# Chapter 4

## Air Basin Trends and Forecasts -- Criteria Pollutants

# *Introduction*

This chapter provides a look at emissions and air quality in California's five major air basins (data for individual counties are provided in Appendix A). Emissions data include past trends and projections of future emissions levels. The air quality statistics include values reflecting both the State and national ambient air quality standards. Below we will briefly discuss some of the statistics used to characterize ozone and PM air quality in this chapter.

In addition to maximum concentrations and number of days above the standards, the ozone statistics include the peak indicator and the three-year average of the 4$^{th}$ highest 8-hour concentration. The peak indicator represents the maximum concentration expected to be exceeded no more than once per year, on average, based on the distribution of data at a particular monitoring site. Because it is based on a robust statistical calculation using three years of data, the peak indicator is relatively stable and provides a trend indicator that is not highly influenced by year-to-year changes in weather. The 1-hour and 8-hour peak indicators are calculated from measured data and relate to State standards. In contrast, the three-year average of the 4$^{th}$ highest concentration is related to the national 8-hour ozone standard. (Please note that a different indicator was used for determining compliance with the federal 1-hour ozone standard.) These statistics are reported for the end year of the three year period. For example, the 2005 peak indicator reflects data for the years 2003 through 2005.

The peak indicator and the three-year average of the 4$^{th}$ high are generally called "design values" and are the concentrations that are compared to the standard for the purpose of determining attainment status. However, values for these statistics that are included in this almanac may not satisfy data completeness requirements or the boundaries of a nonattainment area, which may differ from county or air basin boundaries. Data conforming to the established design value requirements are available for the national 8-hour ozone standard on the web at *www.arb.ca.gov/airqualitytoday* under "recent year's ozone air quality." Furthermore, when evaluating these statistics, keep in mind that they represent data for a three-year period.

Some of the PM statistics included in this chapter also relate to the State and national standards and differ from one another because the requirements of the standards are different. For example, there is a maximum 24-hour $PM_{2.5}$ concentration listed for State purposes and another for national purposes. During some years or in some areas the two numbers may differ. These differences occur because the monitors acceptable for the two standards are different. The situation is similar for the State and national annual average. Both reflect a summary statistic based on one year of data. However in this case, both the acceptable monitors differ and the calculation methods differ. Finally, it is important to note that air quality statistics based on a single year of data (for example, the yearly count of days above the standard) can fluctuate from year-to-year because of variations in weather. As a result, this almanac compares three-year averages when characterizing the percentage increase or decrease in days above the standard. In this case, the number of exceedance days for 1986 (which represents an average of 1984, 1985, and 1986) is then compared to the 2005 value (which represents an average of 2003, 2004, and 2005), giving a much more stable indicator of long-term progress.

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# *South Coast Air Basin*

## Introduction - Area Description

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 6,480 square miles, is home to more than 43 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 the nation. As a result, controlling the contributing emission sources poses a great challenge to State and local air pollution control agencies.

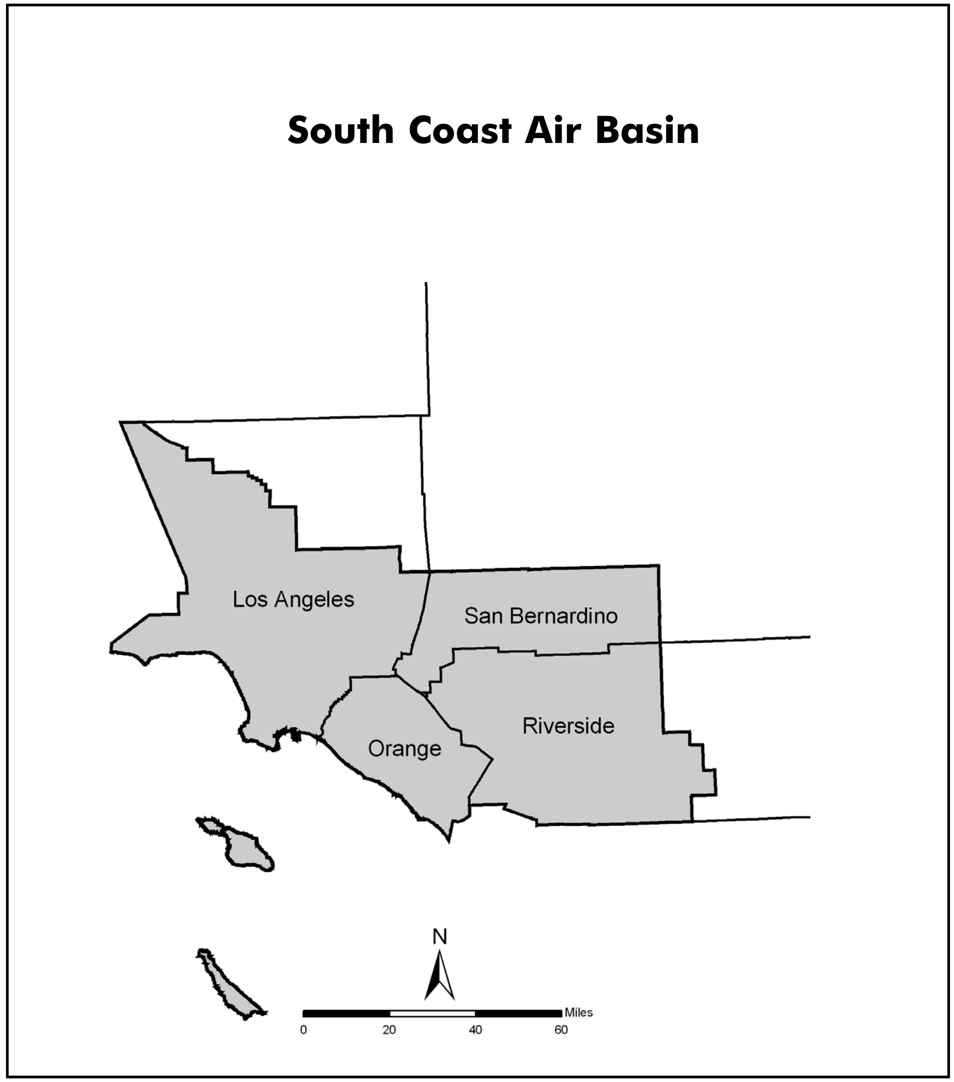



Figure 4-1

# *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 2020. 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. The emission levels for $SO_x$ have decreased since 1975. This is mainly due to the switch from fuel oil to natural gas for electric generation and to reduced fuel sulfur content. The increase in $SO_x$ emissions from 2005 onward is due to predicted growth in shipping activities.

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 Emissions (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pollutant** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| **$NO_x$** | 1693 | 1532 | 1564 | 1561 | 1335 | 1180 | 999 | 755 | 600 | 493 |
| **ROG** | 2748 | 2312 | 2246 | 1801 | 1361 | 1080 | 729 | 569 | 518 | 496 |
| **$PM_{10}$** | 224 | 233 | 254 | 357 | 346 | 348 | 313 | 286 | 296 | 306 |
| **$PM_{2.5}$** | 126 | 115 | 114 | 131 | 114 | 115 | 112 | 103 | 103 | 105 |
| **$SO_x$** | 409 | 194 | 101 | 77 | 52 | 43 | 46 | 48 | 52 | 57 |
| **CO** | 16544 | 13605 | 13148 | 10750 | 7778 | 5648 | 4129 | 2950 | 2472 | 2198 |

Table 4-1

# *South Coast Air Basin*

## Population and VMT

Both population and the daily VMT grew from 1980 to 2005 and are projected to continue to grow at high rates in the South Coast Air Basin from 2005 to 2020. 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.

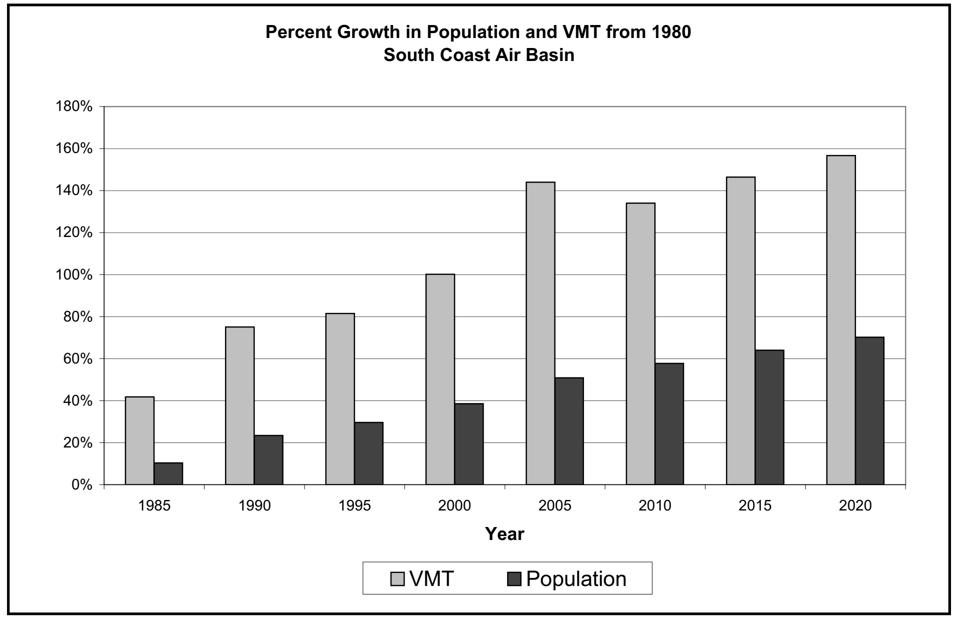



Figure 4-2

| Parameter | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Population | 10604663 | 11698030 | 13083594 | 13745292 | 14687872 | 15996422 | 16727861 | 17389313 | 18050763 |
| Avg. Daily VMT/1000 | 161397 | 228818 | 282561 | 292884 | 323009 | 393767 | 377734 | 397696 | 414267 |

Table 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 2020, 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.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***1693*** | ***1532*** | ***1564*** | ***1561*** | ***1335*** | ***1180*** | ***999*** | ***755*** | ***600*** | ***493*** |
| **Stationary Sources** | 306 | 265 | 229 | 181 | 130 | 112 | 60 | 55 | 51 | 51 |
| **Area-wide Sources** | 60 | 54 | 49 | 42 | 35 | 30 | 27 | 23 | 22 | 23 |
| **On-Road Mobile** | 998 | 880 | 955 | 953 | 831 | 692 | 586 | 400 | 285 | 204 |
| Gasoline Vehicles | 927 | 777 | 796 | 725 | 616 | 455 | 295 | 178 | 127 | 92 |
| Diesel Vehicles | 71 | 103 | 159 | 228 | 215 | 237 | 291 | 222 | 158 | 111 |
| **Other Mobile** | 329 | 333 | 331 | 385 | 338 | 345 | 327 | 276 | 241 | 216 |
| Gasoline Fuel | 27 | 27 | 29 | 32 | 28 | 29 | 28 | 24 | 22 | 21 |
| Diesel Fuel | 268 | 271 | 267 | 314 | 265 | 266 | 241 | 194 | 155 | 123 |
| Other Fuel | 34 | 35 | 35 | 39 | 45 | 51 | 58 | 58 | 64 | 72 |

Table 4-3

| ROG Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***2748*** | ***2312*** | ***2246*** | ***1801*** | ***1361*** | ***1080*** | ***729*** | ***569*** | ***518*** | ***496*** |
| **Stationary Sources** | 599 | 494 | 509 | 455 | 298 | 259 | 101 | 100 | 105 | 110 |
| **Area-wide Sources** | 177 | 188 | 204 | 223 | 192 | 185 | 157 | 147 | 152 | 158 |
| **On-Road Mobile** | 1734 | 1382 | 1269 | 875 | 650 | 438 | 297 | 183 | 139 | 113 |
| Gasoline Vehicles | 1725 | 1368 | 1250 | 852 | 635 | 425 | 280 | 169 | 129 | 105 |
| Diesel Vehicles | 9 | 13 | 19 | 23 | 15 | 13 | 17 | 14 | 11 | 8 |
| **Other Mobile** | 238 | 248 | 264 | 248 | 221 | 198 | 173 | 139 | 121 | 115 |
| Gasoline Fuel | 183 | 192 | 208 | 186 | 164 | 151 | 130 | 104 | 92 | 88 |
| Diesel Fuel | 40 | 40 | 40 | 46 | 41 | 39 | 34 | 27 | 20 | 17 |
| Other Fuel | 15 | 15 | 15 | 16 | 16 | 9 | 9 | 8 | 10 | 11 |

Table 4-4

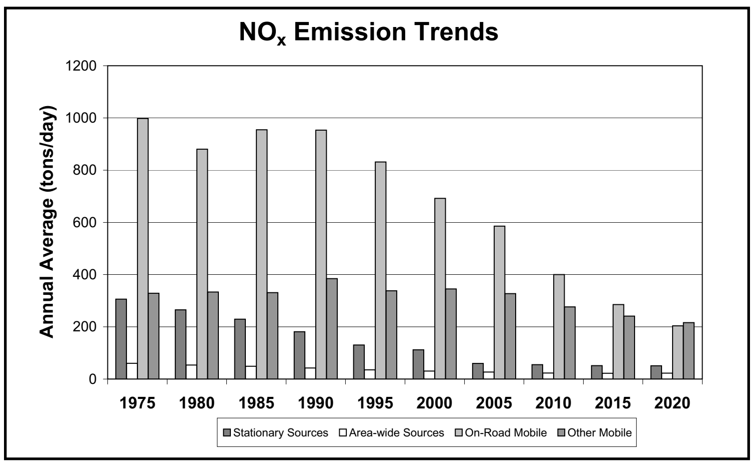



Figure 4-3

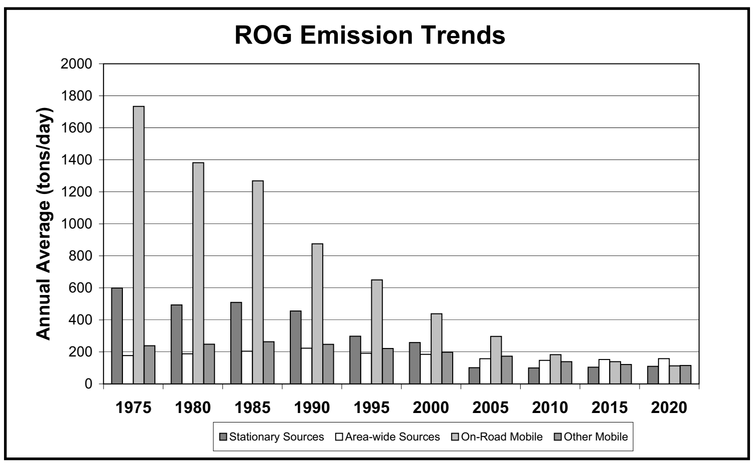



Figure 4-4

# *South Coast Air Basin*

## Ozone Air Quality Trend

Ozone air quality 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 ppm. Today, the maximum measured concentrations are less than one-third of that. The 2005 ozone season in the South Coast was on a par with 2004, with some statistics showing considerable decreases. The 2005 peak 8-hour indicator value was almost 42 percent lower than the 1986 value. The 2006 three-year average of the maximum 8-hour concentration was nearly 40 percent lower than 1988. The number of days above the standards has also declined dramatically, and the trend for 1-hour ozone is similar to that for 8-hour.

Although ozone has improved substantially over time, progress has leveled off during the last several years. This may be attributable to changes in the mix and reactivity of precursor emissions in the South Coast. While the basinwide trends show a slower rate of improvement during recent years, progress in some subregions of the Basin (for example, the coastal area and some of the inland valley areas) is still occurring. Continuing implementation of the aggressive emissions control measures will ensure continued progress throughout the Basin.

The ARB has identified the South Coast Air Basin as a transport contributor to several downwind areas — Mojave Desert Air Basin, Salton Sea Air Basin, San Diego Air Basin, and 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.

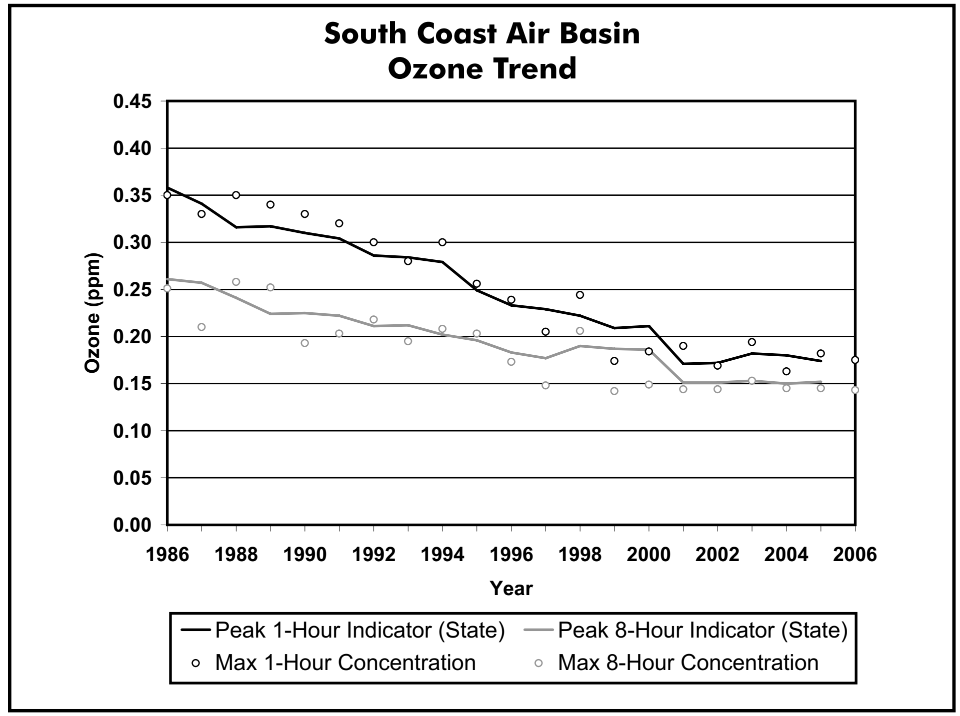



Figure 4-5

| OZONE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hour Indicator (State) | 0.261 | 0.257 | 0.241 | 0.224 | 0.225 | 0.222 | 0.211 | 0.212 | 0.202 | 0.196 | 0.183 | 0.177 | 0.190 | 0.187 | 0.186 | 0.151 | 0.151 | 0.153 | 0.150 | 0.152 | |
| Avg. of 4th High 8-Hr. in 3 Yrs | 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 | 0.128 | 0.131 | 0.127 | 0.127 | |
| Peak 1-Hour Indicator (State) | 0.358 | 0.341 | 0.316 | 0.317 | 0.310 | 0.304 | 0.286 | 0.284 | 0.279 | 0.249 | 0.233 | 0.229 | 0.222 | 0.209 | 0.211 | 0.171 | 0.172 | 0.182 | 0.180 | 0.174 | |
| 4th High 1-Hr. in 3 Yrs[2] | 0.360 | 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 | 0.184 | 0.169 | 0.184 | 0.171 | 0.173 | |
| Max. 8-Hr. Concentration | 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 | 0.144 | 0.153 | 0.145 | 0.145 | 0.143 |
| Maximum 1-Hr. Concentration | 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 | 0.169 | 0.194 | 0.163 | 0.182 | 0.175 |
| Days Above State 8-Hr. Std. | 221 | 198 | 215 | 221 | 192 | 188 | 199 | 205 | 176 | 173 | 165 | 175 | 139 | 146 | 147 | 154 | 147 | 153 | 152 | 138 | 130 |
| Days Above Nat. 8-Hr. Std. | 191 | 179 | 194 | 181 | 161 | 160 | 173 | 161 | 148 | 120 | 115 | 118 | 93 | 93 | 94 | 92 | 96 | 109 | 88 | 83 | 86 |
| Days Above State 1-Hr. Std. | 217 | 196 | 216 | 211 | 185 | 184 | 190 | 185 | 165 | 153 | 141 | 144 | 107 | 111 | 115 | 121 | 116 | 125 | 105 | 99 | 102 |

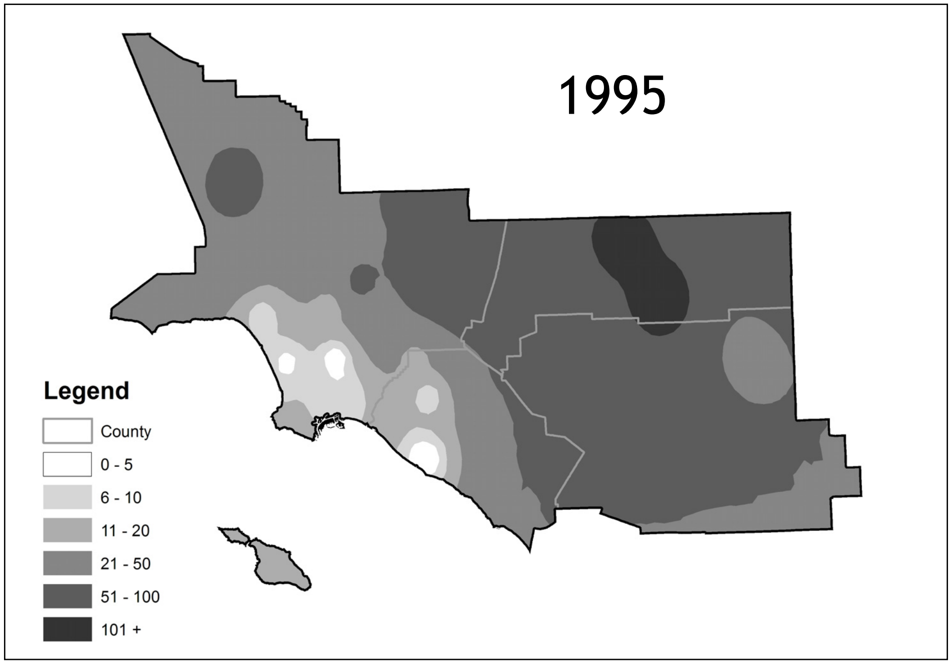
[1] Preliminary data for 2006 are shown here, however they are subject to change. 2005 is the last year for which complete and approved data is available, thus calculated annual statistics are not included for 2006.

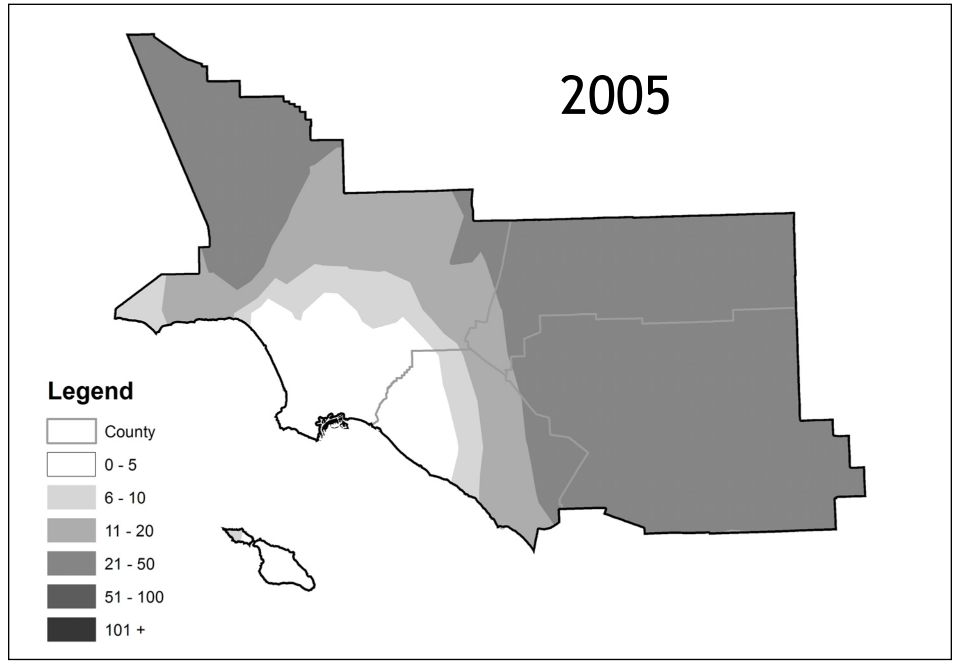
[2] The national 1-Hour standard has been revoked. Historical 1-Hour data are provided for reference.

Table 4-5

# *South Coast Air Basin*

## Ozone Contour Maps - 3-year Average of National 8-Hour Exceedance Days




NOTE: Values used in these maps are for long-term sites only. Long-term sites are used ito more accurately represent a trend over a period, by comparing the same or similar sites over a long period.

Figure 4-6

Figure 4-7

Another way to look at ozone air quality is to evaluate how widespread the problem is within a region. The maps on this page illustrate how the number of days exceeding the national 8-hour standard have changed across the South Coast Air Basin over the last decade. Three-year averages are used to help mitigate the impact of changes in meteorology.

Overall, the two maps show a substantial reduction in the number of exceedance days over the last 10 years. During the 1995 time period, about half of the South Coast had more than 50 exceedance days, with more than 100 days in the worst area. This is equivalent to more than three months during a year with ozone concentrations above the level of the standard. The coastal areas were cleaner than the inland areas. However, only small, isolated portions of the Basin had ten or fewer exceedance days.

The 2005 map shows a dramatic expansion of clean areas, especially those in the range of zero to five exceedance days. These are the areas that currently meet the national standard, and they include about a third of Orange County and a fourth of Los Angeles County, where the majority of the Basin population lives and works. The areas with 6 to 10 and 11 to 20 exceedance days has also grown substantially. Ozone air quality in the inland areas is still worse than in areas nearer the coast. Even so, the areas with the highest number of exceedance days are limited to the northwestern portion of Los Angeles County and portions of Riverside and San Bernardino counties. However, despite the dramatic improvements in these areas, a large percentage of the basinwide population still experiences more than 50 exceedance days per year.

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# *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, dust from construction and demolition operations, and other sources. The increase in activity of these area-wide sources reflects the increased growth and VMT in the air basin.

PM 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 $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 65 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** | **2015** | **2020** |
| ***All Sources*** | ***224*** | ***233*** | ***254*** | ***357*** | ***346*** | ***348*** | ***313*** | ***286*** | ***296*** | ***306*** |
| **Stationary Sources** | 61 | 45 | 33 | 50 | 45 | 50 | 51 | 22 | 23 | 25 |
| **Area-wide Sources** | 122 | 145 | 172 | 249 | 255 | 253 | 213 | 219 | 231 | 240 |
| **On-Road Mobile** | 18 | 20 | 25 | 32 | 25 | 24 | 27 | 25 | 24 | 24 |
| Gasoline Vehicles | 10 | 8 | 9 | 11 | 11 | 13 | 16 | 16 | 18 | 20 |
| Diesel Vehicles | 8 | 12 | 16 | 21 | 13 | 11 | 11 | 8 | 6 | 4 |
| **Other Mobile** | 24 | 24 | 23 | 27 | 21 | 21 | 21 | 20 | 18 | 17 |
| Gasoline Fuel | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 6 | 7 |
| Diesel Fuel | 19 | 19 | 18 | 21 | 15 | 15 | 14 | 11 | 8 | 5 |
| Other Fuel | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 4 | 5 | 5 |

Table 4-6

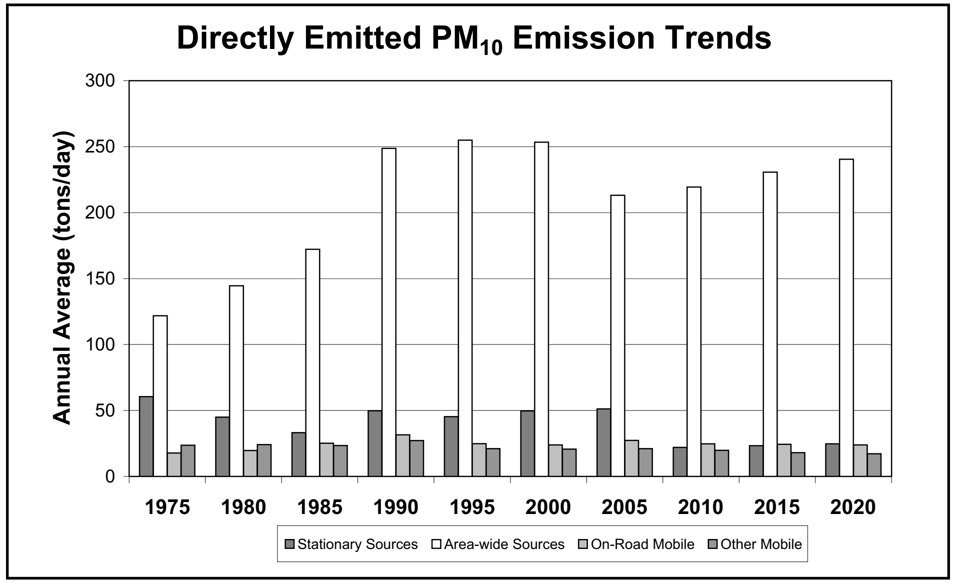



Figure 4-8

# *South Coast Air Basin*

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

Direct emissions of $PM_{2.5}$ have decreased slightly in the South Coast Air Basin since 1975. Stationary source emissions have been decreasing, while area-wide emissions have been increasing. A more significant 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, dust from construction and demolition operations, and other sources. The increase in activity of these area-wide sources reflects the increased growth and VMT in the air basin.

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. 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 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** | **2015** | **2020** |
| ***All Sources*** | ***126*** | ***115*** | ***114*** | ***131*** | ***114*** | ***115*** | ***112*** | ***103*** | ***103*** | ***105*** |
| **Stationary Sources** | 53 | 35 | 24 | 29 | 22 | 23 | 22 | 14 | 15 | 15 |
| **Area-wide Sources** | 38 | 43 | 49 | 52 | 54 | 56 | 51 | 53 | 56 | 58 |
| **On-Road Mobile** | 13 | 15 | 20 | 25 | 19 | 18 | 20 | 18 | 17 | 16 |
| Gasoline Vehicles | 6 | 5 | 5 | 6 | 7 | 8 | 10 | 10 | 12 | 13 |
| Diesel Vehicles | 7 | 11 | 15 | 19 | 12 | 10 | 10 | 8 | 5 | 4 |
| **Other Mobile** | 22 | 22 | 21 | 25 | 19 | 19 | 19 | 18 | 16 | 15 |
| Gasoline Fuel | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 5 |
| Diesel Fuel | 18 | 18 | 17 | 19 | 14 | 14 | 13 | 10 | 7 | 5 |
| Other Fuel | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 4 | 5 | 5 |

Table 4-7

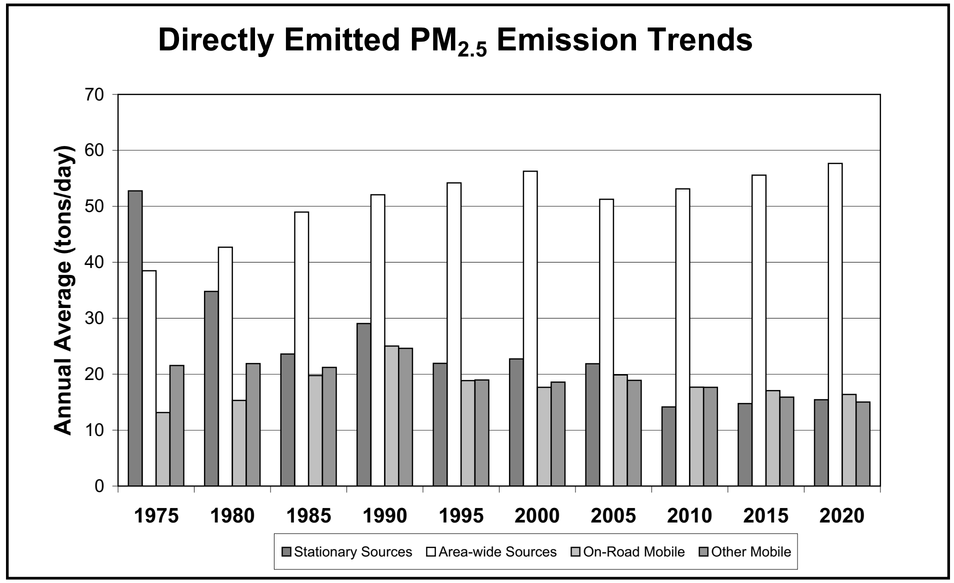



Figure 4-9

# *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 three-year average of the annual average (State) decreased about 36 percent. Although the values in the late 1990's 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 1989, there were 305 calculated days above the State standard and 32 calculated days above the national standard. By 2005, there were 198 calculated State standard exceedance days and no 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.

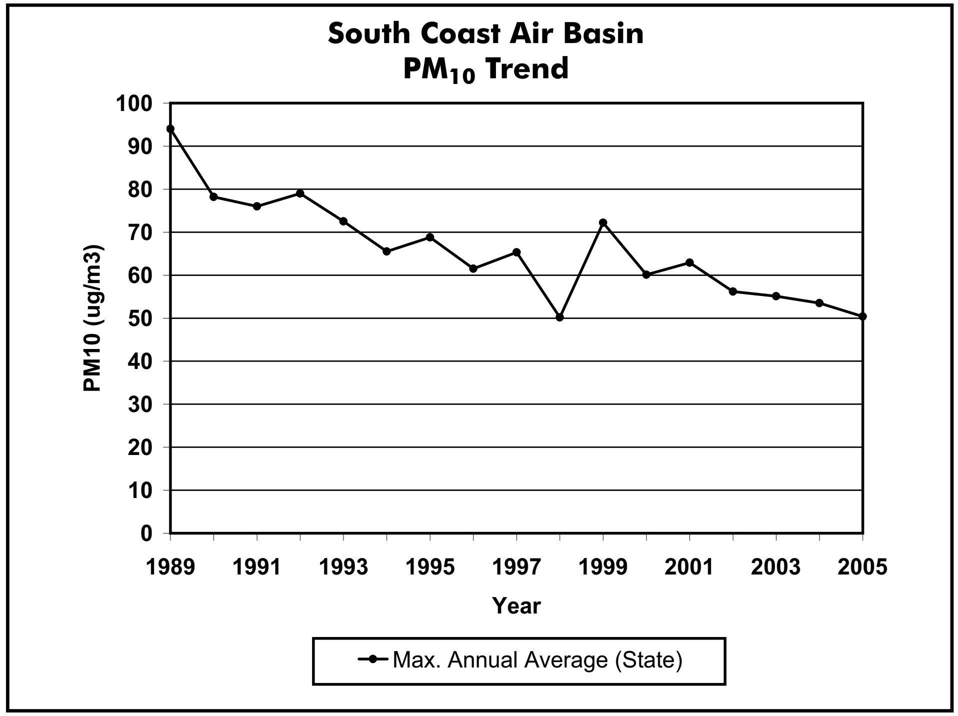



Figure 4-10

| $PM_{10}$ (ug/m3) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | 287 | 271 | 475 | 179 | 649 | 231 | 161 | 219 | 162 | 208 | 116 | 183 | 139 | 219 | 126 | 159 | 133 | 131 |
| Max. 24-Hr. Concentration (Nat) | | | 287 | 271 | 475 | 179 | 649 | 231 | 210 | 219 | 185 | 208 | 116 | 183 | 139 | 219 | 130 | 164 | 137 | 131 |
| Max. Annual Average (State) | | | | 94.0 | 78.2 | 76.0 | 79.0 | 72.5 | 65.5 | 68.8 | 61.5 | 65.3 | 50.2 | 72.2 | 60.1 | 62.9 | 56.2 | 55.1 | 53.5 | 50.4 |
| Max. Annual Average (Nat) | | | 103.7 | 93.0 | 78.2 | 76.1 | 79.0 | 72.5 | 65.5 | 68.8 | 62.8 | 65.6 | 58.7 | 72.2 | 59.1 | 63.3 | 58.1 | 55.6 | 54.8 | 51.8 |
| Calc Days Above State 24-Hr Std | | | | 305 | 275 | 250 | 243 | 251 | 244 | 226 | 251 | 257 | 171 | 261 | 248 | 240 | 228 | 201 | 210 | 198 |
| Calc Days Above Nat 24-Hr Std | | | | 32 | 33 | 15 | 24 | 12 | 4 | 8 | 7 | 17 | 0 | 6 | 0 | 5 | 0 | 6 | 0 | 0 |

Table 4-8

# *South Coast Air Basin*

## $PM_{2.5}$ Air Quality Trend

Figure 4-11 shows the annual average $PM_{2.5}$ concentrations (national) in the South Coast Air Basin from 1999 through 2004. Overall, concentrations were relatively stable during the first three years. However, over the last four years the annual average concentrations have decreased. The State annual average concentrations also show a declining trend, although the trend looks less pronounced, due to differences in State and national monitoring methods. The 98th percentile of 24 hour $PM_{2.5}$ concentrations has also declined within the last seven years. The South Coast Air Basin is currently designated as nonattainment for the State and national $PM_{2.5}$ standards. Measures adopted as part of the upcoming $PM_{2.5}$ SIP, as well as programs to reduce ozone and diesel PM will help in reducing public exposure to $PM_{2.5}$ in this region.

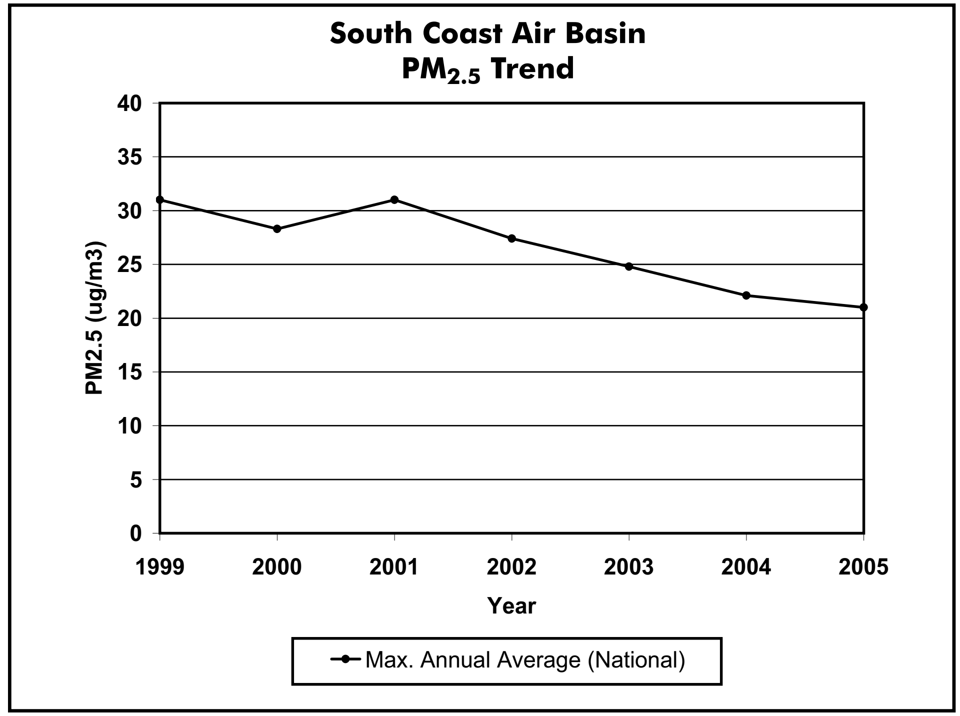



Figure 4-11

| $PM_{2.5}$ (ug/m$^3$) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | | | | | | | | | | | | 121.4 | 119.6 | 104.0 | 82.1 | 121.2 | 93.8 | 132.6 |
| Max. 24-Hr. Concentration (Nat) | | | | | | | | | | | | | | 121.4 | 119.6 | 98.0 | 82.1 | 121.2 | 93.8 | 132.6 |
| 98th Percentile of 24-Hr Conc. | | | | | | | | | | | | | | 85.6 | 83.0 | 74.3 | 66.3 | 76.6 | 72.4 | 58.3 |
| Annual Average (State) | | | | | | | | | | | | | | | 24.0 | 25.0 | 25.8 | 24.8 | 16.6 | 21.0 |
| Annual Average (Nat) | | | | | | | | | | | | | | 31.0 | 28.3 | 31.0 | 27.4 | 24.8 | 22.1 | 21.0 |

Table 4-9

# *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 have declined since 1990 and are projected to decline through 2010 as more stringent emission standards are adopted.

| CO Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***16544*** | ***13605*** | ***13148*** | ***10750*** | ***7778*** | ***5648*** | ***4129*** | ***2950*** | ***2472*** | ***2198*** |
| **Stationary Sources** | 288 | 278 | 66 | 92 | 60 | 45 | 55 | 55 | 55 | 57 |
| **Area-wide Sources** | 85 | 70 | 106 | 70 | 79 | 104 | 109 | 112 | 115 | 119 |
| **On-Road Mobile** | 14958 | 11988 | 11627 | 9103 | 6385 | 4414 | 2979 | 1818 | 1306 | 973 |
| Gasoline Vehicles | 14926 | 11940 | 11558 | 9013 | 6307 | 4350 | 2905 | 1756 | 1254 | 929 |
| Diesel Vehicles | 33 | 48 | 69 | 90 | 78 | 64 | 73 | 62 | 52 | 43 |
| **Other Mobile** | 1213 | 1269 | 1348 | 1485 | 1254 | 1085 | 985 | 964 | 995 | 1049 |
| Gasoline Fuel | 957 | 1011 | 1090 | 1198 | 987 | 858 | 769 | 740 | 744 | 771 |
| Diesel Fuel | 132 | 135 | 135 | 161 | 137 | 123 | 110 | 118 | 137 | 154 |
| Other Fuel | 123 | 123 | 124 | 126 | 130 | 103 | 107 | 106 | 115 | 124 |

Table 4-10

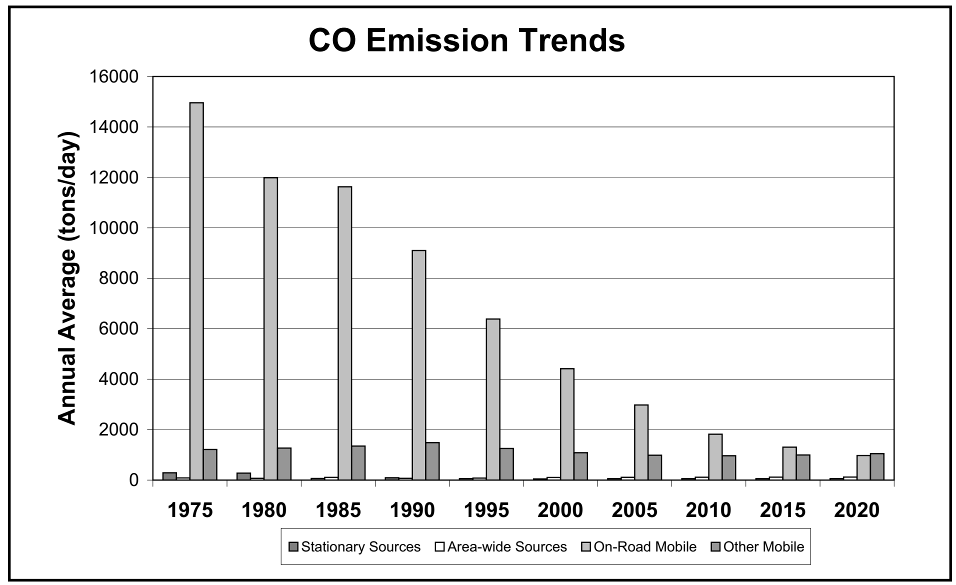



Figure 4-12

# *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 more than 66 percent in the peak 8-hour indicator since 1986. The number of exceedance days has also declined. During 1986 there were 58 days above the State standard and 49 days above the national standard. However, since 2003, there were no exceedance days for either standard.

The entire South Coast Air Basin is now designated as attainment for the national CO standards effective June 11, 2007. Ongoing reductions from motor vehicle control programs should continue the downward trend in ambient CO concentrations.

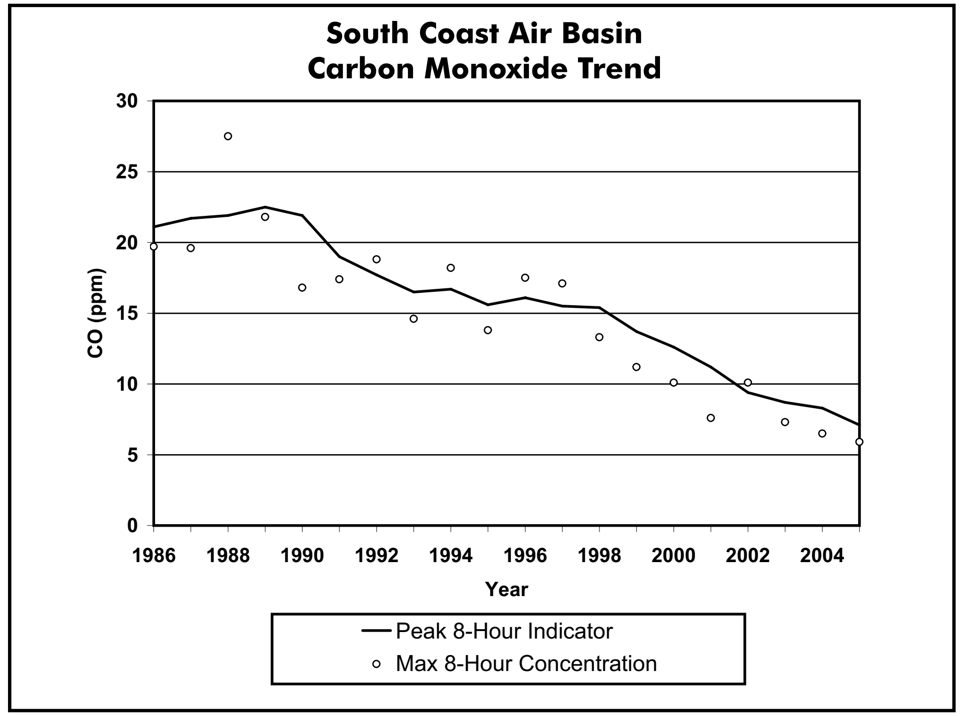



Figure 4-13

| CARBON MONOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator (State) | 21.1 | 21.7 | 21.9 | 22.5 | 21.9 | 19.0 | 17.7 | 16.5 | 16.7 | 15.6 | 16.1 | 15.5 | 15.4 | 13.7 | 12.6 | 11.2 | 9.4 | 8.7 | 8.3 | 7.1 |
| Max. 1-Hr. Concentration | 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 | 15.8 | 12.2 | 10.4 | 7.4 |
| Max. 8-Hr. Concentration (State) | 19.7 | 19.6 | 27.5 | 21.8 | 16.8 | 17.4 | 18.8 | 14.6 | 18.2 | 13.8 | 17.5 | 17.1 | 13.3 | 11.2 | 10.1 | 7.6 | 10.1 | 7.3 | 6.5 | 5.9 |
| Days Above State 8-Hr. Std. | 58 | 50 | 73 | 71 | 50 | 51 | 39 | 29 | 27 | 17 | 26 | 18 | 13 | 11 | 6 | 0 | 1 | 0 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 49 | 40 | 65 | 67 | 42 | 41 | 34 | 19 | 19 | 14 | 19 | 13 | 10 | 7 | 3 | 0 | 1 | 0 | 0 | 0 |

Table 4-11

# *South Coast Air Basin*
## Nitrogen Dioxide
### Oxides of Nitrogen Emission Trends and Forecasts

Oxides of nitrogen ($NO_x$) and nitrogen dioxide ($NO_2$) 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.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***1693*** | ***1532*** | ***1564*** | ***1561*** | ***1335*** | ***1180*** | ***999*** | ***755*** | ***600*** | ***493*** |
| **Stationary Sources** | 306 | 265 | 229 | 181 | 130 | 112 | 60 | 55 | 51 | 51 |
| **Area-wide Sources** | 60 | 54 | 49 | 42 | 35 | 30 | 27 | 23 | 22 | 23 |
| **On-Road Mobile** | 998 | 880 | 955 | 953 | 831 | 692 | 586 | 400 | 285 | 204 |
| Gasoline Vehicles | 927 | 777 | 796 | 725 | 616 | 455 | 295 | 178 | 127 | 92 |
| Diesel Vehicles | 71 | 103 | 159 | 228 | 215 | 237 | 291 | 222 | 158 | 111 |
| **Other Mobile** | 329 | 333 | 331 | 385 | 338 | 345 | 327 | 276 | 241 | 216 |
| Gasoline Fuel | 27 | 27 | 29 | 32 | 28 | 29 | 28 | 24 | 22 | 21 |
| Diesel Fuel | 268 | 271 | 267 | 314 | 265 | 266 | 241 | 194 | 155 | 123 |
| Other Fuel | 34 | 35 | 35 | 39 | 45 | 51 | 58 | 58 | 64 | 72 |

Table 4-12

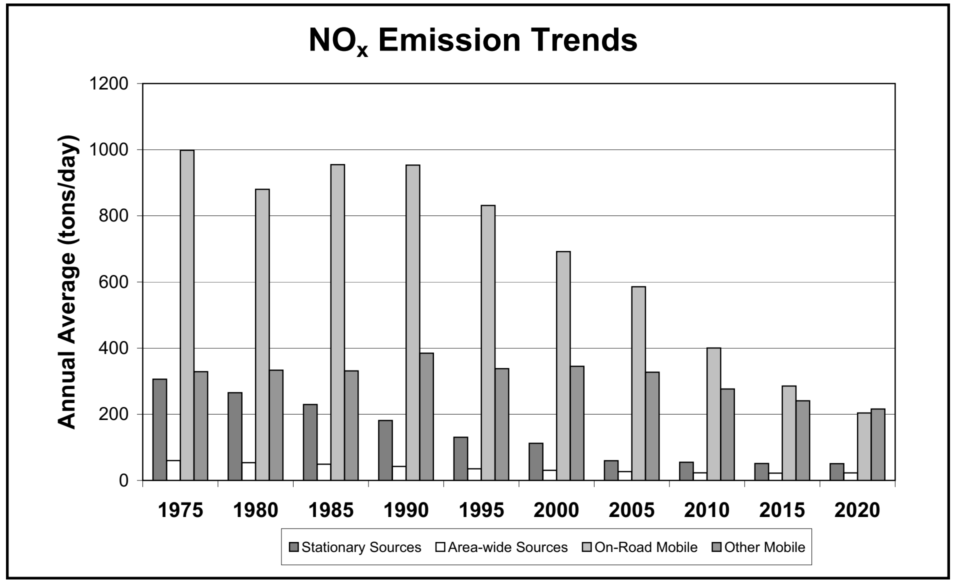



Figure 4-14

# *South Coast Air Basin*

## Nitrogen Dioxide Air Quality Trend

The South Coast Air Basin is one of only a few areas in California where $NO_2$ has been a problem. The South Coast Air Basin attained the State 1-hour $NO_2$ standard in 1994, bringing the entire State into attainment. The federal standard has not been exceeded since 1991.

Over the last 20 years, $NO_2$ values have decreased significantly in the South Coast Air Basin. The peak 1-hour indicator for 2005 was half of what it was during 1986. However, since the early 1990's, maximum 1-hour $NO_2$ concentrations that exceed the level of the State standard have occasionally occurred but have not affected the area's attainment status. These exceedances have been very infrequent and limited to either the Banning Airport or the Burbank-West Palm Avenue monitoring sites. Maximum concentrations have been much lower in the last three years.

$NO_2$ is formed from $NO_x$ emissions, 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 $NO_x$ emissions.

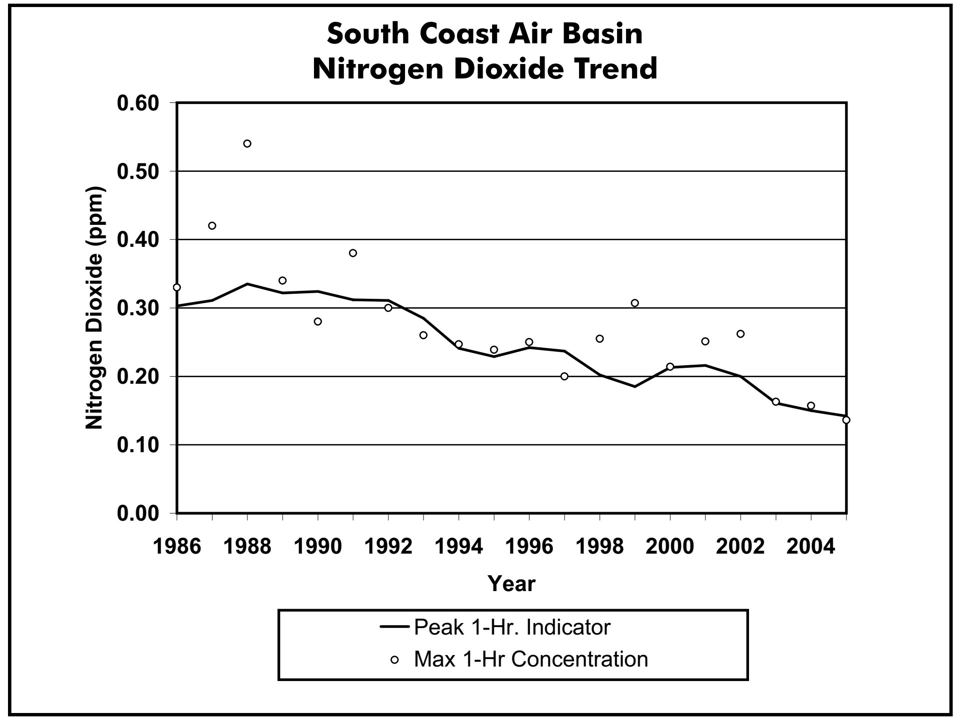



Figure 4-15

| NITROGEN DIOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hr. Indicator (State) | 0.303 | 0.311 | 0.335 | 0.322 | 0.324 | 0.312 | 0.311 | 0.285 | 0.241 | 0.229 | 0.242 | 0.237 | 0.202 | 0.185 | 0.213 | 0.216 | 0.200 | 0.161 | 0.150 | 0.142 |
| Max. 1-Hr. Concentration | 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 | 0.262 | 0.163 | 0.157 | 0.136 |
| Max. Annual Average | 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 | 0.040 | 0.035 | 0.033 | 0.031 |

Table 4-13

# *San Francisco Bay Area Air Basin*

## Introduction - Area Description

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 5,340 square miles.

About 19 percent of California's population resides in the San Francisco Bay Area, and pollution sources in the region account for about 15 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 inland areas such as the South Coast, San Joaquin Valley, and Sacramento regions. This is due to a more favorable climate, with cooler temperatures and better ventilation. However, exceedances of the State ozone and PM standards continue to occur in the San Francisco Bay Area Air Basin, and still pose challenges to State and local air pollution control agencies.

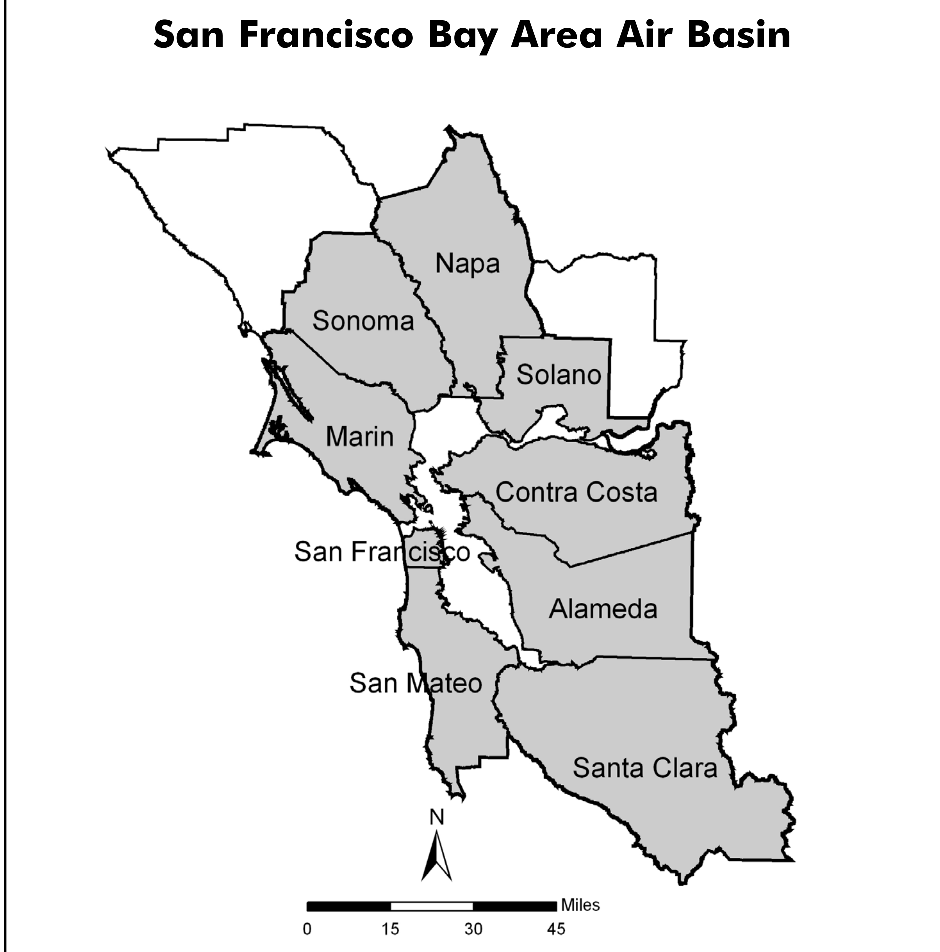



Figure 4-16

# *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 1975. CO emissions have also been trending downward since 1975. 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 reduce ROG emissions. The emission levels for $SO_x$ have decreased since 1975. This is mainly due to the switch from fuel oil to natural gas for electric generation and to reduced fuel sulfur content. The increase in $SO_x$ emissions from 2005 onward is due to predicted growth in shipping activities. An increase in petroleum refining emissions is also seen.

| San Francisco Bay Area Air Basin Emissions (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pollutant** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| **$NO_x$** | 943 | 918 | 821 | 797 | 720 | 622 | 496 | 423 | 348 | 301 |
| **ROG** | 1430 | 1320 | 1047 | 764 | 646 | 525 | 382 | 330 | 302 | 290 |
| **$PM_{10}$** | 181 | 182 | 195 | 194 | 189 | 218 | 210 | 220 | 230 | 241 |
| **$PM_{2.5}$** | 81 | 79 | 79 | 83 | 81 | 84 | 81 | 83 | 84 | 87 |
| **$SO_x$** | 210 | 196 | 106 | 109 | 67 | 64 | 58 | 57 | 62 | 68 |
| **CO** | 9075 | 8334 | 7011 | 5325 | 3917 | 2961 | 2041 | 1617 | 1363 | 1230 |

Table 4-14

# *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 steeply until 1990, having slowed in recent years and are projected to continue at a slower rate in the San Francisco Bay Area Air Basin through 2020. During that 40-year period , the population is projected to increase about 60 percent, from about 5.1 million in 1980 to more than eight million in 2020. During the same period, the daily VMT is projected to increase 109 percent, from 93 million miles per day in 1980 to over 194 million miles per day in 2020. While these growth rates are lower than the growth rates seen in other areas, they still represent substantial increases.

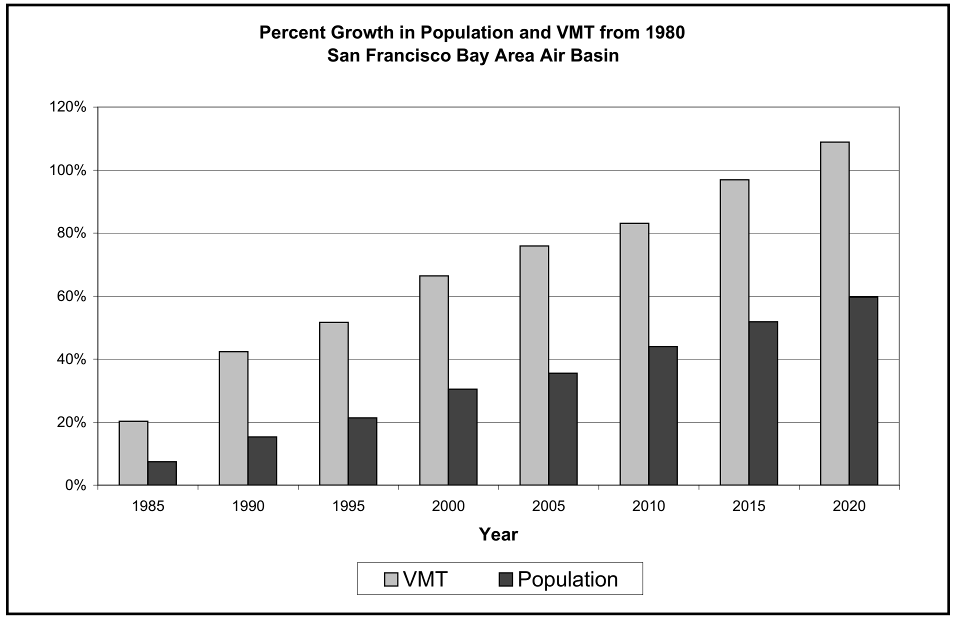



Figure 4-17

| Parameter | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Population | 5095406 | 5473956 | 5874273 | 6182722 | 6646802 | 6904411 | 7337485 | 7736635 | 8135781 |
| Avg. Daily VMT/1000 | 93109 | 111964 | 132558 | 141224 | 154959 | 163790 | 170505 | 183332 | 194476 |

Table 4-15

# *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 1975 and are projected to continue declining through 2020. 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.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***943*** | ***918*** | ***821*** | ***797*** | ***720*** | ***622*** | ***496*** | ***423*** | ***348*** | ***301*** |
| **Stationary Sources** | 229 | 205 | 134 | 124 | 107 | 83 | 49 | 49 | 51 | 53 |
| **Area-wide Sources** | 13 | 14 | 15 | 19 | 20 | 19 | 20 | 20 | 21 | 21 |
| **On-Road Mobile** | 542 | 540 | 500 | 453 | 385 | 312 | 234 | 181 | 124 | 88 |
| Gasoline Vehicles | 516 | 493 | 427 | 356 | 296 | 215 | 128 | 86 | 59 | 42 |
| Diesel Vehicles | 26 | 47 | 73 | 97 | 89 | 98 | 106 | 94 | 64 | 46 |
| **Other Mobile** | 159 | 159 | 172 | 201 | 208 | 207 | 194 | 174 | 153 | 138 |
| Gasoline Fuel | 10 | 10 | 11 | 13 | 14 | 14 | 13 | 11 | 10 | 10 |
| Diesel Fuel | 123 | 121 | 130 | 154 | 158 | 154 | 142 | 120 | 97 | 77 |
| Other Fuel | 27 | 28 | 31 | 34 | 37 | 39 | 39 | 43 | 46 | 51 |

Table 4-16

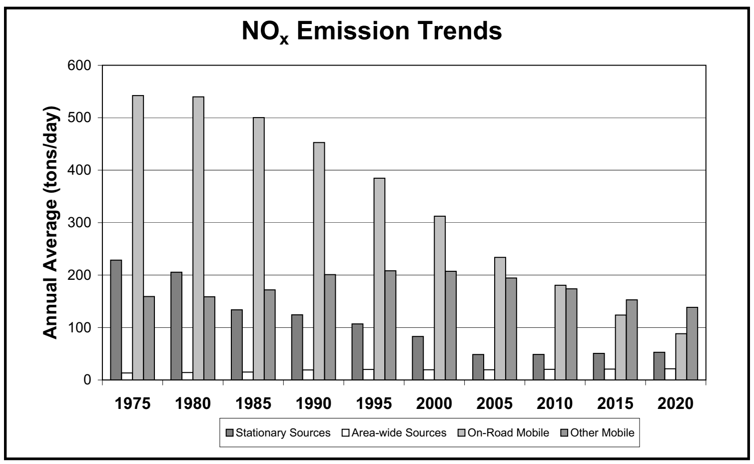



Figure 4-18

| ROG Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***1430*** | ***1320*** | ***1047*** | ***764*** | ***646*** | ***525*** | ***382*** | ***330*** | ***302*** | ***290*** |
| **Stationary Sources** | 294 | 255 | 164 | 113 | 121 | 111 | 73 | 75 | 79 | 82 |
| **Area-wide Sources** | 111 | 110 | 107 | 111 | 97 | 93 | 88 | 90 | 93 | 96 |
| **On-Road Mobile** | 915 | 841 | 654 | 425 | 319 | 223 | 139 | 97 | 72 | 57 |
| Gasoline Vehicles | 912 | 836 | 647 | 417 | 314 | 218 | 133 | 92 | 68 | 54 |
| Diesel Vehicles | 3 | 5 | 7 | 8 | 5 | 5 | 5 | 5 | 4 | 3 |
| **Other Mobile** | 111 | 114 | 122 | 114 | 108 | 98 | 83 | 67 | 59 | 56 |
| Gasoline Fuel | 83 | 85 | 90 | 79 | 74 | 67 | 56 | 44 | 38 | 36 |
| Diesel Fuel | 18 | 17 | 19 | 22 | 24 | 22 | 20 | 16 | 12 | 10 |
| Other Fuel | 11 | 12 | 13 | 13 | 11 | 9 | 7 | 8 | 9 | 10 |

Table 4-17

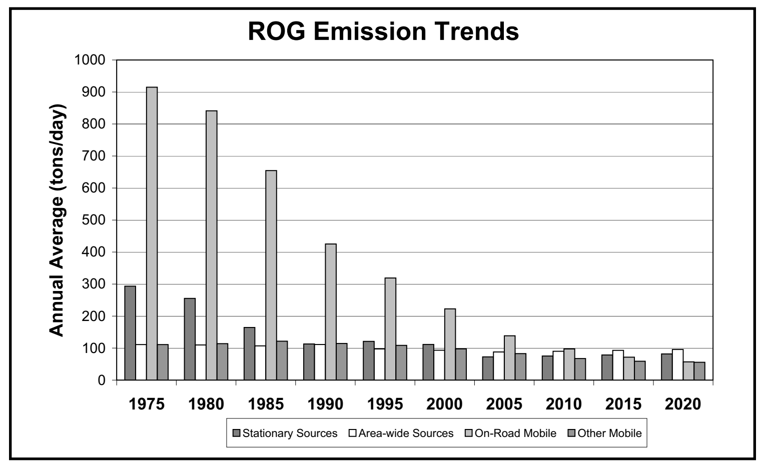



Figure 4-19

# *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 and San Joaquin Valley Air Basins. The peak 1-hour and 8-hour indicators have declined by over 21 percent during the last 20 years. The number of days when State and federal standards are exceeded show a similar trend. Another indication of progress is that the Bay Area now qualifies for attainment of the federal 8-hour ozone standard, although they still exceed the more stringent State 1-hour and 8-hour standards. Although the long-term trends indicate improving air quality, since 1994 the peak indicators have been relatively flat. However, it is not yet clear whether these data represent a significant change in the overall trend.

Meteorology can cause ozone and ozone precursor emissions to 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 Sacramento region, 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.

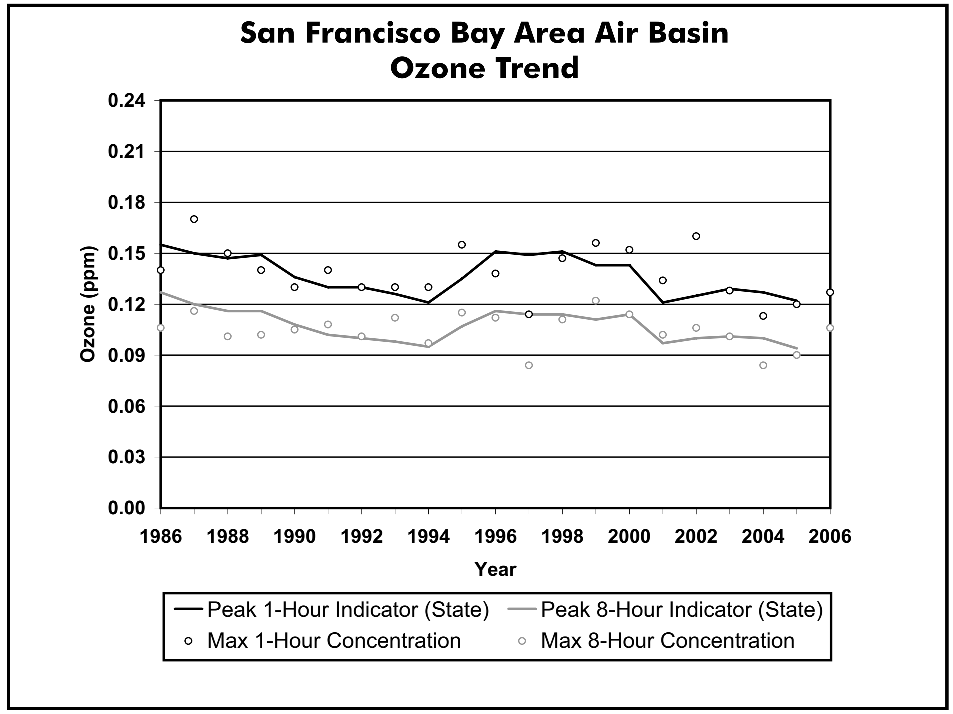



Figure 4-20

| OZONE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hour Indicator (State) | 0.127 | 0.120 | 0.116 | 0.116 | 0.108 | 0.102 | 0.100 | 0.098 | 0.095 | 0.107 | 0.116 | 0.114 | 0.114 | 0.111 | 0.114 | 0.097 | 0.100 | 0.101 | 0.100 | 0.094 | |
| Avg. of 4th High 8-Hr. in 3 Yrs | 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 | 0.082 | 0.086 | 0.084 | 0.078 | |
| Peak 1-Hour Indicator (State) | 0.155 | 0.150 | 0.147 | 0.149 | 0.136 | 0.130 | 0.130 | 0.126 | 0.121 | 0.135 | 0.151 | 0.149 | 0.151 | 0.143 | 0.143 | 0.121 | 0.125 | 0.129 | 0.127 | 0.122 | |
| 4th High 1-Hr. in 3 Yrs[2] | 0.150 | 0.150 | 0.140 | 0.140 | 0.130 | 0.130 | 0.130 | 0.120 | 0.121 | 0.138 | 0.138 | 0.138 | 0.138 | 0.139 | 0.139 | 0.126 | 0.124 | 0.123 | 0.123 | 0.113 | |
| Max. 8-Hr. Concentration | 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 | 0.106 | 0.101 | 0.084 | 0.090 | 0.106 |
| Maximum 1-Hr. Concentration | 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 | 0.160 | 0.128 | 0.113 | 0.120 | 0.127 |
| Days Above State 8-Hr. Std. | 34 | 57 | 44 | 34 | 17 | 26 | 30 | 23 | 20 | 30 | 37 | 10 | 29 | 28 | 17 | 21 | 19 | 20 | 13 | 9 | 22 |
| Days Above Nat. 8-Hr. Std. | 13 | 29 | 20 | 13 | 7 | 6 | 6 | 5 | 4 | 18 | 14 | 0 | 16 | 9 | 4 | 7 | 7 | 7 | 0 | 1 | 12 |
| Days Above State 1-Hr. Std. | 39 | 46 | 41 | 22 | 14 | 23 | 23 | 19 | 13 | 28 | 34 | 8 | 29 | 20 | 12 | 15 | 16 | 19 | 7 | 9 | 18 |

[1] Preliminary data for 2006 are shown here, however they are subject to change. 2005 is the last year for which complete and approved data is available, thus calculated annual statistics are not included for 2006.

[2] The national 1-Hour standard has been revoked. Historical 1-Hour data are provided for reference.

Table 4-18

# *San Francisco Bay Area Air Basin*
## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ increased in the San Francisco Bay Area Air Basin between 1975 and 2005 and are projected to continue increasing through 2020. 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 VMT are growing, due to adoption of more stringent emission standards.

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 75 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** | **2015** | **2020** |
| ***All Sources*** | ***181*** | ***182*** | ***195*** | ***194*** | ***189*** | ***218*** | ***210*** | ***220*** | ***230*** | ***241*** |
| **Stationary Sources** | 38 | 26 | 23 | 20 | 21 | 19 | 15 | 16 | 17 | 17 |
| **Area-wide Sources** | 123 | 134 | 148 | 146 | 145 | 177 | 174 | 184 | 195 | 205 |
| **On-Road Mobile** | 7 | 9 | 11 | 12 | 10 | 10 | 10 | 10 | 10 | 10 |
| Gasoline Vehicles | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 7 | 8 | 8 |
| Diesel Vehicles | 2 | 4 | 6 | 8 | 5 | 4 | 3 | 3 | 2 | 1 |
| **Other Mobile** | 13 | 13 | 14 | 16 | 13 | 12 | 11 | 10 | 9 | 8 |
| Gasoline Fuel | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| Diesel Fuel | 8 | 8 | 9 | 11 | 9 | 9 | 8 | 7 | 5 | 3 |
| Other Fuel | 3 | 3 | 4 | 4 | 3 | 2 | 1 | 2 | 2 | 2 |

Table 4-19

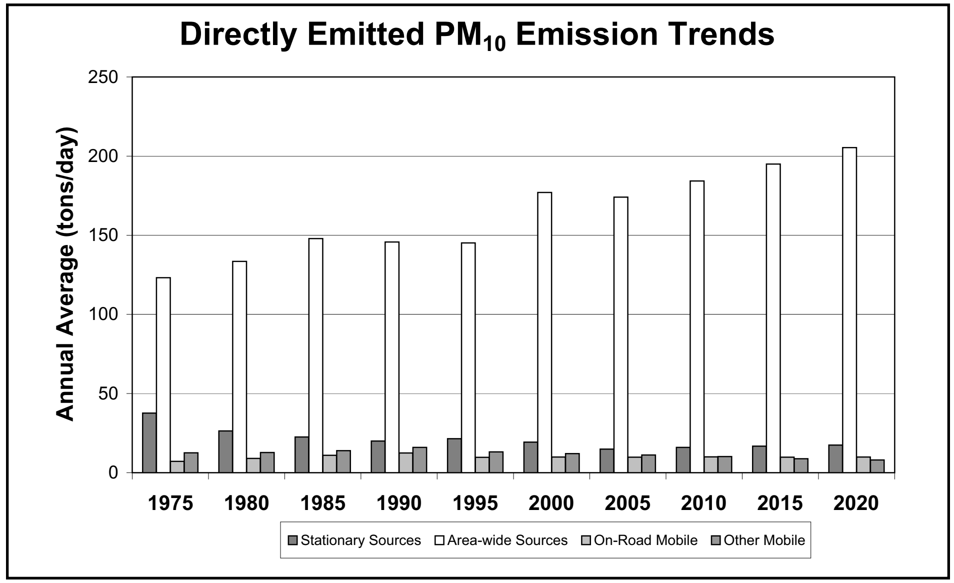



Figure 4-21

# *San Francisco Bay Area Air Basin*
## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ remained relatively constant in the San Francisco Bay Area Air Basin between 1975 and 2005 and are projected to increase slightly through 2020. Emissions from stationary sources declined slightly, while area-wide sources increased. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust sources. Emissions of directly emitted $PM_{2.5}$ from diesel motor vehicles have been decreasing since 1990 even though population and VMT are growing, due to adoption of more stringent emission standards.

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. 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 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** | **2015** | **2020** |
| ***All Sources*** | ***81*** | ***79*** | ***79*** | ***83*** | ***81*** | ***84*** | ***81*** | ***83*** | ***84*** | ***87*** |
| **Stationary Sources** | 26 | 20 | 14 | 12 | 15 | 14 | 11 | 12 | 13 | 13 |
| **Area-wide Sources** | 38 | 41 | 44 | 47 | 47 | 51 | 53 | 55 | 57 | 60 |
| **On-Road Mobile** | 5 | 7 | 8 | 10 | 7 | 7 | 7 | 7 | 7 | 7 |
| Gasoline Vehicles | 3 | 3 | 2 | 3 | 3 | 3 | 4 | 4 | 5 | 5 |
| Diesel Vehicles | 2 | 4 | 6 | 7 | 4 | 4 | 3 | 3 | 2 | 1 |
| **Other Mobile** | 12 | 12 | 13 | 15 | 12 | 11 | 10 | 9 | 8 | 7 |
| Gasoline Fuel | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| Diesel Fuel | 8 | 8 | 8 | 10 | 8 | 8 | 7 | 6 | 4 | 3 |
| Other Fuel | 3 | 3 | 3 | 4 | 3 | 2 | 1 | 2 | 2 | 2 |

Table 4-20

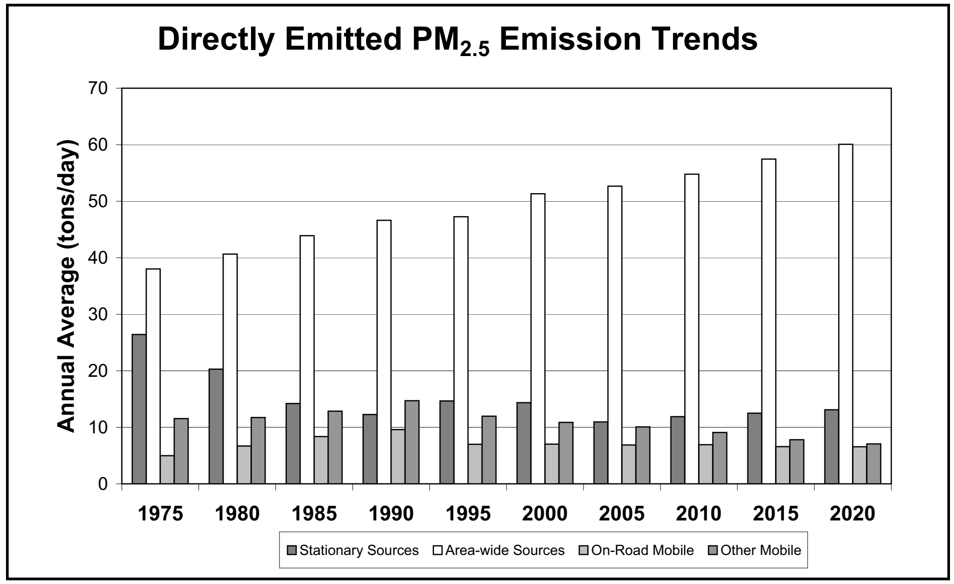



Figure 4-22

# *San Francisco Bay Area 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 three-year average of the annual average (State) decreased by more than 32 percent.

Calculated exceedance days for the State 24-hour standard dropped from a high of 76 days during 1989 to 23 days during 2005. 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.

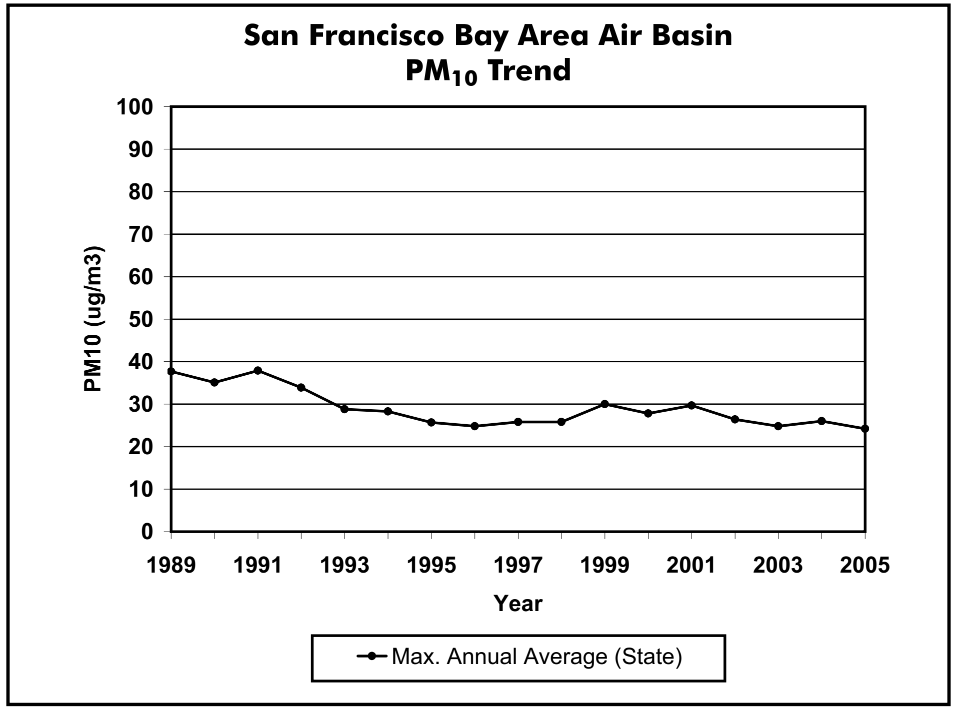



Figure 4-23

| $PM_{10}$ (ug/m³) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | 146 | 147 | 165 | 155 | 112 | 93 | 97 | 74 | 76 | 85 | 100 | 117 | 80 | 114 | 84 | 60 | 65 | 81 |
| Max. 24-Hr. Concentration (Nat) | | | 146 | 150 | 165 | 155 | 112 | 101 | 97 | 75 | 77 | 95 | 92 | 119 | 76 | 109 | 80 | 58 | 63 | 78 |
| Max. Annual Average (State) | | | | 37.7 | 35.1 | 37.9 | 33.9 | 28.8 | 28.3 | 25.7 | 24.8 | 25.8 | 25.8 | 30.0 | 27.8 | 29.7 | 26.4 | 24.8 | 26.0 | 24.2 |
| Max. Annual Average (Nat) | | | 33.8 | 40.8 | 35.2 | 38.3 | 33.7 | 28.8 | 28.6 | 28.4 | 24.9 | 25.8 | 25.1 | 28.7 | 26.8 | 28.9 | 30.6 | 24.2 | 25.3 | 23.5 |
| Calc Days Above State 24-Hr Std | | | | 76 | 70 | 91 | 53 | 37 | 36 | 24 | 12 | 18 | 18 | 37 | 42 | 48 | 24 | 18 | 25 | 23 |
| Calc Days Above Nat 24-Hr Std | | | | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-21

# *San Francisco Bay Area Air Basin*

## $PM_{2.5}$ Air Quality Trend

Annual average $PM_{2.5}$ concentrations (national) in the San Francisco Bay Area decreased slightly in the last seven years. The State annual average concentration trend however, remained relatively constant during the last six years, due to differences in State and national monitoring methods. The 98th percentile of 24-hour $PM_{2.5}$ concentrations also declined during the last six-year period. Similar to $PM_{10}$, year-to-year changes in meteorology can mask the impacts of emission control programs. Several more years are needed before determining longer-term trends. Measures adopted as part of SB 656, as well as programs to reduce ozone and diesel PM will help in reducing public exposure to $PM_{2.5}$ in this region.

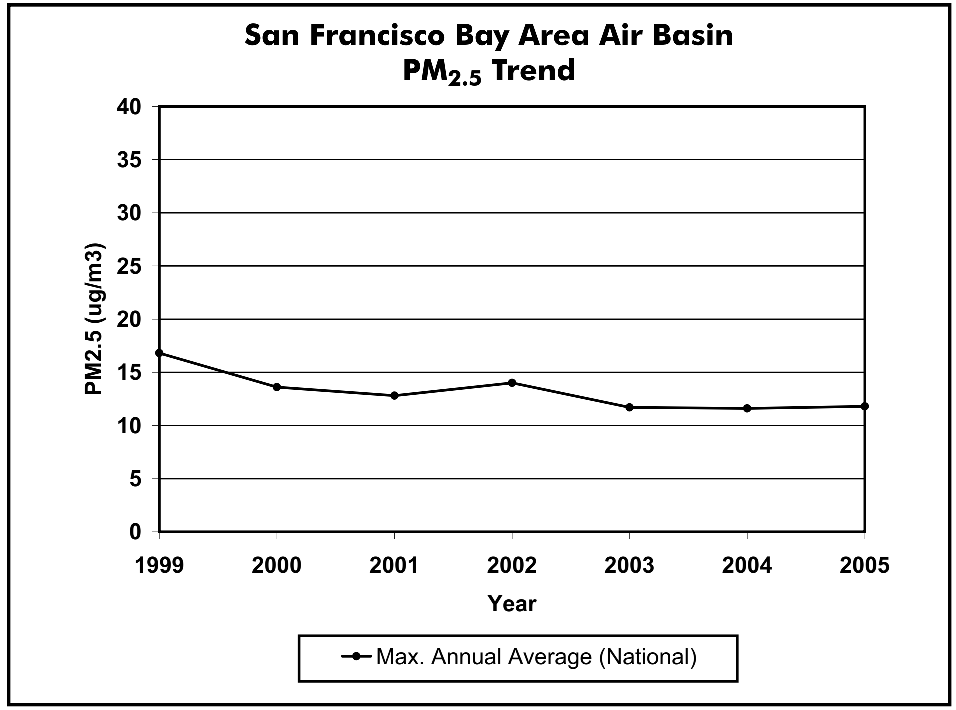



Figure 4-24

| $PM_{2.5}$ (ug/m$^3$) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | | | | | | | | | | | | 90.5 | 67.2 | 107.5 | 84.5 | 56.1 | 73.7 | 54.6 |
| Max. 24-Hr. Concentration (Nat) | | | | | | | | | | | | | | 90.5 | 67.2 | 107.5 | 76.7 | 56.1 | 73.7 | 54.6 |
| 98th Percentile of 24-Hr Conc. | | | | | | | | | | | | | | | 55.3 | 85.6 | 62.3 | 37.4 | 42.2 | 39.8 |
| Annual Average (State) | | | | | | | | | | | | | | | 11.6 | 12.9 | 14.0 | 11.7 | 11.6 | 11.8 |
| Annual Average (Nat) | | | | | | | | | | | | | | 16.8 | 13.6 | 12.8 | 14.0 | 11.7 | 11.6 | 11.8 |

Table 4-22

# *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 VMT. Commercial and industrial fuel combustion 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** | **2015** | **2020** |
| ***All Sources*** | ***9075*** | ***8334*** | ***7011*** | ***5325*** | ***3917*** | ***2961*** | ***2041*** | ***1617*** | ***1363*** | ***1230*** |
| **Stationary Sources** | 46 | 55 | 73 | 65 | 62 | 50 | 38 | 38 | 40 | 42 |
| **Area-wide Sources** | 126 | 135 | 143 | 160 | 163 | 169 | 178 | 182 | 188 | 194 |
| **On-Road Mobile** | 8391 | 7615 | 6209 | 4446 | 3077 | 2203 | 1338 | 914 | 631 | 460 |
| Gasoline Vehicles | 8381 | 7597 | 6182 | 4414 | 3050 | 2177 | 1312 | 889 | 611 | 444 |
| Diesel Vehicles | 9 | 18 | 27 | 32 | 27 | 26 | 25 | 25 | 20 | 16 |
| **Other Mobile** | 511 | 529 | 586 | 654 | 615 | 539 | 488 | 484 | 504 | 533 |
| Gasoline Fuel | 401 | 416 | 463 | 512 | 472 | 410 | 364 | 351 | 359 | 376 |
| Diesel Fuel | 57 | 57 | 64 | 79 | 82 | 71 | 62 | 62 | 67 | 73 |
| Other Fuel | 53 | 56 | 59 | 62 | 62 | 59 | 61 | 70 | 77 | 85 |

Table 4-23

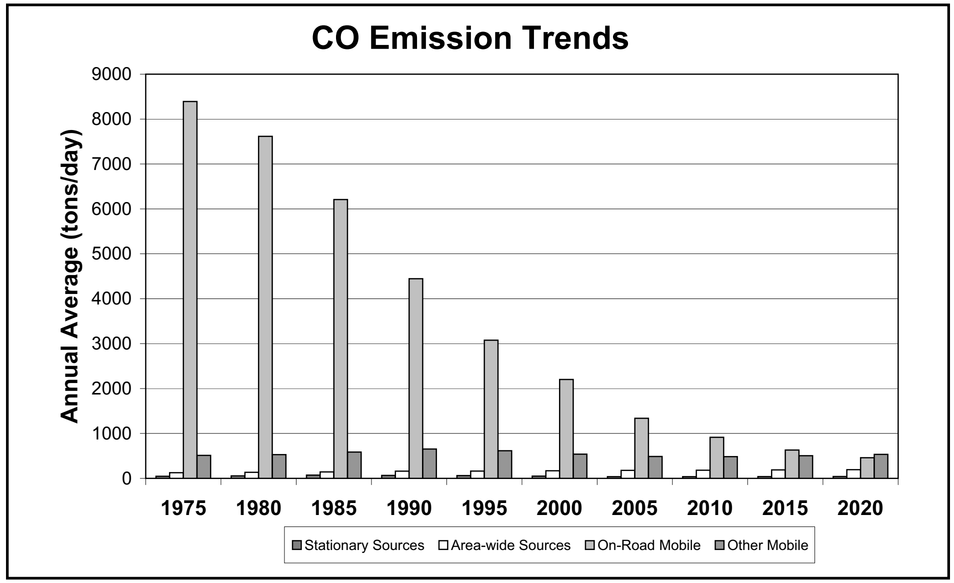



Figure 4-25

# *San Francisco Bay Area Air Basin*

## Carbon Monoxide Air Quality Trend

Similar to other areas of the State, CO concentrations in the San Francisco Bay Area Air Basin have declined substantially over the last 20 years. The peak 8-hour indicator value during 2005 is 26 percent of what it was during 1986 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 CO 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.

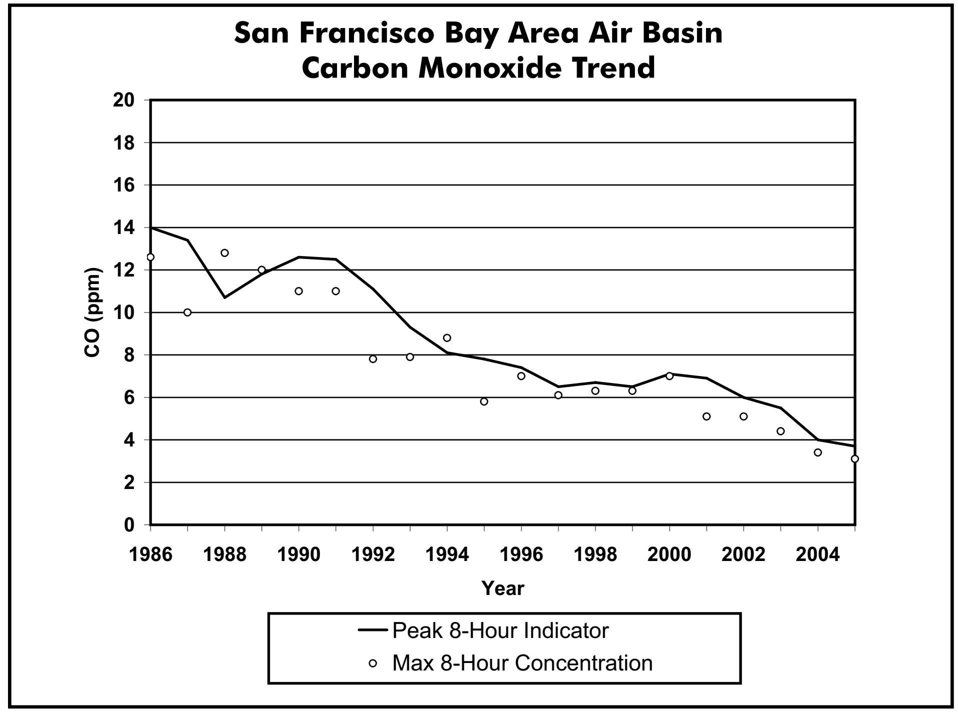



Figure 4-26

| CARBON MONOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator (State) | 14.0 | 13.4 | 10.7 | 11.8 | 12.6 | 12.5 | 11.1 | 9.3 | 8.1 | 7.8 | 7.4 | 6.5 | 6.7 | 6.5 | 7.1 | 6.9 | 6.0 | 5.5 | 4.0 | 3.7 |
| Max. 1-Hr. Concentration | 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 | 7.7 | 8.6 | 4.8 | 4.5 |
| Max. 8-Hr. Concentration (State) | 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 | 5.1 | 4.4 | 3.4 | 3.1 |
| Days Above State 8-Hr. Std. | 8 | 2 | 4 | 10 | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 8 | 1 | 4 | 9 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-24

# *San Francisco Bay Area Air Basin*
## Nitrogen Dioxide
### Oxides of Nitrogen Emission Trends and Forecasts

Emissions of $NO_x$ and $NO_2$ have decreased in the San Francisco Bay Area Air Basin since 1975 and are projected to continue declining through 2020. The Bay Area has a significant motor vehicle population, and the implementation of stricter motor vehicle controls has resulted in significant emissions reductions for $NO_x$.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***943*** | ***918*** | ***821*** | ***797*** | ***720*** | ***622*** | ***496*** | ***423*** | ***348*** | ***301*** |
| **Stationary Sources** | 229 | 205 | 134 | 124 | 107 | 83 | 49 | 49 | 51 | 53 |
| **Area-wide Sources** | 13 | 14 | 15 | 19 | 20 | 19 | 20 | 20 | 21 | 21 |
| **On-Road Mobile** | 542 | 540 | 500 | 453 | 385 | 312 | 234 | 181 | 124 | 88 |
| Gasoline Vehicles | 516 | 493 | 427 | 356 | 296 | 215 | 128 | 86 | 59 | 42 |
| Diesel Vehicles | 26 | 47 | 73 | 97 | 89 | 98 | 106 | 94 | 64 | 46 |
| **Other Mobile** | 159 | 159 | 172 | 201 | 208 | 207 | 194 | 174 | 153 | 138 |
| Gasoline Fuel | 10 | 10 | 11 | 13 | 14 | 14 | 13 | 11 | 10 | 10 |
| Diesel Fuel | 123 | 121 | 130 | 154 | 158 | 154 | 142 | 120 | 97 | 77 |
| Other Fuel | 27 | 28 | 31 | 34 | 37 | 39 | 39 | 43 | 46 | 51 |

Table 4-25

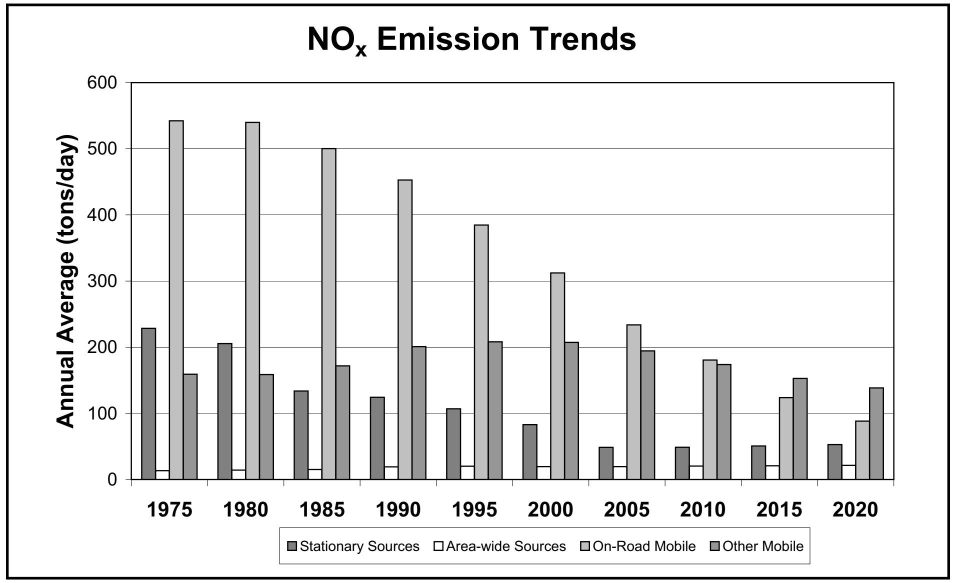



Figure 4-27

# *San Francisco Bay Area Air Basin*

## Nitrogen Dioxide Air Quality Trend

The San Francisco Bay Area has attained both the State and national $NO_2$ standards for more than 20 years. During this time-period, there have been no concentrations that exceeded the level of the State 1-hour or the national annual standard.  Ambient concentrations continue to be well below the level of both standards.  The peak 1-hour indicator has declined by almost 58 percent in the San Francisco Bay Area since 1986. This downward trend is expected to continue.

$NO_2$ is formed from $NO_x$ emissions, 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 $NO_x$ emissions.

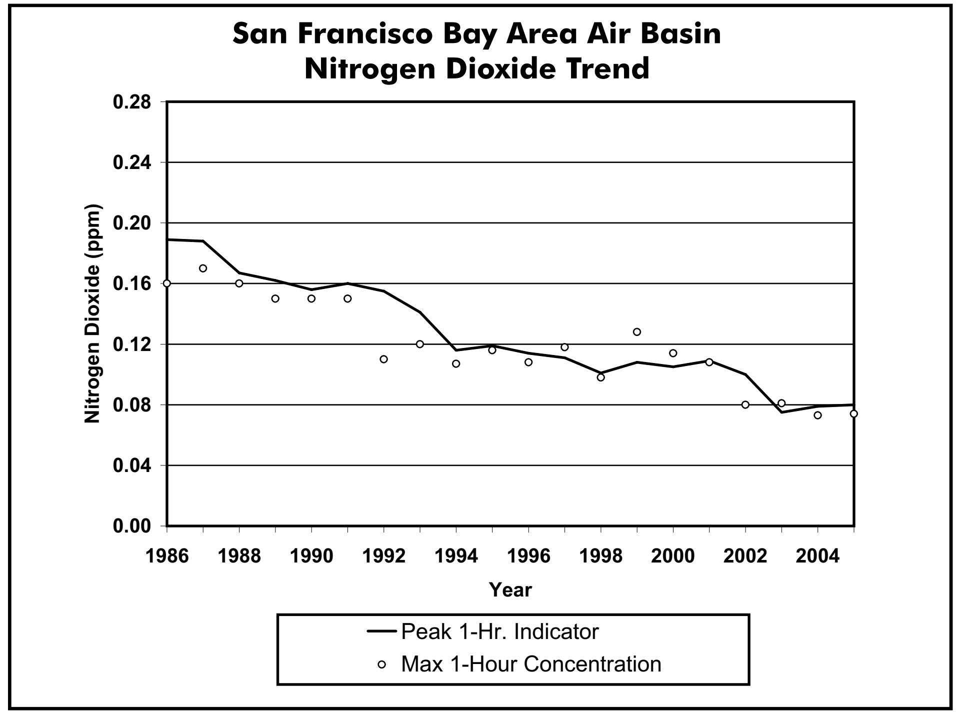



Figure 4-28

| NITROGEN DIOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hr. Indicator (State) | 0.189 | 0.188 | 0.167 | 0.162 | 0.156 | 0.160 | 0.155 | 0.141 | 0.116 | 0.119 | 0.114 | 0.111 | 0.101 | 0.108 | 0.105 | 0.109 | 0.100 | 0.075 | 0.079 | 0.080 |
| Max. 1-Hr. Concentration | 0.160 | 0.170 | 0.160 | 0.150 | 0.150 | 0.150 | 0.110 | 0.120 | 0.107 | 0.116 | 0.108 | 0.118 | 0.098 | 0.128 | 0.114 | 0.108 | 0.080 | 0.081 | 0.073 | 0.074 |
| Max. Annual Average | 0.033 | 0.031 | 0.032 | 0.032 | 0.030 | 0.031 | 0.027 | 0.027 | 0.028 | 0.027 | 0.025 | 0.025 | 0.025 | 0.026 | 0.025 | 0.024 | 0.019 | 0.018 | 0.017 | 0.019 |

Table 4-26

# *San Joaquin Valley Air Basin*

## Introduction - Area Description

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 23,490 square miles. With very few exceptions, the San Joaquin Valley is flat, with most of the area lying below 1,000 feet in elevation and most of the population living below 500 feet. 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 10 percent of California's population lives in the San Joaquin Valley, and pollution sources in the region account for about 13 percent of the total statewide criteria pollutant emissions.

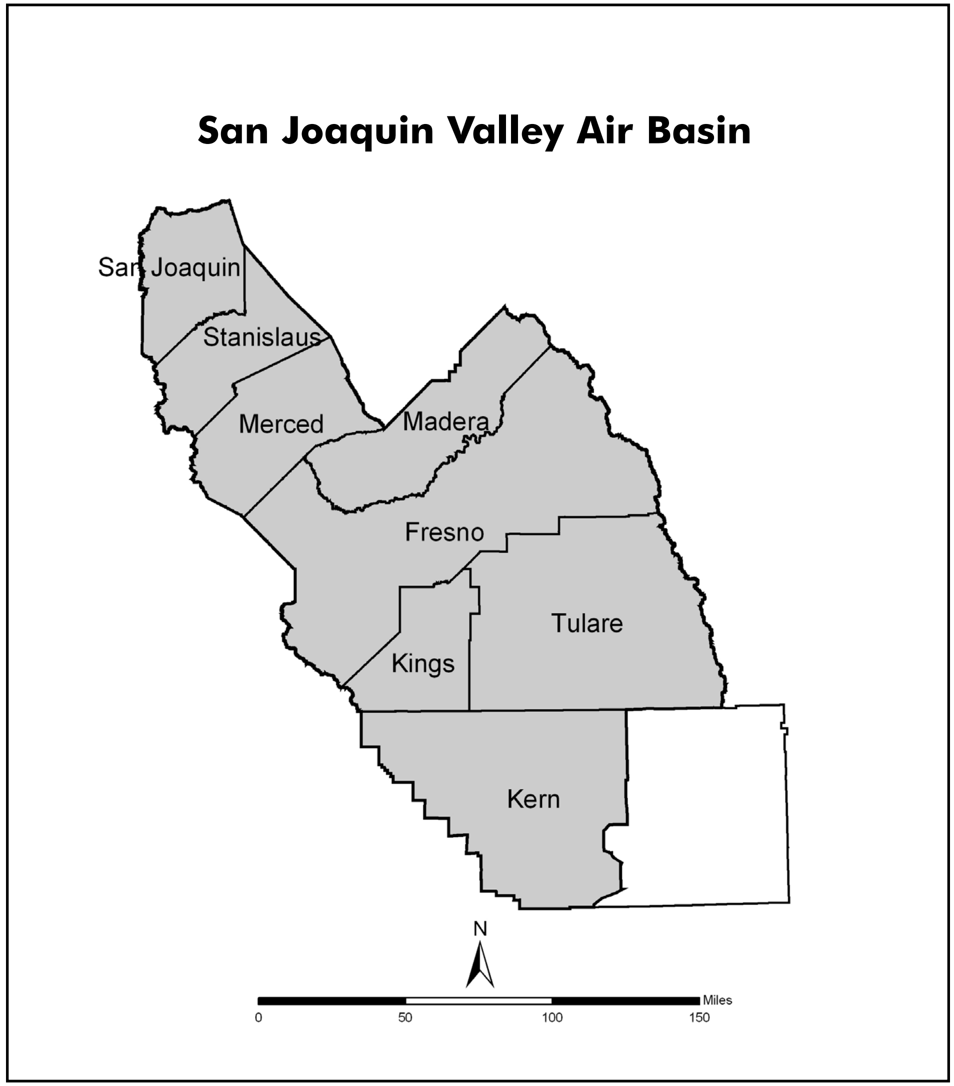



Figure 4-29

# *San Joaquin Valley Air Basin*

## Emission Trends and Forecasts

With the exception of $PM_{10}$, 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. The emission levels for $SO_x$ have decreased since 1975. This is mainly due to the switch from fuel oil to natural gas for electric generation and to reduced fuel sulfur content. The $SO_x$ emissions increase slightly after 2010. This increase is seen mainly in the industrial fuel combustion categories.

| San Joaquin Valley Air Basin Emissions (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pollutant** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| **$NO_x$** | 700 | 839 | 831 | 844 | 750 | 672 | 616 | 549 | 431 | 349 |
| **ROG** | 1102 | 1176 | 1026 | 617 | 486 | 432 | 381 | 357 | 344 | 343 |
| **$PM_{10}$** | 287 | 284 | 287 | 346 | 336 | 339 | 297 | 293 | 294 | 300 |
| **$PM_{2.5}$** | 126 | 118 | 114 | 123 | 114 | 114 | 106 | 102 | 99 | 99 |
| **$SO_x$** | 299 | 272 | 129 | 100 | 33 | 37 | 26 | 25 | 27 | 29 |
| **CO** | 3564 | 3514 | 3241 | 3020 | 2404 | 1966 | 1538 | 1285 | 1101 | 1001 |

Table 4-27

# *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 has grown and is projected to grow at a much faster rate than most other areas of the State. The population is projected to increase about 144 percent, from nearly two million in 1980 to nearly five million in 2020. During the same period, the daily VMT is projected to increase by 312 percent, from nearly 33 million miles per day in 1980 to over 129 million miles per day in 2020. These growth rates are much higher than the growth rates in other areas.

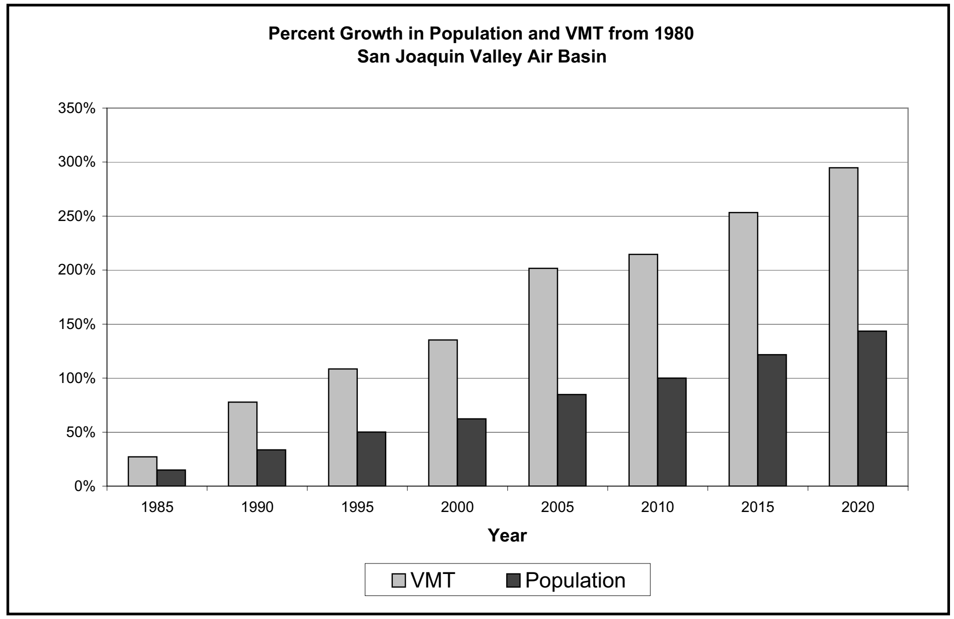



Figure 4-30

| Parameter | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Population | 1979840 | 2275776 | 2645311 | 2972667 | 3212615 | 3658320 | 3959518 | 4389922 | 4820322 |
| Avg. Daily VMT/1000 | 32804 | 41697 | 58326 | 68389 | 77176 | 98950 | 103176 | 115884 | 129484 |

Table 4-28

# *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 1980, even though 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.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***700*** | ***839*** | ***831*** | ***844*** | ***750*** | ***672*** | ***616*** | ***549*** | ***431*** | ***349*** |
| **Stationary Sources** | 246 | 328 | 321 | 267 | 197 | 135 | 104 | 104 | 107 | 108 |
| **Area-wide Sources** | 21 | 21 | 21 | 20 | 19 | 19 | 18 | 18 | 17 | 17 |
| **On-Road Mobile** | 245 | 261 | 293 | 344 | 344 | 339 | 339 | 298 | 204 | 140 |
| Gasoline Vehicles | 158 | 158 | 152 | 160 | 150 | 117 | 77 | 55 | 39 | 29 |
| Diesel Vehicles | 87 | 103 | 141 | 184 | 194 | 221 | 262 | 243 | 165 | 111 |
| **Other Mobile** | 189 | 230 | 196 | 214 | 190 | 179 | 155 | 129 | 104 | 84 |
| Gasoline Fuel | 4 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Diesel Fuel | 180 | 220 | 188 | 204 | 181 | 169 | 143 | 117 | 92 | 72 |
| Other Fuel | 4 | 5 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 7 |

Table 4-29

| ROG Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***1102*** | ***1176*** | ***1026*** | ***617*** | ***486*** | ***432*** | ***381*** | ***357*** | ***344*** | ***343*** |
| **Stationary Sources** | 632 | 701 | 568 | 185 | 92 | 88 | 77 | 80 | 83 | 86 |
| **Area-wide Sources** | 120 | 127 | 134 | 141 | 149 | 146 | 147 | 152 | 161 | 171 |
| **On-Road Mobile** | 285 | 271 | 250 | 216 | 174 | 131 | 95 | 72 | 53 | 41 |
| Gasoline Vehicles | 274 | 257 | 231 | 193 | 158 | 114 | 78 | 55 | 40 | 32 |
| Diesel Vehicles | 11 | 14 | 18 | 23 | 16 | 17 | 17 | 17 | 13 | 9 |
| **Other Mobile** | 64 | 78 | 74 | 75 | 71 | 67 | 63 | 54 | 48 | 46 |
| Gasoline Fuel | 31 | 39 | 43 | 42 | 40 | 38 | 36 | 32 | 30 | 30 |
| Diesel Fuel | 24 | 30 | 25 | 28 | 26 | 23 | 19 | 15 | 11 | 8 |
| Other Fuel | 9 | 9 | 6 | 6 | 5 | 6 | 7 | 7 | 7 | 7 |

Table 4-30

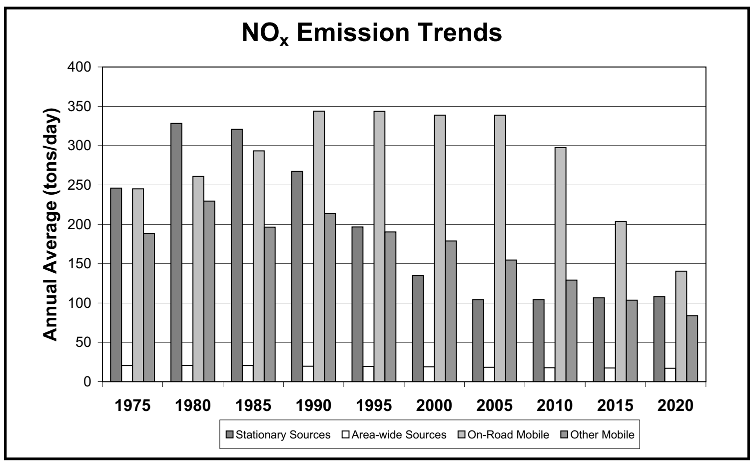



Figure 4-31

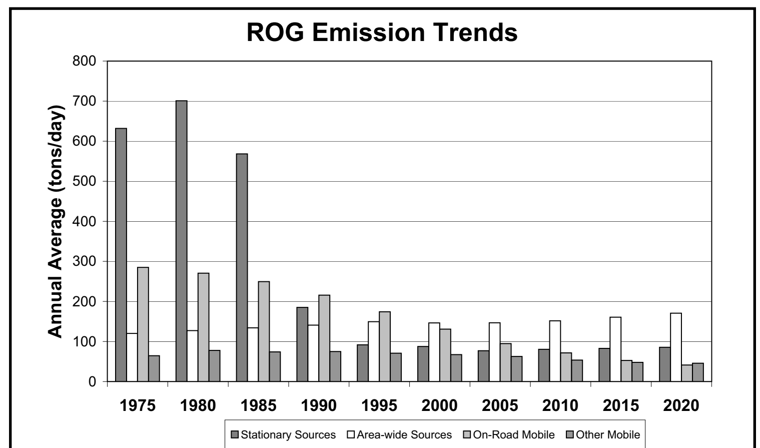



Figure 4-32

# *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. Looking at ozone air quality from a historical perspective is challenging because of the lack of long-term monitors prior to 1990. Furthermore, monitoring did not include the sites in the worst portions of the basin until 1990. For this reason we are using 1990 as the beginning year to characterize trends.

Similar to other areas of the State, exceedance days have declined at a faster rate than peak levels. Peak levels declined by six percent while the number of State and national 8-hour exceedance days declined by 16 percent and 23 percent respectively. Most of this progress has occurred since 2003. However, the number of exceedance days in 2005 and 2006 were among the lowest in this 17 year period.

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 Sacramento region, 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.

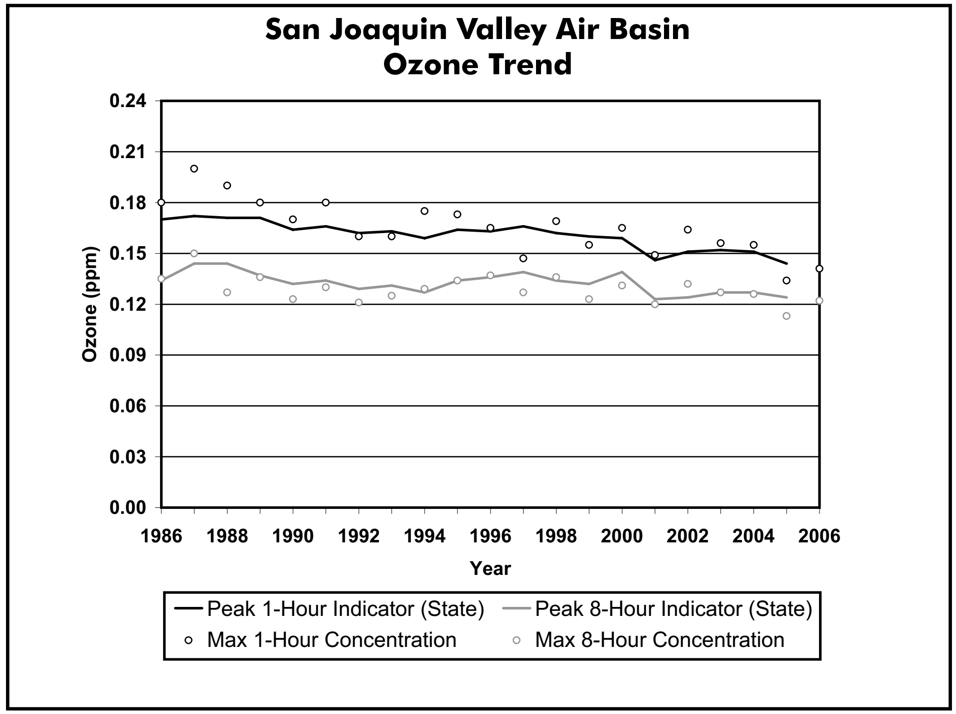



Figure 4-33

| OZONE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hour Indicator (State) | 0.134 | 0.144 | 0.144 | 0.137 | 0.132 | 0.134 | 0.129 | 0.131 | 0.127 | 0.134 | 0.136 | 0.139 | 0.134 | 0.132 | 0.139 | 0.123 | 0.124 | 0.127 | 0.127 | 0.124 | |
| Avg. of 4th High 8-Hr. in 3 Yrs | 0.117 | 0.118 | 0.121 | 0.116 | 0.112 | 0.118 | 0.115 | 0.112 | 0.111 | 0.119 | 0.119 | 0.115 | 0.115 | 0.113 | 0.111 | 0.109 | 0.115 | 0.115 | 0.116 | 0.113 | |
| Peak 1-Hour Indicator (State) | 0.170 | 0.172 | 0.171 | 0.171 | 0.164 | 0.166 | 0.162 | 0.163 | 0.159 | 0.164 | 0.163 | 0.166 | 0.162 | 0.160 | 0.159 | 0.146 | 0.151 | 0.152 | 0.151 | 0.144 | |
| 4th High 1-Hr. in 3 Yrs[2] | 0.180 | 0.170 | 0.170 | 0.180 | 0.170 | 0.160 | 0.160 | 0.160 | 0.160 | 0.164 | 0.165 | 0.164 | 0.161 | 0.161 | 0.161 | 0.146 | 0.151 | 0.151 | 0.151 | 0.149 | |
| Max. 8-Hr. Concentration | 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 | 0.132 | 0.127 | 0.126 | 0.113 | 0.122 |
| Maximum 1-Hr. Concentration | 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 | 0.164 | 0.156 | 0.155 | 0.134 | 0.141 |
| Days Above State 8-Hr. Std. | 186 | 189 | 200 | 182 | 179 | 167 | 169 | 174 | 166 | 163 | 164 | 169 | 127 | 175 | 158 | 192 | 181 | 172 | 167 | 124 | 141 |
| Days Above Nat. 8-Hr. Std. | 134 | 148 | 140 | 133 | 104 | 121 | 119 | 103 | 108 | 109 | 114 | 95 | 84 | 117 | 103 | 109 | 125 | 134 | 109 | 72 | 86 |
| Days Above State 1-Hr. Std. | 147 | 156 | 156 | 148 | 131 | 133 | 127 | 125 | 118 | 124 | 120 | 110 | 90 | 123 | 114 | 123 | 127 | 137 | 106 | 83 | 90 |

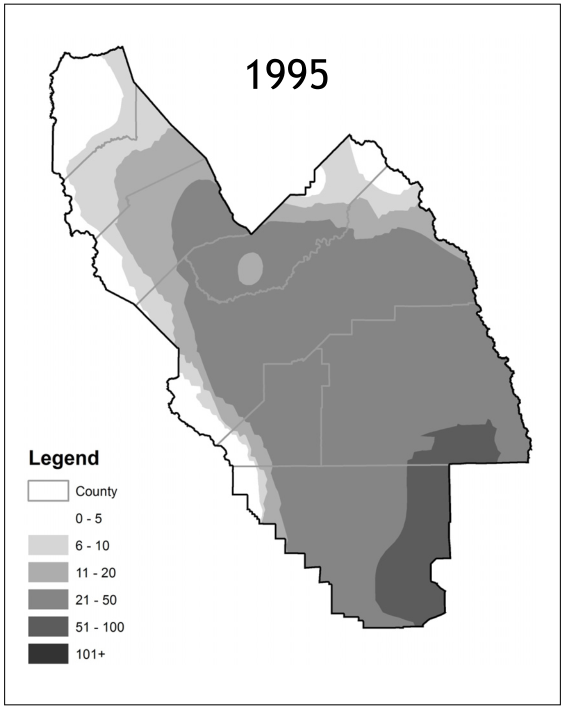
[1] Preliminary data for 2006 are shown here, however they are subject to change. 2005 is the last year for which complete and approved data is available, thus calculated annual statistics are not included for 2006.

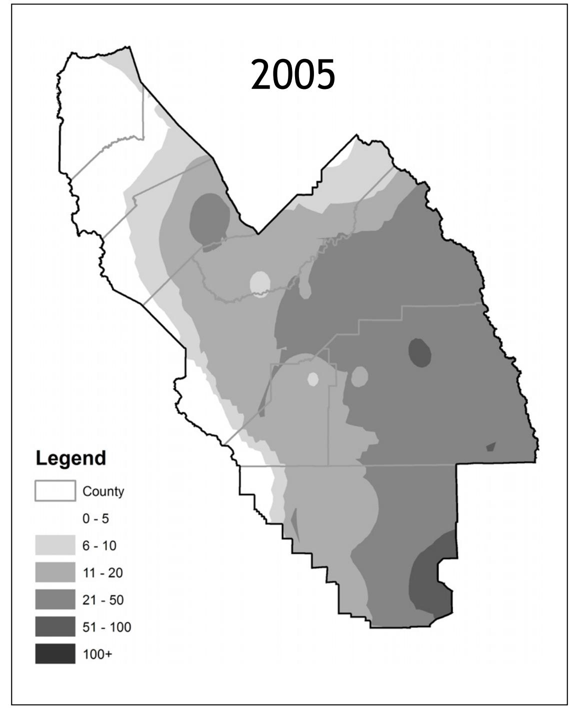
[2] The national 1-Hour standard has been revoked. Historical 1-Hour data are provided for reference.

Table 4-31

# *San Joaquin Valley Air Basin*

## Ozone Contour Maps - 3-year Average of National 8-Hour Exceedance Days




NOTE: Values used in these maps are for long-term sites only. Long-term sites are used ito more accurately represent a trend over a period, by comparing the same or similar sites over a long period.

Figure 4-34

Figure 4-35

Another way to look at ozone air quality is to evaluate how widespread the problem is within the air basin, using data for all sites. The maps on this page illustrate the reduction in days exceeding the national 8-hour standard over the last decade throughout the basin. The use of three-year averages helps to mitigate the changes in meteorology.

Similar to the South Coast, the two maps show a substantial reduction in the number of exceedance days over the last ten years. During the 1995 time period, more than half of the San Joaquin Valley had between 21 and 50 exceedance days. The worst site had about 90 days, which is equivalent to about three months during a year with ozone concentrations above the level of the standard. Areas in the northern San Joaquin Valley were cleaner than areas in the central and southern Valley. However, only a relatively small portion of the Basin averaged ten or fewer exceedance days.

The 2005 map shows a dramatic expansion of cleaner areas. Most of San Joaquin and Stanislaus counties now attain the federal 8-hour ozone standard. Much of the rest of the Valley experiences an average of only 6 to 20 exceedance days per year. Areas with more than 20 exceedance days are now generally limited to the eastern portion of the central and southern San Joaquin Valley. While the extent of these areas is much smaller than the 1995 timeframe, the areas of poor ozone air quality are also the most heavily populated. Even though these areas still pose a challenge, the worst sites show an average reduction in exceedance days of more than 35 percent over the last decade.

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# *San Joaquin Valley Air Basin*
## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ have remained relatively unchanged between 1975 and 2005 and are projected to remain unchanged through 2020. $PM_{10}$ 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, dust from farming operations, waste burning, and residential fuel combustion (including wood).

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 75 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** | **2015** | **2020** |
| ***All Sources*** | ***287*** | ***284*** | ***287*** | ***346*** | ***336*** | ***339*** | ***297*** | ***293*** | ***294*** | ***300*** |
| **Stationary Sources** | 58 | 42 | 34 | 27 | 26 | 27 | 25 | 24 | 25 | 26 |
| **Area-wide Sources** | 204 | 213 | 222 | 281 | 282 | 285 | 246 | 246 | 250 | 258 |
| **On-Road Mobile** | 12 | 14 | 18 | 23 | 17 | 15 | 15 | 14 | 11 | 10 |
| Gasoline Vehicles | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| Diesel Vehicles | 10 | 12 | 16 | 21 | 14 | 12 | 11 | 9 | 6 | 4 |
| **Other Mobile** | 13 | 16 | 14 | 15 | 11 | 11 | 10 | 9 | 7 | 6 |
| Gasoline Fuel | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Diesel Fuel | 12 | 15 | 12 | 13 | 10 | 9 | 8 | 6 | 4 | 3 |
| Other Fuel | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |

Table 4-32

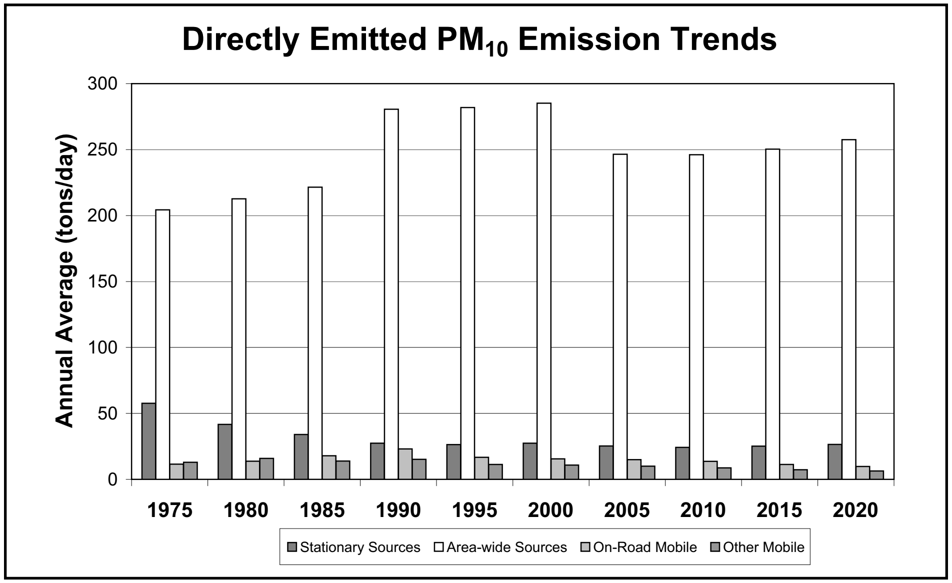


Figure 4-36

# *San Joaquin Valley Air Basin*
## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ decreased from 1975 to 2005 and are projected to continue decreasing through 2020. $PM_{2.5}$ 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, dust from farming operations, waste burning, and residential fuel combustion (including wood).

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. 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 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** | **2015** | **2020** |
| ***All Sources*** | ***126*** | ***118*** | ***114*** | ***123*** | ***114*** | ***114*** | ***106*** | ***102*** | ***99*** | ***99*** |
| **Stationary Sources** | 46 | 32 | 24 | 18 | 18 | 18 | 17 | 17 | 18 | 19 |
| **Area-wide Sources** | 57 | 59 | 61 | 72 | 72 | 73 | 67 | 66 | 66 | 68 |
| **On-Road Mobile** | 10 | 12 | 16 | 20 | 14 | 13 | 12 | 11 | 9 | 7 |
| Gasoline Vehicles | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 |
| Diesel Vehicles | 9 | 11 | 15 | 19 | 13 | 11 | 10 | 8 | 5 | 4 |
| **Other Mobile** | 12 | 15 | 13 | 14 | 10 | 10 | 9 | 8 | 7 | 6 |
| Gasoline Fuel | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Diesel Fuel | 11 | 13 | 11 | 12 | 9 | 8 | 7 | 5 | 4 | 2 |
| Other Fuel | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |

Table 4-33

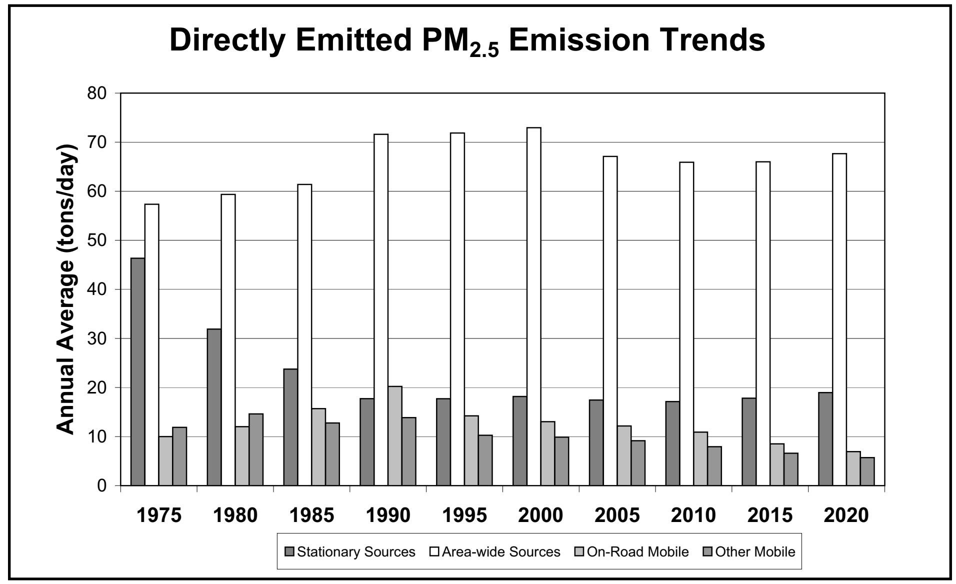


Figure 4-37

# *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. The low values for the annual average in 1988 and 1989 are due to the limited number of monitors with complete data for these years during the startup of the PM monitoring network. The period between 1990 and 2005 provides a better indication of trends. Over this period, the three-year average of the annual average (State) shows a decrease of nearly 34 percent. The calculated number of days exceeding the State and national 24-hour standards also shows a decrease. There were 292 calculated State standard exceedance days and 54 calculated national standard exceedance days during 1990. During 2005, there were 146 calculated State standard exceedance days and no national standard exceedance days.

Although $PM_{10}$ air quality has improved overall in the San Joaquin Valley Air Basin, values overall are highly variable. The variability appears to be a result of meteorology, while the overall downward trend is consistent with a change in emissions. While, based on the ambient data, the San Joaquin Valley now attains the national $PM_{10}$ standards, it will still be a number of years before this area reaches attainment of the more stringent State standards.

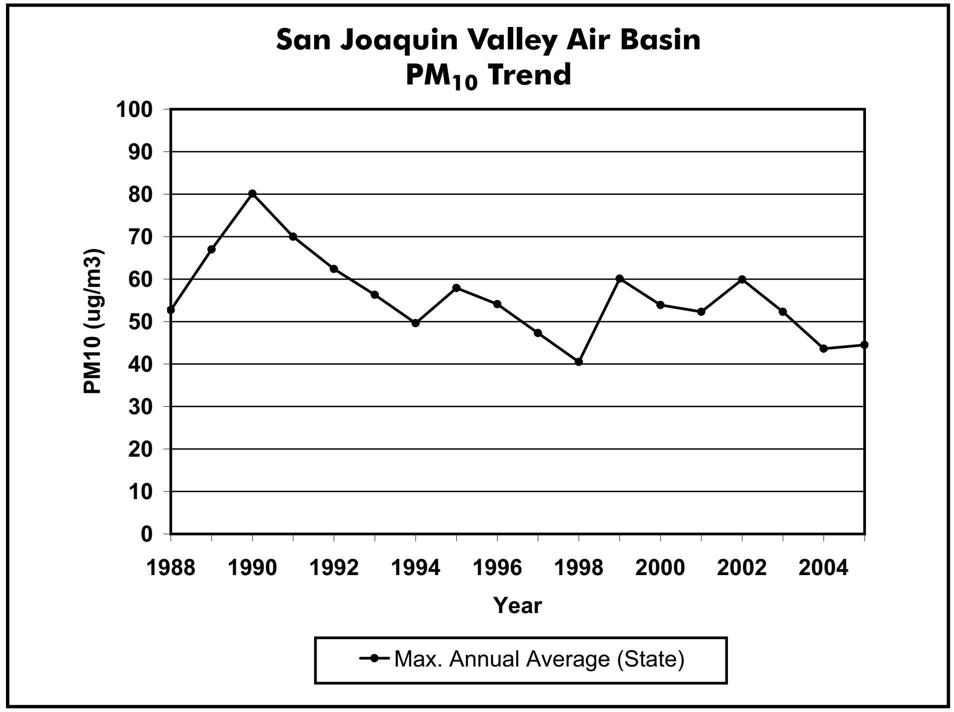


Figure 4-38

| $PM_{10}$ (ug/m³) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | 206 | 237 | 439 | 279 | 186 | 239 | 192 | 279 | 153 | 199 | 167 | 186 | 153 | 221 | 194 | 150 | 219 | 137 |
| Max. 24-Hr. Concentration (Nat) | | | 206 | 237 | 439 | 279 | 186 | 239 | 192 | 279 | 153 | 228 | 160 | 183 | 145 | 212 | 189 | 150 | 217 | 131 |
| Max. Annual Average (State) | | | 52.7 | 67.0 | 80.1 | 70.0 | 62.4 | 56.3 | 49.6 | 57.9 | 54.1 | 47.3 | 40.5 | 60.1 | 53.9 | 52.3 | 59.9 | 52.3 | 43.6 | 44.5 |
| Max. Annual Average (Nat) | | | 74.3 | 79.3 | 79.3 | 76.3 | 62.9 | 56.9 | 50.1 | 58.2 | 52.0 | 48.2 | 52.5 | 59.5 | 53.1 | 57.4 | 59.2 | 52.4 | 47.9 | 44.3 |
| Calc Days Above State 24-Hr Std | | | 159 | 208 | 292 | 225 | 246 | 183 | 166 | 184 | 204 | 107 | 102 | 182 | 196 | 168 | 256 | 167 | 113 | 146 |
| Calc Days Above Nat 24-Hr Std | | | 46 | 29 | 54 | 40 | 9 | 3 | 2 | 4 | 0 | 2 | 5 | 4 | 0 | 4 | 3 | 0 | 1 | 0 |

Table 4-34

# *San Joaquin Valley Air Basin*

## $PM_{2.5}$ Air Quality Trend

Annual average (national) $PM_{2.5}$ concentrations in the San Joaquin Valley Air Basin show a definite downward trend from 1999 through 2005. The State annual average concentrations remained relatively constant from 1999 through 2005, with a slight drop in 2004. The differences in trends are due to differences in State and national monitoring methods. The 98th percentile of 24-hour $PM_{2.5}$ concentrations also declined during this period. Similar to $PM_{10}$, year-to-year changes in meteorology can mask the impacts of emission control programs. Several more years are needed before determining longer-term trends. The San Joaquin Valley Air Basin is currently designated as nonattainment for the State and national $PM_{2.5}$ standards. Measures adopted as part of the upcoming $PM_{2.5}$ SIP, as well as programs to reduce ozone and diesel PM will help in reducing public exposure to $PM_{2.5}$ in this region.

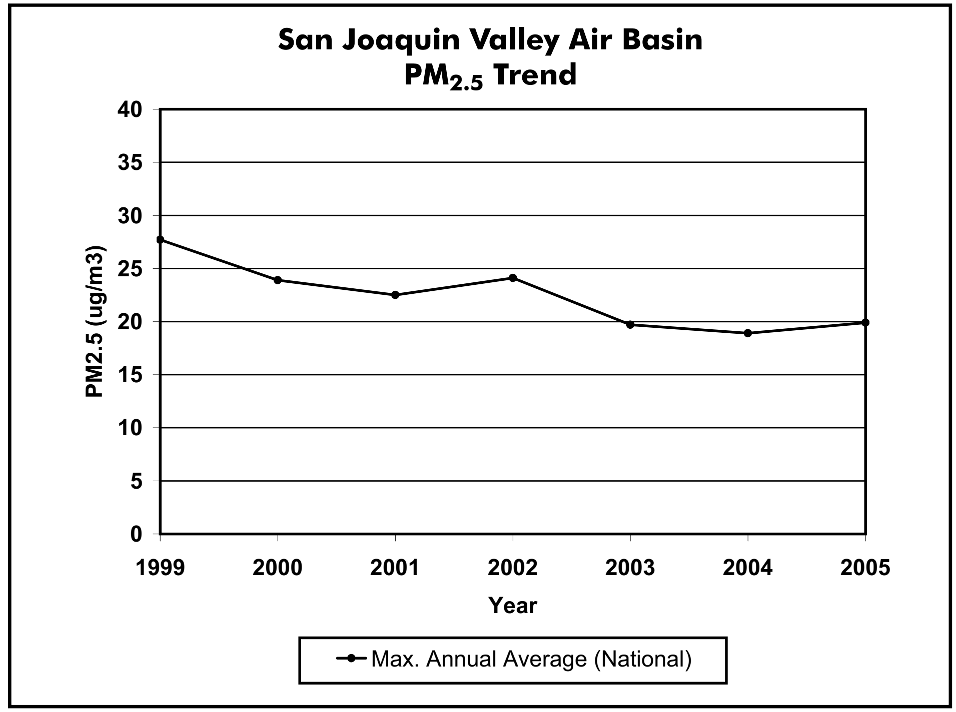


Figure 4-39

| $PM_{2.5}$ (ug/m3) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | | | | | | | | | | | | 136.0 | 160.0 | 154.7 | 104.3 | 84.5 | 77.0 | 102.1 |
| Max. 24-Hr. Concentration (Nat) | | | | | | | | | | | | | | 136.0 | 160.0 | 154.7 | 90.7 | 67.8 | 71.0 | 92.5 |
| 98th Percentile of 24-Hr Conc. | | | | | | | | | | | | | | 120.0 | 108.0 | 96.0 | 80.4 | 56.0 | 54.0 | 74.9 |
| Annual Average (State) | | | | | | | | | | | | | | 23.4 | 23.9 | 20.8 | 24.1 | 24.8 | 18.2 | 22.4 |
| Annual Average (Nat) | | | | | | | | | | | | | | 27.7 | 23.9 | 22.5 | 24.1 | 19.7 | 18.9 | 19.9 |

Table 4-35

# *San Joaquin Valley Air Basin*
## Carbon Monoxide Emission Trends and Forecasts

Emissions of CO decreased between 1975 and 2005 and are projected to continue decreasing through 2020. Motor vehicles are by far the largest source of CO emissions. Emissions from motor vehicles have been declining since 1975, despite increases in 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** | **2015** | **2020** |
| ***All Sources*** | ***3564*** | ***3514*** | ***3241*** | ***3020*** | ***2404*** | ***1966*** | ***1538*** | ***1285*** | ***1101*** | ***1001*** |
| **Stationary Sources** | 188 | 160 | 62 | 76 | 63 | 55 | 53 | 55 | 56 | 57 |
| **Area-wide Sources** | 261 | 266 | 272 | 275 | 270 | 269 | 269 | 268 | 268 | 269 |
| **On-Road Mobile** | 2767 | 2664 | 2516 | 2241 | 1676 | 1285 | 877 | 629 | 443 | 331 |
| Gasoline Vehicles | 2726 | 2613 | 2449 | 2156 | 1597 | 1209 | 801 | 556 | 387 | 286 |
| Diesel Vehicles | 41 | 51 | 67 | 85 | 79 | 76 | 75 | 72 | 56 | 45 |
| **Other Mobile** | 348 | 424 | 391 | 428 | 395 | 357 | 339 | 334 | 334 | 345 |
| Gasoline Fuel | 160 | 213 | 221 | 256 | 236 | 211 | 197 | 194 | 193 | 200 |
| Diesel Fuel | 80 | 101 | 91 | 104 | 93 | 77 | 63 | 56 | 53 | 53 |
| Other Fuel | 109 | 111 | 78 | 69 | 67 | 70 | 79 | 84 | 88 | 92 |

Table 4-36

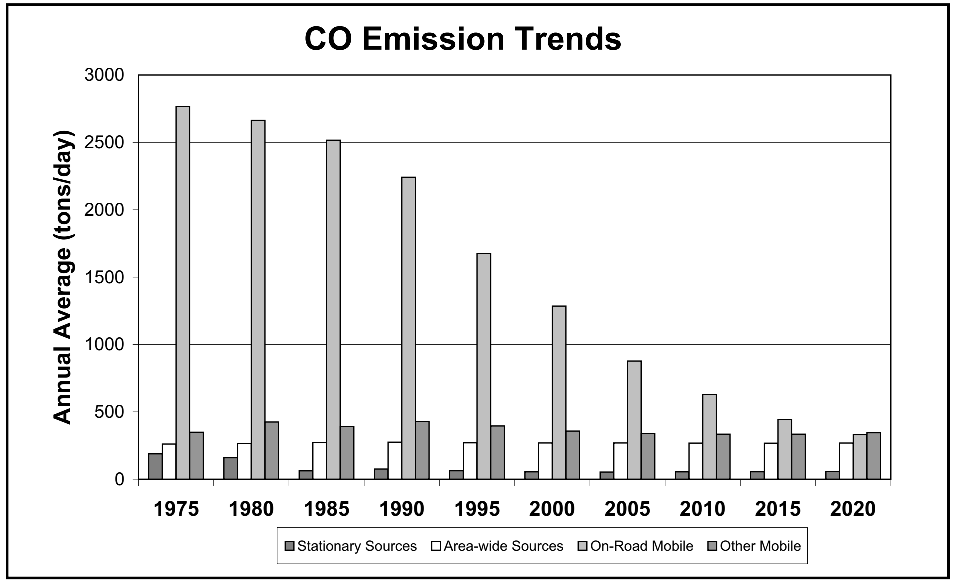


Figure 4-40

# *San Joaquin Valley Air Basin*

## Carbon Monoxide Air Quality Trend

CO concentrations show a fairly consistent downward trend from 1986 through 2005. The peak 8-hour indicator for 2005 is almost 74 percent lower than that for 1986. 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 10 years. Much of the decline in ambient CO concentrations can be attributed to the introduction of clean fuels and newer, cleaner motor vehicles.

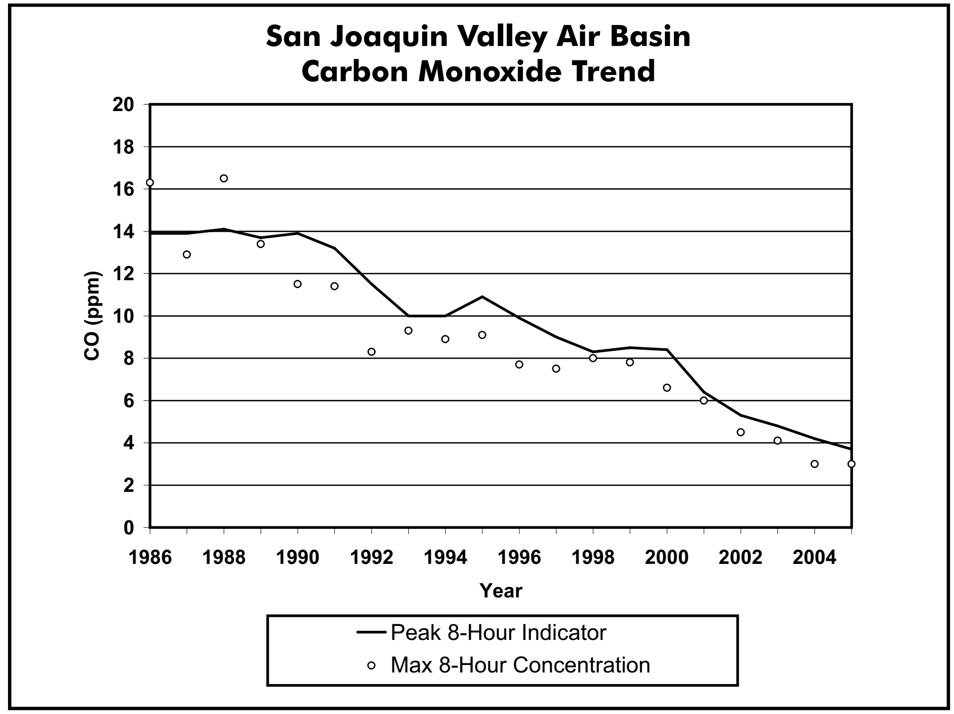

Figure 4-41

| CARBON MONOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator (State) | 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 | 5.3 | 4.8 | 4.2 | 3.7 |
| Max. 1-Hr. Concentration | 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 | 8.4 | 6.1 | 5.8 | 4.6 | 4.3 |
| Max. 8-Hr. Concentration (State) | 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 | 4.5 | 4.1 | 3.0 | 3.0 |
| Days Above State 8-Hr. Std. | 13 | 4 | 5 | 24 | 10 | 3 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 11 | 4 | 6 | 18 | 9 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-37

# *San Joaquin Valley Air Basin*
## Nitrogen Dioxide
### Oxides of Nitrogen Emission Trends and Forecasts

Emissions of $NO_x$ and $NO_2$ increased between 1975 and 1990. Since 1990, however, emissions decreased and are projected to continue declining 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.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Emission Source | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
| ***All Sources*** | ***700*** | ***839*** | ***831*** | ***844*** | ***750*** | ***672*** | ***616*** | ***549*** | ***431*** | ***349*** |
| **Stationary Sources** | 246 | 328 | 321 | 267 | 197 | 135 | 104 | 104 | 107 | 108 |
| **Area-wide Sources** | 21 | 21 | 21 | 20 | 19 | 19 | 18 | 18 | 17 | 17 |
| **On-Road Mobile** | 245 | 261 | 293 | 344 | 344 | 339 | 339 | 298 | 204 | 140 |
| Gasoline Vehicles | 158 | 158 | 152 | 160 | 150 | 117 | 77 | 55 | 39 | 29 |
| Diesel Vehicles | 87 | 103 | 141 | 184 | 194 | 221 | 262 | 243 | 165 | 111 |
| **Other Mobile** | 189 | 230 | 196 | 214 | 190 | 179 | 155 | 129 | 104 | 84 |
| Gasoline Fuel | 4 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Diesel Fuel | 180 | 220 | 188 | 204 | 181 | 169 | 143 | 117 | 92 | 72 |
| Other Fuel | 4 | 5 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 7 |

Table 4-38

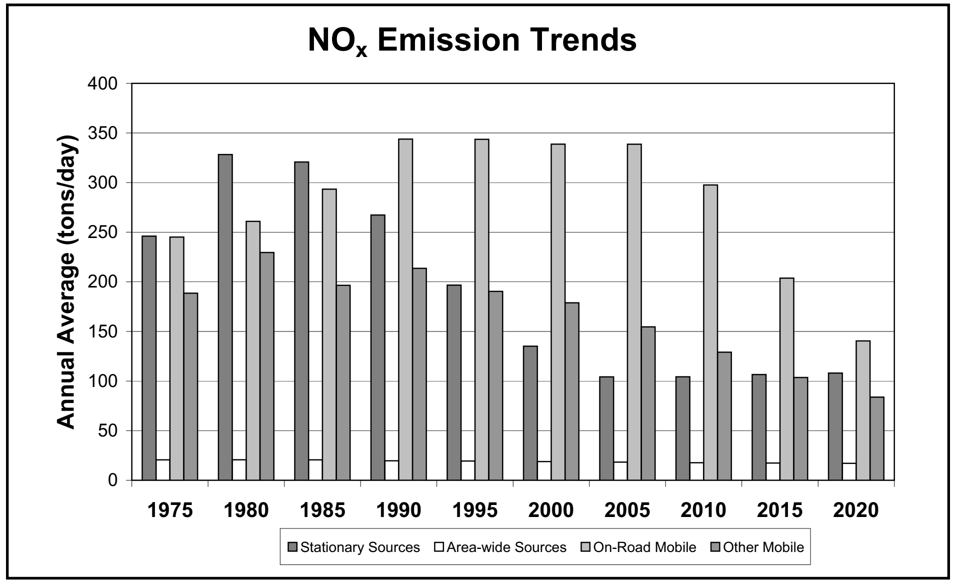


Figure 4-42

# *San Joaquin Valley Air Basin*

## Nitrogen Dioxide Air Quality Trend

The San Joaquin Valley has attained both the State and national $NO_2$ standards for more than 20 years. During this time-period, there have been no concentrations that exceeded the level of the State 1-hour or the national annual standard. Ambient concentrations continue to be well below the level of both standards. From 1986 through 1989, ambient levels increased somewhat, but have decreased substantially since 1990. The peak 1-hour indicator has declined by more than 44 percent since 1990. This downward trend is expected to continue.

$NO_2$ is formed from $NO_x$ emissions, 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 $NO_x$ emissions.

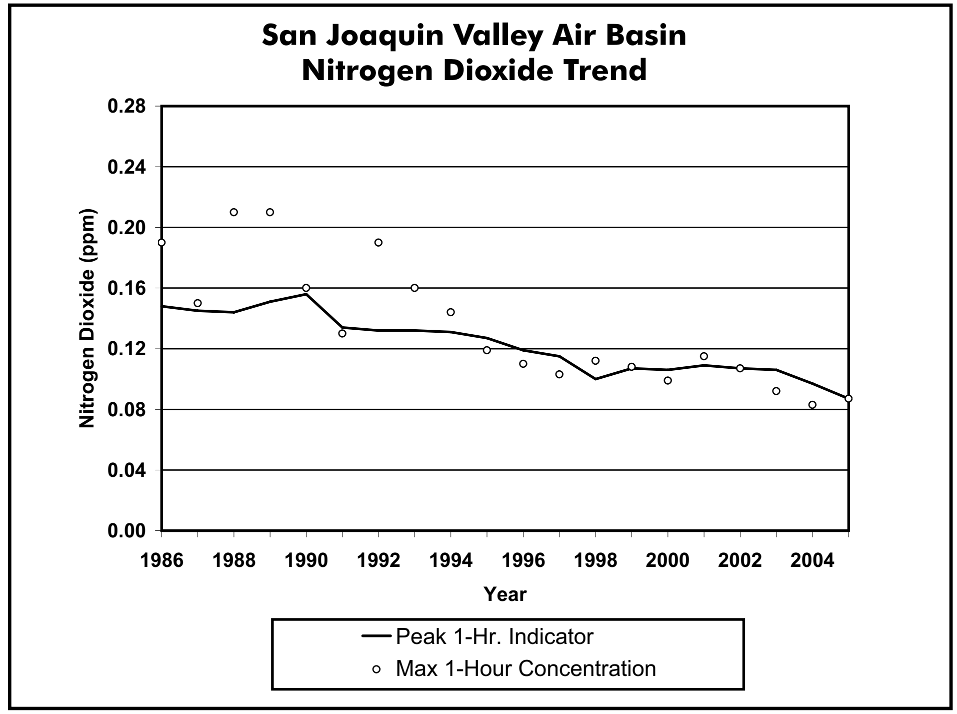


Figure 4-43

| NITROGEN DIOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hr. Indicator (State) | 0.148 | 0.145 | 0.144 | 0.151 | 0.156 | 0.134 | 0.132 | 0.132 | 0.131 | 0.127 | 0.119 | 0.115 | 0.100 | 0.107 | 0.106 | 0.109 | 0.107 | 0.106 | 0.097 | 0.087 |
| Max. 1-Hr. Concentration | 0.190 | 0.150 | 0.210 | 0.210 | 0.160 | 0.130 | 0.190 | 0.160 | 0.144 | 0.119 | 0.110 | 0.103 | 0.112 | 0.108 | 0.099 | 0.115 | 0.107 | 0.092 | 0.083 | 0.087 |
| Max. Annual Average | 0.030 | 0.030 | 0.032 | 0.033 | 0.031 | 0.030 | 0.027 | 0.024 | 0.024 | 0.029 | 0.029 | 0.024 | 0.023 | 0.027 | 0.024 | 0.022 | 0.024 | 0.020 | 0.018 | 0.021 |

Table 4-39

# *San Diego Air Basin*

## Introduction - Area Description

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 4,200 square miles, includes about eight percent of the State's population, and produces about seven 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. Higher temperatures and seasonal variations are experienced further inland.

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.

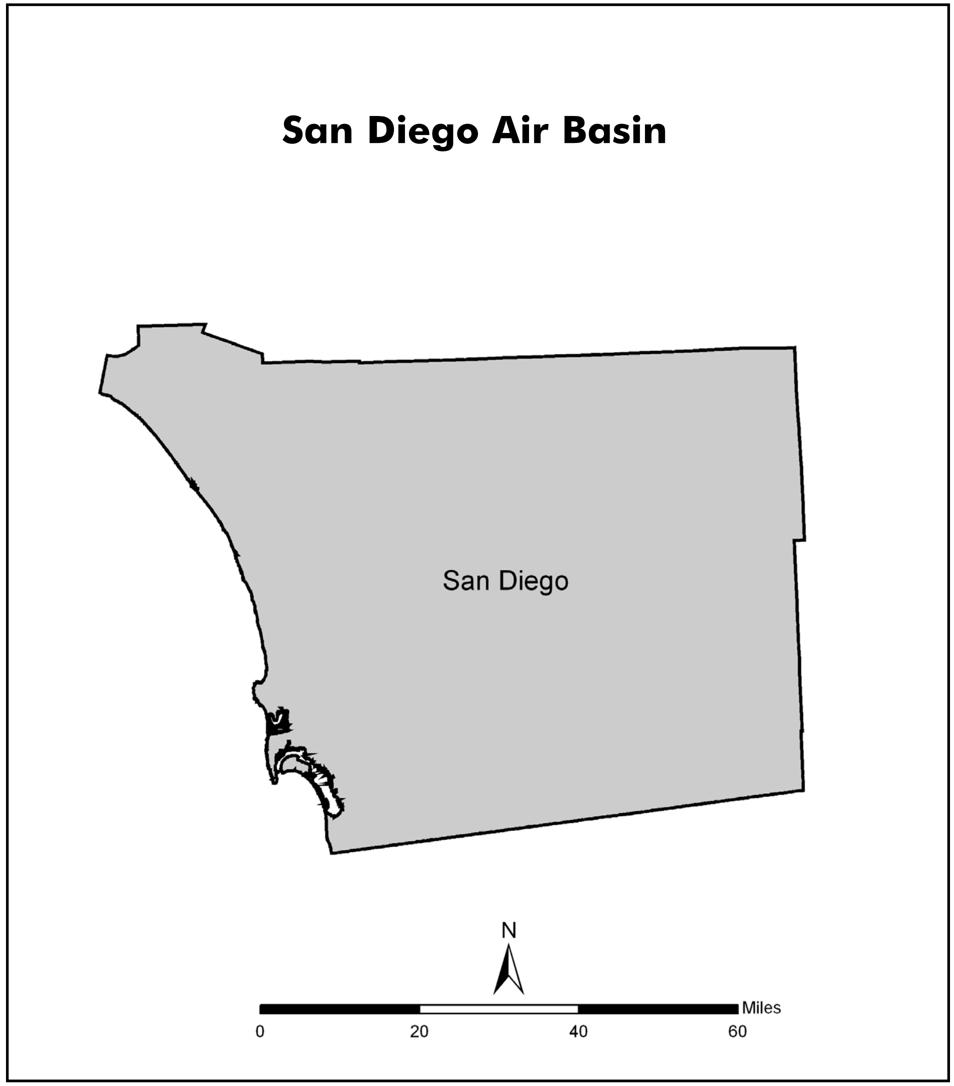


Figure 4-44

# 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. The emission levels for $SO_x$ have also followed the statewide trends since 1975. The $SO_x$ emissions are forecasted to increase in future years due to predicted growth in shipping activities.

| San Diego Air Basin Emissions (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pollutant** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| **$NO_x$** | 284 | 268 | 271 | 305 | 268 | 232 | 193 | 160 | 129 | 111 |
| **ROG** | 448 | 436 | 401 | 333 | 261 | 213 | 172 | 151 | 141 | 138 |
| **$PM_{10}$** | 69 | 77 | 86 | 104 | 99 | 107 | 116 | 121 | 127 | 134 |
| **$PM_{2.5}$** | 27 | 28 | 25 | 30 | 29 | 31 | 31 | 32 | 33 | 35 |
| **$SO_x$** | 45 | 47 | 20 | 24 | 8 | 4 | 4 | 5 | 7 | 11 |
| **CO** | 3389 | 3066 | 2897 | 2517 | 1787 | 1333 | 955 | 753 | 630 | 564 |

Table 4-40

# San Diego Air Basin

## Population and VMT

Population in the San Diego Air Basin during the 1980-2020 period is projected to nearly double: from almost 1.9 million in 1980 to over 3.6 million in 2020. During this same time period, the number of vehicle miles traveled each day is projected to triple, from over 32 million miles per day in 1980 to nearly 97 million miles per day in 2020. 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.

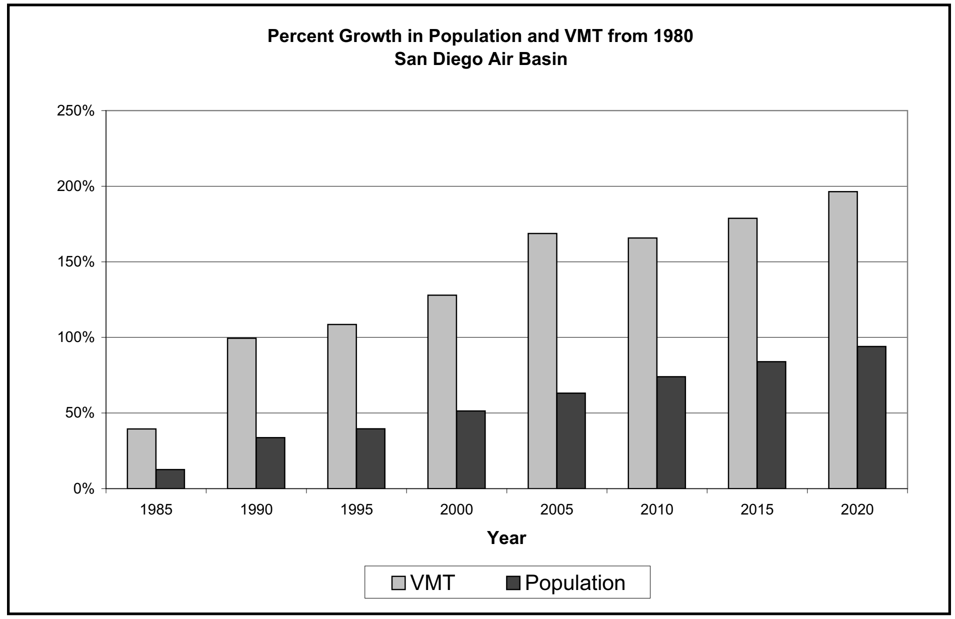


Figure 4-45

| Parameter | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Population | 1873300 | 2109300 | 2504897 | 2615201 | 2836158 | 3057000 | 3258951 | 3446262 | 3633572 |
| Avg. Daily VMT/1000 | 32722 | 45636 | 65250 | 68235 | 74567 | 87944 | 86948 | 91223 | 96987 |

Table 4-41

# *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.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***284*** | ***268*** | ***271*** | ***305*** | ***268*** | ***232*** | ***193*** | ***160*** | ***129*** | ***111*** |
| **Stationary Sources** | 48 | 32 | 17 | 19 | 16 | 14 | 9 | 10 | 10 | 10 |
| **Area-wide Sources** | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **On-Road Mobile** | 186 | 176 | 187 | 203 | 178 | 146 | 113 | 88 | 64 | 48 |
| Gasoline Vehicles | 172 | 159 | 160 | 165 | 141 | 104 | 64 | 45 | 32 | 24 |
| Diesel Vehicles | 13 | 17 | 26 | 38 | 37 | 42 | 50 | 43 | 31 | 24 |
| **Other Mobile** | 48 | 58 | 65 | 80 | 70 | 70 | 68 | 60 | 53 | 50 |
| Gasoline Fuel | 3 | 4 | 5 | 6 | 6 | 6 | 7 | 6 | 6 | 6 |
| Diesel Fuel | 38 | 47 | 52 | 65 | 55 | 54 | 49 | 41 | 32 | 25 |
| Other Fuel | 7 | 8 | 8 | 9 | 9 | 11 | 12 | 13 | 15 | 20 |

Table 4-42

| ROG Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***448*** | ***436*** | ***401*** | ***333*** | ***261*** | ***213*** | ***172*** | ***151*** | ***141*** | ***138*** |
| **Stationary Sources** | 28 | 44 | 42 | 38 | 32 | 31 | 32 | 34 | 36 | 39 |
| **Area-wide Sources** | 32 | 37 | 41 | 44 | 39 | 39 | 36 | 37 | 38 | 40 |
| **On-Road Mobile** | 351 | 310 | 268 | 200 | 142 | 96 | 63 | 45 | 34 | 29 |
| Gasoline Vehicles | 350 | 308 | 265 | 196 | 139 | 93 | 60 | 42 | 32 | 27 |
| Diesel Vehicles | 2 | 2 | 3 | 4 | 3 | 3 | 3 | 3 | 2 | 2 |
| **Other Mobile** | 37 | 43 | 50 | 52 | 49 | 46 | 42 | 35 | 32 | 30 |
| Gasoline Fuel | 28 | 33 | 39 | 39 | 36 | 35 | 31 | 26 | 24 | 23 |
| Diesel Fuel | 5 | 7 | 8 | 10 | 9 | 8 | 7 | 6 | 4 | 3 |
| Other Fuel | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 |

Table 4-43

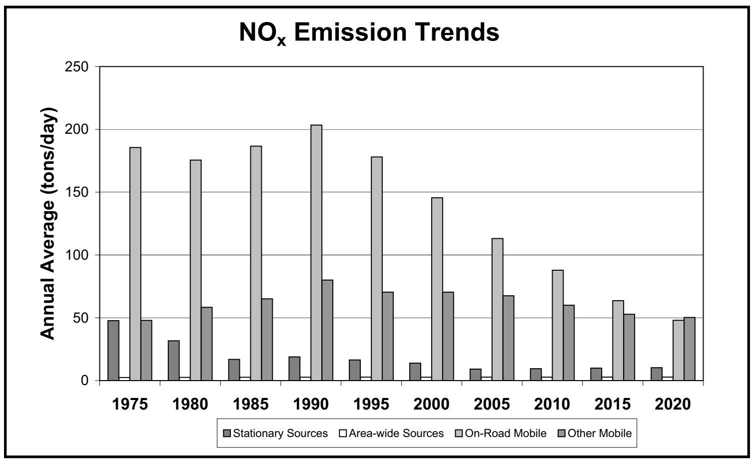


Figure 4-46

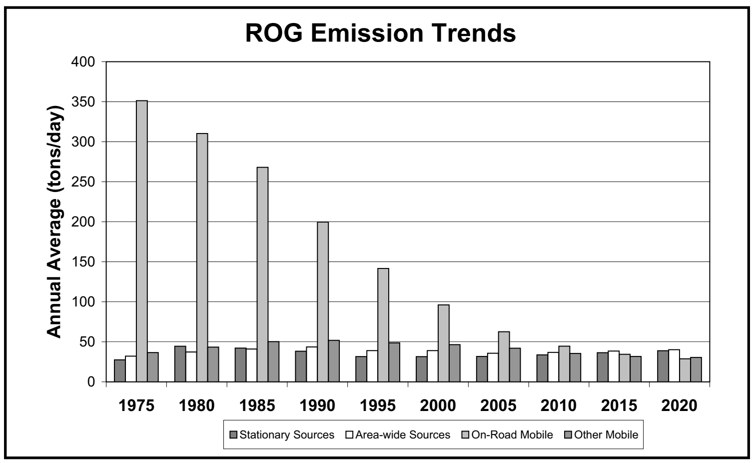


Figure 4-47

# *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 substantially over the last 20 years. The peak 8-hour ozone indicator shows an overall decline of 34 percent from 1986 to 2005. The number of State and national 8-hour standard exceedance days has dropped even more. There were 159 State 8-hour standard exceedance days during 1986 compared with 68 during 2006. This represents a decrease of about 67 percent in the three-year average of the State standard exceedance days. During 1986, there were 81 national 8-hour standard exceedance days compared with 14 during 2006.

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.

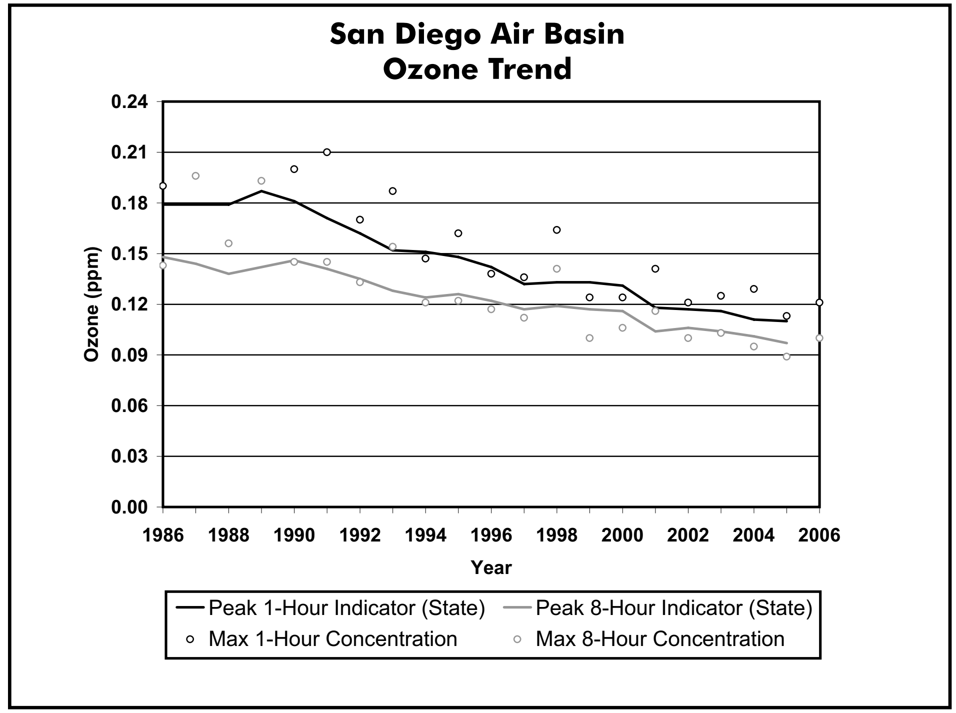


Figure 4-48

| OZONE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hour Indicator (State) | 0.148 | 0.144 | 0.138 | 0.142 | 0.146 | 0.141 | 0.135 | 0.128 | 0.124 | 0.126 | 0.122 | 0.117 | 0.119 | 0.117 | 0.116 | 0.104 | 0.106 | 0.104 | 0.101 | 0.097 | |
| Avg. of 4th High 8-Hr. in 3 Yrs | 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 | 0.095 | 0.093 | 0.089 | 0.086 | |
| Peak 1-Hour Indicator (State) | 0.179 | 0.179 | 0.179 | 0.187 | 0.181 | 0.171 | 0.162 | 0.152 | 0.151 | 0.148 | 0.142 | 0.132 | 0.133 | 0.133 | 0.131 | 0.118 | 0.117 | 0.116 | 0.111 | 0.110 | |
| 4th High 1-Hr. in 3 Yrs[2] | 0.190 | 0.180 | 0.180 | 0.190 | 0.190 | 0.170 | 0.170 | 0.154 | 0.150 | 0.146 | 0.141 | 0.137 | 0.133 | 0.131 | 0.130 | 0.118 | 0.118 | 0.118 | 0.115 | 0.112 | |
| Max. 8-Hr. Concentration | 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 | 0.100 | 0.103 | 0.095 | 0.089 | 0.100 |
| Maximum 1-Hr. Concentration | 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 | 0.121 | 0.125 | 0.129 | 0.113 | 0.121 |
| Days Above State 8-Hr. Std. | 159 | 160 | 189 | 189 | 167 | 144 | 133 | 127 | 122 | 127 | 89 | 73 | 88 | 74 | 75 | 64 | 56 | 59 | 43 | 51 | 68 |
| Days Above Nat. 8-Hr. Std. | 81 | 99 | 119 | 122 | 96 | 67 | 66 | 58 | 46 | 48 | 31 | 16 | 35 | 17 | 16 | 17 | 13 | 6 | 8 | 5 | 14 |
| Days Above State 1-Hr. Std. | 131 | 127 | 160 | 159 | 139 | 106 | 97 | 90 | 79 | 96 | 51 | 43 | 54 | 27 | 24 | 29 | 15 | 24 | 12 | 16 | 23 |

[1] Preliminary data for 2006 are shown here, however they are subject to change. 2005 is the last year for which complete and approved data is available, thus calculated annual statistics are not included for 2006.

[2] The national 1-Hour standard has been revoked. Historical 1-Hour data are provided for reference.

Table 4-44

# *San Diego Air Basin*
## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ are projected to almost double in the San Diego Air Basin between 1975 and 2020. 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 VMT.

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 70 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** | **2015** | **2020** |
| ***All Sources*** | ***69*** | ***77*** | ***86*** | ***104*** | ***99*** | ***107*** | ***116*** | ***121*** | ***127*** | ***134*** |
| **Stationary Sources** | 18 | 13 | 7 | 8 | 9 | 8 | 10 | 11 | 12 | 13 |
| **Area-wide Sources** | 43 | 55 | 68 | 82 | 79 | 87 | 94 | 99 | 104 | 110 |
| **On-Road Mobile** | 3 | 4 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 5 |
| Gasoline Vehicles | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 |
| Diesel Vehicles | 1 | 2 | 3 | 4 | 2 | 2 | 2 | 2 | 1 | 1 |
| **Other Mobile** | 5 | 6 | 7 | 8 | 6 | 6 | 6 | 6 | 6 | 6 |
| Gasoline Fuel | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| Diesel Fuel | 3 | 3 | 4 | 5 | 3 | 3 | 3 | 2 | 2 | 1 |
| Other Fuel | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |

Table 4-45

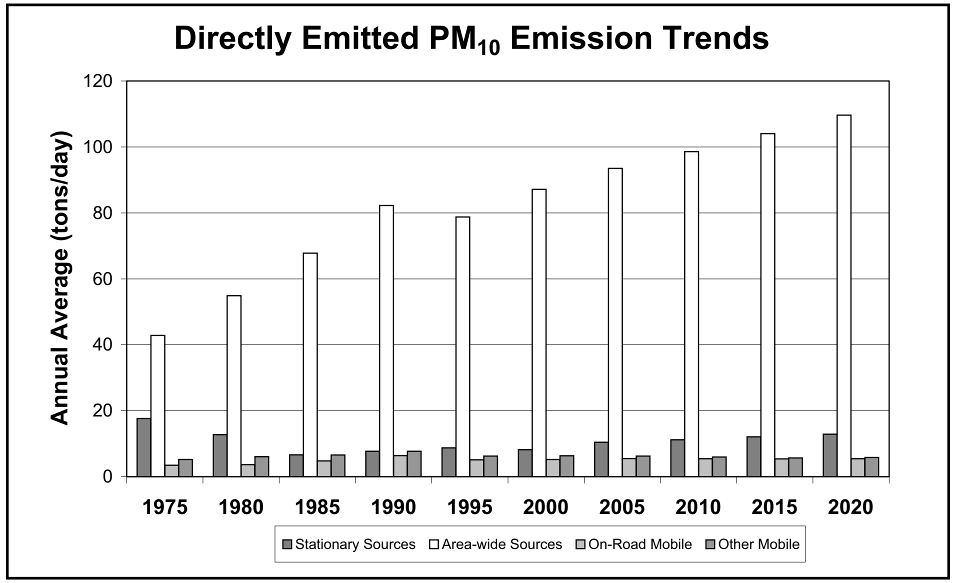


Figure 4-49

# *San Diego Air Basin*
## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ increased steadily in the San Diego Air Basin between 1975 and 2005 and are projected to continue increasing through 2020. 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 VMT.

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. 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** | **2015** | **2020** |
| ***All Sources*** | ***27*** | ***28*** | ***25*** | ***30*** | ***29*** | ***31*** | ***31*** | ***32*** | ***33*** | ***35*** |
| **Stationary Sources** | 12 | 10 | 4 | 4 | 6 | 6 | 6 | 6 | 7 | 7 |
| **Area-wide Sources** | 8 | 10 | 12 | 14 | 14 | 15 | 16 | 17 | 18 | 19 |
| **On-Road Mobile** | 3 | 3 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 |
| Gasoline Vehicles | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| Diesel Vehicles | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 |
| **Other Mobile** | 5 | 6 | 6 | 7 | 6 | 6 | 6 | 5 | 5 | 5 |
| Gasoline Fuel | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Diesel Fuel | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 2 | 1 | 1 |
| Other Fuel | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |

Table 4-46

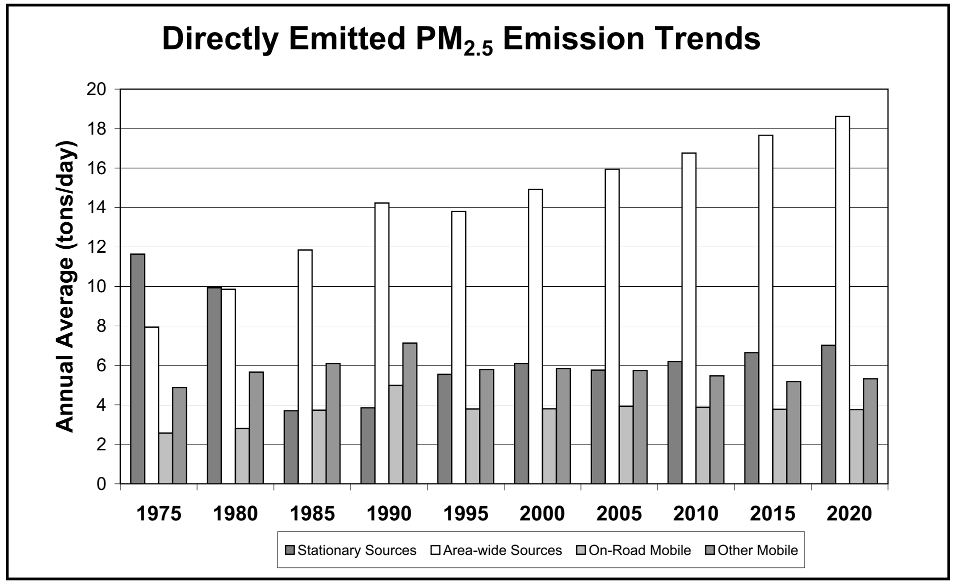


Figure 4-50

# *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 annual average for 2005 exceeds the State annual standard and in previous years has been higher than the 1989 value, however in 2005 it dropped below what it was during 1989. The previous apparent lack of progress was, in part, a result of monitoring that began at a new site in 1993, which measured higher concentrations. The maximum 24-hour concentrations exceed the national and State standards. The highest maximum 24-hour concentration of 289 ug/m$^3$ occurred in 2003, and was due to severe wildfires that occurred in Southern California during October.

During 1989, there were 114 calculated State standard exceedance days, compared with 13 during 2005. During 2005, there were six calculated days over the 24-hour national standard. 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 with the State standards.

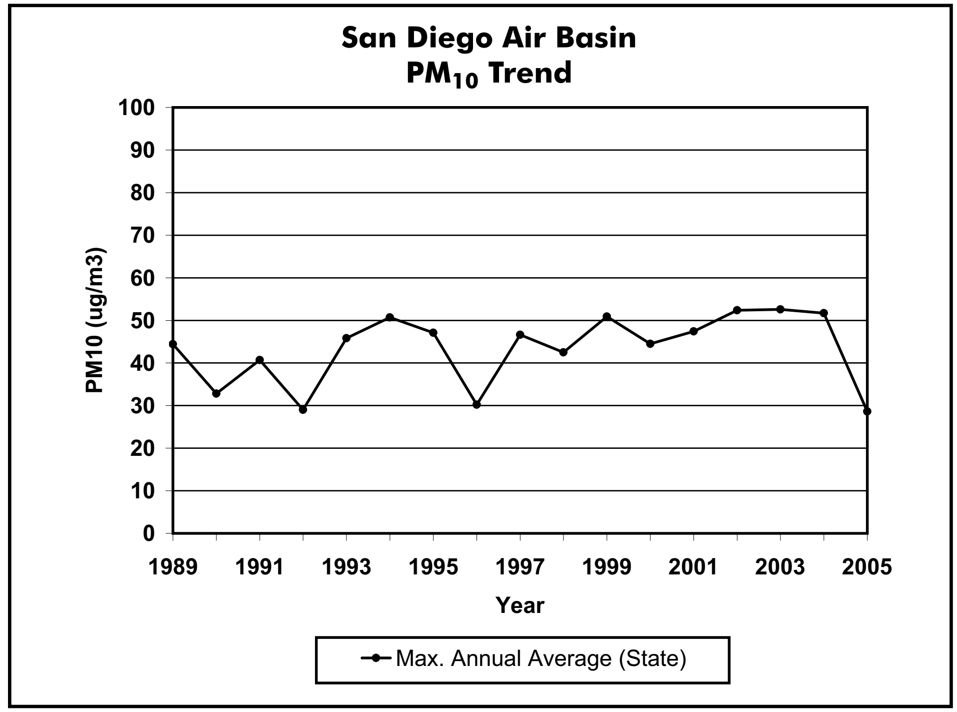


Figure 4-51

| $PM_{10}$ (ug/m$^3$) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | 80 | 90 | 115 | 81 | 67 | 159 | 129 | 121 | 93 | 125 | 89 | 119 | 136 | 106 | 131 | 289 | 138 | 154 |
| Max. 24-Hr. Concentration (Nat) | | | 80 | 90 | 115 | 81 | 67 | 159 | 129 | 121 | 93 | 125 | 89 | 121 | 139 | 107 | 130 | 280 | 137 | 155 |
| Max. Annual Average (State) | | | | 44.4 | 32.8 | 40.7 | 29.0 | 45.8 | 50.7 | 47.1 | 30.2 | 46.6 | 42.5 | 50.9 | 44.5 | 47.4 | 52.4 | 52.6 | 51.7 | 28.6 |
| Max. Annual Average (Nat) | | | 40.0 | 43.8 | 37.6 | 36.4 | 35.9 | 45.9 | 50.7 | 46.8 | 38.5 | 46.6 | 42.5 | 52.2 | 45.2 | 49.1 | 54.9 | 52.1 | 51.2 | 49.8 |
| Calc Days Above State 24-Hr Std | | | | 114 | 38 | 84 | 12 | 134 | 134 | 122 | 12 | 125 | 107 | 124 | 109 | 129 | 173 | 151 | 175 | 13 |
| Calc Days Above Nat 24-Hr Std | | | | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 6 |

Table 4-47

# *San Diego Air Basin*

## $PM_{2.5}$ Air Quality Trend

Annual average $PM_{2.5}$ concentrations (national) in the San Diego Air Basin have declined during the period of 1999 through 2005. The State annual average concentrations also decreased within this period. The highest maximum 24-hour concentration of 239 ug/$m^3$ occurred in 2003, and was due to severe wildfires that occurred in Southern California during October. The 98$^{th}$ percentile of 24-hour $PM_{2.5}$ concentrations showed substantial variability within this period, a reflection of changes in meteorology and the influence of the 2003 wildfires. Several more years are needed before determining longer-term trends. Measures adopted as part of SB 656, as well as programs to reduce ozone and diesel PM should help in reducing public exposure to $PM_{2.5}$ in this region.

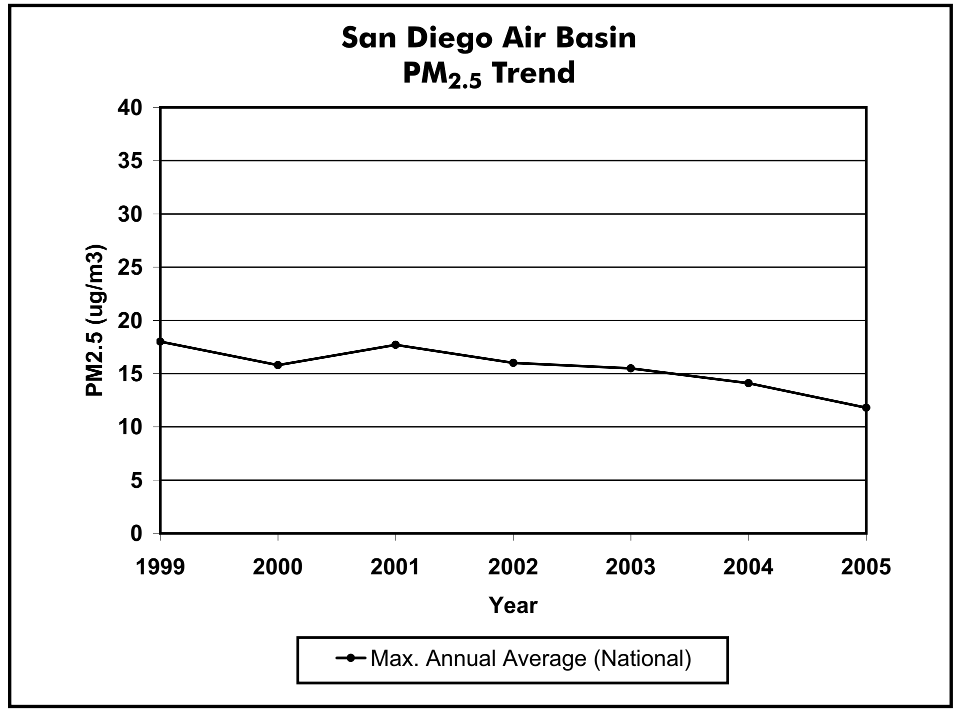


Figure 4-52

| $PM_{2.5}$ (ug/$m^3$) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | | | | | | | | | | | | 64.3 | 66.3 | 60.0 | 53.6 | 239.2 | 67.3 | 44.1 |
| Max. 24-Hr. Concentration (Nat) | | | | | | | | | | | | | | 64.3 | 66.3 | 60.0 | 53.6 | 239.2 | 67.3 | 44.1 |
| 98th Percentile of 24-Hr Conc. | | | | | | | | | | | | | | 35.7 | 32.5 | 40.8 | 36.0 | 46.9 | 37.4 | 30.2 |
| Annual Average (State) | | | | | | | | | | | | | | | | | 15.5 | 14.4 | 14.1 | |
| Annual Average (Nat) | | | | | | | | | | | | | | 18.0 | 15.8 | 17.7 | 16.0 | 15.5 | 14.1 | 11.8 |

Table 4-48

# *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 2020, even though the 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** | **2015** | **2020** |
| ***All Sources*** | ***3389*** | ***3066*** | ***2897*** | ***2517*** | ***1787*** | ***1333*** | ***955*** | ***753*** | ***630*** | ***564*** |
| **Stationary Sources** | 30 | 29 | 28 | 27 | 26 | 40 | 27 | 26 | 25 | 25 |
| **Area-wide Sources** | 23 | 25 | 27 | 29 | 27 | 28 | 28 | 28 | 29 | 30 |
| **On-Road Mobile** | 3169 | 2799 | 2586 | 2145 | 1448 | 1007 | 657 | 456 | 327 | 251 |
| Gasoline Vehicles | 3164 | 2792 | 2574 | 2130 | 1434 | 994 | 643 | 444 | 317 | 242 |
| Diesel Vehicles | 6 | 8 | 11 | 16 | 14 | 14 | 14 | 13 | 10 | 9 |
| **Other Mobile** | 167 | 213 | 256 | 316 | 286 | 259 | 243 | 243 | 248 | 258 |
| Gasoline Fuel | 126 | 165 | 207 | 255 | 231 | 207 | 194 | 193 | 197 | 206 |
| Diesel Fuel | 17 | 23 | 25 | 34 | 29 | 26 | 22 | 22 | 22 | 23 |
| Other Fuel | 24 | 26 | 24 | 27 | 26 | 26 | 27 | 28 | 28 | 29 |

Table 4-49

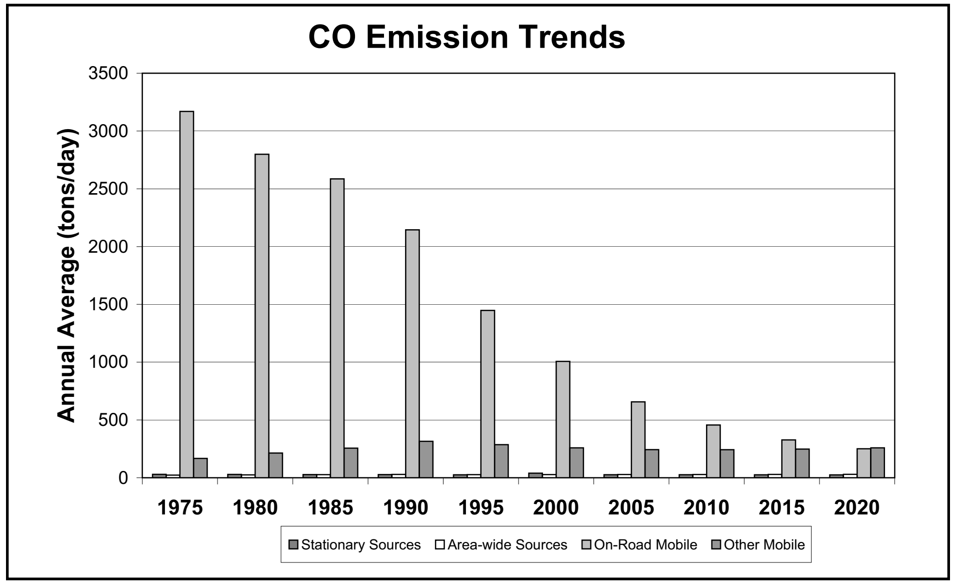


Figure 4-53

# *San Diego Air Basin*

## Carbon Monoxide Air Quality Trend

The peak 8-hour indicator for CO in the San Diego Air Basin decreased substantially over the trend period: an almost 57 percent decrease from 1986 to 2005. As a result of these decreases, the national CO standards had not been exceeded in the San Diego Air Basin since 1989. However, in 2003 the CO standards were exceeded due to extensive wildfires that impacted air quality throughout Southern California. This exceedance does not impact San Diego's attainment status, because it qualifies as an exceptional event.

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

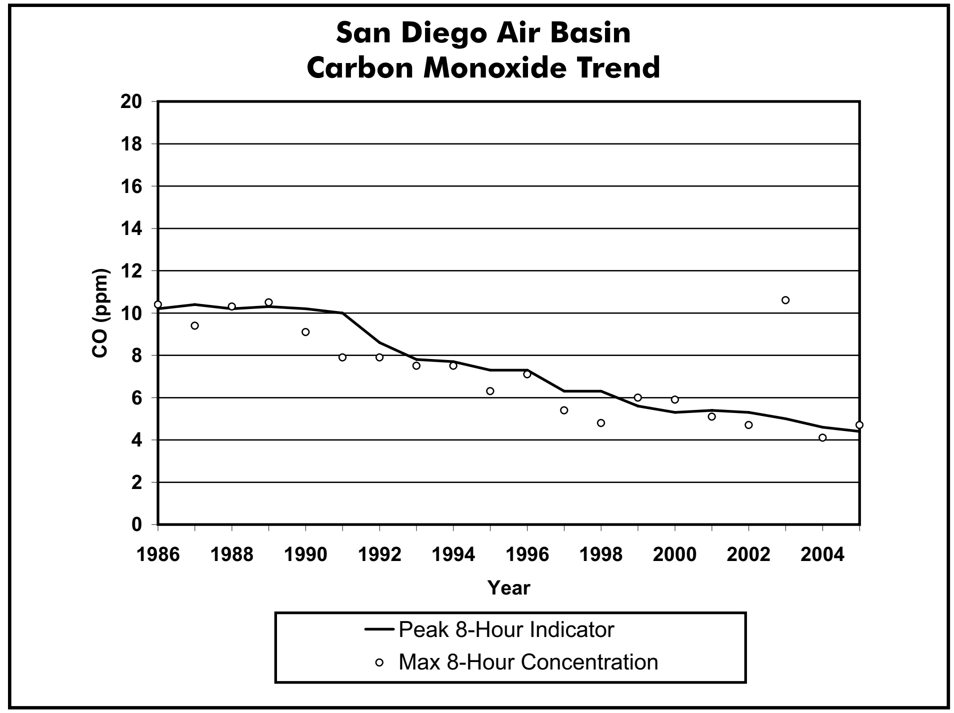


Figure 4-54

| CARBON MONOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator (State) | 10.2 | 10.4 | 10.2 | 10.3 | 10.2 | 10.0 | 8.6 | 7.8 | 7.7 | 7.3 | 7.3 | 6.3 | 6.3 | 5.6 | 5.3 | 5.4 | 5.3 | 5.0 | 4.6 | 4.4 |
| Max. 1-Hr. Concentration | 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 | 8.5 | 12.7 | 6.9 | 7.9 |
| Max. 8-Hr. Concentration (State) | 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 | 4.7 | 10.6 | 4.1 | 4.7 |
| Days Above State 8-Hr. Std. | 2 | 1 | 5 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 1 | 0 | 2 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

Table 4-50

# *San Diego Air Basin*
## Nitrogen Dioxide
### Oxides of Nitrogen Emission Trends and Forecasts

$NO_x$ and $NO_2$ emissions in the San Diego Air Basin follow the declining statewide trend from 1990 to 2020. The continued adoption of more stringent motor vehicle and stationary source emission standards should continue to reduce $NO_2$ emissions.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***284*** | ***268*** | ***271*** | ***305*** | ***268*** | ***232*** | ***193*** | ***160*** | ***129*** | ***111*** |
| **Stationary Sources** | 48 | 32 | 17 | 19 | 16 | 14 | 9 | 10 | 10 | 10 |
| **Area-wide Sources** | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **On-Road Mobile** | 186 | 176 | 187 | 203 | 178 | 146 | 113 | 88 | 64 | 48 |
| Gasoline Vehicles | 172 | 159 | 160 | 165 | 141 | 104 | 64 | 45 | 32 | 24 |
| Diesel Vehicles | 13 | 17 | 26 | 38 | 37 | 42 | 50 | 43 | 31 | 24 |
| **Other Mobile** | 48 | 58 | 65 | 80 | 70 | 70 | 68 | 60 | 53 | 50 |
| Gasoline Fuel | 3 | 4 | 5 | 6 | 6 | 6 | 7 | 6 | 6 | 6 |
| Diesel Fuel | 38 | 47 | 52 | 65 | 55 | 54 | 49 | 41 | 32 | 25 |
| Other Fuel | 7 | 8 | 8 | 9 | 9 | 11 | 12 | 13 | 15 | 20 |

Table 4-51

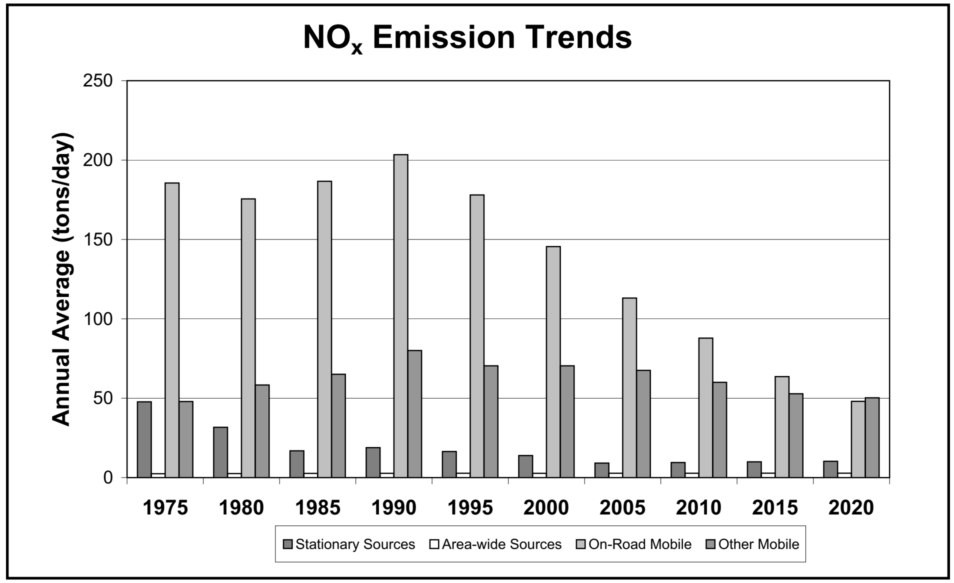


Figure 4-55

# *San Diego Air Basin*

## Nitrogen Dioxide Air Quality Trend

The San Diego Air Basin attains both the State and national $NO_2$ standards. Since 1990 ambient concentrations have been well below the levels of both the State and national standards. Data show that the peak 1-hour indicator decreased over 37 percent from 1986 to 2005.

Because $NO_x$ emissions contribute to ozone, as well as to $NO_2$, 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. As a result, these controls should ensure continued attainment of the State and national $NO_2$ standards.

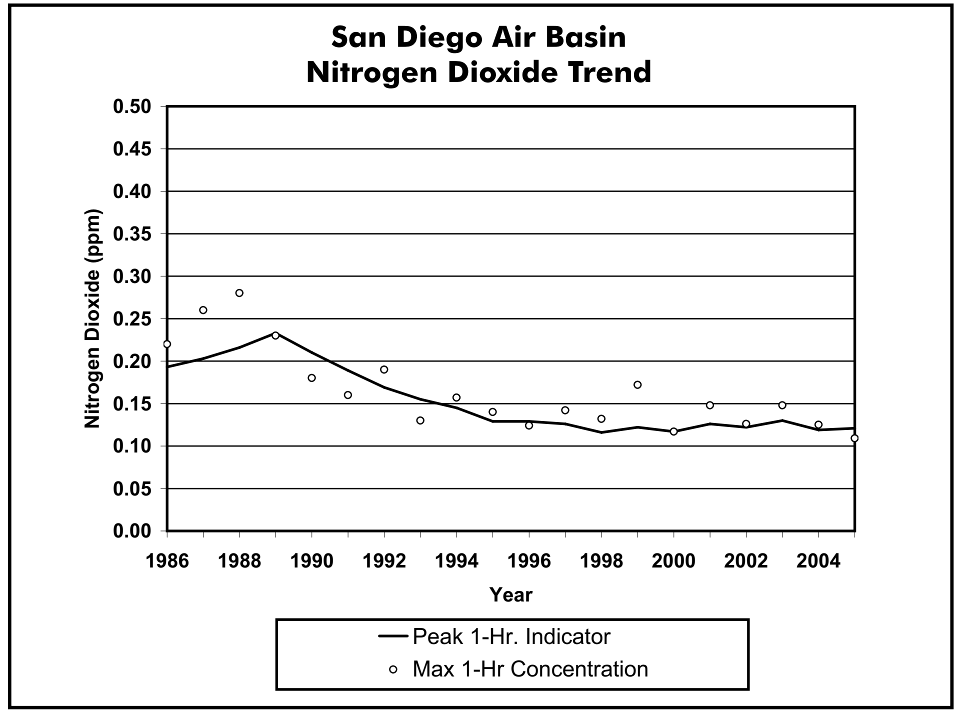


Figure 4-56

| NITROGEN DIOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hr. Indicator (State) | 0.193 | 0.203 | 0.216 | 0.233 | 0.210 | 0.189 | 0.169 | 0.155 | 0.145 | 0.129 | 0.129 | 0.126 | 0.116 | 0.122 | 0.117 | 0.126 | 0.122 | 0.130 | 0.119 | 0.121 |
| Max. 1-Hr. Concentration | 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 | 0.126 | 0.148 | 0.125 | 0.109 |
| Max. Annual Average | 0.030 | 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 | 0.022 | 0.021 | 0.023 | 0.015 |

Table 4-52

# *Sacramento Valley Air Basin*

## Introduction - Area Description

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 northeastern portion of Solano County. The Sacramento Valley Air Basin occupies 14,994 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 that of the San Francisco Bay Area or South Coast air basins. The winters are generally cool and wet, while the summers are hot and dry.

Emissions from the urbanized portion of the basin (Sacramento, Yolo, Solano, and Placer Counties) 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.

Note: The Sacramento Metropolitan Nonattainment Area includes the southern part of the Air Basin, as well as the western portion of El Dorado County and the western portion of Placer County.

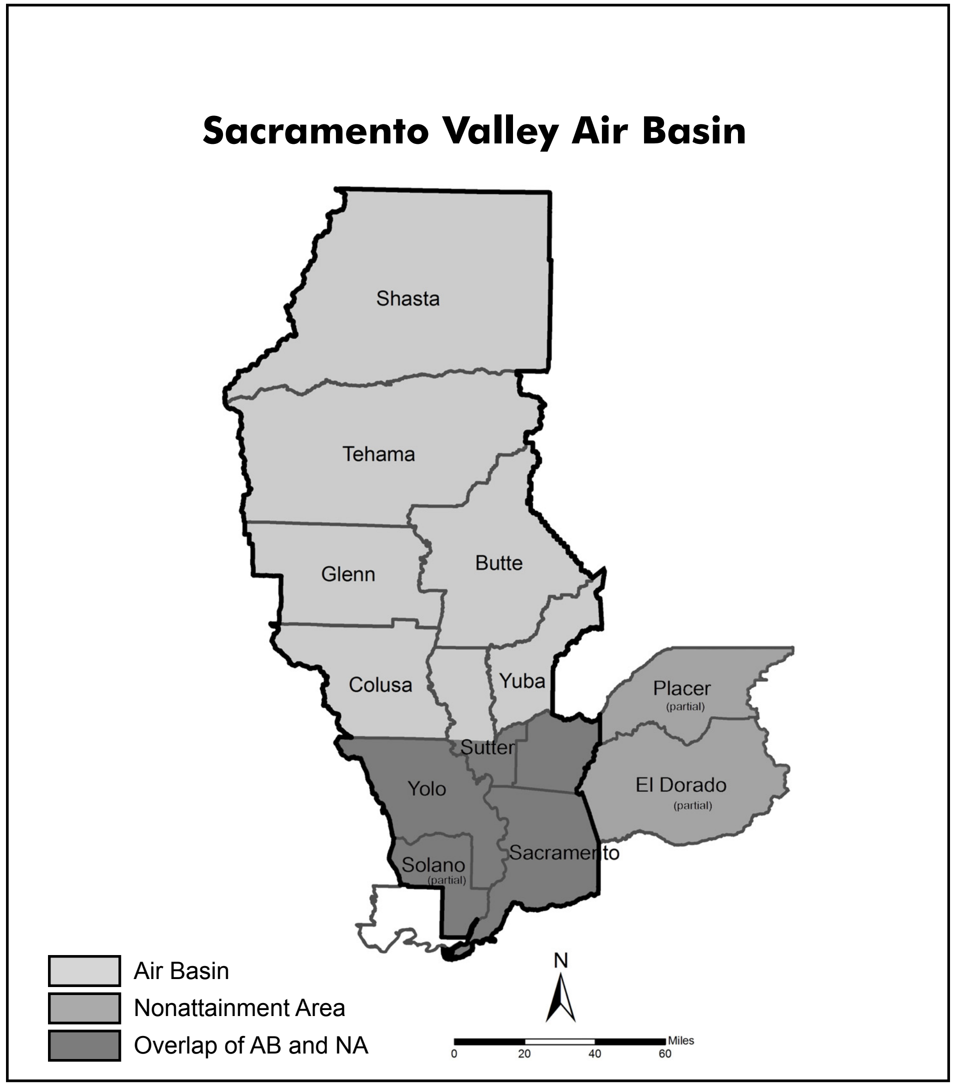


Figure 4-57

# *Sacramento Valley Air Basin*

## Emission Trends and Forecasts

The emission levels in the Sacramento Valley Air Basin are trending downward from 1990 to 2020 for $NO_x$, and downward from 1975 to 2020 for ROG and CO. The decreases in $NO_x$, ROG, and CO are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources 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 increasing from 1975 to 2020. The emission levels for $SO_x$ have declined after 1990. Most of the reduction in $SO_x$ emissions is seen for on-road motor vehicles and other mobile sources.

| Sacramento Valley Air Basin Emissions (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pollutant | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
| $NO_x$ | 335 | 351 | 342 | 382 | 354 | 318 | 290 | 250 | 200 | 164 |
| ROG | 461 | 447 | 415 | 362 | 301 | 243 | 207 | 183 | 170 | 165 |
| $PM_{10}$ | 199 | 206 | 213 | 226 | 215 | 222 | 227 | 232 | 237 | 242 |
| $PM_{2.5}$ | 73 | 71 | 73 | 81 | 73 | 74 | 73 | 74 | 75 | 76 |
| $SO_x$ | 25 | 23 | 26 | 30 | 9 | 6 | 5 | 4 | 4 | 4 |
| CO | 3116 | 3113 | 2899 | 2573 | 1935 | 1520 | 1223 | 1032 | 908 | 835 |

Table 4-53

# *Sacramento Valley Air Basin*

## Population and VMT

Between 1980 and 2020, population in the Sacramento Valley Air Basin is projected to grow at a higher rate than the statewide average- a 140 percent increase compared with an 84 percent increase statewide. Population is projected to grow from 15 million in 1980 to 36 million in 2020. During this same period, the increase in the number of vehicle miles traveled each day is projected to be higher than the overall statewide value: a 200 percent increase in the Sacramento Valley Air Basin. VMT are projected to increase from about 30 million miles in 1980 to nearly 90 million miles in 2020.

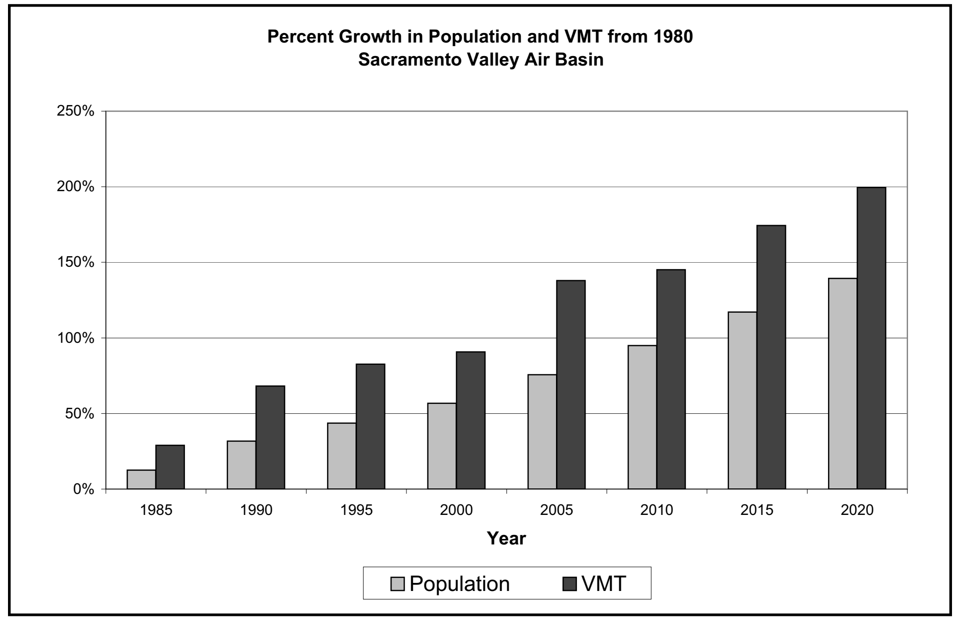


Figure 4-58

| Parameter | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Population | 1500924 | 1688217 | 1977544 | 2155490 | 2353225 | 2636019 | 2925202 | 3259235 | 3593262 |
| Avg. Daily VMT/1000 | 30025 | 38728 | 50471 | 54826 | 57268 | 71433 | 73601 | 82374 | 89914 |

Table 4-54

# *Sacramento Valley Air Basin*

## Ozone Precursor Emission - Trends and Forecasts

Emissions of $NO_x$ decreased from 1990 to 2005 and are projected to continue decreasing from 2005 to 2020. 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 30 years due to more stringent motor vehicle standards and new rules for control of ROG from various industrial coating and solvent operations.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***335*** | ***351*** | ***342*** | ***382*** | ***354*** | ***318*** | ***290*** | ***250*** | ***200*** | ***164*** |
| **Stationary Sources** | 38 | 32 | 31 | 45 | 46 | 42 | 38 | 39 | 39 | 38 |
| **Area-wide Sources** | 9 | 9 | 9 | 10 | 9 | 9 | 9 | 9 | 9 | 9 |
| **On-Road Mobile** | 186 | 194 | 202 | 215 | 196 | 167 | 154 | 127 | 88 | 62 |
| Gasoline Vehicles | 156 | 158 | 151 | 144 | 123 | 88 | 59 | 42 | 30 | 22 |
| Diesel Vehicles | 30 | 35 | 51 | 72 | 74 | 79 | 96 | 85 | 58 | 40 |
| **Other Mobile** | 102 | 116 | 100 | 112 | 102 | 100 | 88 | 75 | 64 | 54 |
| Gasoline Fuel | 3 | 4 | 5 | 6 | 5 | 5 | 7 | 7 | 7 | 6 |
| Diesel Fuel | 96 | 108 | 92 | 103 | 93 | 90 | 77 | 64 | 53 | 43 |
| Other Fuel | 3 | 4 | 4 | 3 | 4 | 5 | 4 | 4 | 4 | 5 |

Table 4-55

| ROG Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***461*** | ***447*** | ***415*** | ***362*** | ***301*** | ***243*** | ***207*** | ***183*** | ***170*** | ***165*** |
| **Stationary Sources** | 72 | 50 | 52 | 49 | 41 | 30 | 31 | 32 | 35 | 37 |
| **Area-wide Sources** | 58 | 65 | 63 | 70 | 67 | 65 | 61 | 62 | 64 | 66 |
| **On-Road Mobile** | 289 | 279 | 244 | 185 | 137 | 94 | 67 | 49 | 36 | 29 |
| Gasoline Vehicles | 285 | 274 | 238 | 177 | 132 | 89 | 61 | 43 | 32 | 26 |
| Diesel Vehicles | 4 | 5 | 6 | 8 | 6 | 5 | 6 | 6 | 4 | 3 |
| **Other Mobile** | 42 | 53 | 55 | 58 | 55 | 53 | 47 | 40 | 35 | 33 |
| Gasoline Fuel | 29 | 36 | 41 | 43 | 40 | 39 | 35 | 30 | 27 | 26 |
| Diesel Fuel | 12 | 14 | 12 | 14 | 13 | 12 | 11 | 8 | 6 | 5 |
| Other Fuel | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

Table 4-56

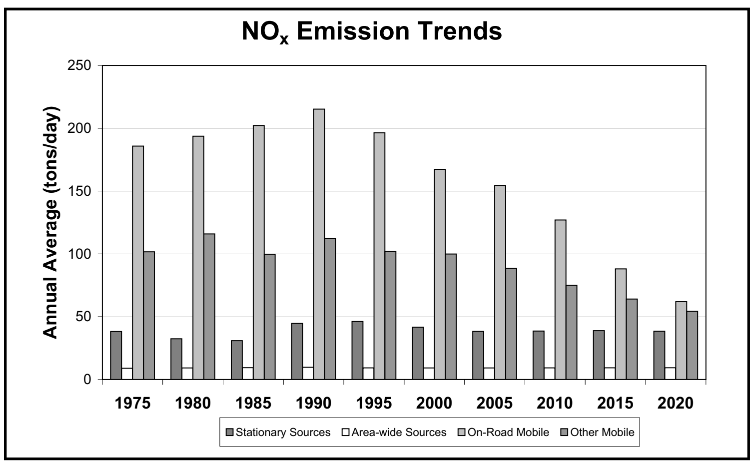


Figure 4-59

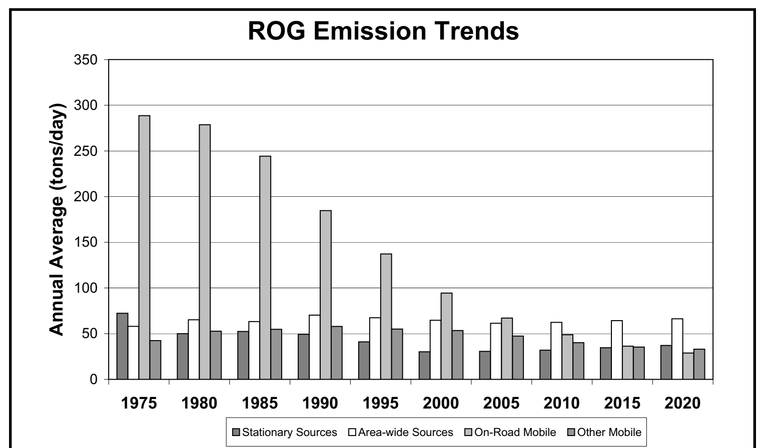


Figure 4-60

# *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 peak 8-hour indicator remained fairly constant from 1986 to 1989. Since 1989, the peak 8-hour indicator has decreased slightly, and the overall decline for the 20-year period is almost 17 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 8-hour concentrations have also decreased, but with more year-to-year variation.

Similar to the San Joaquin Valley, the Sacramento Metropolitan area, which includes the urbanized portion of the Southern Sacramento Valley Air Basin, along with the urbanized portions of El Dorado and Placer Counties in the Mountain Counties Air Basin, is identified as both a transport contributor and receptor. The region is a transport contributor to the Mountain Counties, Upper Sacramento Valley, San Joaquin Valley, and San Francisco Bay Area air basins and is a receptor area for the San Francisco Bay Area and San Joaquin Valley air basins.

The data for the Sacramento Metropolitan Area, on the following page, reflects the portion of the region that is nonattainment for the national ozone standards.

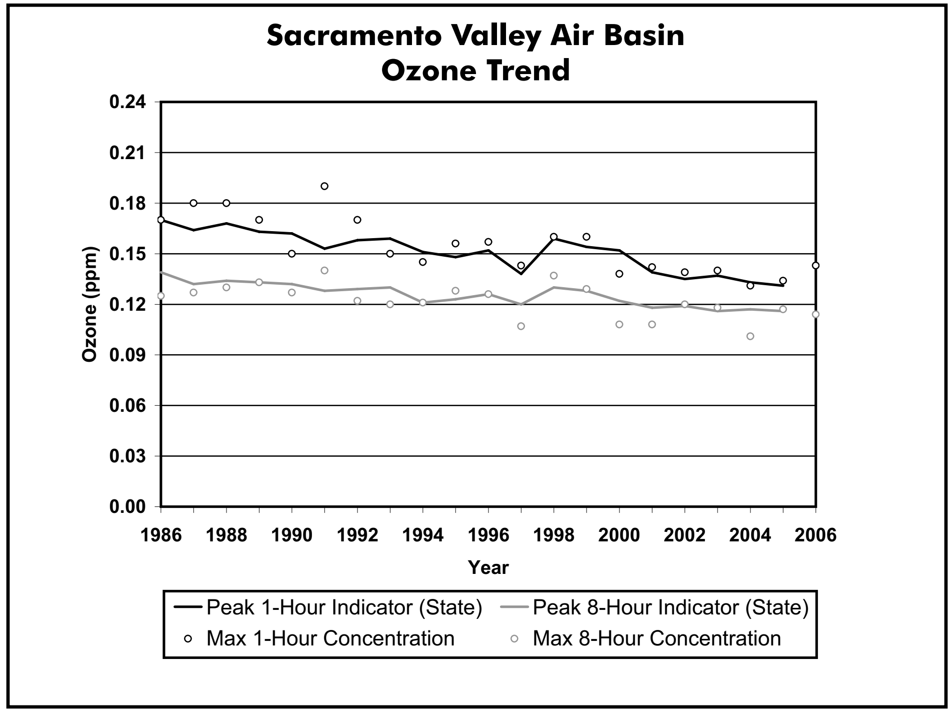


Figure 4-61

| OZONE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hour Indicator (State) | 0.139 | 0.132 | 0.134 | 0.133 | 0.132 | 0.128 | 0.129 | 0.130 | 0.121 | 0.123 | 0.126 | 0.120 | 0.130 | 0.128 | 0.122 | 0.118 | 0.119 | 0.116 | 0.117 | 0.116 | |
| Avg. of 4th High 8-Hr. in 3 Yrs | 0.118 | 0.114 | 0.114 | 0.114 | 0.107 | 0.105 | 0.105 | 0.110 | 0.104 | 0.106 | 0.106 | 0.097 | 0.095 | 0.101 | 0.105 | 0.101 | 0.101 | 0.100 | 0.097 | 0.097 | |
| Peak 1-Hour Indicator (State) | 0.170 | 0.164 | 0.168 | 0.163 | 0.162 | 0.153 | 0.158 | 0.159 | 0.151 | 0.148 | 0.152 | 0.138 | 0.159 | 0.154 | 0.152 | 0.139 | 0.135 | 0.137 | 0.133 | 0.131 | |
| 4th High 1-Hr. in 3 Yrs[2] | 0.180 | 0.160 | 0.160 | 0.160 | 0.160 | 0.150 | 0.160 | 0.150 | 0.142 | 0.145 | 0.145 | 0.143 | 0.149 | 0.149 | 0.149 | 0.138 | 0.134 | 0.138 | 0.138 | 0.131 | |
| Max. 8-Hr. Concentration | 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 | 0.120 | 0.118 | 0.101 | 0.117 | 0.114 |
| Maximum 1-Hr. Concentration | 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 | 0.139 | 0.140 | 0.131 | 0.134 | 0.143 |
| Days Above State 8-Hr. Std. | 88 | 136 | 125 | 99 | 104 | 111 | 107 | 61 | 113 | 86 | 103 | 60 | 97 | 111 | 81 | 84 | 95 | 92 | 87 | 62 | 88 |
| Days Above Nat. 8-Hr. Std. | 50 | 73 | 68 | 37 | 44 | 60 | 56 | 22 | 48 | 40 | 44 | 15 | 60 | 43 | 35 | 37 | 34 | 40 | 20 | 25 | 39 |
| Days Above State 1-Hr. Std. | 66 | 94 | 98 | 68 | 50 | 68 | 74 | 34 | 60 | 50 | 58 | 25 | 62 | 59 | 41 | 44 | 46 | 51 | 29 | 33 | 44 |

[1] Preliminary data for 2006 are shown here, however they are subject to change. 2005 is the last year for which complete and approved data is available, thus calculated annual statistics are not included for 2006.

[2] The national 1-Hour standard has been revoked. Historical 1-Hour data are provided for reference.

Table 4-57

# *Sacramento Metropolitan Area[1]*

## Ozone Air Quality Table

| OZONE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hour Indicator (State) | 0.139 | 0.132 | 0.134 | 0.133 | 0.132 | 0.128 | 0.129 | 0.130 | 0.121 | 0.123 | 0.126 | 0.120 | 0.130 | 0.128 | 0.126 | 0.119 | 0.124 | 0.127 | 0.126 | 0.116 | |
| Avg. of 4th High 8-Hr. in 3 Yrs | 0.118 | 0.114 | 0.114 | 0.114 | 0.107 | 0.105 | 0.105 | 0.110 | 0.104 | 0.106 | 0.106 | 0.099 | 0.103 | 0.103 | 0.107 | 0.104 | 0.106 | 0.107 | 0.102 | 0.097 | |
| Peak 1-Hour Indicator (State) | 0.170 | 0.164 | 0.168 | 0.163 | 0.162 | 0.153 | 0.158 | 0.159 | 0.151 | 0.148 | 0.152 | 0.140 | 0.159 | 0.154 | 0.152 | 0.139 | 0.142 | 0.146 | 0.143 | 0.131 | |
| 4th High 1-Hr. in 3 Yrs | 0.180 | 0.160 | 0.160 | 0.160 | 0.160 | 0.150 | 0.160 | 0.150 | 0.142 | 0.145 | 0.145 | 0.145 | 0.149 | 0.149 | 0.149 | 0.144 | 0.148 | 0.148 | 0.145 | 0.139 | |
| Max. 8-Hr. Concentration | 0.125 | 0.127 | 0.138 | 0.133 | 0.127 | 0.140 | 0.122 | 0.120 | 0.121 | 0.128 | 0.126 | 0.107 | 0.137 | 0.129 | 0.113 | 0.109 | 0.137 | 0.122 | 0.102 | 0.117 | 0.116 |
| Maximum 1-Hr. Concentration | 0.170 | 0.180 | 0.180 | 0.170 | 0.150 | 0.190 | 0.170 | 0.150 | 0.145 | 0.156 | 0.157 | 0.145 | 0.163 | 0.160 | 0.138 | 0.148 | 0.156 | 0.145 | 0.118 | 0.134 | 0.139 |
| Days Above State 8-Hr. Std. | 81 | 121 | 125 | 114 | 99 | 102 | 113 | 61 | 103 | 80 | 96 | 62 | 72 | 108 | 78 | 88 | 106 | 94 | 81 | 69 | 90 |
| Days Above Nat. 8-Hr. Std. | 49 | 65 | 72 | 53 | 43 | 57 | 55 | 24 | 42 | 42 | 48 | 19 | 34 | 48 | 37 | 41 | 47 | 43 | 25 | 35 | 42 |
| Days Above State 1-Hr. Std. | 57 | 86 | 99 | 74 | 47 | 65 | 76 | 36 | 54 | 52 | 57 | 25 | 49 | 56 | 45 | 51 | 59 | 53 | 35 | 43 | 50 |

[1] The Sacramento Metropolitan Area includes urbanized portions of the Sacramento Valley Air Basin (Sacramento, Yolo, Placer, and Solano Counties, and part of Sutter County) and all of El Dorado and Placer Counties in the Mountain Counties Air Basin.

[2] Preliminary data for 2006 are shown here, however they are subject to change. 2005 is the last year for which complete and approved data is available, thus calculated annual statistics are not included for 2006.

Table 4-58

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# *Sacramento Valley Air Basin*
## Directly Emitted $PM_{10}$ Emission Trends and Forecasts

Direct emissions of $PM_{10}$ increased in the Sacramento Valley Air Basin between 1975 and 2005 and are projected to continue increasing through 2020. Emissions are dominated by contributions from area-wide sources, primarily fugitive dust from paved and unpaved roads, dust from farming operations, 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.

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. The $PM_{10}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{10}$ emissions contribute approximately 75 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** | **2015** | **2020** |
| ***All Sources*** | ***199*** | ***206*** | ***213*** | ***226*** | ***215*** | ***222*** | ***227*** | ***232*** | ***237*** | ***242*** |
| **Stationary Sources** | 25 | 20 | 18 | 22 | 17 | 18 | 17 | 18 | 20 | 21 |
| **Area-wide Sources** | 163 | 173 | 181 | 187 | 185 | 192 | 197 | 202 | 208 | 212 |
| **On-Road Mobile** | 5 | 6 | 7 | 9 | 7 | 6 | 6 | 6 | 6 | 5 |
| Gasoline Vehicles | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 |
| Diesel Vehicles | 3 | 4 | 6 | 7 | 5 | 4 | 4 | 3 | 2 | 1 |
| **Other Mobile** | 7 | 8 | 7 | 8 | 6 | 6 | 6 | 5 | 5 | 4 |
| Gasoline Fuel | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| Diesel Fuel | 6 | 7 | 6 | 7 | 5 | 4 | 4 | 3 | 2 | 2 |
| Other Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-59

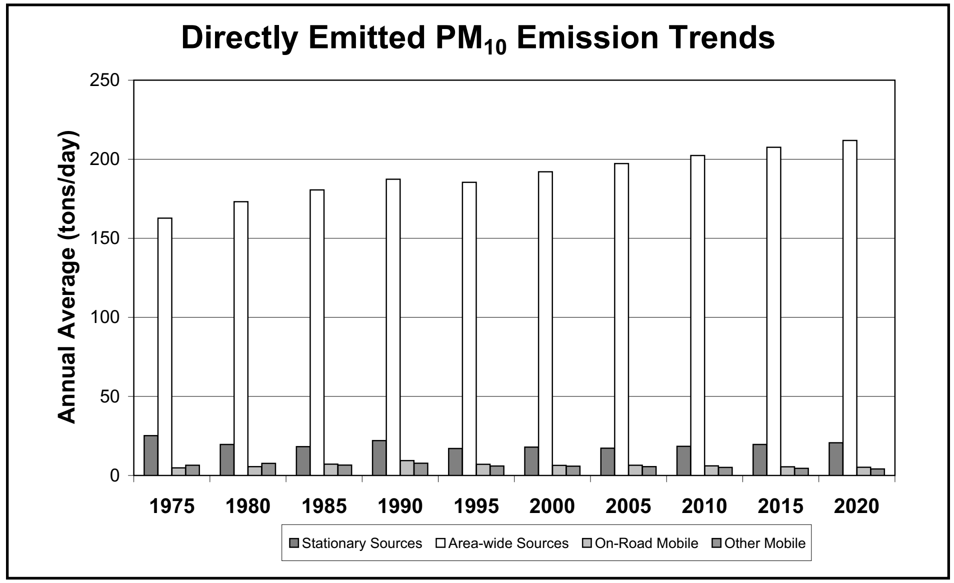


Figure 4-62

# *Sacramento Valley Air Basin*
## Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ have remained relatively steady in the Sacramento Valley Air Basin between 1975 and 2005 and are projected to increase slightly through 2020. Emissions are dominated by contributions from area-wide sources, primarily fugitive dust from paved and unpaved roads, fugitive dust from construction and demolition, particulates from residential fuel combustion, and waste burning. Emissions of directly emitted $PM_{2.5}$ from mobile sources and stationary sources in the Sacramento Valley Air Basin have remained relatively steady.

PM can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere (secondary PM) from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia. 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 70 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** | **2015** | **2020** |
| ***All Sources*** | ***73*** | ***71*** | ***73*** | ***81*** | ***73*** | ***74*** | ***73*** | ***74*** | ***75*** | ***76*** |
| **Stationary Sources** | 18 | 12 | 11 | 13 | 10 | 10 | 10 | 11 | 11 | 12 |
| **Area-wide Sources** | 45 | 48 | 50 | 52 | 52 | 53 | 54 | 55 | 56 | 57 |
| **On-Road Mobile** | 4 | 5 | 6 | 8 | 6 | 5 | 5 | 5 | 4 | 4 |
| Gasoline Vehicles | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| Diesel Vehicles | 3 | 4 | 5 | 7 | 5 | 4 | 3 | 3 | 2 | 1 |
| **Other Mobile** | 6 | 7 | 6 | 7 | 5 | 5 | 5 | 4 | 4 | 3 |
| Gasoline Fuel | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Diesel Fuel | 5 | 6 | 5 | 6 | 4 | 4 | 4 | 3 | 2 | 1 |
| Other Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-60

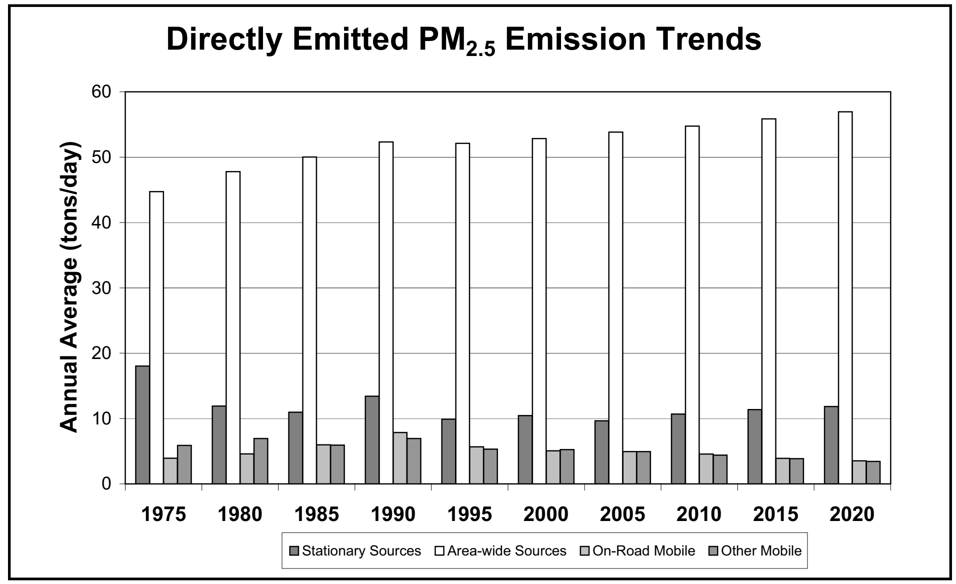


Figure 4-63

# *Sacramento Valley Air Basin*

## $PM_{10}$ Air Quality Trend

The annual average (State) $PM_{10}$ concentration in the Sacramento Valley Air Basin shows a fairly steady decline over the trend period, with some variability over the last several years. The three-year average of the annual average (State) shows a decrease of 21 percent from 1991 to 2005. The three-year average of calculated days over the State 24-hour standard decreased by 41 percent from 1991 to 2005. Because many of the sources that contribute to ozone also contribute to $PM_{10}$, future ozone emission controls should improve $PM_{10}$ air quality.

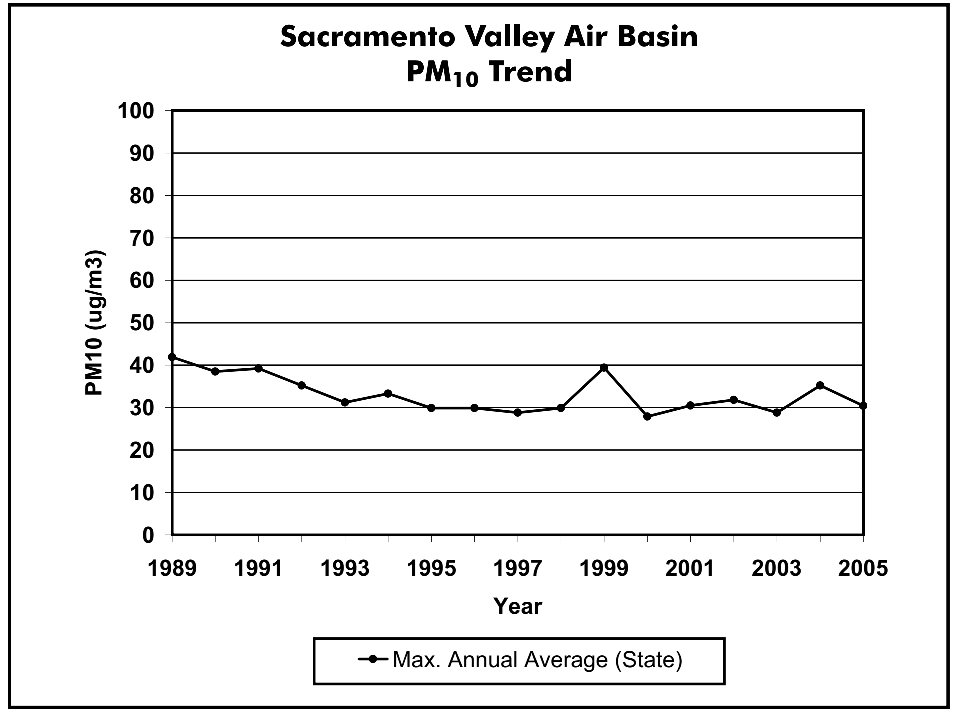


Figure 4-64

| $PM_{10}$ (ug/m³) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | 100 | 147 | 153 | 136 | 111 | 113 | 154 | 145 | 98 | 126 | 130 | 179 | 90 | 112 | 96 | 123 | 171 | 109 |
| Max. 24-Hr. Concentration (Nat) | | | 100 | 147 | 153 | 136 | 111 | 113 | 204 | 287 | 98 | 126 | 130 | 275 | 109 | 123 | 145 | 89 | 169 | 110 |
| Max. Annual Average (State) | | | | 41.9 | 38.5 | 39.2 | 35.2 | 31.2 | 33.3 | 29.9 | 29.9 | 28.8 | 29.9 | 39.4 | 27.9 | 30.5 | 31.8 | 28.8 | 35.2 | 30.4 |
| Max. Annual Average (Nat) | | 38.2 | 51.2 | 46.0 | 51.9 | 46.4 | 42.3 | 36.9 | 34.5 | 40.7 | 32.6 | 28.6 | 29.0 | 38.4 | 27.9 | 30.2 | 30.9 | 28.4 | 34.5 | 27.2 |
| Calc Days Above State 24-Hr Std | | | | 82 | 74 | 104 | 70 | 63 | 36 | 57 | 44 | 22 | 60 | 64 | 43 | 50 | 41 | 31 | 80 | 42 |
| Calc Days Above Nat 24-Hr Std | | | | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 0 |

Table 4-61

# *Sacramento Valley Air Basin*

## $PM_{2.5}$ Air Quality Trend

Overall, annual average (national) $PM_{2.5}$ concentrations in the Sacramento Valley Air Basin decreased slightly during 1999 through 2005. The State annual average concentrations also show a declining trend, although the trends looks less pronounced, due to differences in State and national monitoring methods. The 98th percentile of 24-hour $PM_{2.5}$ concentrations also declined during this seven-year period. Similar to $PM_{10}$, year-to-year changes in meteorology can mask the impacts of emission control programs. Several more years are needed before determining longer-term trends. Measures adopted as part of SB 656, as well as programs to reduce ozone and diesel PM will help in reducing public exposure to $PM_{2.5}$ in this region.

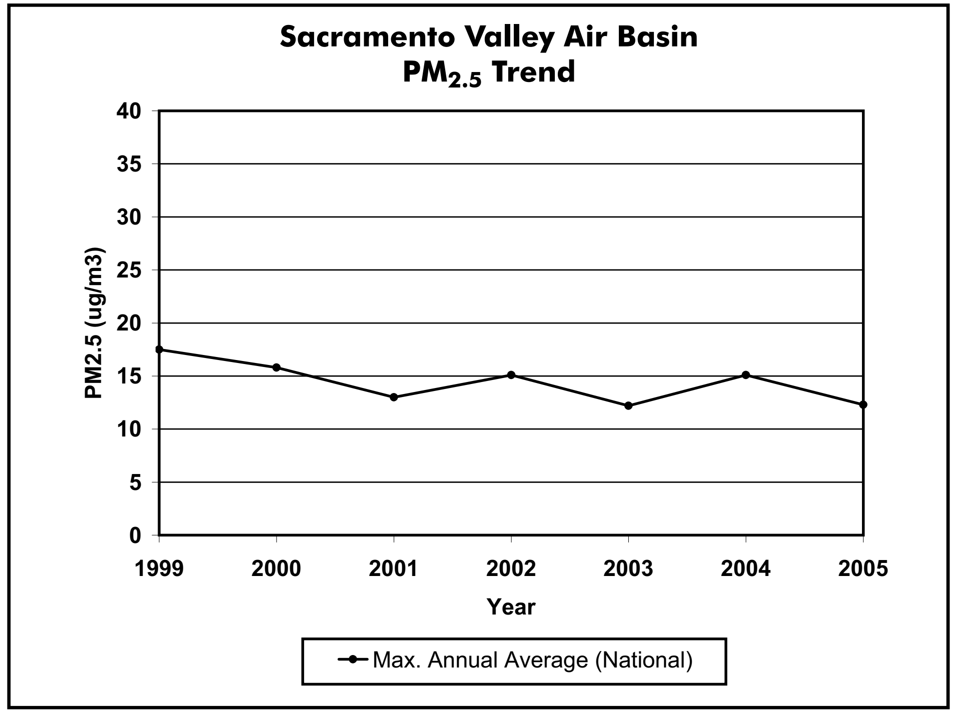


Figure 4-65

| $PM_{2.5}$ (ug/m$^3$) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 24-Hr. Concentration (State) | | | | | | | | | | | | | 96.0 | 108.0 | 123.1 | 128.2 | 96.1 | 73.2 | 76.3 | 82.7 |
| Max. 24-Hr. Concentration (Nat) | | | | | | | | | | | | | 96.0 | 108.0 | 98.0 | 78.0 | 91.0 | 65.0 | 65.0 | 80.0 |
| 98th Percentile of 24-Hr Conc. | | | | | | | | | | | | | 96.0 | 84.0 | 81.0 | 78.0 | 77.0 | 43.0 | 54.0 | 54.0 |
| Annual Average (State) | | | | | | | | | | | | | | 17.5 | 15.8 | 11.9 | 15.1 | 15.9 | 16.5 | 13.8 |
| Annual Average (Nat) | | | | | | | | | | | | | | 17.5 | 15.8 | 13.0 | 15.1 | 12.2 | 15.1 | 12.3 |

Table 4-62

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

Emissions of CO declined in the Sacramento Valley Air Basin between 1975 and 2005 and are projected to decrease through 2020. 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 1975, despite increases in VMT. Stationary and area-wide source CO emissions have remained relatively steady since 1990, with additional emission controls offsetting growth.

| CO Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***3116*** | ***3113*** | ***2899*** | ***2573*** | ***1935*** | ***1520*** | ***1223*** | ***1032*** | ***908*** | ***835*** |
| **Stationary Sources** | 27 | 28 | 15 | 50 | 38 | 40 | 49 | 51 | 53 | 55 |
| **Area-wide Sources** | 252 | 265 | 275 | 286 | 283 | 282 | 284 | 286 | 289 | 293 |
| **On-Road Mobile** | 2638 | 2568 | 2342 | 1915 | 1318 | 927 | 635 | 445 | 312 | 229 |
| Gasoline Vehicles | 2624 | 2551 | 2319 | 1885 | 1290 | 902 | 608 | 420 | 292 | 213 |
| Diesel Vehicles | 13 | 17 | 23 | 31 | 28 | 26 | 26 | 25 | 20 | 16 |
| **Other Mobile** | 200 | 253 | 267 | 323 | 296 | 270 | 255 | 251 | 254 | 258 |
| Gasoline Fuel | 145 | 186 | 209 | 257 | 235 | 212 | 200 | 197 | 199 | 202 |
| Diesel Fuel | 37 | 44 | 39 | 47 | 43 | 38 | 33 | 31 | 30 | 30 |
| Other Fuel | 18 | 23 | 19 | 19 | 19 | 20 | 22 | 23 | 25 | 25 |

Table 4-63

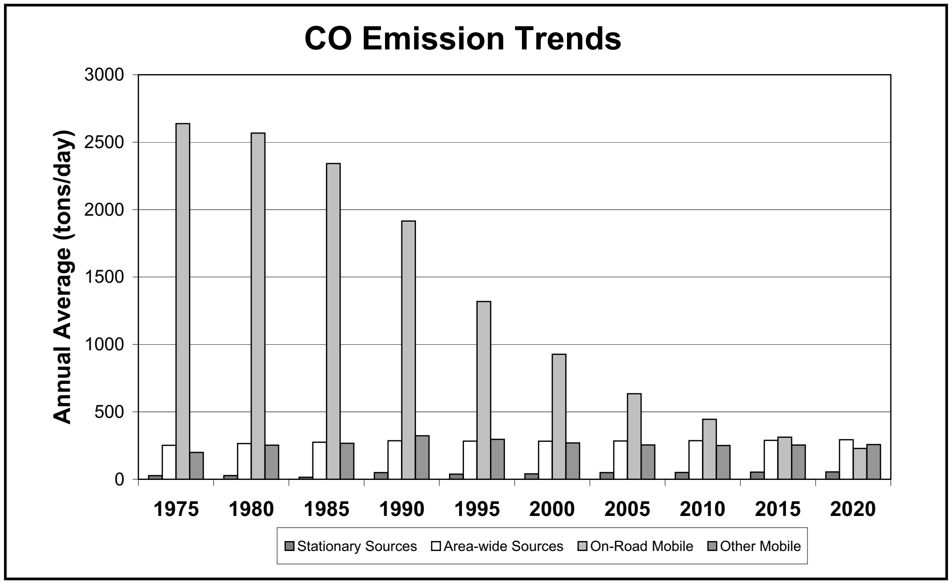


Figure 4-66

# *Sacramento Valley Air Basin*

## Carbon Monoxide Air Quality Trend

The trend of the peak 8-hour indicator for CO for the Sacramento Valley Air Basin was relatively flat from 1986 to 1991, with some year-to-year variability that was probably caused by meteorology. Since 1991, indicator values have decreased substantially. The 2005 value was 70 percent lower than the 1991 value. 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 CO 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.

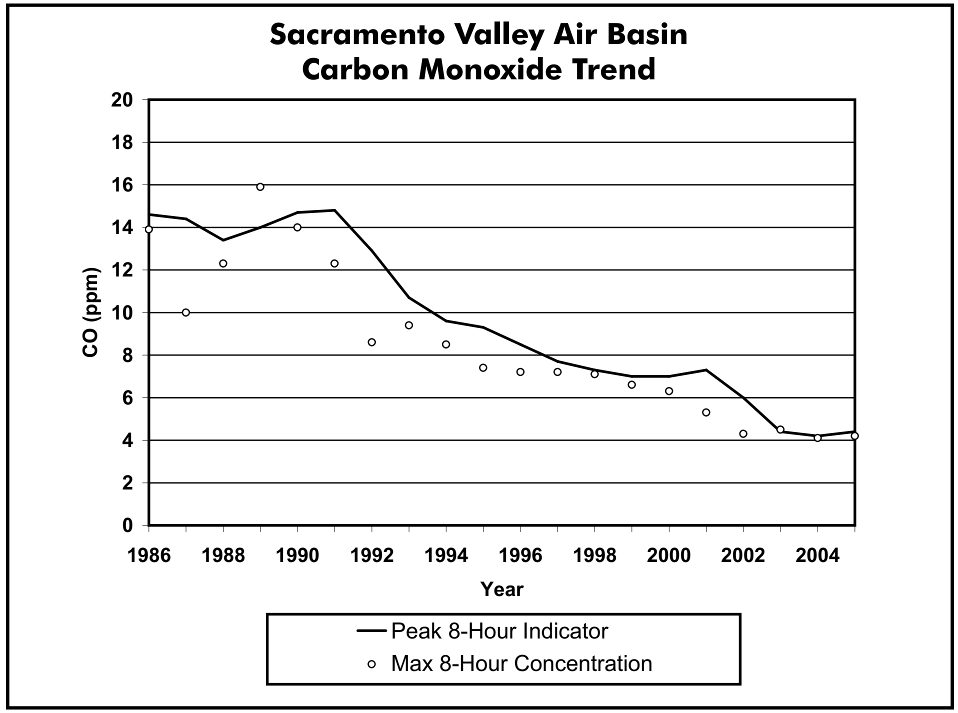


Figure 4-67

| CARBON MONOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 8-Hr. Indicator (State) | 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 | 6.0 | 4.4 | 4.2 | 4.4 |
| Max. 1-Hr. Concentration | 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 | 17.2 | 7.8 | 8.5 | 7.3 | 8.0 |
| Max. 8-Hr. Concentration (State) | 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 | 4.3 | 4.5 | 4.1 | 4.2 |
| Days Above State 8-Hr. Std. | 13 | 5 | 12 | 22 | 14 | 9 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Days Above Nat. 8-Hr. Std. | 12 | 3 | 9 | 22 | 12 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4-64

# *Sacramento Valley Air Basin*
## Nitrogen Dioxide
### Oxides of Nitrogen Emission Trends and Forecasts

Emissions of $NO_x$ show a steady decrease from 1990 to 2020. 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.

| $NO_x$ Emission Trends (tons/day, annual average) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **1975** | **1980** | **1985** | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| ***All Sources*** | ***335*** | ***351*** | ***342*** | ***382*** | ***354*** | ***318*** | ***290*** | ***250*** | ***200*** | ***164*** |
| **Stationary Sources** | 38 | 32 | 31 | 45 | 46 | 42 | 38 | 39 | 39 | 38 |
| **Area-wide Sources** | 9 | 9 | 9 | 10 | 9 | 9 | 9 | 9 | 9 | 9 |
| **On-Road Mobile** | 186 | 194 | 202 | 215 | 196 | 167 | 154 | 127 | 88 | 62 |
| Gasoline Vehicles | 156 | 158 | 151 | 144 | 123 | 88 | 59 | 42 | 30 | 22 |
| Diesel Vehicles | 30 | 35 | 51 | 72 | 74 | 79 | 96 | 85 | 58 | 40 |
| **Other Mobile** | 102 | 116 | 100 | 112 | 102 | 100 | 88 | 75 | 64 | 54 |
| Gasoline Fuel | 3 | 4 | 5 | 6 | 5 | 5 | 7 | 7 | 7 | 6 |
| Diesel Fuel | 96 | 108 | 92 | 103 | 93 | 90 | 77 | 64 | 53 | 43 |
| Other Fuel | 3 | 4 | 4 | 3 | 4 | 5 | 4 | 4 | 4 | 5 |

Table 4-65

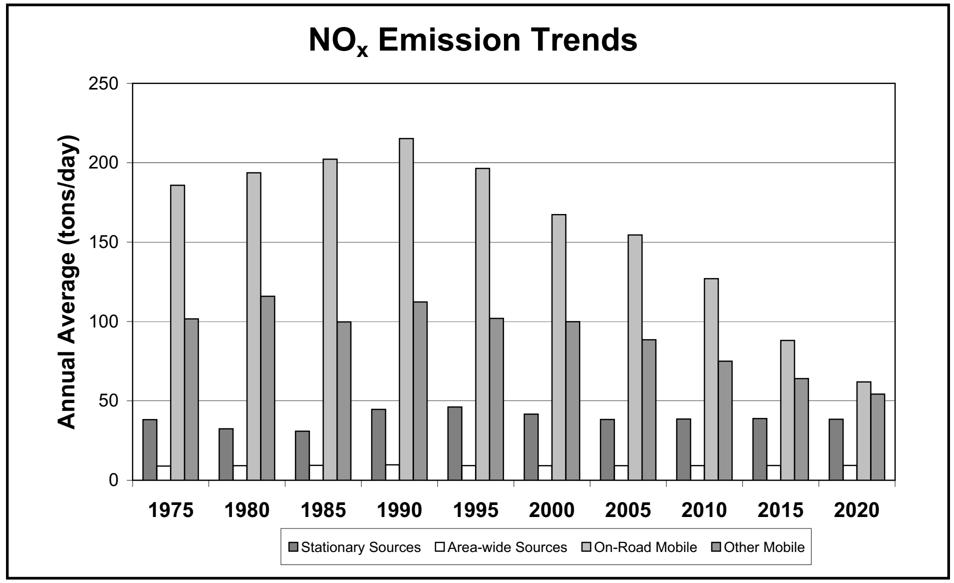


Figure 4-68

# *Sacramento Valley Air Basin*

## Nitrogen Dioxide Air Quality Trend

The Sacramento Valley Air Basin has attained both the State and national $NO_2$ standards for more than 20 years. The peak 1-hour indicator increased from 1986 through 1993, but has declined by 33 percent since 1993. There is more variability in maximum 1-hour concentrations as compared to other areas. This variability may be due to changes in emission sources and may also reflect year-to-year changes in meteorology. However, ambient concentrations are well below the level of the two standards, and a decline in $NO_2$ concentrations is expected in the coming years.

$NO_2$ is formed from $NO_x$ emissions, 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 $NO_x$ emissions.

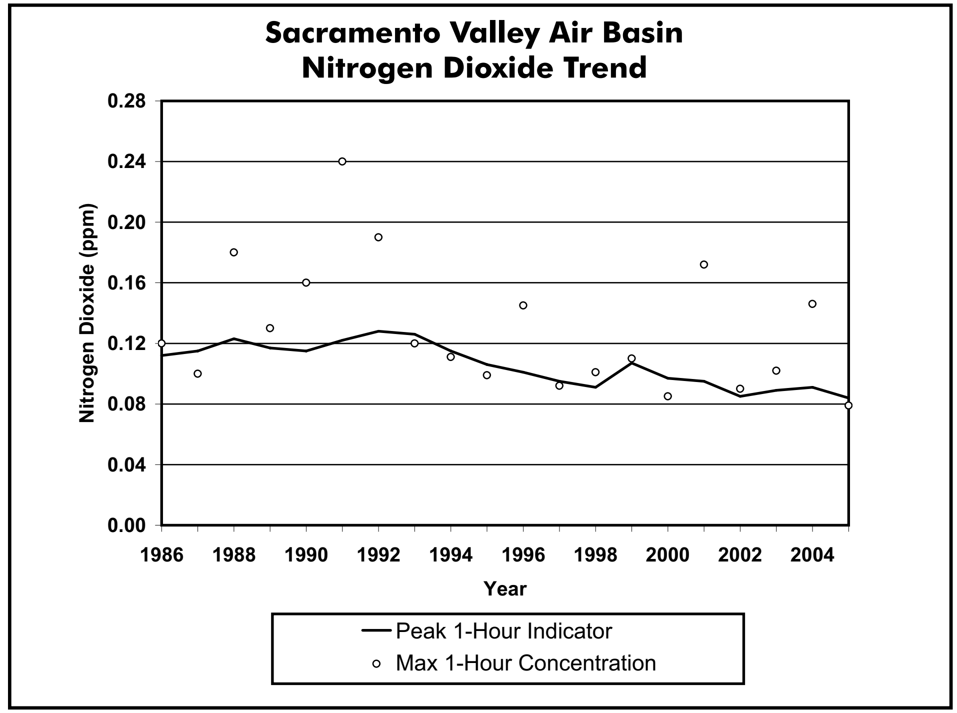

Figure 4-69

| NITROGEN DIOXIDE (ppm) | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak 1-Hour Indicator (State) | 0.112 | 0.115 | 0.123 | 0.117 | 0.115 | 0.122 | 0.128 | 0.126 | 0.115 | 0.106 | 0.101 | 0.095 | 0.091 | 0.107 | 0.097 | 0.095 | 0.085 | 0.089 | 0.091 | 0.084 |
| Max. 1-Hr. Concentration | 0.120 | 0.100 | 0.180 | 0.130 | 0.160 | 0.240 | 0.190 | 0.120 | 0.111 | 0.099 | 0.145 | 0.092 | 0.101 | 0.110 | 0.085 | 0.172 | 0.090 | 0.102 | 0.146 | 0.079 |
| Max. Annual Average | 0.022 | 0.022 | 0.025 | 0.019 | 0.023 | 0.024 | 0.021 | 0.017 | 0.022 | 0.022 | 0.022 | 0.019 | 0.021 | 0.021 | 0.019 | 0.019 | 0.020 | 0.015 | 0.017 | 0.016 |

Table 4-66

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