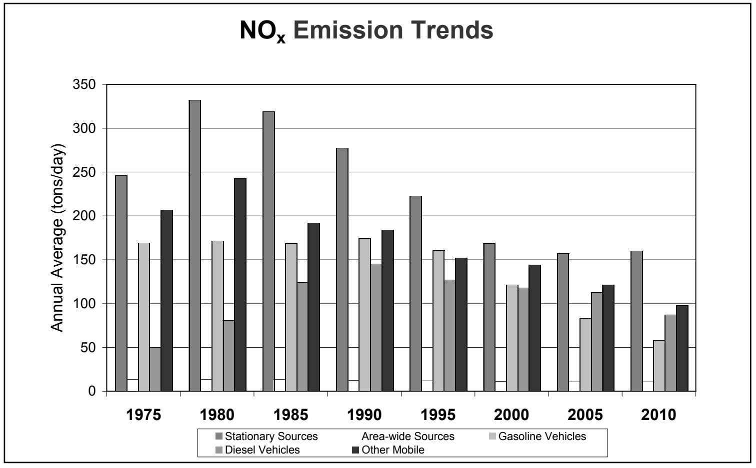


Figure 4-25

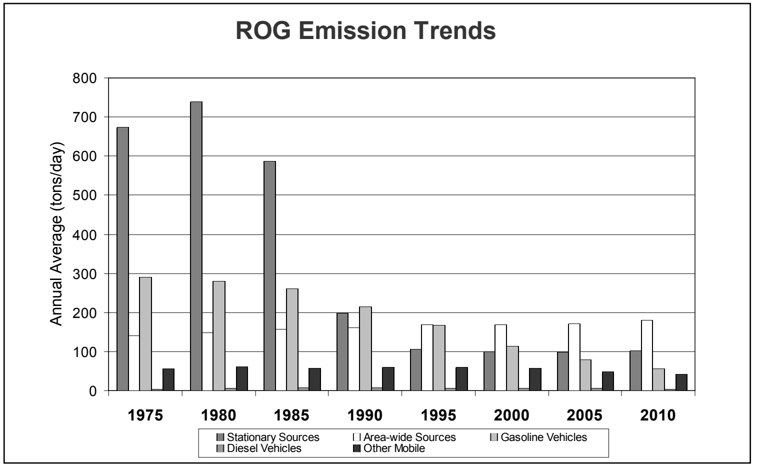


Figure 4-26

# *San Joaquin Valley Air Basin*

## Ozone Air Quality Trend

The ozone problem in the San Joaquin Valley ranks among the most severe in the State. From 1982 to 2001, the maximum peak 1-hour indicator decreased 22 percent. The number of national 1-hour standard exceedance days has been quite variable over the years, but has also shown overall improvement. During 1982, there were 43 national 1-hour standard exceedance days. This compares with 32 national 1-hour standard exceedance days in 2000. In contrast, the number of State standard exceedance days shows an increase when comparing the two end years: 113 in 1982 compared with 123 in 2001.

The ARB has identified the San Joaquin Valley Air Basin as both a contributor and a receptor for ozone transport. The Valley is a transport contributor to the Broader Sacramento Area, the Great Basin Valleys Air Basin, the Mountain Counties Air Basin, the Mojave Desert Air Basin, the North Central Coast Air Basin, and the South Central Coast Air Basin. In contrast, the San Joaquin Valley Air Basin is a receptor area for ozone transported from the Broader Sacramento Area and the San Francisco Bay Area Air Basin.

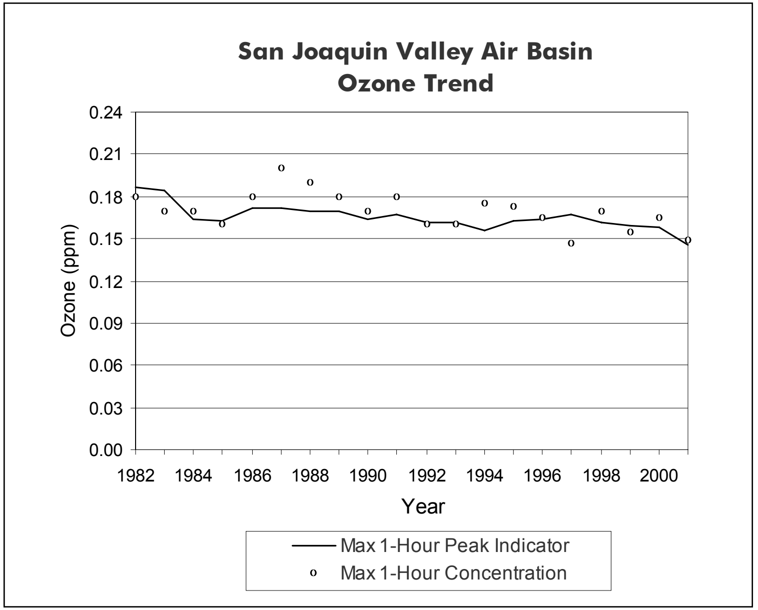


Figure 4-27

# *San Joaquin Valley Air Basin*

## Ozone Air Quality Table

| OZONE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hour Indicator | 0.187 | 0.184 | 0.164 | 0.163 | 0.172 | 0.172 | 0.169 | 0.170 | 0.164 | 0.167 | 0.162 | 0.162 | 0.156 | 0.163 | 0.164 | 0.167 | 0.162 | 0.159 | 0.158 | 0.146 |
| 4th High 1-Hr in 3 Yrs | 0.170 | 0.170 | 0.160 | 0.160 | 0.170 | 0.170 | 0.170 | 0.170 | 0.160 | 0.160 | 0.160 | 0.160 | 0.160 | 0.165 | 0.165 | 0.164 | 0.161 | 0.161 | 0.161 | 0.146 |
| Avg of 4th Hi 8-Hr in 3 Yrs | 0.123 | 0.116 | 0.114 | 0.111 | 0.117 | 0.118 | 0.121 | 0.120 | 0.119 | 0.118 | 0.115 | 0.112 | 0.111 | 0.119 | 0.119 | 0.115 | 0.115 | 0.113 | 0.111 | 0.109 |
| Maximum 1-Hr. Concentration | 0.180 | 0.170 | 0.170 | 0.160 | 0.180 | 0.200 | 0.190 | 0.180 | 0.170 | 0.180 | 0.160 | 0.160 | 0.175 | 0.173 | 0.165 | 0.147 | 0.169 | 0.155 | 0.165 | 0.149 |
| Max. 8-Hr. Concentration | 0.133 | 0.122 | 0.136 | 0.131 | 0.135 | 0.150 | 0.127 | 0.136 | 0.123 | 0.130 | 0.121 | 0.125 | 0.129 | 0.134 | 0.137 | 0.127 | 0.136 | 0.123 | 0.131 | 0.120 |
| Days Above State Standard | 113 | 105 | 135 | 149 | 147 | 156 | 156 | 148 | 131 | 133 | 127 | 125 | 118 | 124 | 120 | 110 | 90 | 123 | 114 | 123 |
| Days Above Nat. 1-Hr. Std. | 43 | 41 | 61 | 53 | 59 | 65 | 74 | 54 | 45 | 51 | 29 | 43 | 43 | 44 | 56 | 16 | 39 | 28 | 30 | 32 |
| Days Above Nat. 8-Hr. Std. | 108 | 100 | 120 | 127 | 134 | 148 | 140 | 133 | 104 | 121 | 119 | 104 | 108 | 109 | 114 | 95 | 84 | 117 | 103 | 109 |

Table 4-21

# *San Joaquin Valley Air Basin*

## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ decrease from 1975 to 1995, and stay steady between 2000 and 2010. $PM_{10}$ emissions in the San Joaquin Valley are dominated by emissions area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, waste burning, and residential fuel combustion (including wood).

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 25 percent of the ambient $PM_{10}$ in the San Joaquin Valley Air Basin.

| Directly Emitted $PM_{10}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***463*** | ***432*** | ***414*** | ***405*** | ***377*** | ***365*** | ***364*** | ***362*** |
| **Stationary Sources** | 56 | 41 | 32 | 26 | 26 | 26 | 28 | 30 |
| **Area-wide Sources** | 390 | 371 | 363 | 359 | 336 | 324 | 321 | 319 |
| **On-Road Mobile** | 4 | 6 | 8 | 9 | 7 | 6 | 6 | 6 |
| Gasoline Vehicles | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 |
| Diesel Vehicles | 2 | 4 | 6 | 6 | 4 | 3 | 3 | 2 |
| **Other Mobile** | 12 | 15 | 12 | 12 | 9 | 9 | 8 | 7 |

Table 4-22

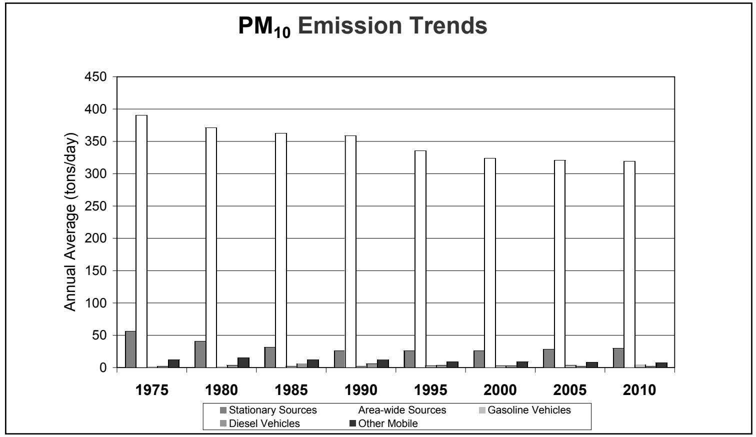


Figure 4-28

# *San Joaquin Valley Air Basin*

## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ decrease from 1975 to 1995, and stay steady between 2000 and 2010. $PM_{2.5}$ emissions in the San Joaquin Valley are dominated by emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, waste burning, and residential fuel combustion (including wood).

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 40 percent of the ambient $PM_{2.5}$ in the San Joaquin Valley Air Basin.

| Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***194*** | ***180*** | ***168*** | ***162*** | ***151*** | ***146*** | ***146*** | ***145*** |
| **Stationary Sources** | 46 | 32 | 23 | 18 | 18 | 17 | 19 | 20 |
| **Area-wide Sources** | 134 | 130 | 128 | 126 | 119 | 116 | 115 | 114 |
| **On-Road Mobile** | 3 | 5 | 6 | 7 | 5 | 4 | 4 | 4 |
| Gasoline Vehicles | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| Diesel Vehicles | 2 | 4 | 6 | 6 | 4 | 3 | 2 | 2 |
| **Other Mobile** | 11 | 14 | 11 | 11 | 8 | 8 | 8 | 6 |

Table 4-23

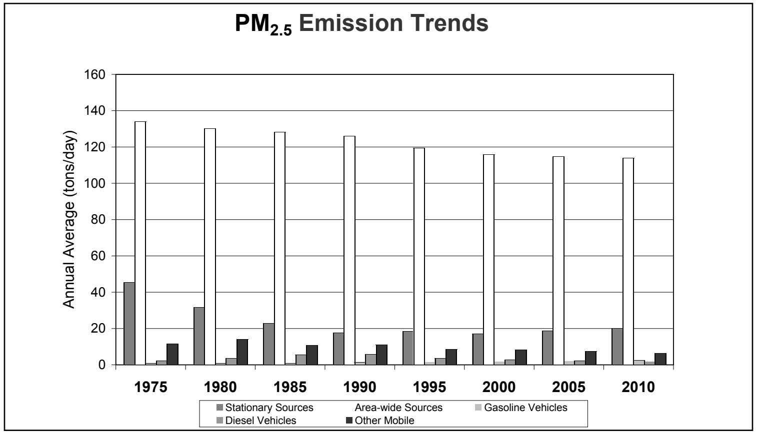


Figure 4-29

# *San Joaquin Valley Air Basin*
## $PM_{10}$ Air Quality Trend

The available $PM_{10}$ data show some variation during the trend period, but overall, there has been a downward trend. Part of the variation can be attributed to meteorology. Long periods of stagnation during the winter months allow $PM_{10}$ to accumulate over many days with resulting high concentrations. The maximum annual average shows a decrease of about 19 percent from 1988 to 2001. The calculated number of days exceeding the State and national 24-hour standards also shows a decrease. There were 300 calculated State standard exceedance days and 40 calculated national standard exceedance days during 1988. During 2001, there were 236 calculated State standard exceedance days and 12 national standard exceedance days. Although $PM_{10}$ air quality has improved overall in the San Joaquin Valley Air Basin, values for 1999 through 2001 were higher than those for 1998. We will need several more years of data before we can determine whether this trend is a result of meteorology or a change in emissions. However, based on the ambient data, it will still be a number of years before this area reaches attainment.

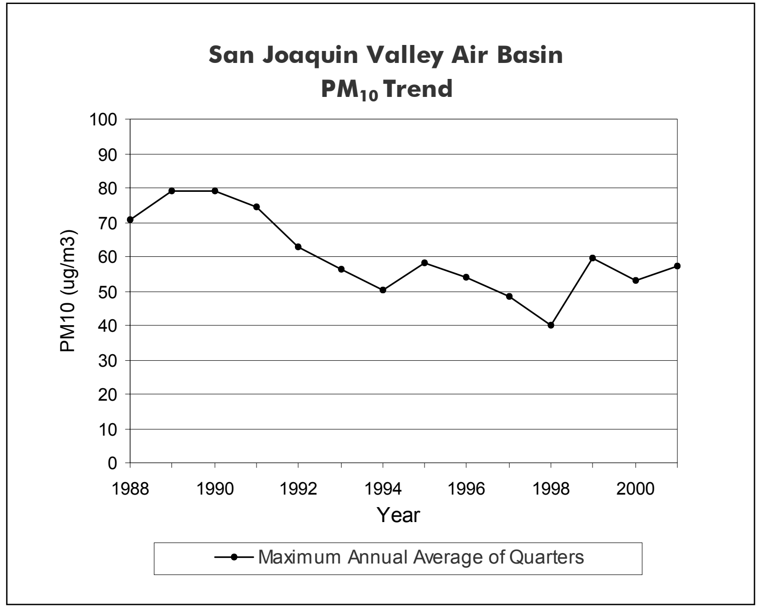


Figure 4-30

# *San Joaquin Valley Air Basin*

## $PM_{10}$ Air Quality Table

| $PM_{10}$ (ug/m3) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hour Concentration | | | | | | | 244 | 250 | 439 | 279 | 183 | 239 | 190 | 279 | 153 | 199 | 160 | 183 | 145 | 205 |
| Max. Avg. of Quarters | | | | | | | 70.8 | 79.3 | 79.3 | 74.3 | 62.9 | 56.3 | 50.1 | 58.2 | 54.1 | 48.2 | 39.9 | 59.5 | 53.1 | 57.4 |
| Calc Days Above State 24-Hr Std | | | | | | | 300 | 302 | 313 | 285 | 273 | 233 | 253 | 246 | 225 | 188 | 185 | 216 | 237 | 236 |
| Calc Days Above Nat 24-Hr Std | | | | | | | 40 | 40 | 56 | 40 | 3 | 11 | 8 | 8 | 0 | 3 | 6 | 12 | 0 | 12 |

Table 4-24

# *San Joaquin Valley Air Basin*

## Carbon Monoxide Emission Trends and Forecasts

Emissions of CO are trending downward between 1985 and 2010. Motor vehicles are by far the largest source of CO emissions. Emissions from motor vehicles have been declining since 1985, despite increases in vehicle miles traveled (VMT), with the introduction of new automotive emission controls and fleet turnover.

| CO Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***3830*** | ***3855*** | ***3620*** | ***3290*** | ***2578*** | ***2035*** | ***1647*** | ***1367*** |
| **Stationary Sources** | 180 | 160 | 59 | 76 | 70 | 58 | 64 | 68 |
| **Area-wide Sources** | 434 | 431 | 430 | 417 | 400 | 394 | 391 | 388 |
| **On-Road Mobile** | 2895 | 2869 | 2784 | 2428 | 1751 | 1252 | 874 | 606 |
| **Gasoline Vehicles** | 2883 | 2848 | 2750 | 2391 | 1721 | 1227 | 851 | 585 |
| **Diesel Vehicles** | 12 | 21 | 34 | 37 | 30 | 25 | 24 | 21 |
| **Other Mobile** | 321 | 394 | 346 | 369 | 357 | 331 | 318 | 304 |

Table 4-25

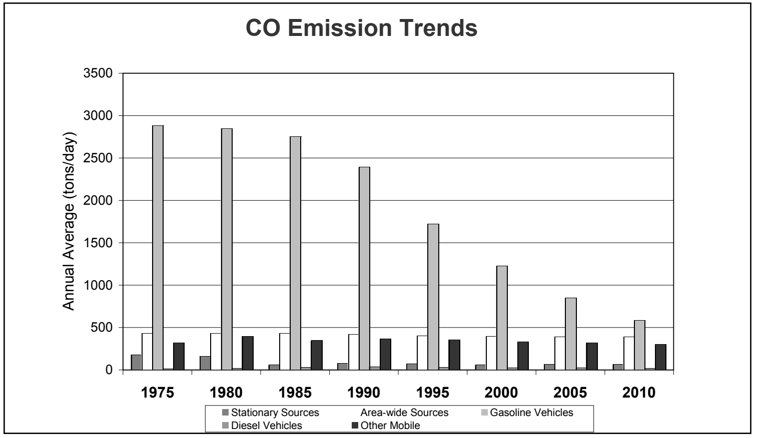


Figure 4-31

# *San Joaquin Valley Air Basin*

## Carbon Monoxide Air Quality Trend

Carbon monoxide concentrations show a fairly consistent downward trend from 1982 through 2001. Similar to other areas of the State, the trend line for the San Joaquin Valley Air Basin shows a slight increase during the late 1980s, probably related to meteorology. The maximum peak 8-hour indicator for 2001 is less than half that for 1982. Measured concentrations in the San Joaquin Valley Air Basin have not exceeded the national CO standards since 1991, and concentrations have not exceeded the State standards for the last six years. Much of the decline in ambient CO concentrations can be attributed to the introduction of clean fuels and newer, cleaner motor vehicles.

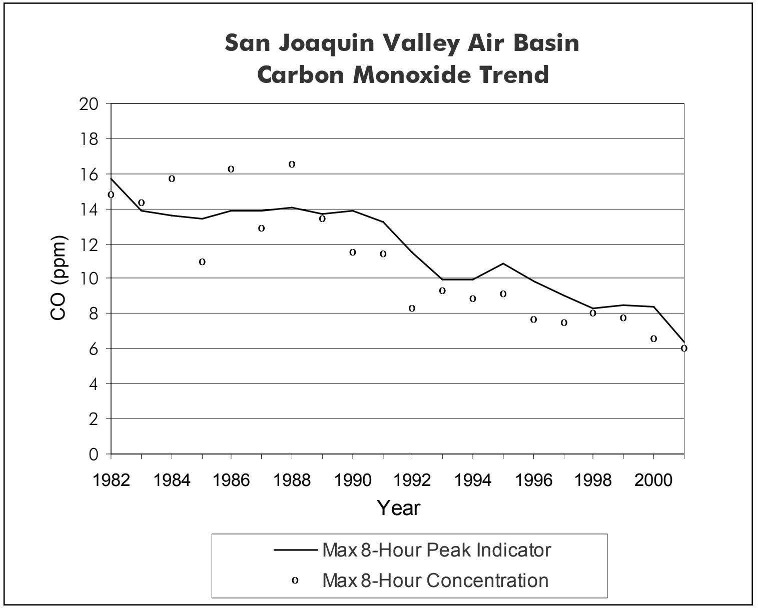


Figure 4-32

# *San Joaquin Valley Air Basin*

## Carbon Monoxide Air Quality Table

| CARBON MONOXIDE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator | 15.7 | 13.9 | 13.6 | 13.4 | 13.9 | 13.9 | 14.1 | 13.7 | 13.9 | 13.2 | 11.5 | 10.0 | 10.0 | 10.9 | 9.9 | 9.0 | 8.3 | 8.5 | 8.4 | 6.4 |
| Max. 1-Hr. Concentration | 18.0 | 17.0 | 24.0 | 18.0 | 21.0 | 16.0 | 19.0 | 23.0 | 17.0 | 19.0 | 13.0 | 13.0 | 15.0 | 12.0 | 11.0 | 9.9 | 10.3 | 11.9 | 10.1 | 16.0 |
| Max. 8-Hr. Concentration | 14.8 | 14.3 | 15.7 | 11.0 | 16.3 | 12.9 | 16.5 | 13.4 | 11.5 | 11.4 | 8.3 | 9.3 | 8.9 | 9.1 | 7.7 | 7.5 | 8.0 | 7.8 | 6.6 | 6.0 |
| Days Above State 8-Hr. Std. | 9 | 12 | 7 | 7 | 13 | 4 | 5 | 24 | 10 | 3 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 8 | 9 | 6 | 7 | 11 | 4 | 6 | 18 | 9 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-26

# *San Diego Air Basin*

## Introduction - Area Description


Figure 4-33

The San Diego Air Basin lies in the southwest corner of California and comprises all of San Diego County. However, the population and emissions are concentrated mainly in the western portion of the County. The air basin covers 4,260 square miles, includes about 11 percent of the State's population, and produces about 7 percent of the State's criteria pollutant emissions. Because of its southerly location and proximity to the ocean, much of the San Diego Air Basin has a relatively mild climate.

Air quality in the San Diego Air Basin is impacted not only by local emissions, but also by pollutants transported from other areas -- in particular, ozone and ozone precursor emissions transported from the South Coast Air Basin and Mexico. Although the impact of transport is particularly important on days with high ozone concentrations, transported pollutants and emissions cannot be blamed entirely for the ozone problem in the San Diego area. Studies show that emissions from the San Diego Air Basin are sufficient, on their own, to cause ozone violations.

# *San Diego Air Basin*

## Emission Trends and Forecasts

Emissions of $NO_x$, ROG, $PM_{10}$, and CO in the San Diego Air Basin have been following the statewide trends since 1975. These trends are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources (both on-road and other) are by far the largest contributors to $NO_x$, ROG, and CO emissions in the San Diego Air Basin. The majority of the $PM_{10}$ emissions are from area-wide sources.

# *San Diego Air Basin*
## Population and VMT

Growth rates in the San Diego Air Basin during the last 20 years were among the highest in the State's urban areas. The population increased 54 percent: from over 1.9 million in 1982 to almost 2.9 million in 2001. During this same time period, the number of vehicle miles traveled each day increased over 120 percent, from about 34 million miles per day in 1982 to over 75 million miles per day in 2001. As in other parts of California, overall air quality in the San Diego Air Basin has improved, despite high growth rates, indicating the benefits of cleaner technologies.

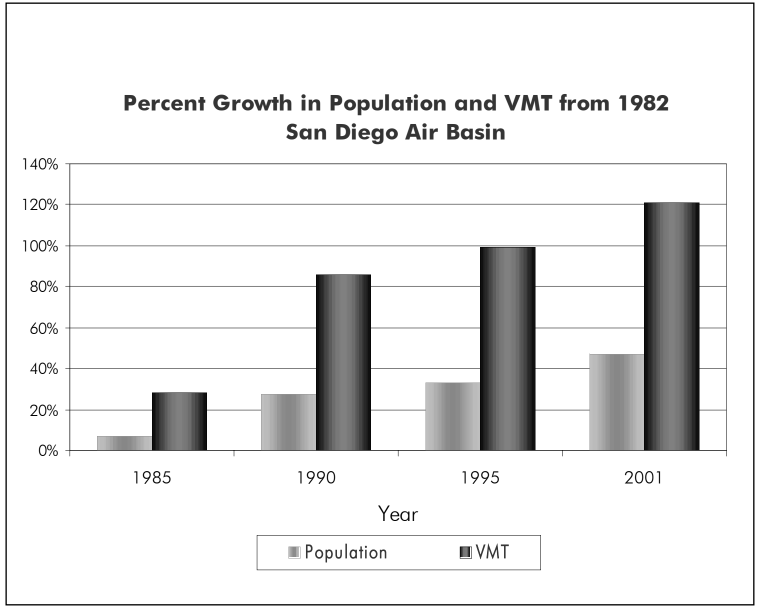


Figure 4-34

# *San Diego Air Basin*
## Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursor $NO_x$ increase between 1975 and 1990 and decrease thereafter. ROG emissions have been decreasing overall since 1975. These decreases are mostly due to decreased emissions from motor vehicles, brought about by stricter motor vehicle emission standards. Stationary and area-wide source emissions of ROG have remained mostly unchanged over the last 20 years, with stricter emission standards offsetting industrial and population growth.

| NOx Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***289*** | ***282*** | ***294*** | ***326*** | ***277*** | ***235*** | ***194*** | ***161*** |
| **Stationary Sources** | 51 | 37 | 22 | 25 | 21 | 17 | 15 | 20 |
| **Area-wide Sources** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **On-Road Mobile** | 178 | 174 | 195 | 216 | 185 | 149 | 113 | 83 |
| **Gasoline Vehicles** | 168 | 155 | 156 | 157 | 133 | 96 | 62 | 43 |
| **Diesel Vehicles** | 10 | 19 | 39 | 59 | 52 | 52 | 51 | 40 |
| **Other Mobile** | 57 | 69 | 73 | 81 | 68 | 66 | 62 | 55 |

Table 4-27

| ROG Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***432*** | ***431*** | ***407*** | ***335*** | ***260*** | ***218*** | ***184*** | ***172*** |
| **Stationary Sources** | 35 | 56 | 54 | 52 | 45 | 50 | 56 | 64 |
| **Area-wide Sources** | 35 | 41 | 45 | 47 | 42 | 42 | 40 | 42 |
| **On-Road Mobile** | 338 | 306 | 274 | 196 | 133 | 89 | 60 | 43 |
| **Gasoline Vehicles** | 337 | 305 | 271 | 193 | 130 | 86 | 58 | 41 |
| **Diesel Vehicles** | 1 | 1 | 3 | 3 | 3 | 2 | 2 | 2 |
| **Other Mobile** | 24 | 29 | 34 | 39 | 40 | 37 | 27 | 23 |

Table 4-28

# *San Diego Air Basin*
## Ozone Precursor Emission Trends and Forecasts

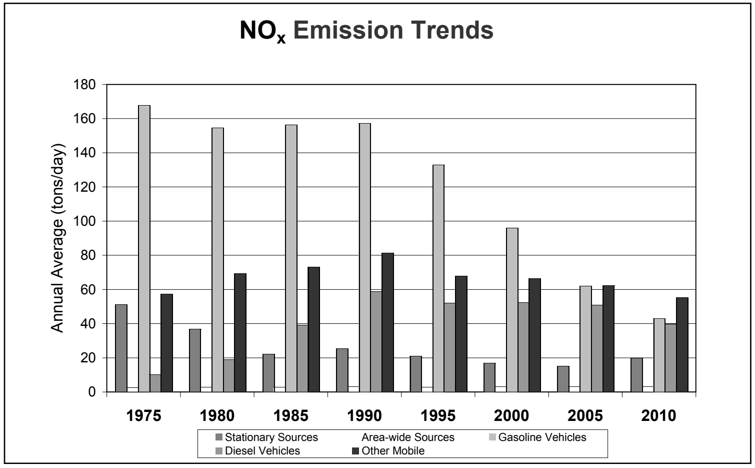


Figure 4-35

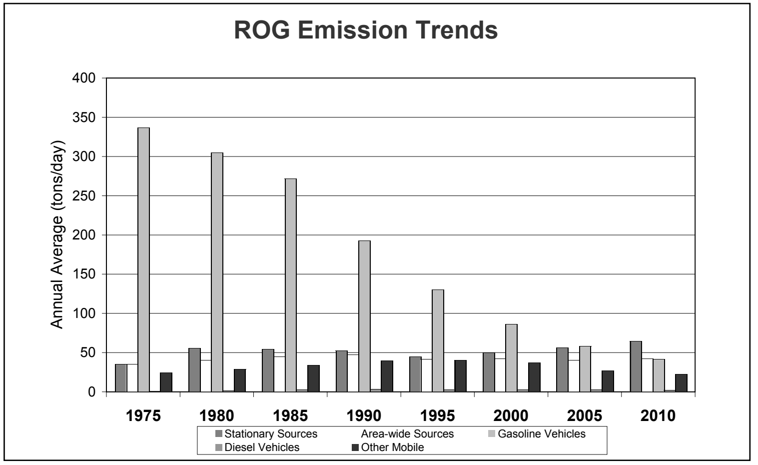


Figure 4-36

# *San Diego Air Basin*

## Ozone Air Quality Trend

Both the peak indicator and the number of days above the State and national ozone standards have decreased over the last 20 years. The peak 1-hour ozone indicator shows an overall decline of 42 percent from 1982 to 2001. The number of State and national 1-hour standard exceedance days has dropped even more. There were 120 State standard exceedance days during 1982 compared with 29 during 2001. This represents a decrease of about 76 percent. During 1982, there were 47 national 1-hour standard exceedance days compared with 2 during 2001. However, there were still 17 national 8-hour standard exceedance days during 2001.

The San Diego Air Basin is the only one of the five major air basins the ARB has not identified as a transport contributor to a downwind area. The San Diego area is, however, a transport receptor. While it is clear that additional local emission controls will be needed to reach attainment of the ozone standards in the San Diego area, because of transport, future air quality in this area will also be affected by emission controls and growth in the South Coast Air Basin and, to some extent, Mexico.

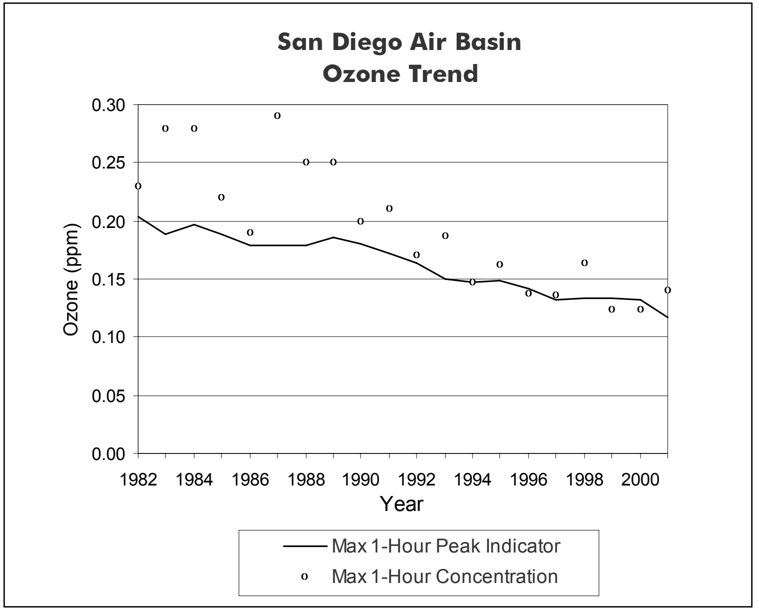


Figure 4-37

# San Diego Air Basin

## Ozone Air Quality Table

| OZONE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hour Indicator | 0.203 | 0.188 | 0.197 | 0.189 | 0.179 | 0.179 | 0.179 | 0.186 | 0.180 | 0.172 | 0.164 | 0.150 | 0.147 | 0.148 | 0.142 | 0.132 | 0.134 | 0.134 | 0.132 | 0.117 |
| 4th High 1-Hr in 3 Yrs | 0.210 | 0.200 | 0.200 | 0.210 | 0.190 | 0.180 | 0.180 | 0.190 | 0.190 | 0.170 | 0.170 | 0.154 | 0.150 | 0.146 | 0.141 | 0.138 | 0.135 | 0.135 | 0.131 | 0.118 |
| Avg of 4th Hi 8-Hr in 3 Yrs | 0.137 | 0.130 | 0.126 | 0.132 | 0.125 | 0.124 | 0.121 | 0.125 | 0.129 | 0.125 | 0.118 | 0.112 | 0.109 | 0.108 | 0.104 | 0.099 | 0.102 | 0.099 | 0.100 | 0.094 |
| Maximum 1-Hr. Concentration | 0.230 | 0.280 | 0.280 | 0.220 | 0.190 | 0.290 | 0.250 | 0.250 | 0.200 | 0.210 | 0.170 | 0.187 | 0.147 | 0.162 | 0.138 | 0.136 | 0.164 | 0.124 | 0.124 | 0.141 |
| Max. 8-Hr. Concentration | 0.162 | 0.176 | 0.207 | 0.168 | 0.143 | 0.196 | 0.156 | 0.193 | 0.145 | 0.145 | 0.133 | 0.154 | 0.121 | 0.122 | 0.117 | 0.112 | 0.141 | 0.100 | 0.106 | 0.116 |
| Days Above State Standard | 120 | 125 | 146 | 148 | 131 | 127 | 160 | 159 | 139 | 106 | 97 | 90 | 79 | 96 | 51 | 43 | 54 | 27 | 24 | 29 |
| Days Above Nat. 1-Hr. Std. | 47 | 61 | 51 | 50 | 42 | 40 | 45 | 56 | 39 | 27 | 19 | 14 | 9 | 12 | 2 | 1 | 9 | 0 | 0 | 2 |
| Days Above Nat. 8-Hr. Std. | 83 | 101 | 98 | 109 | 81 | 99 | 119 | 122 | 96 | 67 | 66 | 58 | 46 | 48 | 31 | 16 | 35 | 16 | 16 | 17 |

Table 4-29

# *San Diego Air Basin*

## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ almost double in the San Diego Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, dust from construction and demolition operations, and particulates from residential fuel combustion (including wood). The growth in these area-wide sources is primarily due to population growth and increases in vehicle miles traveled (VMT).

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 30 percent of the ambient $PM_{10}$ in the San Diego Air Basin.

| Directly Emitted $PM_{10}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***74*** | ***83*** | ***92*** | ***109*** | ***106*** | ***112*** | ***119*** | ***126*** |
| **Stationary Sources** | 17 | 12 | 6 | 8 | 11 | 8 | 8 | 10 |
| **Area-wide Sources** | 49 | 61 | 74 | 89 | 85 | 93 | 100 | 105 |
| **On-Road Mobile** | 3 | 3 | 4 | 5 | 4 | 4 | 5 | 5 |
| Gasoline Vehicles | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| Diesel Vehicles | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 |
| **Other Mobile** | 6 | 7 | 7 | 8 | 6 | 7 | 7 | 6 |

Table 4-30

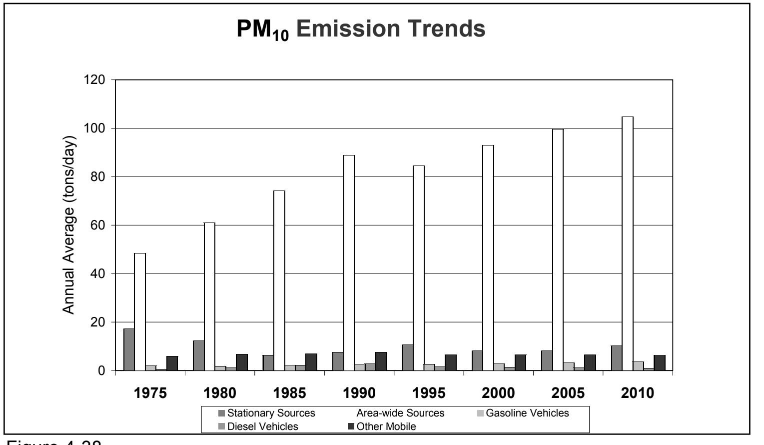


Figure 4-38

# *San Diego Air Basin*

## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ increase steadily in the San Diego Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, dust from construction and demolition operations, and particulates from residential fuel combustion (including wood). The growth in these area-wide sources is primarily due to population growth and increases in vehicle miles traveled (VMT).

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 50 percent of the ambient $PM_{2.5}$ in the San Diego Air Basin.

| Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***34*** | ***37*** | ***36*** | ***41*** | ***39*** | ***40*** | ***42*** | ***44*** |
| **Stationary Sources** | 11 | 10 | 4 | 4 | 6 | 5 | 5 | 7 |
| **Area-wide Sources** | 16 | 19 | 22 | 26 | 24 | 26 | 27 | 29 |
| **On-Road Mobile** | 2 | 2 | 3 | 4 | 3 | 3 | 3 | 3 |
| **Gasoline Vehicles** | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| **Diesel Vehicles** | 0 | 1 | 2 | 3 | 2 | 1 | 1 | 1 |
| **Other Mobile** | 6 | 6 | 6 | 7 | 6 | 6 | 6 | 6 |

Table 4-31

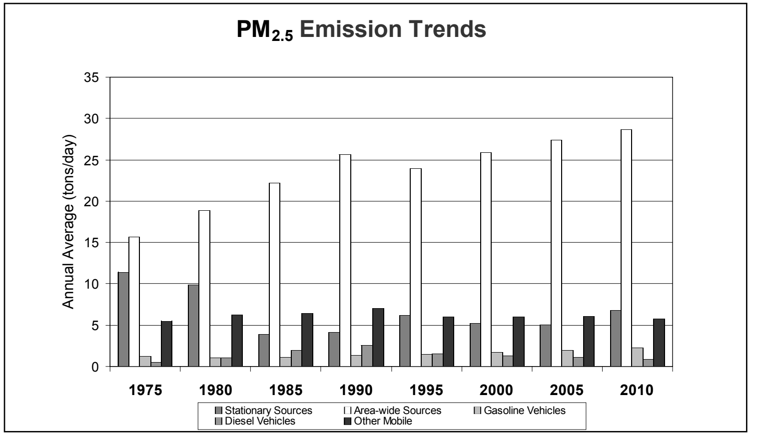


Figure 4-39

# *San Diego Air Basin*

## $PM_{10}$ Air Quality Trend

$PM_{10}$ concentrations in the San Diego Air Basin have changed little during the years for which reliable data are available. The maximum annual average for 2001 exceeds the State annual standard and is actually higher than it was during 1988. This apparent lack of progress is a result of monitoring that began at a new site, with higher concentrations, during 1993. The maximum 24-hour concentration also exceeds the State standard. During 2001, the maximum 24-hour concentration was 107 $\mu g/m^3$.

During 1988, there were 105 calculated State standard exceedance days, compared with 146 during 2001. Again, some of this apparent increase is attributable to the new site that began operating in 1993. There is a substantial amount of variability from year-to-year in the 24-hour statistics. This variability is a reflection of meteorology, the 1-in-6-day sampling schedule, and changes in monitoring location. Although ambient $PM_{10}$ concentrations in the San Diego Air Basin are not as high as in some other areas of the State, additional emission controls will be needed to bring this area into attainment.

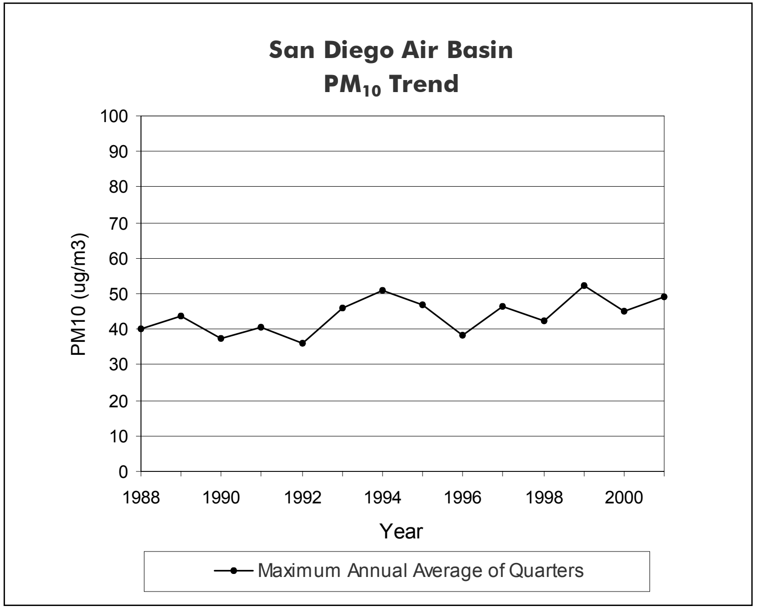


Figure 4-40

# *San Diego Air Basin*

## $PM_{10}$ Air Quality Table

| $PM_{10}$ (ug/m3) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hour Concentration | | | | | | | 81 | 90 | 115 | 81 | 67 | 159 | 129 | 121 | 93 | 125 | 89 | 121 | 139 | 107 |
| Max. Avg. of Quarters | | | | | | | 40.0 | 43.8 | 37.6 | 40.6 | 35.9 | 45.9 | 50.7 | 46.8 | 38.5 | 46.6 | 42.5 | 52.2 | 45.2 | 49.1 |
| Calc Days Above State 24-Hr Std | | | | | | | 105 | 146 | 60 | 90 | 42 | 144 | 131 | 117 | 96 | 125 | 108 | 140 | 144 | 146 |
| Calc Days Above Nat 24-Hr Std | | | | | | | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-32

# *San Diego Air Basin*
## Carbon Monoxide Emission Trends and Forecasts

CO emissions in the San Diego Air Basin mirror the decreasing statewide trend from 1975 to 2010, even though the motor vehicle miles traveled (VMT) are increasing. This is yet another example of how California's motor vehicle control program is having a positive impact on CO emissions.

| CO Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***3274*** | ***3006*** | ***2894*** | ***2425*** | ***1702*** | ***1266*** | ***950*** | ***775*** |
| **Stationary Sources** | 17 | 23 | 23 | 28 | 30 | 43 | 39 | 59 |
| **Area-wide Sources** | 56 | 62 | 68 | 72 | 64 | 66 | 68 | 70 |
| **On-Road Mobile** | 3059 | 2740 | 2586 | 2067 | 1360 | 930 | 626 | 438 |
| **Gasoline Vehicles** | 3056 | 2735 | 2575 | 2052 | 1347 | 918 | 616 | 429 |
| **Diesel Vehicles** | 3 | 6 | 11 | 15 | 13 | 11 | 11 | 9 |
| **Other Mobile** | 142 | 181 | 217 | 259 | 248 | 227 | 217 | 208 |

Table 4-33

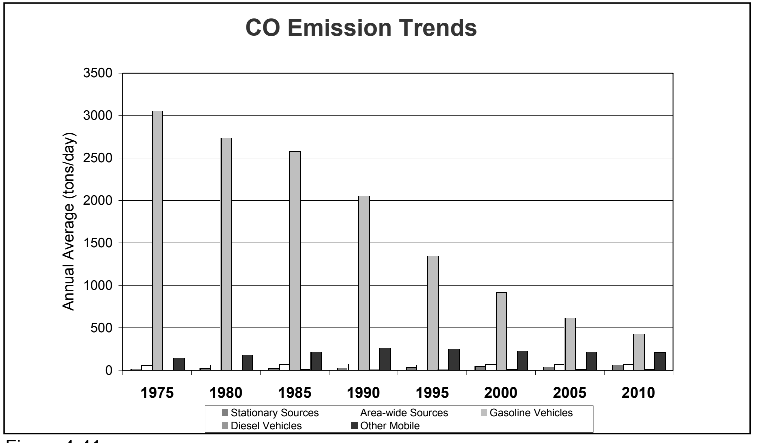


Figure 4-41

# *San Diego Air Basin*
## Carbon Monoxide Air Quality Trend

Peak 8-hour carbon monoxide concentrations in the San Diego Air Basin decreased substantially over the trend period: a 43 percent decrease from 1982 to 2001. As a result of these decreases, the national CO standards have not been exceeded in the San Diego Air Basin since 1989. The last exceedance of the State standards occurred during 1990.

With existing and anticipated motor vehicle and clean fuels regulations, ambient CO concentrations should continue to decline. This should be sufficient to maintain a healthful level of carbon monoxide in this area.

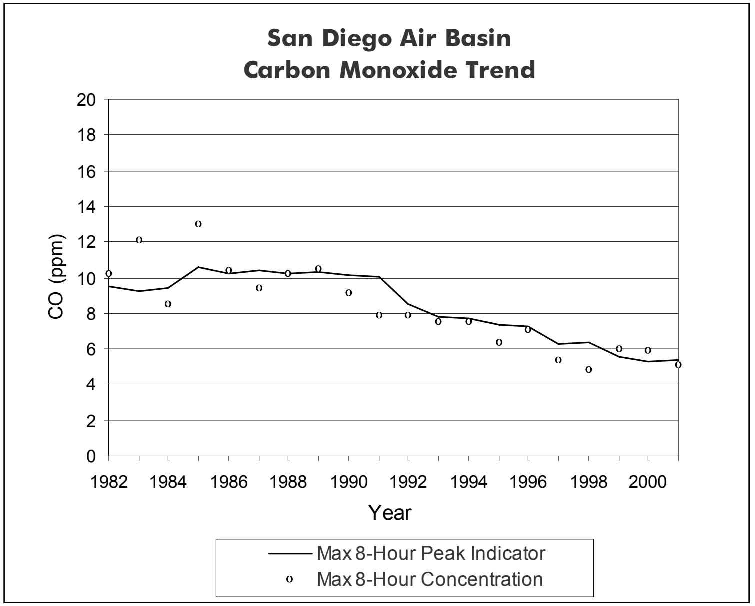


Figure 4-42

# *San Diego Air Basin*

## Carbon Monoxide Air Quality Table

| CARBON MONOXIDE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator | 9.5 | 9.2 | 9.4 | 10.6 | 10.2 | 10.4 | 10.2 | 10.3 | 10.2 | 10.0 | 8.5 | 7.8 | 7.7 | 7.3 | 7.3 | 6.3 | 6.3 | 5.6 | 5.3 | 5.4 |
| Max. 1-Hr. Concentration | 15.0 | 16.0 | 16.0 | 17.0 | 16.0 | 14.0 | 17.0 | 17.0 | 18.0 | 14.0 | 14.0 | 11.4 | 11.0 | 9.9 | 12.4 | 9.3 | 10.2 | 9.9 | 9.3 | 8.5 |
| Max. 8-Hr. Concentration | 10.3 | 12.1 | 8.5 | 13.0 | 10.4 | 9.4 | 10.3 | 10.5 | 9.1 | 7.9 | 7.9 | 7.5 | 7.5 | 6.3 | 7.1 | 5.4 | 4.8 | 6.0 | 5.9 | 5.1 |
| Days Above State 8-Hr. Std. | 1 | 1 | 0 | 5 | 2 | 1 | 5 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 1 | 1 | 0 | 3 | 1 | 0 | 2 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-34

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# *San Diego Air Basin*

## Oxides of Nitrogen Emission Trends and Forecasts

$NO_x$ (and nitrogen dioxide) emissions in the San Diego Air Basin follow the declining statewide trend from 1990 to 2010. The continued adoption of more stringent motor vehicle and stationary source emission standards should continue to reduce nitrogen dioxide emissions.

| NOx Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***289*** | ***282*** | ***294*** | ***326*** | ***277*** | ***235*** | ***194*** | ***161*** |
| **Stationary Sources** | 51 | 37 | 22 | 25 | 21 | 17 | 15 | 20 |
| **Area-wide Sources** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **On-Road Mobile** | 178 | 174 | 195 | 216 | 185 | 149 | 113 | 83 |
| Gasoline Vehicles | 168 | 155 | 156 | 157 | 133 | 96 | 62 | 43 |
| Diesel Vehicles | 10 | 19 | 39 | 59 | 52 | 52 | 51 | 40 |
| **Other Mobile** | 57 | 69 | 73 | 81 | 68 | 66 | 62 | 55 |

Table 4-35

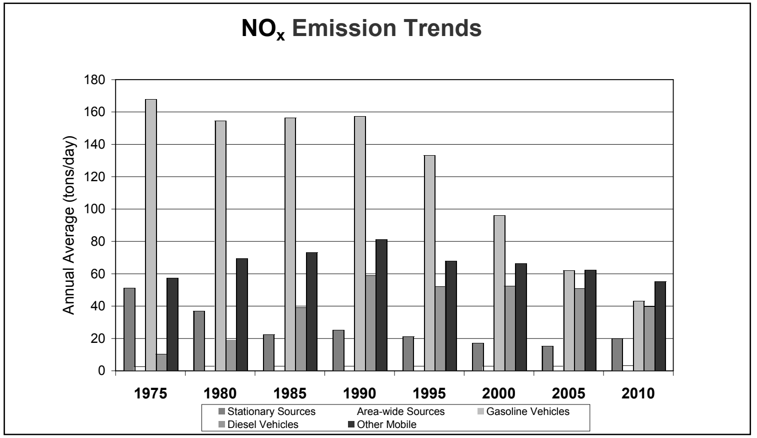


Figure 4-43

# *San Diego Air Basin*
## Nitrogen Dioxide Air Quality Trend

In the past, the San Diego Air Basin had a nitrogen dioxide problem. Maximum 1-hour concentrations during the 1980s occasionally exceeded the ambient air quality standards. However, ambient concentrations are now well below the levels of both the State and national standards. Data show that the maximum peak 1-hour indicator decreased 46 percent from 1982 to 2001, and the San Diego Air Basin is in attainment for the nitrogen dioxide standards.

Because oxides of nitrogen ($NO_x$) emissions contribute to ozone, as well as to nitrogen dioxide, many of the ozone control measures help reduce ambient $NO_2$ concentrations. Furthermore, $NO_x$ emission controls are a critical part of the ozone control strategy and are not expected to be relaxed in the future. As a result, these controls should assure continued attainment of the State and national nitrogen dioxide standards.

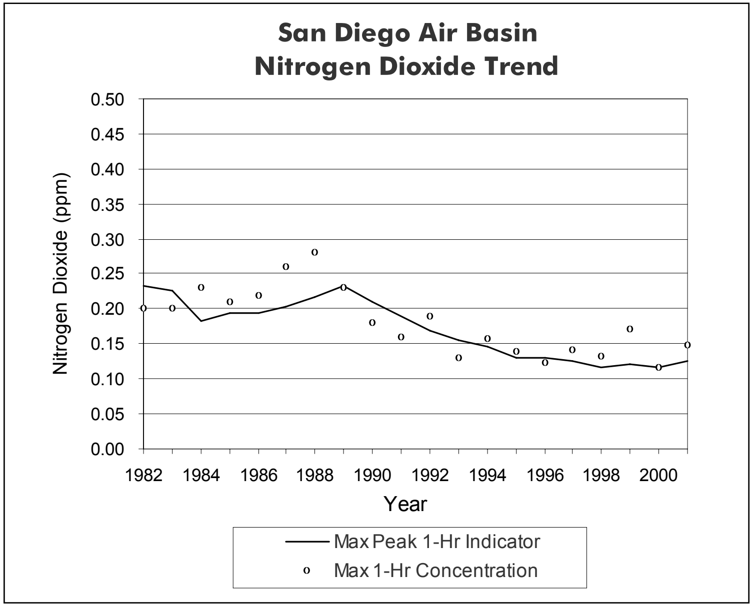


Figure 4-44

# *San Diego Air Basin*

## Nitrogen Dioxide Air Quality Table

| NITROGEN DIOXIDE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hr. Indicator | 0.233 | 0.225 | 0.183 | 0.193 | 0.193 | 0.203 | 0.217 | 0.233 | 0.210 | 0.189 | 0.169 | 0.155 | 0.145 | 0.130 | 0.129 | 0.126 | 0.116 | 0.122 | 0.117 | 0.126 |
| Max. 1-Hr. Concentration | 0.200 | 0.200 | 0.230 | 0.210 | 0.220 | 0.260 | 0.280 | 0.230 | 0.180 | 0.160 | 0.190 | 0.130 | 0.157 | 0.140 | 0.124 | 0.142 | 0.132 | 0.172 | 0.117 | 0.148 |
| Max. Annual Average | 0.030 | 0.027 | 0.031 | | | 0.032 | 0.035 | 0.031 | 0.029 | 0.029 | 0.027 | 0.023 | 0.024 | 0.026 | 0.022 | 0.024 | 0.023 | 0.026 | 0.024 | 0.022 |

Table 4-36

# *Sacramento Valley Air Basin*

## Introduction - Area Description

Figure 4-45

The Sacramento Valley Air Basin is home to California's capital. Located in the northern portion of the Central Valley, the Sacramento Valley Air Basin includes Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba counties, the western urbanized portion of Placer County, and the eastern portion of Solano County. The Sacramento Valley Air Basin occupies 15,043 square miles and has a population of more than two million people.

Because of its inland location, the climate of the Sacramento Valley Air Basin is more extreme than the climate in the San Francisco Bay Area Air Basin or South Coast Air Basin. The winters are generally cool and wet, while the summers are hot and dry.

Emissions from the Sacramento metropolitan area dominate the emission inventory for the Sacramento Valley Air Basin, and on-road motor vehicles are the primary source of emissions in the metropolitan area. While pollutant concentrations have generally declined over the years, additional regulations will be needed to attain the State and national ambient air quality standards in this air basin.

# *Sacramento Valley Air Basin*

## Emission Trends and Forecasts

The emission levels in the Sacramento Valley Air Basin are trending downward from 1990 to 2010 for $NO_x$ and ROG, and downward from 1985 to 2010 for CO. The decreases in $NO_x$, ROG, and CO are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources (both on-road and other) are by far the largest contributors to $NO_x$, ROG, and CO emissions in the Sacramento Valley Air Basin. $PM_{10}$ and $PM_{2.5}$ emissions are steady from 1975 to 2010.

# *Sacramento Valley Air Basin*
## Population and VMT

Between 1982 and 2001, population in the Sacramento Valley Air Basin grew at a higher rate than the statewide average--a 52 percent increase, compared with a 40 percent increase statewide. During this same period, the increase in the number of vehicle miles traveled each day was not much different from the overall statewide value: a 93 percent increase in the Sacramento Valley Air Basin compared with a 97 percent increase statewide. While the actual population and VMT totals for the Sacramento Valley Air Basin are much smaller than those for the South Coast Air Basin and San Francisco Bay Area Air Basin, they are important because motor vehicles are a significant source of emissions in the Sacramento Valley Air Basin.

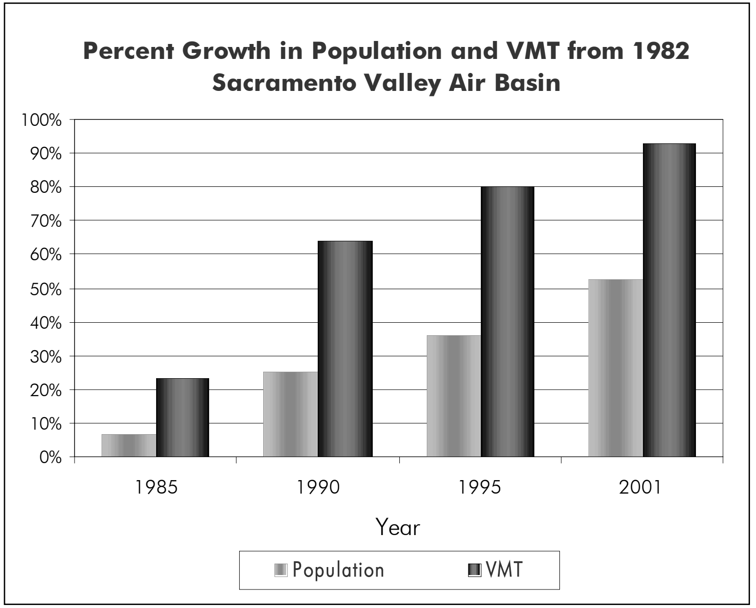


Figure 4-46

# *Sacramento Valley Air Basin*
## Ozone Precursor Emission Trends and Forecasts

Emissions of $NO_x$ show a steady decrease from 1980 to 2010. On-road motor vehicles and other mobile sources are by far the largest contributors to $NO_x$ emissions. More stringent mobile source emission standards and cleaner burning fuels have largely contributed to the decline in $NO_x$ emissions. ROG emissions have been decreasing for the last 20 years due to more stringent motor vehicle standards and new rules for control of ROG from various industrial coating and solvent operations.

| NOx Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***341*** | ***378*** | ***358*** | ***385*** | ***333*** | ***289*** | ***242*** | ***198*** |
| **Stationary Sources** | 37 | 35 | 31 | 49 | 52 | 47 | 46 | 48 |
| **Area-wide Sources** | 8 | 8 | 8 | 9 | 8 | 8 | 8 | 8 |
| **On-Road Mobile** | 179 | 194 | 208 | 216 | 182 | 147 | 113 | 80 |
| **Gasoline Vehicles** | 147 | 148 | 143 | 132 | 112 | 78 | 54 | 38 |
| **Diesel Vehicles** | 32 | 46 | 65 | 84 | 70 | 68 | 59 | 43 |
| **Other Mobile** | 118 | 142 | 111 | 110 | 92 | 88 | 75 | 61 |

Table 4-37

| ROG Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***444*** | ***433*** | ***409*** | ***358*** | ***292*** | ***234*** | ***203*** | ***186*** |
| **Stationary Sources** | 83 | 61 | 62 | 62 | 50 | 42 | 45 | 50 |
| **Area-wide Sources** | 61 | 68 | 65 | 71 | 65 | 62 | 61 | 63 |
| **On-Road Mobile** | 272 | 268 | 243 | 180 | 130 | 86 | 62 | 44 |
| **Gasoline Vehicles** | 270 | 265 | 239 | 176 | 126 | 83 | 59 | 42 |
| **Diesel Vehicles** | 2 | 3 | 4 | 4 | 3 | 3 | 3 | 2 |
| **Other Mobile** | 28 | 37 | 38 | 44 | 47 | 45 | 34 | 28 |

Table 4-38

# *Sacramento Valley Air Basin*
## Ozone Precursor Emission Trends and Forecasts

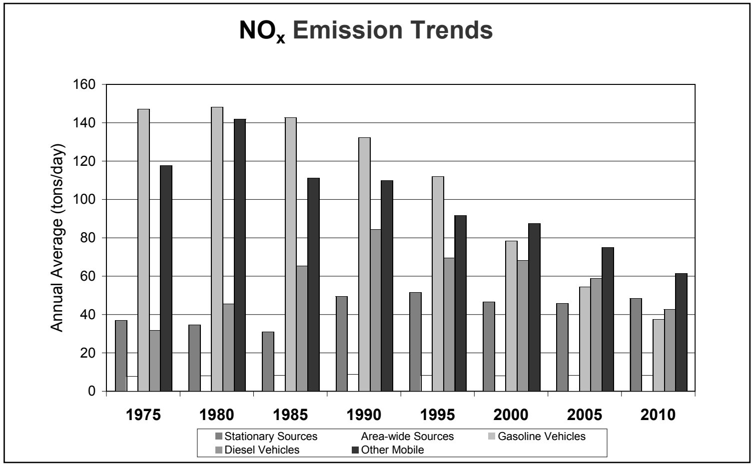


Figure 4-47

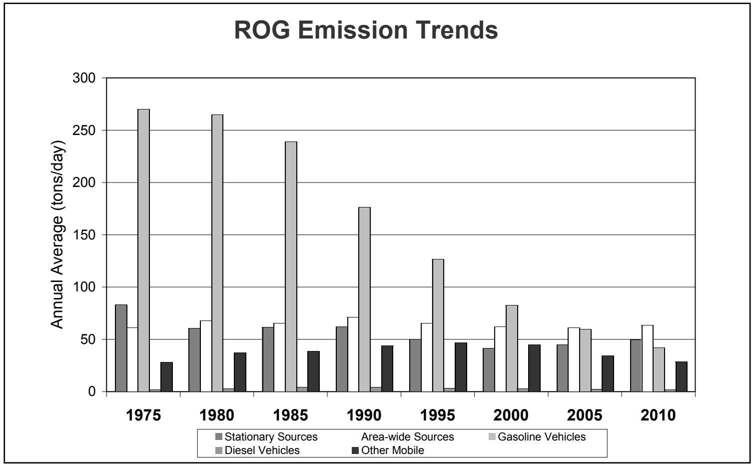


Figure 4-48

# *Sacramento Valley Air Basin*

## Ozone Air Quality Trend

Peak ozone values in the Sacramento Valley Air Basin have not declined as quickly over the last several years as they have in other urban areas. The maximum peak 1-hour values remained fairly constant from 1982 to 1988. Since 1988, the peak values have decreased slightly, and the overall decline for the 20-year period is about 20 percent. Looking at the number of days above the State and national standards, the trend is much more variable. However, the number of exceedance days has declined since 1988. The maximum measured 1-hour concentrations have also decreased, but with more year-to-year variation. Based on the data, it is apparent that additional emission controls will be needed for this area to attain the ozone standards.

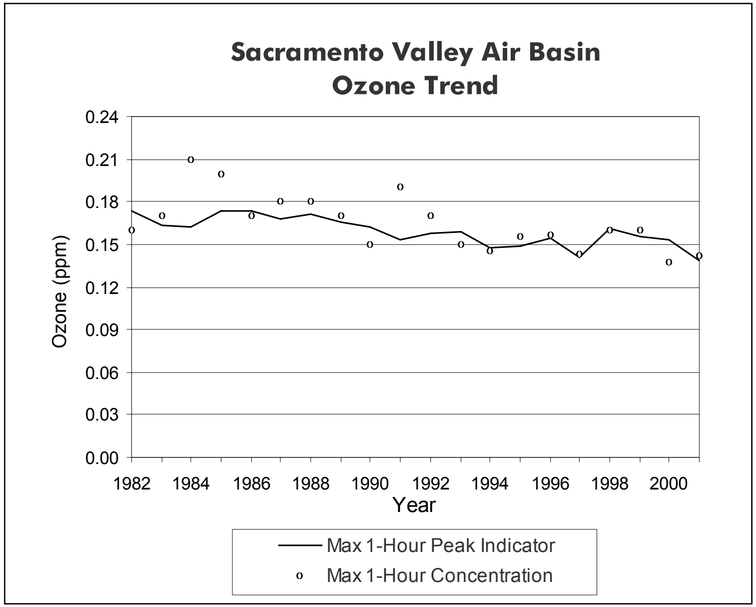


Figure 4-49

Similar to the San Joaquin Valley, the urbanized portion of the Sacramento Valley Air Basin, or the Broader Sacramento Area (BSA), is identified as both a contributor and a receptor for ozone transport. The BSA is a transport contributor to the Mountain Counties, San Joaquin Valley, and San Francisco Bay Area Air Basins, as well as to the Upper Sacramento Valley. In contrast, the BSA is a transport receptor for the San Francisco Bay Area and San Joaquin Valley Air Basins.

# *Sacramento Valley Air Basin*
## Ozone Air Quality Table

| OZONE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hour Indicator | 0.174 | 0.163 | 0.162 | 0.173 | 0.173 | 0.168 | 0.171 | 0.166 | 0.162 | 0.153 | 0.158 | 0.159 | 0.148 | 0.149 | 0.154 | 0.141 | 0.161 | 0.155 | 0.153 | 0.139 |
| 4th High 1-Hr in 3 Yrs | 0.160 | 0.160 | 0.180 | 0.180 | 0.180 | 0.160 | 0.160 | 0.160 | 0.160 | 0.150 | 0.150 | 0.150 | 0.143 | 0.145 | 0.145 | 0.133 | 0.148 | 0.148 | 0.148 | 0.133 |
| Avg of 4th Hi 8-Hr in 3 Yrs | 0.112 | 0.114 | 0.115 | 0.118 | 0.118 | 0.114 | 0.114 | 0.114 | 0.107 | 0.105 | 0.105 | 0.110 | 0.104 | 0.106 | 0.106 | 0.097 | 0.097 | 0.101 | 0.105 | 0.099 |
| Maximum 1-Hr. Concentration | 0.160 | 0.170 | 0.210 | 0.200 | 0.170 | 0.180 | 0.180 | 0.170 | 0.150 | 0.190 | 0.170 | 0.150 | 0.145 | 0.156 | 0.157 | 0.143 | 0.160 | 0.160 | 0.138 | 0.142 |
| Max. 8-Hr. Concentration | 0.133 | 0.125 | 0.138 | 0.161 | 0.125 | 0.127 | 0.130 | 0.133 | 0.127 | 0.140 | 0.122 | 0.120 | 0.121 | 0.128 | 0.126 | 0.107 | 0.137 | 0.129 | 0.108 | 0.108 |
| Days Above State Standard | 66 | 62 | 64 | 59 | 66 | 94 | 98 | 68 | 50 | 68 | 74 | 34 | 60 | 50 | 58 | 25 | 62 | 59 | 42 | 46 |
| Days Above Nat. 1-Hr. Std. | 17 | 15 | 23 | 19 | 24 | 24 | 35 | 8 | 16 | 14 | 14 | 7 | 9 | 11 | 9 | 3 | 14 | 7 | 5 | 2 |
| Days Above Nat. 8-Hr. Std. | 46 | 44 | 46 | 42 | 50 | 73 | 68 | 37 | 44 | 60 | 56 | 22 | 48 | 40 | 44 | 15 | 60 | 43 | 35 | 37 |

Table 4-39

# *Sacramento Valley Air Basin*

## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ are fairly steady in the Sacramento Valley Air Basin between 1975 and 2010. Emissions are dominated by contributions from area-wide sources, primarily fugitive dust from paved and unpaved roads, fugitive dust from construction and demolition, and particulates from residential fuel combustion. Emissions of directly emitted $PM_{10}$ from mobile sources and stationary sources in the Sacramento Valley Air Basin have remained relatively steady.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 25 percent of the ambient $PM_{10}$ in the Sacramento Valley Air Basin.

| Directly Emitted $PM_{10}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***253*** | ***255*** | ***258*** | ***260*** | ***242*** | ***243*** | ***247*** | ***250*** |
| **Stationary Sources** | 25 | 19 | 16 | 21 | 16 | 17 | 17 | 19 |
| **Area-wide Sources** | 218 | 224 | 231 | 227 | 216 | 217 | 221 | 223 |
| **On-Road Mobile** | 3 | 4 | 5 | 5 | 4 | 4 | 4 | 4 |
| Gasoline Vehicles | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 |
| Diesel Vehicles | 2 | 2 | 3 | 4 | 2 | 2 | 1 | 1 |
| **Other Mobile** | 7 | 8 | 7 | 7 | 6 | 6 | 6 | 5 |

Table 4-40

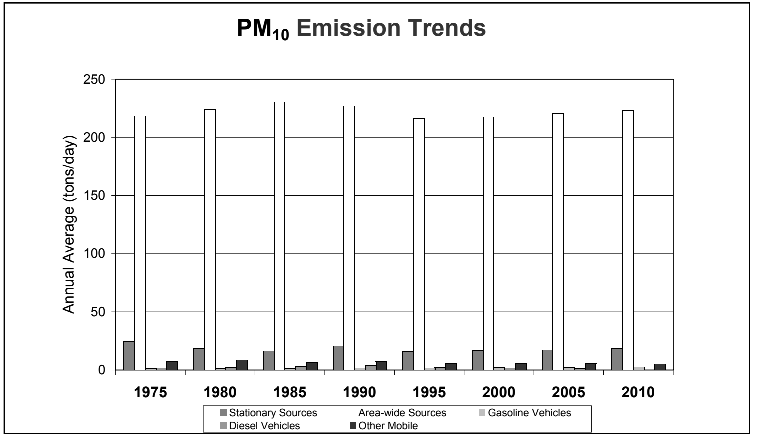


Figure 4-50

# *Sacramento Valley Air Basin*

## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ are fairly steady in the Sacramento Valley Air Basin between 1975 and 2010. Emissions are dominated by contributions from area-wide sources, primarily fugitive dust from paved and unpaved roads, fugitive dust from construction and demolition, and particulates from residential fuel combustion. Emissions of directly emitted $PM_{2.5}$ from mobile sources and stationary sources in the Sacramento Valley Air Basin have remained relatively steady.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 30 percent of the ambient $PM_{2.5}$ in the Sacramento Valley Air Basin.

| Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | ***103*** | ***102*** | ***102*** | ***104*** | ***93*** | ***92*** | ***93*** | ***94*** |
| **Stationary Sources** | 18 | 12 | 11 | 13 | 10 | 10 | 11 | 11 |
| **Area-wide Sources** | 77 | 79 | 82 | 79 | 75 | 74 | 75 | 75 |
| **On-Road Mobile** | 2 | 3 | 4 | 4 | 3 | 3 | 3 | 2 |
| Gasoline Vehicles | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| Diesel Vehicles | 1 | 2 | 3 | 3 | 2 | 2 | 1 | 1 |
| **Other Mobile** | 6 | 8 | 6 | 6 | 5 | 5 | 5 | 4 |

Table 4-41

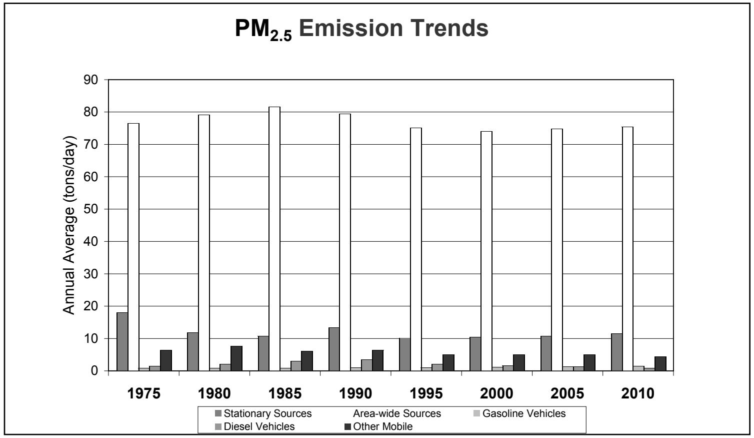


Figure 4-51

# *Sacramento Valley Air Basin*

## $PM_{10}$ Air Quality Trend

The maximum annual average $PM_{10}$ concentrations in the Sacramento Valley Air Basin show a fairly steady decline over the trend period, with some variability over the last several years. The maximum annual average shows a decrease of about 41 percent from 1988 to 2001. The number of exceedance days also decreased. During 1988, there were 183 calculated exceedance days of the State 24-hour standard, compared with 96 days during 2001. Because many of the sources that contribute to ozone also contribute to $PM_{10}$, future ozone emission controls should improve $PM_{10}$ air quality.

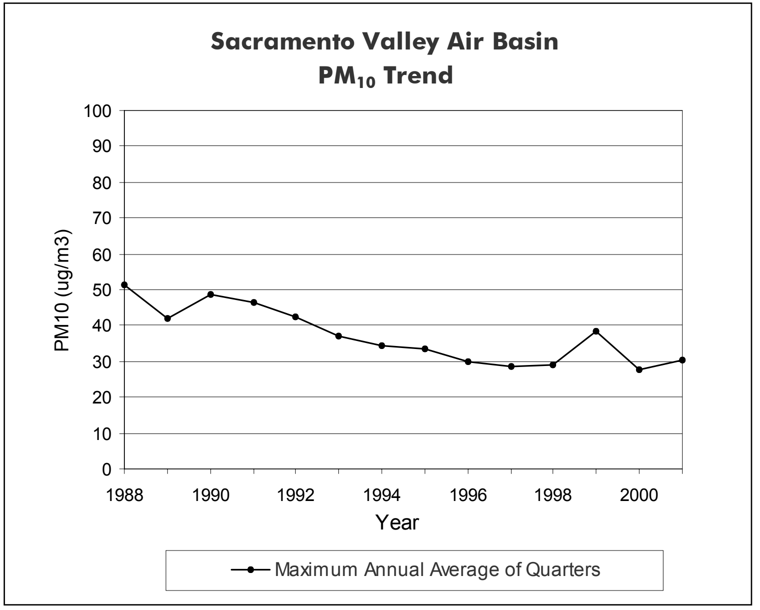


Figure 4-52

# *Sacramento Valley Air Basin*

## $PM_{10}$ Air Quality Table

| $PM_{10}$ (ug/m3) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hour Concentration | | | | | | | 115 | 139 | 153 | 136 | 111 | 110 | 154 | 145 | 98 | 126 | 130 | 179 | 86 | 105 |
| Max. Avg. of Quarters | | | | | | | 51.2 | 41.9 | 48.7 | 46.4 | 42.3 | 36.9 | 34.5 | 33.4 | 29.8 | 28.6 | 29.0 | 38.4 | 27.9 | 30.2 |
| Calc Days Above State 24-Hr Std | | | | | | | 183 | 134 | 175 | 189 | 177 | 92 | 108 | 108 | 129 | 65 | 97 | 144 | 81 | 96 |
| Calc Days Above Nat 24-Hr Std | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 |

Table 4-42

# *Sacramento Valley Air Basin*
## Carbon Monoxide Emission Trends and Forecasts

Emissions of CO are declining in the Sacramento Valley Air Basin between 1980 and 2010. Motor vehicles are the largest source of CO emissions. With the introduction of new automotive emission controls to meet more stringent emission standards, motor vehicle CO emissions have been declining since 1985, despite increases in vehicle miles traveled (VMT). Stationary and area-wide source CO emissions have remained relatively steady, with additional emission controls offsetting growth.

| CO Emission Trends (tons/day, annual average) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** |
| ***All Sources*** | **3010** | **3015** | **2877** | **2503** | **1875** | **1446** | **1192** | **1006** |
| **Stationary Sources** | 28 | 30 | 18 | 54 | 42 | 45 | 46 | 48 |
| **Area-wide Sources** | 362 | 376 | 387 | 367 | 342 | 329 | 332 | 334 |
| **On-Road Mobile** | 2450 | 2389 | 2246 | 1813 | 1225 | 822 | 576 | 398 |
| **Gasoline Vehicles** | 2442 | 2377 | 2228 | 1793 | 1210 | 808 | 565 | 389 |
| **Diesel Vehicles** | 8 | 12 | 17 | 20 | 16 | 13 | 12 | 9 |
| **Other Mobile** | 170 | 220 | 227 | 269 | 265 | 250 | 239 | 226 |

Table 4-43

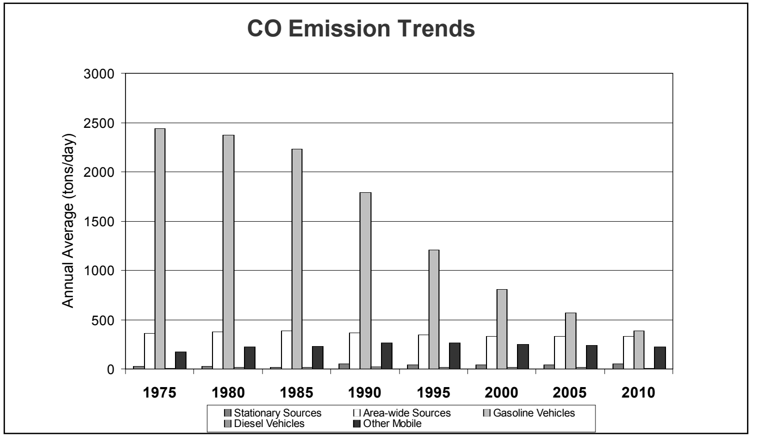


Figure 4-53

# *Sacramento Valley Air Basin*

## Carbon Monoxide Air Quality Trend

The maximum peak 8-hour carbon monoxide trend for the Sacramento Valley Air Basin was relatively flat from 1982 to 1991, with some year-to-year variability that was probably caused by meteorology. Since 1991, concentrations have decreased substantially. The 2001 value was about 51 percent lower than the 1991 value. The number of days above the State and national standards is even more variable. However, these indicators also show an overall downward trend. The national CO standards have not been exceeded since 1991, and the State standards were last exceeded in 1993. Much of the decline in ambient carbon monoxide concentrations is attributable to the introduction of cleaner fuels and newer, cleaner motor vehicles. These controls will help keep the area in attainment for both the State and national CO standards.

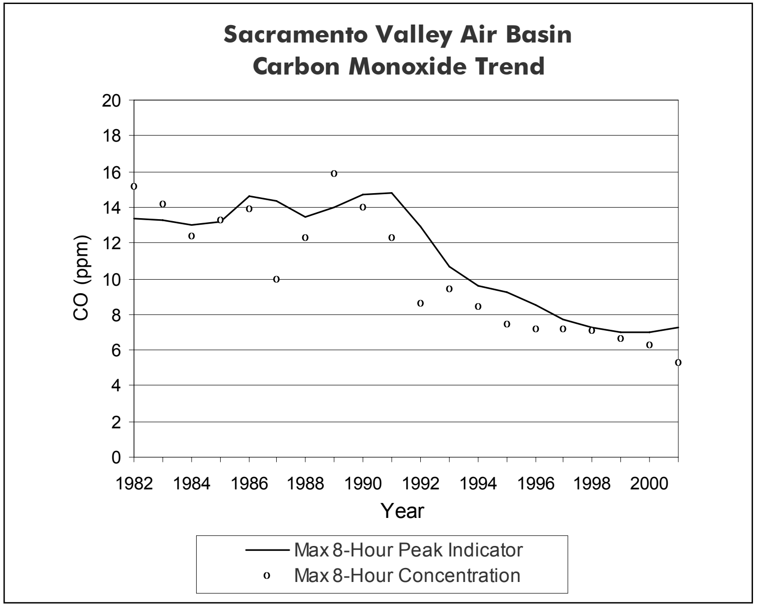


Figure 4-54

# *Sacramento Valley Air Basin*

## Carbon Monoxide Air Quality Table

| CARBON MONOXIDE (ppm) | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator | 13.4 | 13.2 | 13.0 | 13.1 | 14.6 | 14.4 | 13.4 | 14.0 | 14.7 | 14.8 | 12.9 | 10.7 | 9.6 | 9.3 | 8.5 | 7.7 | 7.3 | 7.0 | 7.0 | 7.3 |
| Max. 1-Hr. Concentration | 17.0 | 19.0 | 18.0 | 17.0 | 20.0 | 15.0 | 17.0 | 18.0 | 17.0 | 15.0 | 14.0 | 12.0 | 10.8 | 9.8 | 8.7 | 9.5 | 7.9 | 7.7 | 10.0 | 19.1 |
| Max. 8-Hr. Concentration | 15.1 | 14.1 | 12.4 | 13.3 | 13.9 | 10.0 | 12.3 | 15.9 | 14.0 | 12.3 | 8.6 | 9.4 | 8.5 | 7.4 | 7.2 | 7.2 | 7.1 | 6.6 | 6.3 | 5.3 |
| Days Above State 8-Hr. Std. | 11 | 6 | 6 | 12 | 13 | 5 | 12 | 22 | 14 | 9 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 9 | 4 | 5 | 12 | 12 | 3 | 9 | 22 | 12 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-44