Chapter 2

Current Emissions and Air Quality -- Criteria Pollutants

Introduction

This chapter provides statewide information on current emissions and air quality, relative to the State and national ambient air quality standards (see Chapter 5 for information on toxic air contaminants). This section gives a national perspective on how California's air quality compares with that in other areas of the nation. The second section of this chapter includes a summary table of the Statewide Emission Inventory. The table shows emissions data by four major source categories: stationary sources, area-wide sources, mobile sources, and natural sources. The third section provides more detailed information for the four major source categories in a table of the Statewide Emission Inventory by Sub-Category. The remaining sections of this Chapter provide information on emissions (including the high emitting facilities) and air quality on a statewide basis. This information is organized by pollutant, for ozone (and ozone precursor emissions), particulate matter (PM_{10} and $PM_{2.5}$), and CO.

Emissions are reported as annual averages, in tons per day. For most sources and pollutants that are not seasonal, this describes emissions very well. However, for some pollutants such as PM_{10}, annual averages do not give an accurate indication of the seasonal nature of emissions. Therefore, they may appear to be artificially low. Many sources of PM_{10} are seasonal, including wildfires, seasonal operations such as agricultural processes, or dust storms in the Owens Valley and Mono Lake areas. Many sources of PM_{10} can also be very localized, and basinwide annual averages do not give any information about these sources.

State and local agencies have implemented many control measures during the last three decades to improve air quality. As a result, there has been a steady decline in both emissions and pollutant concentrations. However, three criteria pollutants -- ozone, particulate matter, and carbon monoxide -- still pose air quality problems. While existing control programs have reduced CO concentrations to levels below the standards, except in parts of Los Angeles County and Calexico, it will be a significant challenge to reduce emissions sufficiently to attain the ozone and PM standards statewide.

Figure 2-1 shows the national 1-hour ozone design values for the top 15 urban areas in the nation, based on data for 1998 to 2000. The design values in all these areas exceed the national 1-hour standard of 0.12 ppm. Six of the fifteen areas are located in California, with the Riverside-San Bernardino area on top. The Houston-Galveston-Brazoria area ranks second. The ranking of areas on the list can change, depending on the ozone statistic being used. For example, Houston-Galveston-Brazoria experienced the highest measured 1-hour ozone concentrations in the United States during 1999 and 2000. Therefore, the Texas area would rank first in the nation for this statistic. Overall, as ozone concentrations in California decline, our air quality continues to improve relative to other areas of the nation.

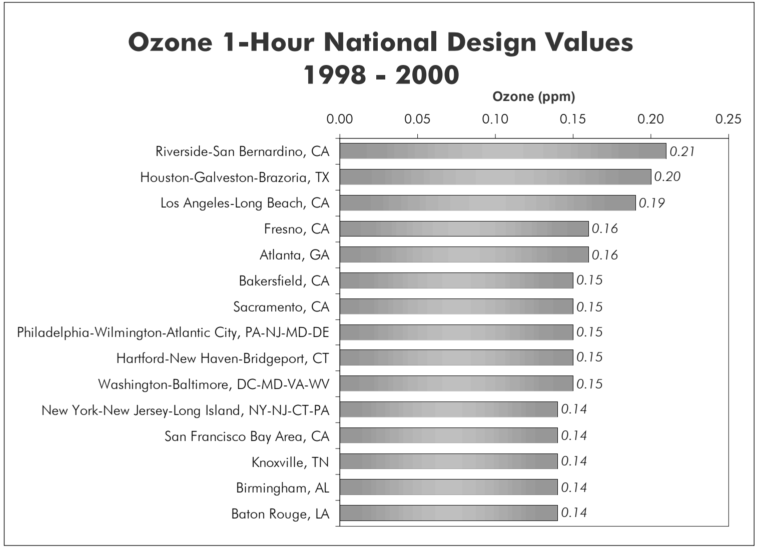

Figure 2-1

Attainment of the standards for particulate matter that is 10 microns and smaller (PM_{10}) is also a significant problem. The PM_{10} problem is most prevalent in the western United States. Eight western areas are classified as serious PM_{10} nonattainment areas. Half of these -- the Coachella Valley, the Owens Valley, the San Joaquin Valley, and the South Coast Air Basin -- are located in California. Because of the complex nature of the particulate matter problem, it will be many years before the standards are attained.

Carbon monoxide poses much less of a problem. Figure 2-2 shows the six areas in the nation that experienced CO concentrations above the level of the national standard during 1998 through 2000. The sites are ranked, based on the average number of exceedance days. The Calexico and Los Angeles areas rank first and second. While these two areas are the only ones in the State where the CO standards are still violated, the State's stringent motor vehicle emission standards and clean fuels programs continue to be effective in reducing ambient CO concentrations. Furthermore, as a result of these controls, CO concentrations in nine other California areas no longer violate the national standards, and these areas were redesignated as attainment for the national standards in 1998.

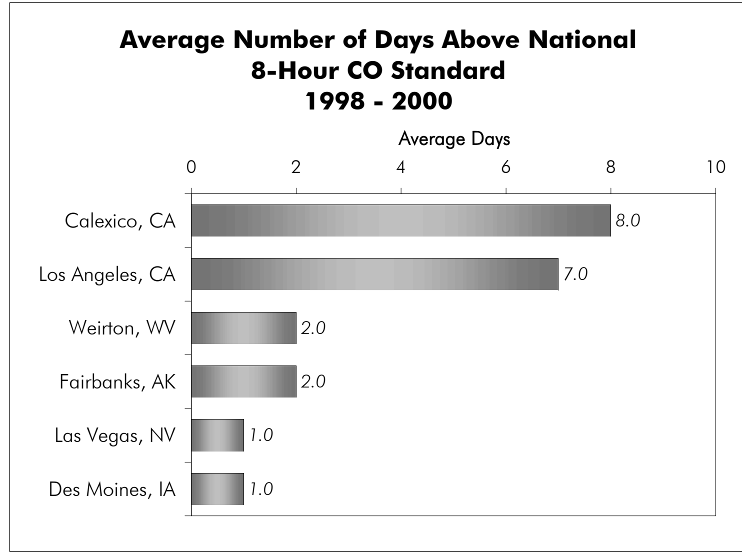

Figure 2-2

2001 Statewide Emission Inventory Summary

Division Major Category	Emissions (tons/day, annual average)					
	TOG	ROG	CO	NOx	SOx	PM_{10}
Stationary Sources	2568	588	362	587	137	139
Fuel Combustion	203	43	304	478	53	42
Waste Disposal	1422	22	3	3	0	1
Cleaning And Surface Coatings	401	285	0	0	0	0
Petroleum Production And Marketing	458	168	9	14	55	3
Industrial Processes	85	69	45	92	28	94
Area-Wide Sources	2032	749	2309	96	5	2076
Solvent Evaporation	561	504	0	0	0	0
Miscellaneous Processes	1471	244	2309	96	5	2076
Mobile Sources	1816	1672	14394	2741	161	123
On-Road Motor Vehicles	1296	1197	11636	1767	12	53
Other Mobile Sources	519	474	2759	974	149	70
Natural Sources*	106	38	409	18	0	80
Total California	***6522***	***3046***	***17474***	***3441***	***302***	***2418***

*Does not include biogenic sources. These summaries do not include emissions from wind blown dust - exposed lake beds from Owens and Mono Lakes. These emissions are estimated to be about 800 tons/day.

Table 2-1

2001 Statewide Emission Inventory by Sub-Category

Division Major Category Sub-Category	Emissions (tons/day, annual average)					
	TOG	ROG	CO	NOx	SOx	PM_{10}
Stationary Sources (division total)	**2568**	**588**	**362**	**587**	**137**	**139**
Fuel Combustion (major category total)	203	43	304	478	53	42
- Electric Utilities	34	4	57	51	3	6
- Cogeneration	18	4	41	33	2	4
- Oil And Gas Production (Combustion)	39	8	23	35	9	3
- Petroleum Refining (Combustion)	3	2	10	47	9	4
- Manufacturing And Industrial	61	10	79	164	18	9
- Food And Agricultural Processing	6	4	53	43	4	4
- Service And Commercial	36	9	30	99	9	5
- Other (Fuel Combustion)	5	1	11	5	0	7
Waste Disposal (major category total)	1422	22	3	3	0	1
- Sewage Treatment	1	1	1	0	0	0
- Landfills	1391	18	1	1	0	0
- Incinerators	1	0	1	2	0	0
- Soil Remediation	0	0	0	0	0	0
- Other (Waste Disposal)	29	4	0	0	0	0
Cleaning And Surface Coatings (major category total)	401	285	0	0	0	0
- Laundering	23	1	0	0	0	0
- Degreasing	164	86	-	-	-	-
- Coatings And Related Process Solvents (sub-category total)	155	145	0	0	0	0
- Auto, Marine, & Aircraft	*25*	*24*	*0*	*0*	*0*	*0*
- Paper & Fabric	*4*	*3*	*0*	*0*	*0*	*0*
- Metal, Wood, & Plastic	*49*	*47*	*0*	*0*	*0*	*0*
- Other	*77*	*70*	*0*	*0*	*0*	*0*

Table 2-2

2001 Statewide Emission Inventory by Sub-Category

Division Major Category Sub-Category	Emissions (tons/day, annual average)					
	TOG	ROG	CO	NOx	SOx	PM10
Stationary Sources (division total) (continued)						
Cleaning And Surface Coatings (major category) (continued)						
- Printing	18	18	0	0	0	0
- Adhesives And Sealants	33	29	0	0	-	0
- Other (Cleaning And Surface Coatings)	8	6	0	0	0	0
Petroleum Production And Marketing (major category total)	458	168	9	14	55	3
- Oil And Gas Production	123	58	1	3	1	0
- Petroleum Refining	36	28	6	10	55	2
- Petroleum Marketing (sub-category total)	294	78	2	1	0	0
- Fuel Distribution Losses	*218*	*4*	*0*	*0*	*0*	*0*
- Fuel Storage Losses	*4*	*3*	*0*	*0*	*0*	*0*
- Vehicle Refueling	*61*	*61*	*0*	*0*	*0*	*0*
- Other	*12*	*11*	*1*	*0*	*0*	*0*
- Other (Petroleum Production And Marketing)	5	4	-	-	-	-
Industrial Processes (major category total)	85	69	45	92	28	94
- Chemical	37	29	1	3	8	5
- Food And Agriculture	21	20	3	9	1	16
- Mineral Processes	8	6	32	56	11	47
- Metal Processes	2	1	2	1	0	1
- Wood And Paper	4	3	1	3	1	16
- Glass And Related Products	0	0	1	17	6	1
- Electronics	0	0	0	0	0	0
- Other (Industrial Processes)	13	9	6	2	0	7

Table 2-2 (continued)

2001 Statewide Emission Inventory by Sub-Category

Division Major Category Sub-Category	Emissions (tons/day, annual average)					
	TOG	ROG	CO	NOx	SOx	PM_{10}
Area-Wide Sources (division total)	**2032**	**749**	**2309**	**96**	**5**	**2076**
Solvent Evaporation (major category total)	561	504	0	0	0	0
- Consumer Products	324	270	-	-	-	-
- Architectural Coatings And Related Process Solvent (sub-category total)	122	119	-	-	-	-
- Architectural Coating	*104*	*102*	-	-	-	-
- Thinning & Cleanup Solvents	*18*	*17*	-	-	-	-
- Pesticides/Fertilizers (sub-category total)	83	83	-	-	-	-
- Farm Use	*80*	*80*	-	-	-	-
- Commercial Use	*3*	*3*	-	-	-	-
- Asphalt Paving / Roofing	33	32	-	-	-	0
Miscellaneous Processes (major category total)	1471	244	2309	96	5	2076
- Residential Fuel Combustion (sub-category total)	152	66	1009	81	5	143
- Wood Combustion	*145*	*64*	*985*	*12*	*2*	*139*
- Cooking And Space Heating	*6*	*2*	*21*	*59*	*3*	*4*
- Other	*1*	*1*	*4*	*10*	*0*	*1*
- Farming Operations (sub-category total)	1170	94	-	-	-	204
- Tilling,Harvesting, & Growing	*0*	*0*	-	-	-	*177*
- Livestock	*1170*	*94*	-	-	-	*27*

Table 2-2 (continued)

2001 Statewide Emission Inventory by Sub-Category

Division Major Category Sub-Category	Emissions (tons/day, annual average) TOG	ROG	CO	NOx	SOx	PM10
Area-Wide Sources (division total) (continued)						
Miscellaneous Processes (major category) (continued)						
- Construction And Demolition (sub-category total)	-	-	-	-	-	225
- Building	-	-	-	-	-	*131*
- Road Construction Dust	-	-	-	-	-	*95*
- Paved Road Dust	-	-	-	-	-	399
- Unpaved Road Dust	-	-	-	-	-	651
- Fugitive Windblown Dust (sub-category total)	-	-	-	-	-	299
- Farm Lands	-	-	-	-	-	*169*
- Pasture Lands	-	-	-	-	-	*14*
- Unpaved Roads	-	-	-	-	-	*116*
- Fires	1	1	10	0	-	1
- Waste Burning And Disposal (sub-category total)	139	77	1289	14	0	128
- Agricultural Burning	*38*	*22*	*251*	*5*	*0*	*30*
- Non-Agricultural Burning	*100*	*55*	*1038*	*9*	*0*	*99*
- Other	*0*	*0*	*0*	*0*	*0*	*0*
- Cooking	9	6	-	-	-	25
- Other (Miscellaneous Processes)	0	0	1	0	-	1

Table 2-2 (continued)

2001 Statewide Emission Inventory by Sub-Category

Division Major Category Sub-Category	Emissions (tons/day, annual average)					
	TOG	ROG	CO	NOx	SOx	PM10
Mobile Sources (division total)	**1816**	**1672**	**14394**	**2741**	**161**	**123**
On-Road Motor Vehicles (major category total)	1296	1197	11636	1767	12	53
- Light Duty Passenger (sub-category total)	682	632	5733	528	3	18
- Non-Evaporative	*409*	*359*	*5731*	*524*	*3*	*17*
- Evaporative	*272*	*272*	*0*	*0*	*0*	*0*
- Diesel	*1*	*1*	*2*	*4*	*0*	*1*
- Light Duty Trucks(<3750 lbs.) (sub-category total)	152	141	1593	139	1	3
- Non-Evaporative	*94*	*83*	*1592*	*138*	*1*	*3*
- Evaporative	*58*	*58*	*0*	*0*	*0*	*0*
- Diesel	*0*	*0*	*0*	*1*	*0*	*0*
- Light Duty Trucks (>3750 lbs) (sub-category total)	144	132	1519	217	1	10
- Non-Evaporative	*95*	*83*	*1518*	*216*	*1*	*10*
- Evaporative	*49*	*49*	*0*	*0*	*0*	*0*
- Diesel	*0*	*0*	*1*	*1*	*0*	*0*
- Medium Duty Trucks (sub-category total)	119	109	1320	139	1	4
- Non-Evaporative	*85*	*75*	*1317*	*132*	*1*	*4*
- Evaporative	*33*	*33*	*0*	*0*	*0*	*0*
- Diesel	*1*	*1*	*3*	*7*	*0*	*0*
- Light Heavy Duty Gas Trucks (<10000 lbs) (sub-category total)	78	72	509	33	0	0
- Non-Evaporative	*48*	*42*	*509*	*33*	*0*	*0*
- Evaporative	*30*	*30*	*0*	*0*	*0*	*0*
- Light Heavy Duty Gas Trucks (>10000 lbs) (sub-category total)	7	6	56	7	0	0
- Non-Evaporative	*4*	*4*	*56*	*7*	*0*	*0*
- Evaporative	*2*	*2*	*0*	*0*	*0*	*0*
- Medium Heavy Duty Gas Trucks (sub-category total)	42	40	335	27	0	0
- Non-Evaporative	*30*	*27*	*335*	*27*	*0*	*0*
- Evaporative	*12*	*12*	*0*	*0*	*0*	*0*

Table 2-2 (continued)

2001 Statewide Emission Inventory by Sub-Category

Division Major Category Sub-Category	Emissions (tons/day, annual average)					
	TOG	ROG	CO	NOx	SOx	PM10
Mobile Sources (division total) (continued)						
On-Road Motor Vehicles (major category) (continued)						
- Heavy Heavy Duty Gas Trucks (sub-category total)	16	14	234	13	0	0
- Non-Evaporative	*13*	*11*	*234*	*13*	*0*	*0*
- Evaporative	*3*	*3*	*0*	*0*	*0*	*0*
- Light Heavy Duty Gas Trucks (<10000 lbs)	1	1	2	10	0	0
- Light Heavy Duty Gas Trucks (>10000 lbs)	1	1	3	13	0	0
- Medium Heavy Duty Diesel Trucks	4	4	25	143	1	4
- Heavy Heavy Duty Diesel Trucks	23	20	90	448	4	12
- Motorcycles (sub-category total)	20	19	126	3	0	0
- Non-Evaporative	*12*	*11*	*126*	*3*	*0*	*0*
- Evaporative	*8*	*8*	*0*	*0*	*0*	*0*
- Heavy Duty Diesel Urban Buses	2	1	6	31	0	1
- Heavy Duty Gas Urban Buses (sub-category total)	2	2	23	3	0	0
- Non-Evaporative	*2*	*2*	*23*	*3*	*0*	*0*
- Evaporative	*0*	*0*	*0*	*0*	*0*	*0*
- School Buses (sub-category total)	1	1	12	5	0	0
- Non-Evaporative	*1*	*1*	*11*	*1*	*0*	*0*
- Evaporative	*0*	*0*	*0*	*0*	*0*	*0*
- Diesel	*0*	*0*	*1*	*4*	*0*	*0*
- Motor Homes (sub-category total)	2	2	51	8	0	0
- Non-Evaporative	*2*	*2*	*51*	*6*	*0*	*0*
- Evaporative	*0*	*0*	*0*	*0*	*0*	*0*
- Diesel	*0*	*0*	*0*	*2*	*0*	*0*

Table 2-2 (continued)

2001 Statewide Emission Inventory by Sub-Category

Division Major Category Sub-Category	Emissions (tons/day, annual average)					
	TOG	ROG	CO	NOx	SOx	PM_{10}
Mobile Sources (division total) (continued)						
Other Mobile Sources (major category total)	519	474	2759	974	149	70
- Aircraft	49	44	262	55	3	9
- Trains	7	6	23	140	7	3
- Ships And Commercial Boats	9	8	20	107	62	9
- Recreational Boats	137	126	677	23	1	7
- Off-Road Recreational Vehicles (sub-category total)	59	54	265	4	0	0
- Snowmobiles	*44*	*41*	*130*	*2*	*0*	*0*
- Motorcycles	*6*	*6*	*53*	*0*	*0*	*0*
- All-Terrain Vehicles	*5*	*5*	*48*	*0*	*0*	*0*
- Four-Wheel Drive Vehicles	*3*	*3*	*34*	*1*	*0*	*0*
- Off-Road Equipment (sub-category total)	145	125	1375	498	57	32
- Lawn And Garden Equipment	*48*	*44*	*429*	*6*	*0*	*1*
- Commercial & Industrial Equipment	*97*	*81*	*946*	*492*	*57*	*31*
- Farm Equipment	23	20	136	146	19	10
- Fuel Storage and Handling	90	90	-	-	-	-
Natural (Non-Anthropogenic) Sources (division total)	**106**	**38**	**409**	**18**	**-**	**80**
Natural Sources* (major category total)	106	38	409	18	-	80
- Geogenic Sources	79	23	-	-	-	-
- Wildfires	27	15	409	18	-	80
Total Statewide - All Sources	***6522***	***3046***	***17474***	***3441***	***302***	***2418***

*Does not include biogenic sources. These summaries do not include emissions from wind blown dust - exposed lake beds from Owens and Mono Lakes. These emissions are estimated to be about 800 tons/day.

Table 2-2 (continued)

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Ozone

2001 Statewide Emission Inventory - Ozone Precursors by Category

NO_x Sources - Statewide

NO_x is a group of gaseous compounds of nitrogen and oxygen, many of which contribute to the formation of ozone, PM_{10}, and $PM_{2.5}$. Most NO_x emissions are produced by the combustion of fuels. Industrial sources report NO_x emissions to local air districts and to the Air Resources Board. Other sources of NO_x emissions are estimated by the local air districts and the ARB. Mobile sources (including on-road and other) make up about 80 percent of the total statewide NO_x emissions. The category of other mobile sources includes emissions from aircraft, trains, ships, recreational boats, industrial and construction equipment, farm equipment, off-road recreational vehicles, and other equipment. Stationary sources of NO_x include both internal and external combustion processes in industries such as manufacturing, food processing, electric utilities, and petroleum refining. Area-wide sources, which include residential fuel combustion, waste burning, and fires, contribute only a small portion of the total NO_x emissions.

NO_x Emissions (annual average)		
Emissions Source	**tons/day**	**Percent**
Stationary Sources	587	17%
Area-wide Sources	96	3%
On-Road Mobile	1767	52%
Gasoline Vehicles	1126	33%
Diesel Vehicles	641	19%
Other Mobile	974	28%
Total Statewide	*3423*	*100%*

Table 2-3

ROG Sources - Statewide

Reactive organic gases (ROG) are volatile organic compounds that are photochemically reactive and contribute to the formation of ozone, as well as PM_{10} and $PM_{2.5}$. These emissions result primarily from incomplete fuel combustion and the evaporation of chemical solvents and fuels. On-road mobile sources are the largest contributors to statewide ROG emissions. This category includes emissions from cars, trucks, and motorcycles powered by gasoline and diesel fuels. Stationary sources of ROG emissions include processes that use solvents (such as dry cleaning, degreasing, and coating operations) and petroleum-related processes (such as petroleum refining and marketing and oil and gas extraction). Area-wide ROG sources include consumer products, pesticides, aerosol and architectural coatings, asphalt paving and roofing, and other evaporative emissions.

ROG Emissions (annual average)		
Emissions Source	**tons/day**	**Percent**
Stationary Sources	588	19%
Area-wide Sources	749	25%
On-Road Mobile	1197	40%
Gasoline Vehicles	1170	39%
Diesel Vehicles	28	1%
Other Mobile	474	16%
Total Statewide	*3008*	*100%*

Table 2-4

Largest Stationary Sources Statewide

Largest Stationary Sources of NO_x Statewide

Air Basin	Facility Name	City	NO_x (Tons/Year)
Mojave Desert	Riverside Cement Co.	Oro Grande	4838
Mojave Desert	Cemex-California Cement	Apple Valley	4483
San Francisco Bay Area	Martinez Refining Company	Martinez	3166
San Francisco Bay Area	Valero Refining	Benicia	2927
Mojave Desert	Cal Portland Cement Co.	Mojave	2874
San Francisco Bay Area	Ultramar, Inc. Avon Refinery	Martinez	2659
San Francisco Bay Area	Chevron Products Company	Richmond	2627
North Central Coast	Duke Energy Moss Landing	Moss Landing	2222
Mojave Desert	IMC Chemicals, Inc.	Trona	2101
Mojave Desert	Mitsubishi Cement	Lucerne Valley	1794

Facility totals are the most recent available data. Some facilities may have reduced or increased emissions since these data were collected. These changes will be reflected in subsequent almanacs.
The list of facilities does not include military bases, landfills, or airports.

Table 2-5

Largest Stationary Sources of ROG Statewide

Air Basin	Facility Name	City	ROG (Tons/Year)
San Francisco Bay Area	Chevron Products Company	Richmond	2365
San Francisco Bay Area	Martinez Refining Company	Martinez	1702
San Francisco Bay Area	Ultramar, Inc. Avon Refinery	Martinez	1563
San Joaquin Valley	Occidental Petroleum	Elk Hills	1137
South Coast	Chevron Products Co.	El Segundo	695
South Coast	Mobil Oil Corp	Torrance	641
San Francisco Bay Area	Tosco Rodeo Refinery	Rodeo	613
San Francisco Bay Area	New United Motor Manufacturing	Fremont	474
South Coast	Arco Products Co.	Carson	452
South Coast	Equilon Enterprises LLC (Refinery)	Wilmington	446

Facility totals are the most recent available data. Some facilities may have reduced or increased emissions since these data were collected. These changes will be reflected in subsequent almanacs.
The list of facilities does not include military bases, landfills, or airports.

Table 2-6

Ozone - 2000 Air Quality

Air quality as it relates to ozone has improved greatly in California over the last several decades, and 1999 was no exception. However, despite aggressive emission controls, maximum measured ozone concentrations are still above the level of the State standard in 11 of the 15 air basins. Maximum measured values exceed the national 1-hour standard in nine air basins. California's highest ozone concentrations occur in the South Coast Air Basin, where the peak 1-hour indicator is more than two times the level of the State standard.

Ozone concentrations are generally lower near the coast than they are inland, and rural areas tend to be cleaner than urban areas. This can be explained in part by the characteristics of ozone, including pollutant reactivity, transport, and deposition. Based on current ozone concentrations, substantial additional emission control measures will be needed to attain the standards throughout the State.

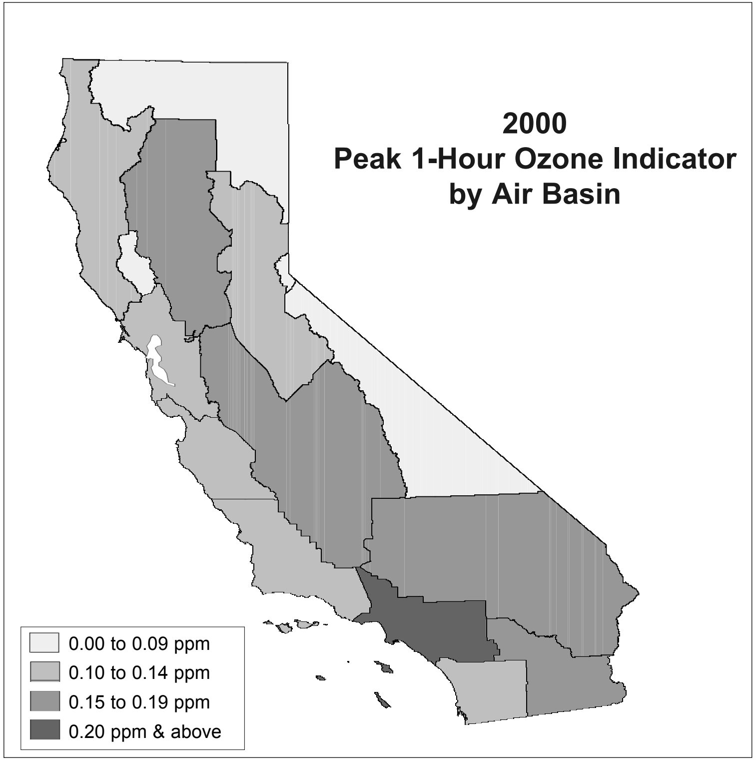

Figure 2-3

Ozone - 2000 Air Quality Tables

Maximum Peak 1-Hour Indicator by Air Basin

AIR BASIN	2000 Maximum Peak 1-Hour Indicator in parts per million	Number of Days in 2000 above State Standard	Number of Days in 2000 above National 1-Hour Standard
Great Basin Valleys Air Basin	0.09	0	0
Lake County Air Basin	0.08	0	0
Lake Tahoe Air Basin	0.09	0	0
Mojave Desert Air Basin	0.15	86	11
Mountain Counties Air Basin	0.14	51	4
North Central Coast Air Basin	0.10	3	0
North Coast Air Basin	0.11	0	0
Northeast Plateau Air Basin	0.09	3	1
Sacramento Valley Air Basin	0.15	42	5
Salton Sea Air Basin	0.15	54	5
San Diego Air Basin	0.13	24	0
San Francisco Bay Area Air Basin	0.14	12	3
San Joaquin Valley Air Basin	0.16	114	30
South Central Coast Air Basin	0.13	38	2
South Coast Air Basin	0.21	115	33

Table 2-7

Top Sites with 1-Hour Peak Indicator Values above the State Ozone Standard

Mojave Desert Air Basin
- Phelan-Beekley Rd. & Phelan Rd.
- Hesperia-Olive Street
- Lancaster-W Pondera Street
- Joshua Tree-National Monument
- Victorville-Armagosa Road

Mountain Counties Air Basin
- Cool-Highway 193
- Jackson-Clinton Road
- Placerville-Gold Nugget Way
- San Andreas-Gold Strike Road
- Grass Valley-Litton Building

North Central Coast Air Basin
- Pinnacles National Monument
- Hollister-Fairview Road

North Coast Air Basin
- Healdsburg-Municipal Airport

Sacramento Valley Air Basin
- Sloughhouse
- Folsom-Natoma Street
- Roseville-N Sunrise Blvd.
- Auburn-Dewitt C Avenue
- Sacramento-Del Paso Manor

Salton Sea Air Basin
- Calexico-Ethel Street
- Palm Springs-Fire Station
- Calexico-East
- Indio-Jackson Street

San Diego Air Basin
- Alpine-Victoria Drive
- Escondido-East Valley Parkway
- El Cajon-Redwood Avenue
- San Diego-Overland Avenue
- Camp Pendleton

San Francisco Bay Area Air Basin
- Livermore-Old 1st Street
- San Martin-Murphy Avenue
- Concord-2975 Treat Blvd.
- Fairfield-Bay Area AQMD
- Livermore-793 Rincon Avenue

San Joaquin Valley Air Basin
- Clovis-N Villa Avenue
- Parlier
- Edison
- Fresno-1st Street
- Fresno-Sierra Parkway #2

South Central Coast Air Basin
- Simi Valley-Cochran Street
- Paso Robles-Santa Fe Avenue
- Ojai-Ojai Avenue
- Thousand Oaks-Moorpark Road
- Ventura County-W Casitas Pass Rd.

Table 2-8

Top Sites with 1-Hour Peak Indicator Values above the State Ozone Standard

South Coast Air Basin

- Crestline
- Glendora-Laurel
- Redlands-Dearborn
- San Bernardino-4th Street
- Upland

Sites with 1-hour peak indicator values above the level of the State ozone standard during 2000. The top five sites in each air basin are listed in descending order of their peak indicator value. If an air basin is not listed, the peak indicator values at sites in that air basin were not above the State ozone standard.

Table 2-8 (continued)

2001 Preliminary Ozone Data

Although ozone concentrations are monitored continuously at the air quality monitoring sites, there is a delay between the time the concentrations are measured and the time they are quality assured and approved for final use. Because 2000 is the last year for which complete and approved data are available, that is the end year used for the air quality trends in this almanac. However, preliminary data for January through October 2001 are available and are summarized in Table 2-9. The table includes several statistics, including the maximum measured 1-hour ozone concentration, the number of days above the State ozone standard, and the number of days above both the national 1-hour and the national 8-hour ozone standards. These statistics are summarized for the five most populated areas of California: South Coast Air Basin, San Francisco Bay Area Air Basin, San Joaquin Valley Air Basin (minus several Sierra mountain sites), San Diego Air Basin, and Sacramento Metropolitan Area. Because data for all of 2001 were not complete at the time this almanac was published, no annual statistics are included. Furthermore, because the statistics are based on preliminary data, they are subject to change.

Area	Maximum 1-Hour Concentration (ppm)	Days Exceeding the Standard		
		State 1-Hour	National 1-Hour	National 8-Hour
South Coast	0.19	121	36	100
San Francisco Bay Area	0.13	15	1	7
San Joaquin Valley	0.15	117	28	101
San Diego	0.14	29	2	17
Sacramento Metro Area	0.15	54	4	45

Table 2-9

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Particulate Matter (PM_{10} and $PM_{2.5}$)

2001 Statewide Emission Inventory - Directly Emitted PM_{10} by Category

The PM_{10} emission inventory includes only directly emitted particulate emissions. However, particulate matter can also be formed in the atmosphere. This secondary PM_{10} is formed by reactions that are driven by emissions of ROG, NO_x, and SO_x. In urban areas (or on a seasonal basis), secondary particulate matter may be the dominant contributor to PM_{10} levels. As a result, PM_{10} control strategies need to account for the relative contribution of both secondary and directly emitted particles.

Area-wide sources account for about 89 percent of the statewide emissions of directly emitted PM_{10}. The major area-wide source of PM_{10} is fugitive dust, especially dust from unpaved and paved roads, agricultural operations, and construction and demolition. Fugitive dust emissions from unpaved and paved roads are related to motor vehicle population levels due to vehicular travel on both types of roads. Other sources of PM_{10} emissions include brake and tire wear, residential wood burning, and industrial sources. Exhaust emissions from mobile sources contribute only a very small portion of directly emitted PM_{10} emissions, but are a major source of the ROG and NO_x that form secondary particles.

PM10 Emissions (annual average)		
Emissions Source	**tons/day**	**Percent**
Stationary Sources	139	6%
Area-wide Sources	2076	89%
On-Road Mobile	53	2%
Gasoline Vehicles	35	2%
Diesel Vehicles	18	1%
Other Mobile	70	2%
Total Statewide	*2338*	*100%*

Table 2-10

Largest Stationary Sources Statewide

Largest Stationary Sources of PM_{10} Statewide

Air Basin	Facility Name	City	PM_{10} (Tons/Year)
Mojave Desert	National Cement Co.	Lebec	756
Mojave Desert	U.S. Borax	Boron	664
Mountain Counties	Ampine (Wood Products)	Martell	565
San Joaquin Valley	Port Of Stockton	Stockton	536
Mojave Desert	IMC Chemicals, Inc.	Trona	526
Mojave Desert	Mitsubishi Cement	Lucerne Valley	472
Mojave Desert	Calaveras Cement Co.	Monolith	404
San Francisco Bay Area	Martinez Refining Company	Martinez	379
San Joaquin Valley	Kern Oil & Refining Co.	Bakersfield	377
Mojave Desert	Cal Portland Cement Co.	Mojave	329

Facility totals are the most recent available data. Some facilities may have reduced or increased emissions since these data were collected. These changes will be reflected in subsequent almanacs.
The list of facilities does not include military bases, landfills, or airports.

Table 2-11

PM_{10} - 2000 Air Quality

PM_{10} is California's most complex air pollution problem. PM_{10} is not a single substance, but a mixture of a number of highly diverse types of particles and liquid droplets. The chemical make-up of ambient PM_{10} and the origins of the PM_{10} particles vary widely from one area to another. In addition, although there is not a single "PM_{10} season," the cause of PM_{10} can vary by season. Furthermore, the timing of the high PM_{10} season can vary from one area to another.

Most areas of California have either 24-hour or annual PM_{10} concentrations that exceed the State standards and pose a serious health problem. Some areas exceed both standards. Several areas also exceed the national standards. The highest annual values occur in the Salton Sea and South Coast Air Basins. In contrast to the annual values, the highest 24-hour concentrations occur in the desert areas where wind-blown dust contributes to local PM_{10} problems. Particles resulting from combustion contribute to high PM_{10} in a number of urban areas. While many of the control programs implemented for ozone will also reduce PM_{10}, more controls specifically for PM_{10} will be needed to reach attainment.

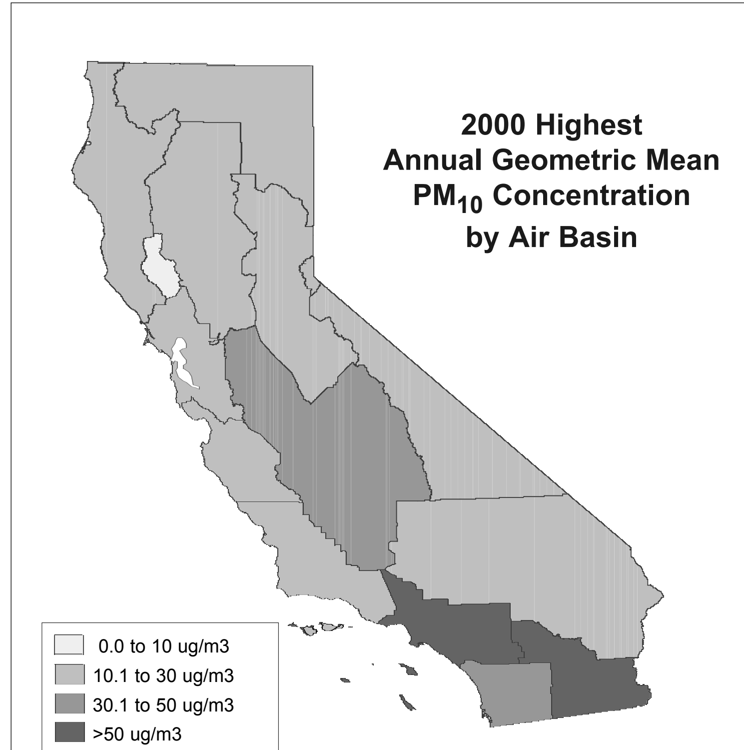

Figure 2-4

PM_{10} - 2000 Air Quality Tables

Maximum Annual Geometric Mean PM_{10} Concentration by Air Basin

AIR BASIN	2000 Maximum Annual Geometric Mean in micrograms/cubic meter
Great Basin Valleys Air Basin	17.4
Lake County Air Basin	9.6
Lake Tahoe Air Basin	17.6
Mojave Desert Air Basin	19.3
Mountain Counties Air Basin	16.1
North Central Coast Air Basin	23.5
North Coast Air Basin	19.8
Northeast Plateau Air Basin	17.6
Sacramento Valley Air Basin	24.7
Salton Sea Air Basin	73.0
San Diego Air Basin	31.6
San Francisco Bay Area Air Basin	23.7
San Joaquin Valley Air Basin	45.4
South Central Coast Air Basin	26.2
South Coast Air Basin	54.6

Table 2-12

Top Sites with Annual Geometric Mean Concentrations Violating the State PM_{10} Standard

Salton Sea Air Basin
- Calexico-Grant Street
- Calexico-Ethel Street
- Indio-Jackson Street
- Brawley-Main Street
- Westmoreland-West 1st Street

San Diego Air Basin
- Otay Mesa-Paseo International
- San Diego-Logan Avenue

San Joaquin Valley Air Basin
- Bakersfield-Golden State Highway
- Visalia-North Church Street
- Hanford-South Irwin Street
- Bakersfield-5558 California Avenue
- Fresno-Drummond Street

South Coast Air Basin
- Riverside-Rubidoux
- Fontana-Arrow Highway
- Ontario-1408 Francis Street
- San Bernardino-4th Street
- Norco-Norconian

Sites with annual geometric mean PM_{10} concentrations violating the State PM_{10} standard during 2000. The top five sites in each air basin are listed in descending order of their maximum annual concentration. If an air basin is not listed, the annual PM_{10} concentrations at sites in that air basin were not above the State annual PM_{10} standard.

Table 2-13

California's $PM_{2.5}$ Monitoring Program

As explained in the Introduction section of Chapter 1, the United States Environmental Protection Agency promulgated new national standards for particulate matter (PM) during July 1997. The national PM standards apply to the mass concentrations of particles with aerodynamic diameters less than 2.5 microns ($PM_{2.5}$) and less than 10 microns (PM_{10}). Notwithstanding the ongoing legal issues related to the challenge of the national standards, the U.S. EPA is continuing to move forward with its $PM_{2.5}$ monitoring program which requires the states to establish and operate a network of $PM_{2.5}$ mass and speciation monitors.

During 1998, the ARB and local air pollution control districts and air quality management districts began establishing a comprehensive network of $PM_{2.5}$ monitoring sites. California's $PM_{2.5}$ monitoring network now comprises 82 monitoring sites. $PM_{2.5}$ mass concentrations are measured at all of these sites using federally approved methods

In addition to the current $PM_{2.5}$ mass monitors, the ARB and local air districts deploy other types of instruments at sites throughout the network, including continuous $PM_{2.5}$ mass monitors and different types of speciation monitors. Currently, 21 continuous mass monitors are operating throughout the State, and 15 more are planned by mid-2002. These monitors collect hourly data that are useful for public reporting, understanding the daily and episodic behavior of fine particles, background monitoring, and transport assessment. Deployment of the $PM_{2.5}$ speciation network has started, with six monitors currently operating. More monitors will be phased in over the next several years, allowing time to evaluate newly emerging measurement technologies. The specifics of the existing and proposed $PM_{2.5}$ monitoring network are detailed in an ARB report titled *"2001 California $PM_{2.5}$ Monitoring Network Description"* (August 2001). The report is available on the web at: *www.arb.ca.gov/aqd/pm25/pmfnet01.htm*.

The majority of sites in California's $PM_{2.5}$ network began sampling in early 1999 and now have sufficient data for making some comparisons among the sites. The 1999 and 2000 data are summarized in Table 2-14. Each site in the $PM_{2.5}$ network is listed, regardless of the amount of data that have been collected. Table 2-14 lists the Monitoring Planning Area, the site name, and for each year: the highest 24-hour average $PM_{2.5}$ mass concentration, the average of quarters (annual average), an indication of data completeness, the number of months represented, the number of quarters represented, and the total number of valid observations during the year. The national $PM_{2.5}$ standards are based on three years of data and percentile averages. As a result, the data in Table 2-14 are not yet sufficient for determining which areas are attainment and which areas are nonattainment.

The high 24-hour $PM_{2.5}$ mass concentrations measured throughout California during 1999 and 2000 reflect a wide range of values. The highest 24-hour concentrations among all sites range from 9.4 $\mu g/m^3$ at Lakeport-Lakeport Blvd to 160 $\mu g/m^3$ at Fresno-1st Street. Neither of these sites has complete data for the entire year. The average of quarters, or annual average concentrations, among sites with valid data range from 3.8 $\mu g/m^3$ at Echo Summit to 31.2 $\mu g/m^3$ at Bakersfield-5558 California Avenue. In general, both the highest 24-hour and annual average $PM_{2.5}$ concentrations are found at sites in the South Coast Air Basin and San Joaquin Valley Air Basin. However, relatively high 24-hour measurements are also found in the Sacramento Valley Air Basin, the San Francisco Bay Area Air Basin, and certain parts of the Mountain Counties Air Basin. The annual concentrations at sites in these areas are substantially lower than those in the South Coast and San Joaquin Valley Air Basins. Among all sites with valid annual concentrations, values exceed 15 $\mu g/m^3$ (the level of the national $PM_{2.5}$ standard) at sites in Imperial County, the Sacramento Valley Air Basin, San Diego County, the San Joaquin Valley Air Basin, and the South Coast Air Basin.

The temporal and spatial nature of $PM_{2.5}$ concentrations within each air basin shows a mixture of isolated exceedances as well as periods of elevated $PM_{2.5}$ concentrations that are more prolonged and regional in nature. In general, however, the highest 24-hour concentrations during 1999 and 2000 occurred in November, December, and January, while the lowest occurred between March and August. Most areas follow this seasonal pattern to some degree. The seasonality is most pronounced in the San Joaquin Valley Air Basin, where the November, December, January concentrations were on the order of 4 to 5 times greater than those for March through August. Less pronounced seasonality following this same pattern occurred in the San Francisco Bay Area Air Basin, the San Diego Air Basin, the Sacramento Valley Air Basin, the North Coast Air Basin, and the Mojave Desert Air Basin. In other areas, the highest $PM_{2.5}$ concentrations occurred throughout the year, though in most cases, the "high" values for these areas were low, when compared with those areas showing seasonality. The exception is the South Coast Air Basin where fairly high values occurred throughout the year.

California monitoring sites with both $PM_{2.5}$ and PM_{10} data can be used to examine seasonal variations in the difference between $PM_{2.5}$ and PM_{10} concentrations. Similar to the seasonal variations seen in $PM_{2.5}$ concentrations, the difference between $PM_{2.5}$ and PM_{10} concentrations is generally smallest in the winter months in most air basins. In fact, the $PM_{2.5}$ fraction can comprise 80 to 90 percent of the PM_{10} concentrations in areas such as the San Joaquin Valley and Sacramento Valley Air Basins. The lowest $PM_{2.5}$ fractions are found in the Salton Sea and Great Basin Valleys Air Basins, both of which often experience severe coarse particle fugitive dust events.

In contrast, the difference between $PM_{2.5}$ and PM_{10} concentrations is generally greatest in the summer and early fall. During these months, geological material (which generally comprises particles that are larger than $PM_{2.5}$, or coarse particles) accounts for the major difference between $PM_{2.5}$ and PM_{10} concentrations. The coarse particle fraction tends to decrease in the winter, when storms suppress fugitive dust producing activities. The South Coast Air Basin provides an exception to this however, with a significant coarse fraction even into early winter.

Similar to PM_{10}, the contrast in $PM_{2.5}$ concentrations throughout California makes the $PM_{2.5}$ problem difficult and complex. The emission sources can be very diverse from one area to another. Furthermore, because of the variety of sources and the size and chemical composition of the particles, both the nature and causes of the problem can vary considerably from area-to-area. As a result, even though two areas may have similar $PM_{2.5}$ concentration levels, they may have very different $PM_{2.5}$ problems. Adding to the complexity, a single area may have a different type of PM problem during different times of the year. Monitoring programs will help in making strides toward understanding and controlling the $PM_{2.5}$ problem.

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
Bay Area AQMD							
Concord-2975 Treat Blvd	1999	56.6	12.0	No	10	4	110
	2000	52.6	10.9	Yes	12	4	191
Fremont-Chapel Way	1999	56.5	13.9	No	12	4	76
	2000	44.8	10.6	Yes	12	4	89
Livermore-793 Rincon Avenue	1999	63.1	28.0	No	1	1	9
	2000	56.4	11.2	Yes	12	4	86
Redwood City	1999	59.7	12.1	No	11	4	68
	2000	44.0	10.9	Yes	12	4	82
San Francisco-Arkansas Street	1999	71.2	12.6	No	11	4	121
	2000	47.9	11.4	No	12	4	193
San Jose-4th Street	1999	70.0	12.3	No	10	4	117
	2000	64.2	13.6	Yes	12	4	180
San Jose-Tully Road	1999	77.0	14.5	No	10	4	117
	2000	67.2	12.2	No	12	4	188
Santa Rosa-5th Street	1999	54.9	12.1	No	12	4	69
	2000	40.1	10.3	Yes	12	4	91
Vallejo-304 Tuolumne Street	1999	90.5	14.1	No	10	4	63
	2000	60.1	11.6	Yes	12	4	90

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
Coachella Valley							
Indio-Jackson Street	1999	29.6	12.8	No	10	4	83
	2000	28.6	11.2	Yes	12	4	115
Palm Springs-Fire Station	2000	28.5	9.6	Yes	12	4	120
Great Basin Unified APCD							
Keeler-Cerro Gordo Road	1999	40.7	7.2	No	10	4	69
	2000	68.0	9.6	No	8	3	72
Mammoth Lakes-Gateway HC	2000	31.0	18.0	No	2	1	13
Imperial County APCD							
Brawley-Main Street	1999	44.2	11.2	No	8	4	65
	2000	55.4	12.3	No	11	4	76
Calexico-Ethel Street	1999	51.6	15.2	Yes	12	4	106
	2000	84.2	16.9	Yes	12	4	113
El Centro-9th Street	1999	52.5	11.7	No	12	4	103
	2000	55.6	10.4	No	10	4	86
Lake County Air Basin							
Lakeport-Lakeport Blvd	1999	14.5	4.4	No	12	4	47
	2000	9.4	4.0	No	6	2	28

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
Lake Tahoe Air Basin							
Echo Summit	2000	10.0	3.8	Yes	12	4	122
South Lake Tahoe-Sandy Way	1999	21.0	8.3	Yes	12	4	59
	2000	23.0	7.8	Yes	12	4	59
Mojave Desert Air Basin							
Lancaster-W Pondera Street	1999	47.6	11.2	Yes	12	4	113
	2000	36.0	10.5	Yes	12	4	113
Mojave-923 Poole Street	1999	27.6	8.5	No	11	4	99
	2000	28.7	7.5	No	12	4	74
Ridgecrest-Las Flores Avenue	1999	22.9	8.5	No	7	3	48
	2000	38.6	7.8	No	12	4	91
Victorville-Armagosa Road	1999	25.4	11.9	Yes	12	4	114
Victorville-14306 Park Avenue	2000	31.0	11.9	Yes	12	4	115
Monterey Bay Unified APCD							
Salinas-Natividad Road #2	1999	30.8	9.8	No	11	4	102
Salinas-#3	2000	26.4	7.9	No	12	4	73
Santa Cruz-2544 Soquel Avenue	1999	31.4	9.4	No	11	4	89
	2000	23.3	7.9	No	12	4	72

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
Mountain Counties Air Basin							
Grass Valley-Litton Building	1999	31.0	7.6	No	12	4	52
	2000	27.0	6.2	No	12	4	45
Portola-Commercial Street	1999	70.0	11.7	No	7	3	46
Portola-161 Nevada Street	2000	46.0	10.6	No	8	3	67
Quincy-N Church Street	1999	92.0	13.3	No	10	4	73
	2000	37.0	9.4	No	12	4	104
San Andreas-Gold Strike Road	1999	33.0	11.1	Yes	12	4	59
	2000	48.0	9.0	Yes	12	4	63
Truckee-Fire Station	1999	50.0	9.0	No	8	4	46
	2000	23.0	8.8	Yes	12	4	111
North Coast Air Basin							
Eureka-Health Dept 6th and I Street	1999	36.9	9.1	Yes	12	4	59
	2000	24.0	9.1	Yes	12	4	58
Ukiah-County Library	1999	35.6	8.9	Yes	12	4	58
	2000	20.0	7.2	No	12	4	57
Northeast Plateau Air Basin							
Alturas-W 4th Street	1999	40.0	7.9	Yes	12	4	56
	2000	38.0	8.5	Yes	12	4	58

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
Sacramento Valley Air Basin							
Chico-Manzanita Avenue	1999	73.0	17.5	Yes	12	4	59
	2000	98.0	15.8	Yes	12	4	61
Colusa-Sunrise Blvd	1999	55.0	13.2	No	12	4	85
	2000	28.0	8.0	Yes	12	4	114
Redding-Health Dept Roof	1999	57.0	12.9	Yes	12	4	57
	2000	45.0	9.2	No	12	4	55
Roseville-N Sunrise Blvd	1999	79.0	13.4	Yes	12	4	59
	2000	51.0	12.2	Yes	12	4	59
Sacramento-Del Paso Manor	1999	86.0	23.7	No	7	3	66
	2000	81.0	11.3	No	9	3	38
Sacramento-Health Dept Stockton Blvd	1999	86.0	16.2	Yes	11	4	158
	2000	65.0	10.3	No	8	3	128
Sacramento-T Street	1999	108.0	17.0	Yes	12	4	264
	2000	67.0	12.3	Yes	12	4	331
Woodland-Gibson Road	1999	70.0	16.3	Yes	11	4	98
	2000	46.0	10.3	Yes	12	4	116
Yuba City-Almond Street	1999	58.0	15.9	Yes	12	4	58
	2000	44.0	11.2	Yes	12	4	61

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
San Diego County APCD							
Chula Vista	1999	47.1	14.5	No	12	4	103
	2000	40.5	13.1	Yes	12	4	101
El Cajon-Redwood Avenue	1999	47.0	16.4	Yes	12	4	321
	2000	65.5	15.7	Yes	12	4	292
Escondido-E Valley Parkway	1999	64.3	18.0	Yes	12	4	255
	2000	65.9	15.8	Yes	12	4	305
San Diego-12th Avenue	1999	46.9	17.7	Yes	12	4	289
	2000	66.3	15.6	Yes	12	4	273
San Diego-Overland Avenue	1999	43.4	14.1	No	12	4	85
	2000	48.5	12.4	Yes	12	4	101
San Joaquin Valley Unified APCD							
Bakersfield-5558 California Avenue	1999	134.8	31.2	Yes	12	4	294
	2000	112.7	23.0	Yes	12	4	329
Bakersfield-Golden State Highway	1999	133.9	26.2	Yes	12	4	84
	2000	108.1	22.6	Yes	12	4	91
Bakersfield-410 E Planz Road	2000	91.0	20.3	Yes	11	4	102
Clovis-N Villa Avenue	1999	97.7	19.8	Yes	12	4	82
	2000	75.1	16.3	Yes	12	4	70

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
San Joaquin Valley Unified APCD (cont)							
Corcoran-Patterson Avenue	1999	53.1	14.3	No	8	3	44
	2000	76.0	16.4	Yes	11	4	67
Fresno-1st Street	1999	136.0	27.7	Yes	12	4	275
	2000	160.0	25.5	No	9	4	194
Fresno-Pacific College	2000	83.5	18.4	Yes	12	4	77
Merced-2334 M Street	1999	108.7	22.6	No	9	3	53
	2000	86.1	17.3	Yes	12	4	88
Modesto-14th Street	1999	108.0	24.9	Yes	12	4	117
	2000	77.0	18.7	Yes	12	4	122
Stockton-Hazelton Street	1999	101.0	19.7	Yes	12	4	117
	2000	78.0	15.5	Yes	12	4	123
Visalia-N Church Street	1999	123.0	27.6	Yes	12	4	117
	2000	105.0	23.9	Yes	12	4	115
San Luis Obispo County APCD							
Atascadero-Lewis Avenue	1999	27.5	9.6	Yes	12	4	59
	2000	52.7	10.8	Yes	12	4	58
San Luis Obispo-Marsh Street	1999	20.0	8.2	Yes	12	4	54
	2000	28.2	8.3	No	12	4	55

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
Santa Barbara County APCD							
Santa Barbara-W Carillo Street	1999	21.3	12.9	No	6	4	15
	2000	24.2	13.1	No	10	4	44
Santa Maria-Broadway	1999	24.3	11.4	No	5	2	22
	2000	28.7	9.8	Yes	12	4	57
South Coast Air Basin							
Anaheim-Harbor Blvd	1999	68.6	25.9	No	8	4	92
	2000	113.9	20.3	Yes	12	4	273
Azusa	1999	81.3	25.0	Yes	12	4	144
	2000	92.5	20.2	Yes	12	4	333
Big Bear City-501 W Valley Blvd	1999	32.1	10.3	Yes	11	4	97
	2000	29.0	10.2	No	12	4	59
Burbank-W Palm Avenue	1999	79.4	22.9	Yes	12	4	106
	2000	84.4	21.2	No	9	4	70
Fontana-Arrow Highway	1999	97.9	25.7	Yes	12	4	121
	2000	72.9	24.5	Yes	12	4	112
Los Angeles-North Main Street	1999	69.3	23.0	Yes	12	4	136
	2000	87.8	21.9	Yes	12	4	334

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
South Coast Air Basin (cont)							
Lynwood	1999	67.7	24.3	Yes	12	4	110
	2000	82.1	23.0	Yes	12	4	121
Mission Viejo-26081 Via Pera	1999	56.6	17.0	No	7	3	65
	2000	94.7	14.7	Yes	12	4	119
North Long Beach	1999	66.9	20.7	Yes	12	4	148
	2000	81.5	19.6	Yes	12	4	304
Ontario-1408 Francis Street	1999	85.8	25.4	Yes	12	4	96
	2000	73.4	24.1	Yes	12	4	111
Pasadena-S Wilson Avenue	1999	73.0	19.9	No	10	4	95
	2000	66.3	19.4	Yes	12	4	110
Pico Rivera	1999	85.6	25.7	Yes	12	4	111
	2000	89.5	24.0	Yes	12	4	116
Reseda	1999	79.0	17.3	Yes	10	4	71
	2000	67.5	18.0	Yes	12	4	108
Riverside-Magnolia	1999	89.9	26.7	Yes	12	4	110
	2000	79.3	25.3	Yes	12	4	111
Riverside-Rubidoux	1999	111.2	31.0	Yes	12	4	137
	2000	119.6	28.3	Yes	12	4	304
San Bernardino-4th Street	1999	121.4	25.6	Yes	12	4	104
	2000	89.8	25.9	Yes	12	4	92

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

$PM_{2.5}$ Air Quality Data

Monitoring Planning Area / Site Name	Year	High 24-Hour Conc. (µg/m3)	Average of Quarters (µg/m3)[1]	Valid?[1]	Number of Months[2]	Number of Quarters[2]	Number of Observations[3]
Ventura County APCD							
El Rio-Rio Mesa School #2	1999	36.7	12.2	No	12	4	92
	2000	45.7	13.0	No	12	4	106
Piru-3301 Pacific Avenue	2000	37.6	10.7	No	2	1	13
Simi Valley-Cochran Street	1999	64.6	13.8	Yes	12	4	109
	2000	55.3	14.8	No	12	4	102
Thousand Oaks-Moorpark Road	1999	53.2	11.8	Yes	12	4	110
	2000	53.7	13.3	No	12	4	103

[1] Average of Quarters and Valid? are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Typically, a year is complete, and the Average of Quarters is therefore valid, if 75% or more of the expected measurements are available in each quarter. Under certain circumstances, however, an Average of Quarters can be deemed valid with fewer measurements (see 40 CFR Part 50, Appendix N for details).
[2] Number of Months and Number of Quarters are the number of months and number of quarters, respectively, that include at least one measurement.
[3] Number of Observations is the total number of 24-hour measurements represented at each site.

Table 2-14 (continued)

PM_{10} and $PM_{2.5}$ - Linking Emissions Sources with Air Quality

Chemical Mass Balance (CMB) models are used to establish which sources and how much of their emissions contribute to ambient particulate matter (PM) concentrations. PM_{10} refers to particles 10 microns and smaller. $PM_{2.5}$, particles 2.5 microns and smaller, are a subset of PM_{10}. CMB models use chemical composition data from ambient PM samples and from emission sources. These data are often collected during special source attribution studies. The source attribution data presented in this section were derived from a variety of studies with differing degrees of chemical speciation. In general, however, the source categories can be interpreted in the following manner. The road and other dust, wood smoke, cooking, vehicle exhaust, and construction categories represent sources which directly emit particles. Road and other dust represents the combination of mechanically disturbed soil (paved and unpaved roads, agricultural activities) and wind-blown dust. Wood smoke generally represents residential wood combustion, but may also include combustion from other biomass burning such as agricultural or prescribed burning. The vehicle exhaust category represents direct motor vehicle exhaust particles from both gasoline and diesel vehicles. Construction reflects construction and demolition activities. Ammonium nitrate and ammonium sulfate represent secondary species (i.e., they form in the atmosphere from the emissions of nitrogen oxides (NO_x), sulfur oxides (SO_x), and ammonia). Combustion sources such as motor vehicles and stationary sources contribute to the NO_x that forms ammonium nitrate. Mobile sources such as diesel vehicles, locomotives, and ships and stationary combustion sources emit the SO_x that forms ammonium sulfate. Ammonia sources include animal feedlots, fertilizers, and motor vehicles. The other carbon sources category reflects organic sources not included in the source attribution models, such as natural gas combustion, as well as secondary organic carbon formation. The unidentified category represents the mass that cannot be accounted for by the identified source categories. It can include particle-bound water, as well as other unidentified sources.

The size, concentration, and chemical composition of PM vary by region and by season. A number of areas exhibit strong seasonal patterns. Other areas have a much more uniform distribution -- PM concentrations remain high throughout the year. In yet other areas, isolated PM exceedances can occur at any time of the year. The figures on the following pages present the best available source attribution data from CMB modeling for selected regions, which highlight the first two seasonal scenarios. These presentations are representative of typical days when the State PM_{10} standards are exceeded (refer to Chapter 1, page 23 for a review of the State standards). The fractions of the constituents shown can vary daily and from year to year, depending on factors such as meteorology.

In the San Joaquin Valley, the San Francisco Bay Area, and the Sacramento area, there is a strong seasonal variation in PM, with higher PM_{10} and $PM_{2.5}$ concentrations in the fall and winter months. These higher concentrations are due to increased activity for some emissions sources and meteorological conditions that are conducive to the build-up of PM. During the winter, the $PM_{2.5}$ size fraction drives the PM concentrations, and the major contributor to high levels of ambient $PM_{2.5}$ is the secondary formation of PM caused by the reaction of NO_x and ammonium to form ammonium nitrate. The San Joaquin Valley also records high PM_{10} levels during the fall. During this season, the coarse fraction ($PM_{2.5-10}$) drives the PM concentrations.

In the South Coast region, PM_{10} and $PM_{2.5}$ concentrations remain high throughout the year. The more uniform activity patterns of emission sources, as well as less variable weather patterns, leads to this more uniform concentration pattern. In other areas, high PM can be more episodic than seasonal. For example, in Owens Lake in the Great Basin Valleys Air Basin, episodic fugitive dust events lead to very high PM_{10} levels, with soil dust as the major contributor to ambient PM_{10}.

San Joaquin Valley Air Basin

Figures 2-5 and 2-6 illustrate source contributions to ambient PM in the San Joaquin Valley during the fall and winter. These are the results from a detailed chemical analysis of samples collected during the 1995 Integrated Monitoring Study (Magliano et al., 1999).

In the fall, at Corcoran, elevated concentrations of PM_{10} were associated with high levels of road and agricultural dust. NO_x emissions from mobile and stationary combustion sources, combined with ammonium, led to significant secondary ammonium nitrate contributions to PM_{10}. During the winter, in Fresno, secondary ammonium nitrate was the major contributor to $PM_{2.5}$ and PM_{10}. Emissions from wood smoke, vehicle exhaust particles, and other carbon sources also contributed significantly to $PM_{2.5}$ levels.

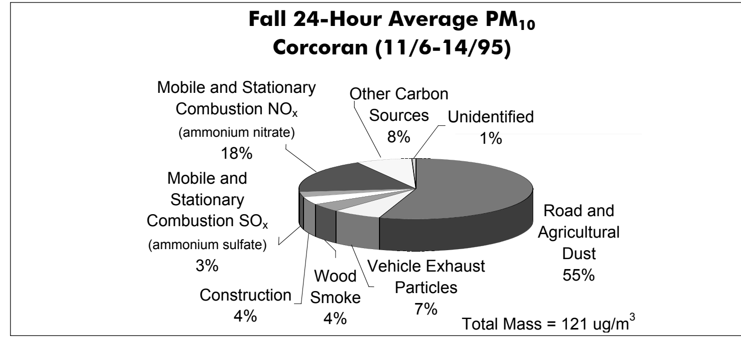

Figure 2-5

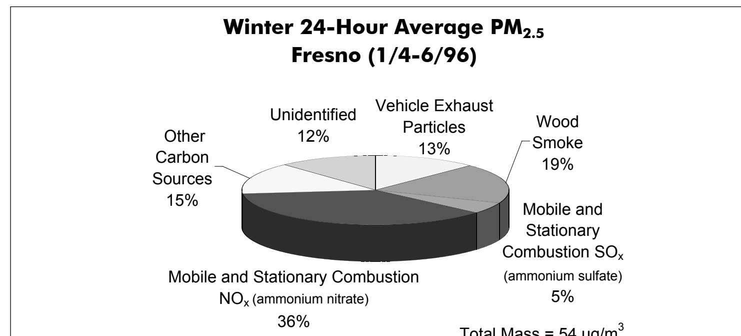

Figure 2-6

San Francisco Bay Area Air Basin

Figures 2-7 and 2-8 illustrate the sources of PM during the winter in the San Francisco Bay Area. The data are from the source apportionment analysis conducted by the Bay Area Air Quality Management District using samples collected during two special studies (Fairley, 1996, 2001).

During the winter, in San Jose, high PM concentrations are associated with high levels of wood smoke -- primarily from residential wood combustion, and cooking. NO_x emitted from mobile and stationary combustion sources, in combination with ammonium, contributes about one-fourth of the PM levels. Particle emissions from mobile and stationary combustion sources are also a major contributor to $PM_{2.5}$. Road dust is a significant contributor to PM_{10}, but not $PM_{2.5}$.

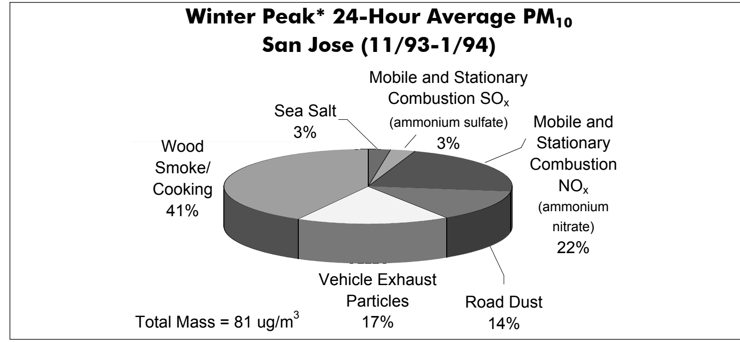

Figure 2-7 * Average of days with PM_{10} > 50 ug/m^3

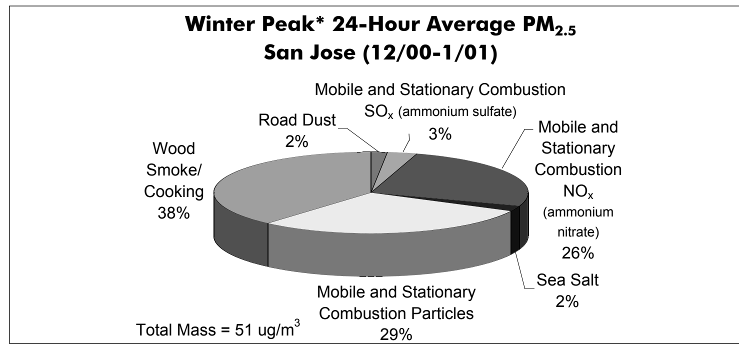

Figure 2-8 * Average of days with $PM_{2.5}$ > 40 ug/m^3

Sacramento Valley Air Basin

Figures 2-9 and 2-10 illustrate source contributions to ambient PM_{10} and $PM_{2.5}$ during the winter in Sacramento. The data are from the analysis of ambient air samples collected from November through January, during six years -- 1991 through 1996 (Motallebi, 1999).

NO_x emissions from mobile and stationary combustion sources, combined with ammonium, contribute the most to ambient PM levels. Vehicle exhaust particle emissions and wood smoke from residential wood combustion also contribute significantly. While road and other dust is a significant component of ambient PM_{10}, its contribution to $PM_{2.5}$ is minor.

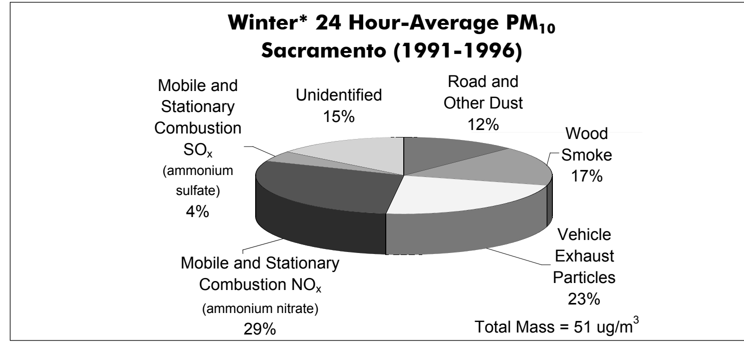

Figure 2-9 * Average of days with PM_{10} > 40 ug/m³

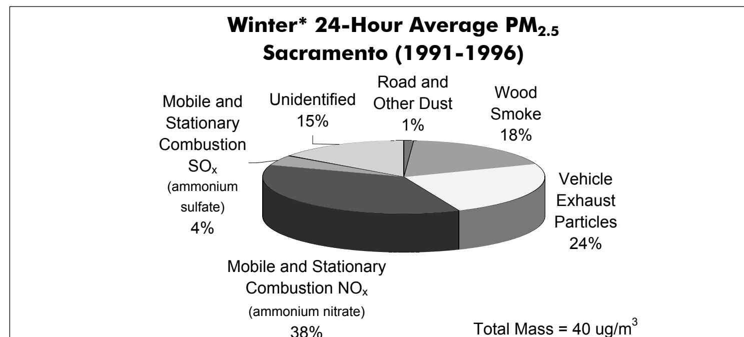

Figure 2-10 * Average of days with PM_{10} > 40 ug/m³

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South Coast Air Basin

Data for Figures 2-11, 2-12, 2-13, and 2-14 are from the source apportionment analysis that the South Coast Air Quality Management District (SCAQMD) performed for the 1997 Air Quality Management Plan. SCAQMD collected samples during a one-year special study from January 1995 to February 1996, as part of the PM_{10} Technical Enhancement Program (SCAQMD, 1996).

On an annual basis, in Central Los Angeles, dust from roads and construction is the major contributor to ambient PM_{10}. This is not the case for the episode on November 17, 1995. In both cases, NO_x and SO_x emitted from mobile and stationary combustion sources, combined with ammonium, contribute significantly. Vehicle exhaust particles and emissions from other carbon sources also contribute to both annual and episodic ambient PM_{10} levels.

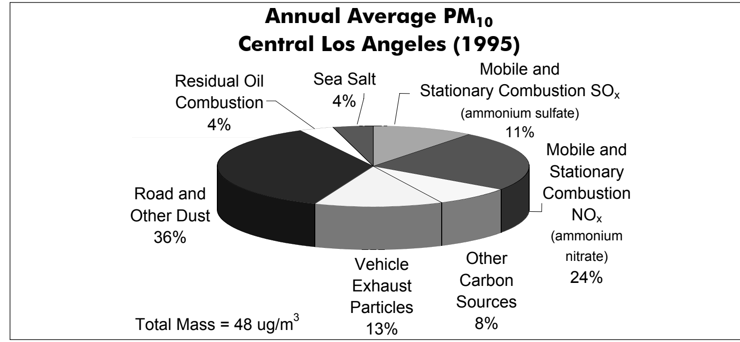

Figure 2-11

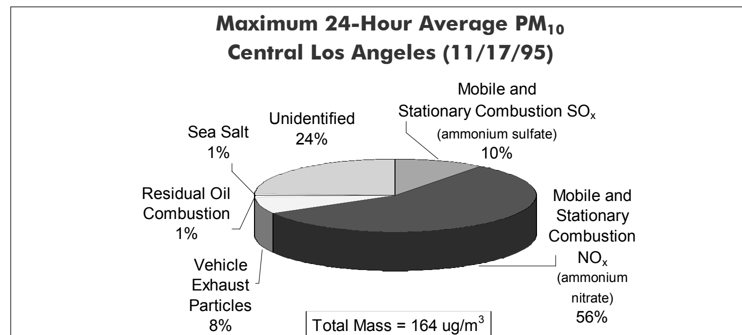

Figure 2-12

On an annual basis, in Rubidoux, dust from roads and construction is the major contributor to ambient PM_{10}. In contrast, dust was a minor contributor to the PM_{10} episode on November 17, 1995. In both cases, NO_x emitted from mobile and stationary combustion sources, combined with ammonium, contributes significantly. Vehicle exhaust particles and emissions from other carbon sources also contribute to both annual and episodic ambient PM_{10} levels.

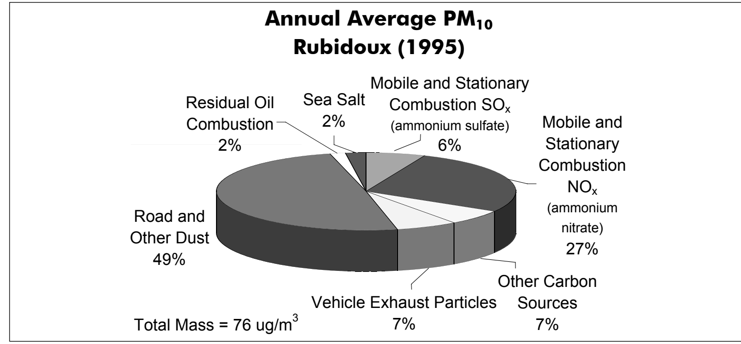

Figure 2-13

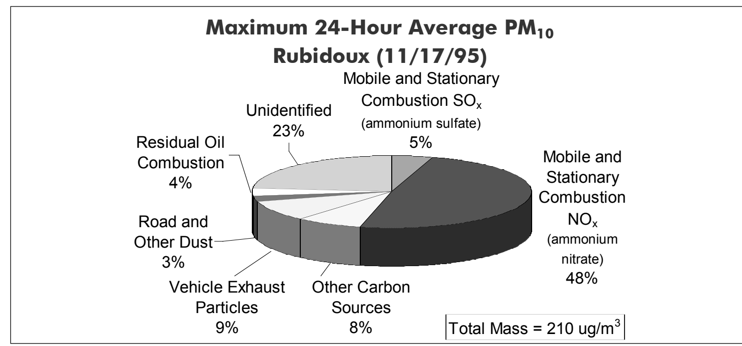

Figure 2-14

References:

Fairley, D. *Source Apportionment of Bay Area Particulates.* 1996; Personal communication.

Fairley, D. *$PM_{2.5}$ Source Apportionment for San Jose 4th Street.* 2001; Personal communication.

Magliano, K. L., Hughes, V. M., Chinkin, L. R., Coe, D. L., Haste, L. T., Kumar, N., Lurmann, F. W. *Spatial and Temporal Variations in PM_{10} and $PM_{2.5}$ Source Contributions and Comparison to Emissions During the 1995 Integrated Monitoring Study.* Atmospheric Environment 1999; 33:4757-4773.

Motallebi, N. *Wintertime PM_{10} and $PM_{2.5}$ Source Apportionment at Sacramento, California.* Journal of the Air & Waste Management Association 1999; 49:PM-25-34.

South Coast Air Quality Management District. "*Modeling and Attainment Demonstrations*" in 1997 Air Quality Management Plan, Diamond Bar, California. 1996.

Carbon Monoxide

2001 Statewide Emission Inventory - Carbon Monoxide by Category

Carbon monoxide (CO) gas is formed as the result of incomplete combustion of fuels and waste materials such as gasoline, diesel fuel, wood, and agricultural debris. Mobile sources generate about 84 percent of the statewide CO emissions. Diesel-powered, on-road vehicles are small CO contributors. Stationary and area-wide sources of CO are the same types of fuel combustion sources that also generate NO_x. The stationary source contribution to statewide CO is small, due in part to widespread use of natural gas as a fuel and the presence of combustion controls.

CO Emissions (annual average)		
Emissions Source	**tons/day**	**Percent**
Stationary Sources	362	2%
Area-wide Sources	2309	14%
On-Road Mobile	11636	68%
Gasoline Vehicles	11507	67%
Diesel Vehicles	129	1%
Other Mobile	2759	16%
Total Statewide	*17065*	*100%*

Table 2-15

Carbon Monoxide - 2000 Air Quality

The State and national carbon monoxide standards are now attained in most areas of California. The requirements for cleaner vehicles and fuels have been primarily responsible for the reductions in CO, despite significant increases in population and the number of vehicle miles traveled each day. However, there are still two problem areas: a limited portion of Los Angeles County and the city of Calexico in Imperial County. The CO problem in Calexico is unique in that this area shares a border with Mexico, and there is a high likelihood that cross-border traffic contributes to the local CO problem. More study is needed to determine the most effective control strategy for this area.

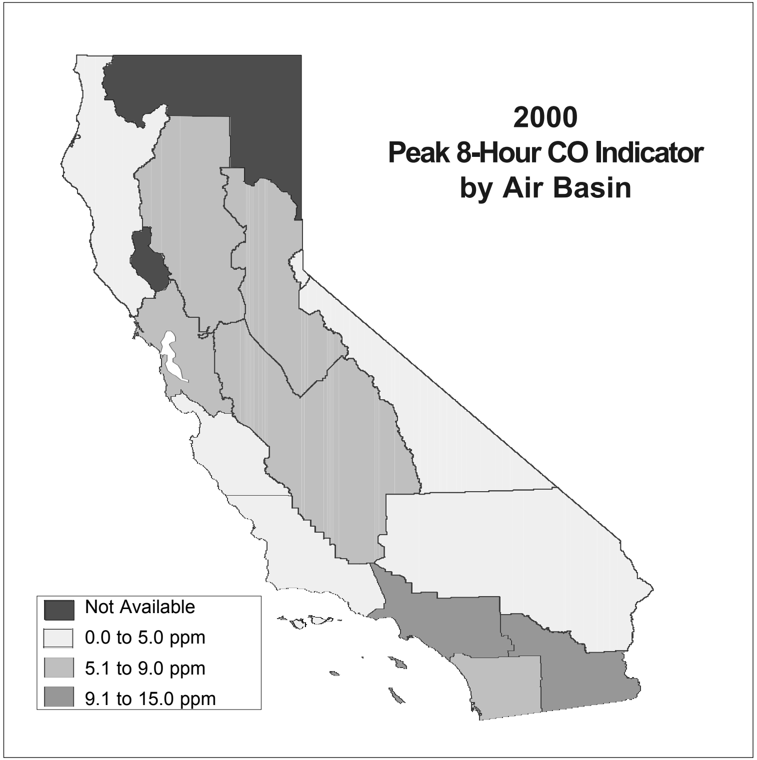

Figure 2-15

Carbon Monoxide - 2000 Air Quality Tables

Maximum Peak 8-Hour Indicator by Air Basin

AIR BASIN	2000 Maximum Peak 8-Hour Indicator in parts per million	Number of Days in 2000 above State 8-Hour Standard	Number of Days in 2000 above National 8-Hour Standard
Great Basin Valleys Air Basin	2.9	0	0
Lake County Air Basin	Incomplete Data	Incomplete Data	Incomplete Data
Lake Tahoe Air Basin	2.1	0	0
Mojave Desert Air Basin	4.6	0	0
Mountain Counties Air Basin	5.7	0	0
North Central Coast Air Basin	1.6	0	0
North Coast Air Basin	3.4	0	0
Northeast Plateau Air Basin	Incomplete Data	Incomplete Data	Incomplete Data
Sacramento Valley Air Basin	7.0	0	0
Salton Sea Air Basin	14.8	7	6
San Diego Air Basin	5.3	0	0
San Francisco Bay Area Air Basin	7.1	0	0
San Joaquin Valley Air Basin	8.3	0	0
South Central Coast Air Basin	4.7	0	0
South Coast Air Basin	12.6	6	3

Table 2-16

Sites with 8-Hour Peak Indicator Values above the State CO Standard

Salton Sea Air Basin

- Calexico-Ethel Street
- Calexico-East

South Coast Air Basin

- Lynwood

Sites with 8-hour peak indicator values above the level of the State CO standard during 2000. Sites in each air basin are listed in descending order of their 8-hour peak indicator value. If an air basin is not listed, the peak indicator values at sites in that air basin were not above the State CO standards.

Table 2-17