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8.1 Air Quality

This section describes existing air quality conditions, maximum potential impacts from the project, and mitigation measures that keep these impacts below thresholds of significance. The project will use combined-cycle technology generation to minimize emissions of criteria pollutants and potential effects on ambient air quality.

Beneficial environmental aspects of the project that minimize adverse air quality include the following:

- Clean-burning natural gas as fuel,
- Combined-cycle technology to minimize the amount of fuel needed to produce electricity,
- Selective catalytic reduction (SCR) to minimize NO_x emissions, and
- Appropriately sized stacks to reduce ground-level concentrations of exhaust constituents.

This section presents the methodology and results of the air quality analyses performed to assess potential impacts associated with air emissions from the construction and operation of the project. Potential public health risks posed by emissions of noncriteria pollutants are addressed in Section 8.6 (Public Health).

Existing air quality conditions are described in Sections 8.1.1 to 8.1.3. Applicable regulations are discussed in Section 8.1.4. The methodology used in the quantitative air quality analysis and the resulting environmental consequences are presented in Section 8.1.5. Consistency with laws, ordinances, regulations, and standards (LORS) is discussed in Section 8.1.5.2.5. The protocol for analyzing cumulative air quality impacts is presented in Section 8.1.5.4. Measures that mitigate the potential impacts to air quality are discussed in Section 8.1.6. References cited in this chapter are listed in Section 8.1.7.

8.1.1 Existing Conditions

8.1.1.1 Geography and Topography

The project is located near the site of the former Rancho Seco nuclear power plant, in south Sacramento County, south of Twin Cities Road (State Route 104) and about 2 miles east of Clay Station Road. The project site is at an elevation of approximately 160 feet above sea level. The terrain in the vicinity of the site gradually slopes downhill from northeast to southwest. The nearest residences are approximately one mile to the west and southwest. Further west, for about 12 miles, there are few residences or other structures between the project site and State Highway 99 (at the Dillard Road interchange). About 12 miles north of the site, across a series of low hills (300 ft maximum elevation) and streams, the nearest residential area is Rancho Murieta. About 11 miles east of the project site, across hills as high as 500 feet, lies the town of Ione, at an elevation of 290 feet. Between the project site and Lockeford, the nearest town to the south (about 12 miles away), the terrain consists of low hills (200 feet) and streams, with few residences or other structures.

8.1.1.2 Climate and Meteorology

The overall climate at the project site is dominated by the semi-permanent eastern Pacific high-pressure system centered off the coast of California. This high is centered between the 140° west (W) and 150° W meridians, and oscillates in a north-south direction. Its position governs California's weather. In the summer, the high moves to its northernmost position, which results in a strong subsidence inversion and clear skies inland; along the coast, the weather is dominated by coastal stratus and fog caused by the cooler and more homogeneous ocean surface temperature.

In the winter, the high moves southwestward toward Hawaii, which allows storms originating in the Gulf of Alaska to reach northern California, bringing wind and rain. About 80 percent of the annual rainfall at the project site (about 20 inches) occurs between November and March.[1] Between storms, skies are fair, winds are light, and temperatures are moderate.

Air quality is determined primarily by the type and amount of pollutants emitted into the atmosphere, the topography of the air basin, and local meteorological conditions. In the project area, stable atmospheric conditions and light winds can provide conditions for pollutants to accumulate in the air basin when emissions are produced. The predominant winds in California are shown in Figures 8.1-1 through 8.1-4. As indicated in the figures, winds in California generally are light and easterly in the winter, but strong and westerly in the spring, summer, and fall.

Wind patterns at the project site can be seen in Figures 8.1-5a through 8.1-9e, which show quarterly and annual wind roses for meteorological data collected at the Sacramento Executive Airport. It can be seen that the winds are persistent (zero calm conditions) and predominantly from the southern through southwestern quadrant on an annual basis. Winds are predominantly from the northwest and southeast during the winter months.

The marine climate influences mixing heights. Often, the base of the inversion is found at the top of a layer of marine air, because of the cooler nature of the marine environment. Inland areas, where the marine influence is absent, often experience strong ground-based inversions, which inhibit mixing and can result in high pollutant concentrations. Smith, et al, (1984) reported that at Sacramento, the nearest upper-level meteorological station (located approximately 24 miles NW of the project site), 50th percentile morning mixing heights for the period 1979–80 were on the order of 440 feet (135 meters) in winter, 625 feet (190 meters) in spring, 510 feet (155 meters) in summer, and 490 feet (150 meters) in fall. The 50th percentile afternoon mixing heights were 1,295 feet (395 meters) in winter, 3,395 feet (1,035 meters) in spring, 3,675 feet (1,120 meters) in summer, and 2,770 feet (845 meters) in fall. The afternoon mixing heights provide generally favorable conditions for the dispersion of pollutants.

8.1.2 Overview of Air Quality Standards

The U.S. Environmental Protection Agency (USEPA) has established national ambient air quality standards (NAAQS) for ozone, nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with aerodynamic diameter less than or equal to

1 "Climate of the States—California," U.S. Department of Commerce, Weather Bureau, December 1959.

10 microns (PM_{10}), particulate matter with aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and airborne lead. Areas with air pollution levels above these standards can be considered "nonattainment areas" subject to planning and pollution control requirements that are more stringent than standard requirements.

In addition, the California Air Resources Board (ARB) has established standards for ozone, CO, NO_2, SO_2, sulfates, PM_{10}, airborne lead, hydrogen sulfide, and vinyl chloride at levels designed to protect the most sensitive members of the population, particularly children, the elderly, and people who suffer from lung or heart diseases.

Both state and national air quality standards consist of two parts: an allowable concentration of a pollutant, and an averaging time over which the concentration is to be measured. Allowable concentrations are based on the results of studies of the effects of the pollutants on human health, crops and vegetation, and, in some cases, damage to paint and other materials. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposures to a high concentration for a short time (1 hour, for instance), or to a relatively lower average concentration over a longer period (8 hours, 24 hours, or 1 month). For some pollutants there is more than one air quality standard, reflecting both the short-term and long-term effects. Table 8.1-1 presents the NAAQS and California ambient air quality standards for selected pollutants. The California standards are generally set at concentrations much lower than the federal standards and in some cases have shorter averaging periods.

USEPA's new NAAQS for ozone and fine particulate matter went into effect on September 16, 1997. For ozone, the previous one-hour standard of 0.12 ppm was replaced by an 8-hour average standard at a level of 0.08 ppm. Compliance with this standard will be based on the 3-year average of the annual 4th-highest daily maximum 8-hour average concentration measured at each monitor within an area.

The NAAQS for particulates were revised in several respects. First, compliance with the current 24-hour PM_{10} standard will now be based on the 99th percentile of 24-hour concentrations at each monitor within an area. Two new $PM_{2.5}$ standards were added: a standard of 15 $\mu g/m^3$, based on the 3-year average of annual arithmetic means from single or multiple monitors (as available); and a standard of 65 $\mu g/m^3$, based on the 3-year average of the 98th percentile of 24-hour average concentrations at each monitor within an area.

Recent court decisions may delay the implementation of these new standards.

8.1.3 Air Quality Trends (Criteria Pollutants)

Several ambient air monitoring stations were used to characterize air quality at the project site. These stations were selected because of their proximity to the project site and because they record area-wide ambient conditions rather than the localized impacts of any particular facility[2]. All ambient air quality data presented in this section were taken from ARB publications and data sources. Except for carbon monoxide (CO) and ultrafine particulate matter ($PM_{2.5}$), the ambient data presented in this document were recorded at monitoring stations operated by the Sacramento Metropolitan Air Quality Management District

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[2] A more extensive discussion of why the data from these stations are considered to be representative of air quality in the vicinity of the proposed project is provided in Section 8.1.5.2.2.

(SMAQMD). Ambient concentrations of CO and of $PM_{2.5}$ are from a monitoring station at 1309 T Street in Sacramento operated by the ARB. Ambient concentrations of ozone are recorded at monitoring stations in Sloughhouse and in Elk Grove. Nitrogen dioxide (NO_2) is also measured at the Elk Grove station. Fine particulate matter (PM_{10}) and ambient levels of sulfates and airborne lead were measured at the Stockton Boulevard station in Sacramento. Sulfur dioxide (SO_2) was monitored at the Del Paso Manor site in Sacramento.

TABLE 8.1-1
Ambient Air Quality Standards

Pollutant	Averaging time	California	National
Ozone	1 hour	0.09 ppm	0.12 ppm
	8 hours	-	0.08 ppm (3-year average of annual 4th-highest daily maximum)
Carbon Monoxide	8 hours	9.0 ppm	9 ppm
	1 hour	20 ppm	35 ppm
Nitrogen Dioxide	Annual Average	-	0.053 ppm
	1 hour	0.25 ppm	-
Sulfur Dioxide	Annual Average	-	80 μg/m^3 (0.03 ppm)
	24 hours	0.04 ppm (105 μg/m^3)	365 μg/m^3 (0.14 ppm)
	3 hours	-	1300[a] μg/m^3 (0.5 ppm)
	1 hour	0.25 ppm	-
Suspended Particulate Matter (10 Micron)	Annual Geometric Mean	30 μg/m^3	-
	24 hours	50 μg/m^3	150 μg/m^3
	Annual Arithmetic Mean	-	50 μg/m^3
Suspended Particulate Matter (2.5 Micron)	Annual Arithmetic Mean	-	15 μg/m^3 (3-year average)
	24 hours	-	65 μg/m^3 (3-year average of 98th percentiles)
Sulfates	24 hours	25 μg/m^3	-
Lead	30 days	1.5 μg/m^3	-
	Calendar Quarter	-	1.5 μg/m^3
Hydrogen Sulfide	1-hour	0.03 ppm	-
Vinyl Chloride	24-hour	0.010 ppm	-
Visibility Reducing Particles	8-hour (10am to 6pm PST)	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent.	-

[a] This is a national secondary standard, which is designed to protect public welfare.

8.1.3.1 Ozone

Ozone is generated by complex reactions between reactive organic gases (ROG) and oxides of nitrogen (NO_x) in the presence of intense ultraviolet radiation. ROG and NO_x emissions from vehicles and stationary sources, in combination with daytime wind flow patterns, mountain barriers, a persistent temperature inversion, and intense sunlight, result in high ozone concentrations. Sacramento County is designated a nonattainment area for both state and federal ambient standards.

Maximum ozone concentrations in the Sacramento Valley are usually recorded during the summer months. Tables 8.1-2a and 8.1-2b show the annual maximum hourly ozone levels recorded at the Elk Grove and Sloughhouse monitoring stations, respectively, for several years prior to and including 2000. (Ozone was not monitored at Sloughhouse before 1997.) The tables also present the number of days in which the state and federal standards were exceeded at each station. The data show that the state ozone air quality standard has been exceeded frequently. The federal standard was exceeded at Elk Grove twice during the 8-year period, and more frequently at Sloughhouse.

TABLE 8.1-2A
Ozone Levels at Elk Grove 1993-2000 (parts per million - ppm)

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	0.100	0.110	0.120	0.121	0.121	0.147	0.160	0.104
Number of Days Exceeding:								
State Standard (0.09 ppm, 1-hour)	3	8	15	21	5	7	16	2
Federal Standard (0.12 ppm, 1-hour)	0	0	0	0	0	1	1	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board.

TABLE 8.1-2B
Ozone Levels at Sloughhouse 1997-2000 (parts per million - ppm)

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	--	--	--	--	0.143	0.149	0.148	0.138
Number of Days Exceeding:								
State Standard (0.09 ppm, 1-hour)	--	--	--	--	5	27	27	21
Federal Standard (0.12 ppm, 1-hour)	--	--	--	--	2	8	4	3

Source: California Air Quality Data, Annual Summary, California Air Resources Board.

The trends of maximum one-hour ozone readings in Elk Grove and Sloughhouse are shown in Figure 8.1-10a. Violations of the state standard in Elk Grove are shown in Figure 8.1-10b (a trend for Sloughhouse would be hard to discern, given only 4 years of data). These charts illustrate that violations of the state ozone standard, while perhaps not numerous, remain persistent.

8.1.3.2 Nitrogen Dioxide

Nitrogen dioxide is formed primarily from reactions in the atmosphere between nitric oxide (NO) and oxygen or ozone. Nitric oxide is formed during high-temperature combustion processes, when the nitrogen and oxygen in the combustion air combine. Although NO is much less harmful than NO_2, it can be converted to NO_2 in the atmosphere within a matter of hours, or even minutes under certain conditions. For purposes of state and federal air quality planning, Sacramento County is in attainment for NO_2.

Table 8.1-3 shows the maximum one-hour NO_2 levels recorded at the Elk Grove monitoring station each year from 1993 through 2000, as well as the annual average level for those years. During this period, there have been no violations of either the state one-hour standard (0.25 ppm) or the federal annual average standard (0.053 ppm). Figure 8.1-11 shows the trend from 1993 through 2000 of maximum one-hour NO_2 levels at Elk Grove. These have been well below the state standard of 0.25 ppm for many years. The trend of annual average NO_2 levels is shown in Figure 8.1-12.

TABLE 8.1-3
Nitrogen Dioxide Levels at Elk Grove 1993-2000 (parts per million - ppm)

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	0.080	0.050	0.052	0.145	0.061	0.048	0.081	0.051
Annual Average	0.007	0.009	0.008	0.009	0.009	0.009	0.011	0.010
Number of Days Exceeding:								
State Standard (0.25 ppm, 1-hour)	0	0	0	0	0	0	0	0
Federal Standard (0.053 ppm, annual)	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board.

8.1.3.3 Carbon Monoxide

Carbon monoxide is a product of inefficient combustion, principally from automobiles and other mobile sources of pollution. In many areas of California, CO emissions from wood-burning stoves and fireplaces can also be measurable contributors. Industrial sources typically contribute less than 10 percent of ambient CO levels. Peak CO levels typically occur during winter months, due to a combination of higher emission rates and stagnant weather conditions. For purposes of state and federal air quality planning, Sacramento County is classified as being in attainment for CO.

Table 8.1-4 shows the California and federal air quality standards for CO, and the maximum one-hour and 8-hour average levels recorded at the 1309 T Street, Sacramento monitoring station during the period 1991 through 2000.

TABLE 8.1-4
Carbon Monoxide Levels at Sacramento 1991-2000 (parts per million - ppm)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Highest 8-hour average	9.63	6.50	9.38	6.33	6.59	6.84	5.96	7.10	5.73	4.43
Highest 1-hour average	12	12	12	11	10	9	8	8	8	--
Number of days exceeding:										
State Standard (20 ppm, 1-hr)	0	0	0	0	0	0	0	0	0	0
State Standard (9.0 ppm, 8-hr)	2	0	1	0	0	0	0	0	0	0
Federal Standard (35 ppm, 1-hr)	0	0	0	0	0	0	0	0	0	0
Federal Standard (9 ppm, 8-hr)	2	0	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board.

Trends of maximum 8-hour and one-hour average CO are shown in Figures 8.1-13 and 8.1-14, respectively, which show that maximum ambient CO levels at Sacramento have been below the state standards for many years, and continue to decline.

8.1.3.4 Sulfur Dioxide

Sulfur dioxide is produced when any sulfur-containing fuel is burned. It is also emitted by chemical plants that treat or refine sulfur or sulfur-containing chemicals. Natural gas contains negligible sulfur, while fuel oils contain much larger amounts. Because of the complexity of the chemical reactions that convert SO_2 to other compounds (such as sulfates), peak concentrations of SO_2 occur at different times of the year in different parts of California, depending on local fuel characteristics, weather, and topography. Sacramento County is considered to be in attainment for SO_2 for purposes of state and federal air quality planning.

Table 8.1-5 presents the state air quality standard for SO_2 and the maximum levels recorded in Sacramento (Del Paso Manor monitoring station) from 1991 through 2000. Maximum one-hour average readings have been an order of magnitude below the state standard of 0.25 ppm. Likewise, the highest 24-hour average levels have been well under the California standard of 0.04 ppm. The federal annual average standard is 0.03 ppm; during most of the period shown, annual average SO_2 levels at the Del Paso site have been less than one-tenth of the federal standard. Figure 8.1-15 shows that for several years the maximum SO_2 levels at the site have been well below the state standard.

TABLE 8.1-5
Sulfur Dioxide Levels in Sacramento 1991–2000 (parts per million - ppm)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	0.03	0.02	0.04	0.03	0.01	0.01	0.02	0.03	0.03	
Highest 24-Hour Average	0.015	0.012	0.006	0.011	0.007	0.006	0.006	0.018	0.014	0.008
Annual Average	0.003	0.001	0.000	0.001	0.001	0.001	0.002	0.003	0.004	0.005

TABLE 8.1-5
Sulfur Dioxide Levels in Sacramento 1991–2000 (parts per million - ppm)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Number of Days Exceeding:										
State Standard										
(0.25 ppm, 1-hr)	0	0	0	0	0	0	0	0	0	0
(0.04 ppm, 24-hr)	0	0	0	0	0	0	0	0	0	0
Federal Standard (0.03 ppm, annual)	0	0	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board.

8.1.3.5 Particulate Sulfates

Particulate sulfates are the product of further oxidation of SO_2. Elevated levels can also result from natural causes, such as sea spray. The Sacramento Valley Air Basin is in attainment of that state standard for sulfates. There is no federal standard for sulfates.

Table 8.1-6 shows the California air quality standard for particulate sulfate and the maximum 24-hour average levels recorded at Sacramento (Stockton Blvd) from 1990 through 1997. Sulfate monitoring was discontinued at Stockton Blvd after 1997. The trend of maximum 24-hour average sulfate concentrations over this period is plotted in Figure 8.1-16. The data show that for many years, concentrations of sulfates in the area have remained well below the state standard.

TABLE 8.1-6
Particulate Sulfate Levels in Sacramento 1991–1997 (micrograms per cubic meter - :g/m^3)

	1991	1992	1993	1994	1995	1996	1997
Highest 24-Hour Average	6.3	5.9	7.5	9.3	8.1	6.5	13.0
Number of Days Exceeding State Standard (25 μg/m^3, 24-hour)	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board.

8.1.3.6 Particulates

Particulates in the air are caused by a combination of wind-blown fugitive dust; particles emitted from combustion sources (usually carbon particles); and organic, sulfate, and nitrate aerosols formed in the air from emitted hydrocarbons, sulfur oxides, and NO_x. In 1984, the ARB adopted standards for fine particulates and phased out the total suspended particulate (TSP) standards that had been in effect until then. Standards for PM_{10} were substituted for TSP standards because PM_{10} corresponds to the size range of inhalable particulates related to human health. In 1987, USEPA also replaced national TSP standards with PM_{10} standards. For air quality planning purposes, Sacramento County is considered to be in nonattainment of both federal and state PM_{10} standards. The USEPA recently published a notice of proposed rulemaking indicating that the agency proposes to determine that the Sacramento PM_{10} nonattainment area has attained the federal PM_{10} standard by the applicable December

31, 2000, attainment date. However, the agency also indicated that additional requirements (including the submittal of a maintenance plan as a SIP revision) must be satisfied before the area can be redesignated as attainment.[3]

As discussed above, the NAAQS for particulates was further revised by USEPA with new standards for $PM_{2.5}$ that went into effect on September 16, 1997. In light of recent court decisions, USEPA will delay implementation of the new $PM_{2.5}$ standards for an indefinite period.

Table 8.1-7 shows the federal and state air quality standards for PM_{10}, maximum 24-hour average levels, and geometric and arithmetic annual averages recorded in Sacramento (Stockton Boulevard) from 1993, when PM_{10} monitoring began at this site, through 2000. Maximum 24-hour PM_{10} levels exceeded the state standard throughout this period, although they were well under the federal standard. Annual average PM_{10} levels were well within both state and federal standards throughout the period.

TABLE 8.1-7
PM_{10} Levels at Sacramento 1993–2000 (micrograms per cubic meter - µg/m^3)

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 24-Hour Average	75	94	67	86	107	79	88	86
Annual Geometric Mean (State Standard = 30 µg/m^3)	26.4	22.4	22.7	19.8	19.5	19.8	21.3	20.2
Annual Arithmetic Mean (Federal Standard = 50 µg/m^3)	31.6	25.4	26.9	21.6	22.7	23.6	25.1	22.8
Number of Days Exceeding:								
State Standard (50 µg/m^3, 24-hour)	7	2	3	2	2	4	3	2
Federal Standard (150 µg/m^3, 24-hour)	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board.

The trend of maximum 24-hour average PM_{10} levels is plotted in Figure 8.1-17, and the trend of expected violations of the state 24-hour standard of 50 µg/m^3 is plotted in Figure 8.1-18. Note that since PM_{10} is measured only once every 6 days, expected violation days are 6 times the number of measured violations.

$PM_{2.5}$ data are available from the 1309 T Street, Sacramento site from 1991 onward, and are presented in Table 8.1-8. During this period, the highest 24-hour average reading, recorded in 1991, was 80 µg/m^3. The proposed federal standard, applied to the 3-year average of 98th percentile readings, is 65 µg/m^3. The table indicates that the 3-year averages during the period shown were below the federal standard (65 µg/m^3), and in a general decline. The three-year average annual arithmetic mean has also declined since the early 1990s and remains below the 15 µg/m^3 annual $PM_{2.5}$ standard. The trend of maximum $PM_{2.5}$ levels over the period 1991-1999 is plotted in Figure 8.1-19.

3 60 FR 38603, Wednesday, July 25, 2001.

TABLE 8.1-8
$PM_{2.5}$ Levels at Sacramento 1991–2000 (micrograms per cubic meter - μg/m³)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Highest 24-Hour Average	80	68	60	64	50	45	52	67	30	N/A[a]
98th Percentile 24-Hour Ave.	80.2	46.0	53.0	60.0	45.0	40.0	42.0	56.0	30.0	N/A
3-Year Average 98th Percentile (Federal Standard = 65 μg/m³)			60	53	53	48	42	46	43	N/A
Annual Arithmetic Mean	34.1	12.2	14.7	16.5	13.8	11.5	11.3	14.5	13.8	N/A
3-Year Average Annual Arithmetic Mean (Federal Standard = 15 μg/m³)			20.3	14.5	15.0	13.9	12.2	12.4	13.2	N/A

[a] Monitoring data for 2000 not available on ARB's website for this pollutant and monitoring station.

8.1.3.7. Airborne Lead

Lead in the air results from the combustion of fuels that contain lead. Twenty-five years ago, motor vehicle gasolines contained relatively large amounts of lead compounds used as octane-rating improvers, and ambient lead levels were relatively high. Beginning with the 1975 model year, manufacturers began equipping new automobiles with exhaust catalysts, which were poisoned by the exhaust products of leaded gasoline. Thus, unleaded gasoline became the required fuel for an increasing fraction of new vehicles, and the phaseout of leaded gasoline began. As a result, ambient lead levels dramatically decreased, and for several years Sacramento County has been in attainment of state airborne lead levels for air quality planning purposes.

Airborne lead was monitored in Sacramento County through the mid-1990s, and was discontinued after 1997. The monitored concentrations are presented in Table 8.1-9. Airborne lead levels in Sacramento, as in all other areas of the state, have been well below the state standard for many years. This is illustrated graphically in Figure 8.1-20.

TABLE 8.1-9
Airborne Lead Levels in Sacramento 1991–1997 (micrograms per cubic meter - μg/m³)

	1991	1992	1993	1994	1995	1996	1997
Highest Monthly Average	0.06	0.02	0.02	0.02	0.02	0.02	0.01
Number of Days Exceeding State Standard (1.5 μg/m³, monthly)	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board.

8.1.4 Laws, Ordinances, Regulations, & Standards (LORS)

Applicable federal, state, and local laws, ordinances, regulations, and standards (LORS) that govern air quality and air pollution are discussed in this section. Specific requirements are identified and the compliance of the proposed project with these requirements is demonstrated. Applicable LORS are summarized in Table 8.1-16 at the end of this regulatory setting. The table also identifies the specific sections in the AFC that demonstrate compliance with the indicated LORS.

8.1.4.1 Federal LORS

The U.S. Environmental Protection Agency (USEPA) implements and enforces the requirements of many of the federal environmental laws. USEPA Region IX, which has its offices in San Francisco, administers USEPA programs in California.

The federal Clean Air Act, as most recently amended in 1990, provides USEPA with the legal authority to regulate air pollution from stationary sources such as the Cosumnes Power Plant (CPP) project. USEPA has promulgated the following stationary source regulatory programs to implement the requirements of the Clean Air Act:

- Standards of Performance for New Stationary Sources (NSPS)
- National Emission Standards for Hazardous Air Pollutants (NESHAP)
- Prevention of Significant Deterioration (PSD)
- New Source Review (NSR)
- Title IV: Acid Rain
- Title V: Operating Permits

8.1.4.1.1 National Standards of Performance for New Stationary Sources

Authority: Clean Air Act §111, 42 USC 7411; 40 CFR Part 60, Subpart GG

Purpose: Establishes standards of performance to limit the emission of criteria pollutants (air pollutants for which USEPA has established national ambient air quality standards (NAAQS)) from new or modified facilities in specific source categories. The applicability of these regulations depends on the equipment size; process rate; and/or the date of construction, modification, or reconstruction of the affected facility. The Standards of Performance for Stationary Gas Turbines (Subpart GG)—which limit NO_x and SO_2 emissions from subject equipment—are applicable to the gas turbines. These standards are implemented at the local level with federal oversight.

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.1.2 National Emission Standards for Hazardous Air Pollutants

Authority: Clean Air Act §112, 42 USC 7412; 40 CFR Part 63

Purpose: Establishes national emission standards to limit hazardous air pollutant (or HAP, which are air pollutants identified by USEPA as causing or contributing to the adverse health effects of air pollution but for which NAAQS have not been established) emissions from existing major sources of HAP emissions in specific source categories. The NESHAPs program also requires the application of maximum achievable control technology (MACT) to any new or reconstructed major source of HAP emissions to minimize those emissions. USEPA is in the process of developing a NESHAP for gas turbines. The proposed NESHAP for gas turbines is expected to be completed in the near future. While there is some uncertainty as to whether the gas turbine NESHAP will be applicable to the project, an analysis of the potential impacts of this regulation on the project is included.

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.1.3 Prevention of Significant Deterioration Program

Authority: Clean Air Act §160-169A, 42 USC 7470-7491; 40 CFR Parts 51 and 52

Purpose: Requires preconstruction review and permitting of new or modified major stationary sources of air pollution to prevent significant deterioration of ambient air quality. PSD applies only to pollutants for which ambient concentrations do not exceed the corresponding NAAQS (i.e., attainment pollutants). The PSD program allows new sources of air pollution to be constructed, or existing sources to be modified, while preserving the existing ambient air quality levels, protecting public health and welfare, and protecting Class I areas (e.g., national parks and wilderness areas). These requirements are implemented at the local level with federal oversight.

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.1.4 New Source Review

Authority: Clean Air Act §171-193, 42 USC 7501 et seq.; 40 CFR Parts 51 and 52

Purpose: Requires preconstruction review and permitting of new or modified major stationary sources of air pollution to allow industrial growth without interfering with the attainment of ambient air quality standards. NSR applies to pollutants for which ambient concentrations exceed the corresponding NAAQS (i.e., nonattainment pollutants). These requirements are implemented at the local level with federal oversight.

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.1.5 Title IV - Acid Rain Program

Authority: Clean Air Act §401, 42 USC 7651 et seq.; 40 CFR Part 72

Purpose: Requires the monitoring and reduction of emissions of acidic compounds and their precursors. The principal source of these compounds is the combustion of fossil fuels. Therefore, Title IV established national standards to limit SO_x and NO_x emissions from electrical power generating facilities. Most standards are implemented at the local level with federal oversight. However, SO_x allowance transactions and monitoring provisions including monitoring plans, notifications, and quarterly monitoring data are still administered by USEPA [Clean Air Markets Division].)

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.1.6 Title V - Operating Permits Program

Authority: Clean Air Act §501 (Title V), 42 USC 7661; 40 CFR Part 70

Purpose: Requires the issuance of operating permits that identify all applicable federal performance, operating, monitoring, recordkeeping, and reporting requirements. Title V applies to major facilities, acid rain facilities, subject solid waste incinerator facilities, and any facility listed by USEPA as requiring a Title V permit. These requirements are implemented at the local level with federal oversight.

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.1.7 CAM Rule

Authority: Clean Air Act §501 (Title V), 42 USC 7414; 40 CFR Part 64

Purpose: Requires facilities to monitor the operation and maintenance of emissions control systems and report any control system malfunctions to the appropriate regulatory agency. If an emissions control system is not working properly, the Compliance Assurance Monitoring (CAM) rule also requires a facility to take action to correct the control system malfunction. The CAM rule applies to emissions units with uncontrolled potential to emit levels greater than applicable major source thresholds. However, emission control systems governed by Title V operating permits requiring continuous compliance determination methods are exempt from the CAM rule. Since the project will be issued a Title V permit requiring the installation and operation of continuous emissions monitoring systems, the project will qualify for this exemption from the requirements of the CAM rule. Consequently, the CAM rule will not be further addressed.

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.2 State LORS

The California Air Resources Board (ARB) was created in 1968 by the Mulford-Carrell Air Resources Act, through the merger of two other state agencies. ARB's primary responsibilities are to develop, adopt, implement, and enforce the state's motor vehicle pollution control program; to administer and coordinate the state's air pollution research program; to adopt and update, as necessary, the state's ambient air quality standards (AAQS); to review the operations of the local air pollution control districts (APCDs); and to review and coordinate preparation of the State Implementation Plan (SIP) for achievement of the federal AAQS.

8.1.4.2.1 State Implementation Plan

Authority: Health & Safety Code (H&SC) §39500 et seq.

Purpose: Required by the federal Clean Air Act, the SIP must demonstrate the means by which all areas of the state will attain NAAQS within the federally mandated deadlines. ARB reviews and coordinates preparation of the SIP. Local APCDs must adopt new rules (and/or revise existing rules) and demonstrate that the resulting emission reductions, in conjunction with reductions in mobile source emissions, will result in the attainment of NAAQS. The relevant SMAQMD Rules and Regulations that also have been incorporated into the SIP are discussed with the local LORS.

Administering Agency: SMAQMD, with ARB and USEPA Region IX oversight.

8.1.4.2.2 California Clean Air Act

Authority: H&SC §§40910-40930

Purpose: Established in 1989, the California Clean Air Act requires local APCDs to attain and maintain both national and state AAQS at the "earliest practicable date." Local APCDs must prepare air quality plans demonstrating the means by which AAQS will be attained. The SMAQMD Air Quality Plan is discussed with the local LORS.

Administering Agency: SMAQMD, with ARB oversight.

8.1.4.2.3 Toxic Air Contaminant Program

Authority: H&SC §§39650-39675

Purpose: Established in 1983, the Toxic Air Contaminant Identification and Control Act creates a two-step process to identify toxic air contaminants (TACs) and control their emissions. ARB identifies and prioritizes the pollutants to be considered for identification as TACs. ARB assesses the potential for human exposure to a substance while the Office of Environmental Health Hazard Assessment evaluates the corresponding health effects. Both agencies collaborate in the preparation of a risk assessment report that concludes whether a substance poses a significant health risk and should be identified as a TAC. In 1993, the Legislature amended the program to identify the 189 federal hazardous air pollutants as TACs. ARB reviews the emission sources of an identified TAC and develops, if necessary, air toxics control measures (ATCMs) to reduce the emissions. This program is implemented at the local level with state oversight.

Administering Agency: SMAQMD, with ARB oversight.

8.1.4.2.4 Air Toxic "Hot Spots" Act

Authority: H&SC §§44300-44384; 17 CCR 93300-93347

Purpose: Established in 1987, the Air Toxics "Hot Spots" Information and Assessment Act supplements the TAC program, by requiring the development of a statewide inventory of TAC emissions from stationary sources. The program requires affected facilities to prepare: (1) an emissions inventory plan that identifies relevant TACs and sources of TAC emissions; (2) an emissions inventory report quantifying TAC emissions; and (3) a health risk assessment, if necessary, to characterize the health risks to the exposed public. Facilities whose TAC emissions are deemed to pose a significant health risk must issue notices to the exposed population. In 1992, the Legislature amended the program to further require facilities whose TAC emissions are deemed to pose a significant health risk to implement risk management plans to reduce the associated health risks. This program is implemented at the local level with state oversight.

Administering Agency: SMAQMD, with ARB oversight.

8.1.4.2.5 CEC and ARB Memorandum of Understanding

Authority: CA Pub. Res. Code §25523(a); 20 CCR 1752, 1752.5, 2300-2309, and Div. 2, Chap. 5, Art. 1, Appendix B, Part (k)

Purpose: Establishes requirements in the CEC's decision-making process on an application for certification that assures protection of environmental quality.

Administering Agency: California Energy Commission.

8.1.4.2.6 Public Nuisance

Authority: H&SC §41700

Purpose: Prohibits the discharge from a facility of air pollutants that cause injury, detriment, nuisance, or annoyance to the public, or which endanger the comfort, repose, health, or safety of the public, or that damage business or property.

Administering Agency: SMAQMD, with ARB oversight.

8.1.4.3 Local LORS

When the state's air pollution statutes were reorganized in the mid-1960s, local APCDs were required to be established in each county of the state. There are three different types of districts: county, regional, and unified. In addition, special air quality management districts (AQMDs), with more comprehensive authority over non-vehicular sources as well as transportation and other regional planning responsibilities, have been established by the Legislature for several regions in California, including the SMAQMD. AQMDs have principal responsibility for developing plans for meeting the state and federal AAQS; for developing control measures for nonvehicular sources of air pollution necessary to achieve and maintain both state and federal air quality standards; for implementing permit programs established for the construction, modification, and operation of sources of air pollution; for enforcing air pollution statutes and regulations governing nonvehicular sources; and for developing employer-based trip reduction programs.

8.1.4.3.1 Sacramento Metropolitan Air Quality Management District Air Quality Plan

Authority: H&SC §40914

Purpose: The SMAQMD plan defines the proposed strategies, including stationary source control measures and new source review rules, whose implementation will attain the state AAQS. The air quality plans also demonstrate a five percent annual reduction in emissions of nonattainment pollutants in the SMAQMD. The relevant stationary source control measures and new source review requirements are discussed with SMAQMD Rules and Regulations.

Administering Agency: SMAQMD, with ARB oversight.

8.1.4.3.2 SMAQMD Rule 201 – General Permit Requirements

Authority: H&SC §40000 et seq., H&SC §40400 et seq.

Purpose and Requirements: Rule 201 establishes an orderly procedure for the review of new and modified sources of air pollution through the issuance of permits. Rule 201 specifies that any facility installing nonexempt equipment that causes or controls the emission of air pollutants must first obtain a Permit to Construct from the SMAQMD.

Administering Agency: SMAQMD, with USEPA Region IX and ARB oversight.

8.1.4.3.3 SMAQMD Preconstruction Review for Criteria Pollutants

Authority: H&SC §40000 et seq., H&SC §40400 et seq.

SMAQMD has two separate preconstruction review programs for new or modified sources of criteria pollutant emissions:

- Rule 202 (New Source Review) combines the federal and state NSR requirements into a single rule. Rule 202 establishes pre-construction requirements for new or modified facilities to ensure that operation of such facilities does not interfere with progress towards the attainment of AAQS without unnecessarily restricting economic growth.
- Rule 203 (Prevention of Significant Deterioration) implements the PSD requirements of the federal Clean Air Act for attainment pollutants (i.e., NO_2, SO_2, CO). Rule 203 establishes pre-construction review requirements for new or modified facilities to ensure that operation of such facilities does not significantly deteriorate air quality in

attainment areas while maintaining a margin for future growth. The PSD requirements apply on a pollutant-specific basis to any project that is a new major stationary source or a major modification to an existing major stationary source. A major source is a listed facility (one of 28 PSD source categories listed in the federal Clean Air Act) that has the potential to emit 100 tons per year (tpy) or more or any other facility that has the potential to emit at least 250 tpy of NO_x, SO_x, or CO. NO_x, SO_x, and CO emissions from a modified major source are subject to PSD if the cumulative emission increase exceeds 40 tpy for NO_x or SO_x or 100 tpy for CO. Since the net emissions increase associated with the installation of the new equipment is below 22 tpy for SO_x, however, the project will only trigger the PSD requirements for NO_x and CO.

A facility can be subject to more than one of these preconstruction review programs depending on the type of criteria pollutants and criteria pollutant precursors they will emit. The relevant criteria pollutants and precursors are summarized in Table 8.1-10. A criteria pollutant (e.g., NO_x, CO, SO_x) can be subject to both nonattainment (i.e., new source review) and attainment (i.e., PSD) preconstruction review programs if it is an attainment pollutant while another secondary pollutant (e.g., ozone for NO_x) is a nonattainment pollutant. A new or modified facility can be subject to the elements of the two programs as shown in Table 8.1-11.

TABLE 8.1-10
Criteria Pollutant Precursors

Criteria Pollutant	Precursor
Ozone	VOC, NO_x
NO_2	NO_x
SO_2	SO_x
Sulfate	SO_x
PM_{10}	VOC, NO_x, SO_x

TABLE 8.1-11
Preconstruction Review Elements for Criteria Pollutants

Element	Rule 202 New Source Review	Rule 203 Prevention of Significant Deterioration
Preconstruction Air Quality Monitoring	-	NO_2, CO, SO_2
Best Available Control Technology (BACT)	CO, PM_{10}, NO_x, SO_x, VOC	NO_x, CO, SO_x
Emission Offsets	CO, NO_x, PM_{10}, VOC, SO_x	-
Air Quality Impact Analysis	CO, PM_{10}, NO_x, SO_x	NO_x, CO, SO_x
Protection of Class I Areas	-	NO_x, SO_x
Visibility, Soils, and Vegetation Impact Analysis	-	NO_x, SO_x

Preconstruction Air Quality Monitoring

The SMAQMD may, at its discretion, require preconstruction ambient air quality monitoring. Preconstruction monitoring data must be gathered over a one-year period to characterize local ambient air quality. SMAQMD may approve a shorter monitoring period of maximum anticipated ambient concentration.

Best Available Control Technology (BACT)

BACT must be applied to any new or modified source resulting in an increase in criteria pollutant or ozone depleting compound. The SMAQMD defines BACT as the following unless the limitations have not been demonstrated to be achievable:

- Most effective emission control device, emission limit, or technique, which has been required for a source or source category; or
- Any control device or technique determined to be technologically feasible and cost-effective.

Under no circumstances shall a BACT determination be less stringent than the emission control required by any applicable federal, state, or District laws, rules, or regulations.

Emission Offsets

For a new or modified facility, whether the project triggers the emission offset requirement is based on comparing the potential emissions from the new/modified facility with the NSR regulation offset trigger levels. The offset trigger levels are summarized in Table 8.1-12. If a project's potential emissions exceed one or more of the offset trigger levels, offsets are required for that pollutant. Depending on the distance between the proposed new/modified project and the source of the emission offsets, the amount of required emission reduction credits (ERCs) is calculated using an offset ratio that ranges from 1.3:1 to 1.5:1 for VOC and NO_x and 1.0:1 to 1.5:1 for SO_x, PM_{10}, and CO.

TABLE 8.1-12
Emission Offset Trigger Levels

Pollutant	Offset Trigger Level (lbs/quarter)
VOC	7,500
CO	49,500
NO_x	7,500
SO_x	13,650
PM_{10}	7,500

Air Quality Impact Analysis

Under the NSR regulations, an air quality dispersion analysis may be required, using an approved dispersion model, to ensure that the new/modified facility will not prevent or interfere with the attainment or maintenance of any applicable ambient air quality standard.

An air quality dispersion analysis must also be conducted, using an approved dispersion model, to evaluate impacts on ambient air quality of significant PSD increases of NO_x and SO_x emissions from any new or modified major stationary source. Project emissions must not cause an exceedance of any AAQS and the increase in ambient air concentrations must not exceed the allowable increments shown in Table 8.1-13.

TABLE 8.1-13
PSD Class II Increments

Pollutant	Averaging Period	Allowable Increment ($\mu g/m^3$)
NO_2	Annual	25
	3-Hour	512
SO_2	24 -Hour	91
	Annual	20

Protection of Class I Areas

A modeling analysis must be conducted to assess the impacts of project emissions on visibility in nearby Class I areas if the increase in NO_x and PM_{10} emissions exceeds 40 tpy or 15 tpy, respectively. The increase in ambient air quality concentrations for the PSD attainment pollutants (i.e., NO_x and SO_x) within the nearest Class I area must also be characterized if there is a significant emission increase associated with the new or modified major source.

Visibility, Soils, and Vegetation Impacts

Impairment to visibility, soils, and vegetation resulting from NO_x or SO_x emissions as well as associated commercial, residential, industrial, and other growth must be analyzed. Cumulative impacts to local ambient air quality must also be analyzed.

Administering Agency: SMAQMD, with USEPA Region IX and ARB oversight.

8.1.4.3.4 SMAQMD - New Source Review of Toxic Air Contaminants

Authority: H&SC §41700 et seq.

Purpose and Requirements: Under the Health and Safety Code, the District is given broad authority to protect the public from the discharge of air contaminants that endanger health and safety. Consequently, the District developed risk assessment guidelines for new and modified stationary sources[4]. These guidelines establish allowable risks for new or modified sources of TAC emissions. The guidelines specify limits for maximum individual cancer risk (MICR), cancer burden, and noncarcinogenic acute and chronic hazard indices (HIs) for new or modified sources of TAC emissions. While the guidelines do not specifically require the application of best available control technology for toxics (T-BACT) to any new or modified source that emits carcinogenic TACs, the rule relaxes the MICR risk threshold when T-BACT is applied. The health risks resulting from project emissions, as demonstrated with a risk assessment, must not exceed the risk thresholds shown in Table 8.1-14.

[4] SMAQMD Supplemental Risk Assessment Guidelines for New and Modified Stationary Sources, December 2000.

TABLE 8.1-14
Health Risk Thresholds

Risk Criteria	Risk Threshold
MICR (w/o T-BACT)	1×10^{-6}
MICR (w/ T-BACT)	10×10^{-6}
Chronic HI	1
Acute HI	1

Administering Agency: SMAQMD.

8.1.4.3.5 SMAQMD Rule 207 - Federal Operating Permit

Authority: H&SC §40000 et seq., H&SC §40400 et seq.

Purpose and Requirements: Rule 207 (Title V Permits) provides for the issuance of federal operating permits that contain all federally enforceable requirements for stationary sources as mandated by Title V of the Clean Air Act. Rule 207 requires major facilities and acid rain facilities undergoing modifications to obtain an operating permit containing the federally enforceable requirements mandated by Title V of the Clean Air Act. A new stationary source must submit a complete Title V application within 12 months of commencing operation. The application submitted to the District must present all information necessary to evaluate the subject facility and determine the applicability of all regulatory requirements.

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.3.6 SMAQMD Rule 208 - Acid Rain Permit

Authority: H&SC §40000 et seq., H&SC §40400 et seq.

Purpose and Requirements: Rule 208 (Acid Rain) provides for the issuance of acid rain permits in accordance with Title IV of the Clean Air Act. Rule 208 requires a subject facility to hold emissions allowances for SO_x, and to monitor SO_x, NO_x, and CO_2 emissions and exhaust gas flow rates (monitoring of operating parameters such as fuel use and fuel constituents is an allowable alternative to exhaust CEM systems). An acid rain facility, such as the CPP project, must also obtain an acid rain permit as mandated by Title IV of the Clean Air Act. A permit application must be submitted to the SMAQMD at least 24 months before operation of the new units commences. The application must present all relevant sources at the facility, a compliance plan for each unit, applicable standards, and an estimated commencement date of operation.

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.3.7 SMAQMD Regulation 8- Standards of Performance for New Stationary Sources

Authority: H&SC §40000 et seq., H&SC §40400 et seq.

Purpose and Requirements: Regulation 8 (New Source Performance Standards) incorporates, by reference, the provisions of Part 60, Chapter I, Title 40 of the Code of Federal Regulations. Regulation 8 requires compliance with federal Standards of Performance for Stationary Gas Turbines.

Subpart GG (Standards of Performance for Stationary Gas Turbines) applies to gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules per hour (Gj/hr), or 10.15 million British thermal units per hour (MMBtu/hr), at the higher heating value. The NSPS limits the sulfur content of fuel to 0.8 percent. The NSPS also limits NO_x emissions as determined by the following equation:

$$STD = \frac{0.0150\ (14.4)}{Y} + F$$

Where:

STD = allowable NO_x emissions (percent by volume at 15 percent O_2 on a dry basis)

Y = manufacturer's rated heat rate at peak load (kilojoules per watt hour)

F = NO_x emission allowance for fuel-bound nitrogen (assumed to be zero for natural gas)

Administering Agency: SMAQMD, with USEPA Region IX oversight.

8.1.4.3.8 SMAQMD Prohibitory Rules

Authority: H&SC §40000 et seq., H&SC §40400 et seq., indicated SMAQMD Rules

Purpose and Requirements: Relevant local prohibitory rules of the SMAQMD include the following:

- Rule 401 – Ringlemann Chart: Establishes limits for visible emissions from stationary sources. Rule 401 prohibits visible emissions as dark or darker than Ringelmann No. 1 for periods greater than three minutes in any hour.
- Rule 402 - Nuisance: Prohibits the discharge from a facility of air pollutants that cause injury, detriment, nuisance, or annoyance to the public, or that damage business or property.
- Rule 403 - Fugitive Dust: Establishes requirements to reduce the amount of PM entrained in the ambient air as a result of man-made fugitive dust sources. Rule 403 requires the implementation of best available control measures to minimize fugitive dust emissions and prohibits visible dust emissions beyond the property line.
- Rule 404 – Particulate Matter: Limits the discharge to the atmosphere from any source of particulate matter in excess of 0.1 grains per dry standard cubic foot.
- Rule 413 – Stationary Gas Turbines: Establishes limits for emissions of NO_x from stationary gas turbines. For natural gas-fired gas turbines equipped with SCR systems, Rule 413 limits NO_x emissions to 9 ppm @ 15 percent O_2.
- Rule 420 – Sulfur Content of Fuels: Rule 420 limits the sulfur content of natural gas to 50 grains per 100 cubic feet.

8.1.4.4 Involved Agencies and Agency Contacts

Each level of government has adopted specific regulations that limit emissions from electrical power generation facilities and are applicable to this project. The agencies with air quality permitting authority for this project are shown in Table 8.1-15. The authority, purpose, and administering agency for each of these are discussed in more detail below.

TABLE 8.1-15
Air Quality Agencies

Agency	Authority	Contact
USEPA Region IX	Oversight of permit issuance, enforcement	Gerardo Rios, Chief Permits Office USEPA Region IX 75 Hawthorne Street San Francisco, CA 94105 (415) 744-1254
California Air Resources Board (ARB)	Regulatory oversight	Michael Tollstrup, Chief Project Assessment Branch California Air Resources Board 2020 L Street Sacramento, CA 95814 (916) 322-6026
Sacramento Metropolitan Air Quality Management District (SMAQMD)	Permit issuance, enforcement	Jorge DeGuzman Program Supervisor Stationary Source Permitting Sacramento Metropolitan Air Quality Management District 777 12th Street Sacramento, CA 95814 (916) 874-4800

8.1.4.5 Permits Required

Table 8.1-16 summarizes the air quality permits required for the proposed project. As shown by the information in this table, the proposed project will trigger the requirements of the Title IV, Title V, NSPS, PSD, and NSR programs. The requirements of each of these regulatory programs will be included in a single Title V permit issued by the SMAQMD.

8.1.5 Environmental Consequences

This section presents the environmental consequences of the project, including emissions and ambient air quality impacts from construction and operation of the facility, and demonstrates compliance with applicable LORS.

The facility is subject to SMAQMD Rules 201, 202, and 203, which contain the District's New Source Review (NSR) and Prevention of Significant Deterioration (PSD) permitting requirements.

The District NSR regulation requires that BACT be used, emission offsets be provided, and an air quality impact analysis be performed. Ambient air quality impact analyses have been conducted to satisfy District and USEPA requirements, as well as CEC requirements, for

TABLE 8.1-16
Laws, Ordinances, Regulations, Standards (LORS), and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
FEDERAL					
Clean Air Act (CAA) §160-169A and implementing regulations, Title 42 United States Code (USC) §7470-7491 (42 USC 7470-7491), Title 40 Code of Federal Regulations (CFR) Parts 51 & 52 (40 CFR Parts 51 & 52). (Prevention of Significant Deterioration Program)	Requires prevention of significant deterioration (PSD) review and facility permitting for construction of new or modified major stationary sources of air pollution. PSD review applies to pollutants for which ambient concentrations are lower than NAAQS.	SMAQMD, with USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-45-46
CAA §171-193, 42 USC 7501 et seq., 40 CFR Parts 51 & 52 (New Source Review)	Requires new source review (NSR) facility permitting for construction or modification of specified stationary sources. NSR applies to pollutants for which ambient concentration levels are higher than NAAQS.	SMAQMD, with USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-47-50
CAA §401 (Title IV), 42 USC 7651 et seq., 40 CFR parts 51 & 52 (Acid Rain Program)	Requires reductions in NO_x and SO_x emissions.	SMAQMD, with USEPA Region IX oversight	Issues Acid Rain permit after review of application.	Part of Title V permit.	8.1.5.2.5 Page 8.1-47
CAA §501 (Title V), 42 USC 7414, 40 CFR Part 64 (CAM Rule)	Establishes on-site monitoring requirements for emission control systems.	SMAQMD, with USEPA Region IX oversight	If applicable, CAM requirements will be included in Title V permit as monitoring/reporting requirements.	Title V permit application to be submitted within 12 months of commencing operation.	8.1.5.2.5 Page 8.1-47
CAA §501 (Title V), 42 USC 7661, 40 CFR Part 70 (Federal Operating Permits Program)	Establishes comprehensive operating permit program for major stationary sources.	SMAQMD, with USEPA Region IX oversight	Issues Title V permit after review of application.	Title V permit application to be submitted within 12 months of commencing operation.	8.1.5.2.5 Page 8.1-47

TABLE 8.1-16
Laws, Ordinances, Regulations, Standards (LORS), and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
CAA §112, 42 USC 7412, 40 CFR Part 63 (National Emission Standards for Hazardous Air Pollutants)	Establishes national emission standards to limit HAPs from existing major sources of HAP emissions.	SMAQMD, with USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-47
CAA §111, 42 USC 7411, 40 CFR Part 60 (New Source Performance Standards – NSPS)	Establishes national standards of performance for new stationary sources.	SMAQMD, with USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-47
STATE					
California Health & Safety Code 17 (H&SC) §§44300-44384; California Code of Regulations (CCR) §§93300-93347 (Toxic "Hot Spots" Act)	Requires preparation and biennial updating of facility emission inventory of hazardous substances; risk assessments, notification, and plans to reduce risks.	SMAQMD, with ARB oversight	After project review, issues PTC with conditions limiting emissions.	Screening HRA submitted as part of AFC, CEC approval of AFC	8.1.5.2.5 Page 8.1-50-51
California Public Resources Code §25523(a); 20 CCR §§1752, 1752.5, 2300-2309, and Division 2, Chapter 5, Article 1, Appendix B, Part(k) (CEC & ARB Memorandum of Understanding)	Requires that CEC's decision on PTC include requirements to assure protection of environmental quality; AFC required to address air quality protection, including mitigation.	CEC	After project review, issues Final Certification of Compliance with conditions limiting emissions.	SMAQMD approval of AFC, i.e., FDOC, to be obtained prior to CEC approval.	8.1.5.2.5 Page 8.1-14
H&SC §41700 (Public Nuisance)	Prohibits emissions in quantities that adversely affect public health, other businesses, or property.	SMAQMD, with ARB oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-50

TABLE 8.1-16
Laws, Ordinances, Regulations, Standards (LORS), and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
LOCAL					
SMAQMD Rule 202, H&SC §§40910-40930 (Review of New or Modified Sources)	NSR: Requires that preconstruction review be conducted for all proposed new or modified sources of air pollution, including BACT, emissions offsets, and air quality impact analysis. NSR applies to pollutants for which ambient concentration levels are higher than state or federal AAQS.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-47-50
SMAQMD Air Quality Plan & H&SC §41914	Defines proposed strategies including stationary source control measures and new source review rules.	SMAQMD, with ARB oversight	Addressed in SMAQMD Rules and Regulations.	Not applicable	Not applicable
SMAQMD Rule 203, H&SC §39500 et seq. (Prevention of Significant Deterioration Program)	Requires PSD review and facility permitting for construction of new or modified major stationary sources of air pollution. PSD review applies to pollutants for which ambient concentrations are lower than NAAQS.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-47-49
SMAQMD Regulation 8, Part 60, Chapter I, Title 40, Subpart GG, H&SC §40000 et seq. (Standards of Performance for New Stationary Sources)	By reference, incorporates the provisions of 40 CFR Part 60, Subpart GG, compliance with Federal Standards of Performance for Stationary Gas Turbines (Subpart GG).	SMAQMD, with USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-47
SMAQMD Rule 207, H&SC §40000 et seq., and H&SC §40400 et seq. (Title V - Federal Operating Permits)	Implements operating permits requirements of CAA Title V.	SMAQMD, with ARB and USEPA Region IX oversight	Issues Title V permit after review of application.	Title V permit application to be submitted within 12 months of commencing operation.	8.1.5.2.5 Page 8.1-47

TABLE 8.1-16
Laws, Ordinances, Regulations, Standards (LORS), and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
SMAQMD Rule 208, H&SC §40000 et seq., and H&SC §40400 et seq. (Acid Rain)	Implements acid rain regulations of CAA Title IV.	SMAQMD, with ARB and USEPA Region IX oversight	Included in Title V permit.	The permit application must be submitted to the SMAQMD at least 24 months prior to commencement of operation.	8.1.5.2.5 Page 8.1-47
SMAQMD Rule 201, H&SC §40000 et seq., and H&SC §40400 et seq. (Permit to Construct)	Defines procedures for review of new and modified sources of air pollution.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before commencement of construction.	8.1.5.2.5 Page 8.1-47-50
SMAQMD Rule 401, H&SC §40000 et seq., and H&SC §40400 et seq. (Ringelmann Chart)	Limits visible emissions to no darker than Ringelmann No. 1 for periods greater than 3 minutes in any hour.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before commencement of construction.	8.1.5.2.5 Page 8.1-50
SMAQMD Rule 402, H&SC §40000 et seq., and H&SC §40400 et seq. (Public Nuisance)	Prohibits emissions in quantities that cause injury, detriment, or annoyance to the public; or that damages businesses or property.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-50
SMAQMD Rule 403, H&SC §40000 et seq., and H&SC §40400 et seq. (Fugitive Dust)	Limits fugitive dust emissions from man-made fugitive dust sources.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-50
SMAQMD Rule 404, H&SC §40000 et seq., and H&SC §40400 et seq. (Particulate Matter)	Limits the particulate grain loading to 0.1 gr/dscf for stationary sources.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-50
SMAQMD Rule 406, H&SC §40000 et seq., and H&SC §40400 et seq. (Specific Contaminants)	Limits SO_x and particulate emissions from stationary sources.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-50

TABLE 8.1-16
Laws, Ordinances, Regulations, Standards (LORS), and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
SMAQMD Rule 413, H&SC §40000 et seq., and H&SC §40400 et seq. (Stationary Gas Turbines)	Limits NO_x emissions from stationary gas turbines.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-50
SMAQMD Rule 420, H&SC §40000 et seq., and H&SC §40400 et seq. (Sulfur Content of Fuels)	Limits the sulfur content of natural gas to reduce SO_x emissions from stationary combustion sources.	SMAQMD, with ARB and USEPA Region IX oversight	After project review, issues PTC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.2.5 Page 8.1-50

criteria pollutants (NO_2, CO, PM_{10}, and SO_2), noncriteria pollutants, and construction and demolition impacts. The applicability of the District regulatory requirements and facility compliance with these requirements is based on facility emission levels and ambient air quality impact analyses.

Maximum pollutant emission rates and ambient impacts of the project have been evaluated to determine compliance with District and federal regulations. The new emissions sources include four new gas turbines and four new unfired heat recovery steam generators (HRSGs). Incidental equipment will include two new cooling towers. The project will be constructed in two separate phases. The first phase will include the installation of two gas turbines, two HRSGs, and one cooling tower. A few years after Phase I of the project is complete, the remaining gas turbines, HRSGs, and cooling tower will be installed. This analysis is based on the installation/operation of all four gas turbines/HRSGs and two cooling towers. Actual operation of the gas turbines/HRSGs ranges between 50 percent and 100 percent of maximum rated output. Emission control systems will be fully operational during all modes of operation except startup and shutdown. Maximum annual emissions are based on operation of the facility at maximum firing rates and include the expected maximum number of startups that may occur in a year. Each gas turbine startup will result in transient emission rates until steady-state operation for the gas turbine and emission control systems is achieved.

The criteria pollutant ambient impact analysis uses pollutant-specific maximum hourly, daily, and annual emission rates from the facility. This allows calculation of maximum ambient impacts for each pollutant and averaging period. The following sections describe the emission sources that have been evaluated for the facility, the analyses of ambient impacts, and the evaluation of facility compliance with the applicable air quality regulations.

8.1.5.1 Construction Phase Impacts

Analysis of the potential ambient impacts from air pollutants during the construction of the new equipment includes an assessment of emissions from vehicle and equipment exhaust and the fugitive dust generated from material handling. A detailed analysis of the emissions and ambient impacts is included in Appendix 8.1A. With the exception of the maximum modeled 24-hour PM_{10} concentrations, the results of the analysis indicate that the maximum construction and demolition impacts will be below the state and federal standards for all the criteria pollutants emitted. The best available emission control techniques will be used.

8.1.5.2 Operational Impacts

8.1.5.2.1 Emissions from the New Equipment

As discussed in Section 2, the new equipment consists of four GE Model 7241FA combustion gas turbines, each rated at 175 megawatts (MW) (nominal); and four unfired heat recovery steam generators. Incidental equipment will include two 9-cell mechanical-draft evaporative cooling towers. Natural gas will be the only fuel used at the facility. Typical specifications for natural gas fuel are shown in Table 8.1-17.

TABLE 8.1-17
Typical Natural Gas Analysis, CPP Project

Parameter	Value
Carbon Dioxide	0.75%
Nitrogen	1.08%
Methane	95.58%
Ethane	2.39%
Propane	0.16%
Butane	0.02%
Pentane	0.01%
Hexane and higher	0.01%
Sulfur Content	Less than 0.25 gr/100 scf
High Heating Value (HHV)	1,018 Btu/ft^3 22,912 Btu/lb

Source: Analysis of typical PG&E gas delivered to SMUD.

Fuel combustion results in the formation of NO_x, SO_x, unburned hydrocarbons (VOC), PM_{10}, and CO. The combustion gas turbines will be equipped with dry low NO_x combustors that minimize the formation of NO_x and CO. To further reduce gas turbine NO_x, selective catalytic reduction (SCR) control systems will be provided. Ammonia (NH_3) will be used in the SCR system; therefore, unreacted NH_3 emissions have also been analyzed. Because natural gas is a clean-burning fuel, there will be minimal formation of combustion PM_{10} and SO_x.

Criteria Pollutant Emissions. The gas turbine emission rates have been estimated from vendor data, facility design criteria, and established emission calculation procedures. Emission rates for the combustion gas turbines at low and high ambient air temperatures are shown in Tables 8.1.18 and 8.1-19.

TABLE 8.1-18
Emissions from Combustion Turbines (104°F and 17 percent relative humidity)[a]

Pollutant	ppmvd @ 15 percent O_2	Lb/MMBtu	Lbs/Hr (per gas turbine)
NO_x (1 hr avg.)[b]	2.5	0.0091	15.49
NO_x (annual avg.)[b]	2.0	0.0072	12.39
SO_x [d]	0.14	0.0007	1.20
CO (1hr avg.)[b]	6.0	0.0132	22.62
VOC[b]	1.4	0.0018	3.02

TABLE 8.1-18
Emissions from Combustion Turbines (104°F and 17 percent relative humidity)[a]

Pollutant	ppmvd @ 15 percent O_2	Lb/MMBtu	Lbs/Hr (per gas turbine)
PM_{10}[b, c]	0.002 gr/dscf	0.0053	9.00

[a] Emission rates shown reflect the highest value at any operating load.
[b] CPP project design criteria.
[c] 100 percent of particulate matter emissions assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half.
[d] Based on expected maximum fuel sulfur content of 0.25 gr/100 scf fuel.

TABLE 8.1-19
Emissions from Combustion Gas Turbines (34°F and 59 percent relative humidity)[a]

Pollutant	ppmvd @ 15 percent O_2	Lb/MMBtu	lbs/hr (per gas turbine)
NO_x (1hr avg.)[b]	2.5	0.0090	16.89
NO_x (annual avg.)[b]	2.0	0.0072	13.51
SO_x[d]	0.14	0.0007	1.31
CO (1hr avg.)[b]	6.0	0.0132	24.68
VOC[b]	1.4	0.0018	3.30
PM_{10}[b,c]	0.001 gr/dscf	0.0048	9.00

[a] Emission rates shown reflect the highest value at any operating load.
[b] CPP project design criteria.
[c] 100 percent of particulate matter emissions assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half.
[d] Based on expected maximum fuel sulfur content of 0.25 gr/100 scf fuel.

Maximum emission rates expected to occur during a startup or shutdown are shown in Table 8.1-20. PM_{10} and SO_x emissions have not been included in this table because emissions of these pollutants will be lower during a startup period than during baseload facility operation.

TABLE 8.1-20
Expected Facility Startup and Shutdown Emission Rates (per gas turbine)[a]

	NO_x	CO	VOC
Startup or Shutdown, lbs/hour	80	902	16
Startup, lbs/start[b]	240	2,706	48

[a] Estimated based on vendor data and source test data. See Appendix 8.1B, Tables 8.1B-3 and 8.1B-4.
[b] Based on maximum of 3 hours per cold start.

The maximum firing rates of the gas turbines for daily and annual fuel consumption rates and operating restrictions are used to calculate maximum potential hourly, daily, and annual emissions for each pollutant. The maximum heat input rates (fuel consumption rates) for the combined cycle operation are shown in Tables 8.1-21 and 8.1-22. These are based on a maximum of 8,760 operating hours per year, per turbine, with each turbine operating at 100 percent load with ambient conditions of 104°F and 17 percent relative humidity and 34°F and 59 percent relative humidity.

TABLE 8.1-21
Maximum Combined Cycle Operation Heat Input Rates (HHV)
(104°F and 17 percent Relative Humidity)

Period	Total Fuel Use, Four Gas Turbines		Gas Turbines, each	Duct Burners, each	
Per Hour	6,840	MMBtu/hr	1,710	N/A	MMBtu/hr
Per Day	164,160	MMBtu/day	41,040	N/A	MMBtu/day
Per Year	59,918,400	MMBtu/yr	14,979,600	N/A	MMBtu/yr

TABLE 8.1-22
Maximum Combined Cycle Operation Heat Input Rates (HHV)
(34°F and 59 percent Relative Humidity)

Period	Total Fuel Use, Four Gas Turbines		Gas Turbines, each	Duct Burners, each	
Per Hour	7,460	MMBtu/hr	1,865	N/A	MMBtu/hr
Per Day	179,040	MMBtu/day	44,760	N/A	MMBtu/day
Per Year	65,349,600	MMBtu/yr	16,337,400	N/A	MMBtu/yr

Analysis of maximum emissions from the new equipment was based on the emission rates during typical operations shown in Tables 8.1-18 and 8.1-19, the expected startup emission rates shown in Table 8.1-20, and the ambient conditions that result in the highest emission rates. Maximum emissions for each period were determined by evaluating the following operating cases for hourly, daily, and annual operations.

Maximum Hourly Emissions:

- Two gas turbines in startup mode.
- Two gas turbines at full load.

Maximum Daily Emissions:

- Gas turbines in startup mode for 3 hours, followed by 21 hours of full-load operation.

Maximum Annual Emissions:

- Each gas turbine has 180 hours of startups and shutdowns per year.
- Each gas turbine operates at full load for the remaining 8,580 hours.

The maximum annual, daily, and hourly emissions for the new equipment are shown in Table 8.1-23. Annual emissions of CO and NO_x are based on expected emission rates that are lower than the short-term maxima shown in Tables 8.1-18 and 8.1-19. Detailed emission calculations appear in Appendix 8.1B, Tables 8.1B-1 and 8.1B-2.

Noncriteria Pollutant Emissions. Noncriteria pollutants are compounds that have been identified as pollutants that pose a significant health hazard. Nine of these pollutants are regulated under the federal New Source Review program: lead, asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds.[5] In addition to these nine compounds, the federal Clean Air Act lists 189 substances as potential hazardous air pollutants (Clean Air Act Sec. 112(b)(1)). Any pollutant that may be emitted from the project and is on the federal New Source Review list and/or the federal Clean Air Act list has been evaluated as part of the AFC. Emission factors were determined by reviewing the available technical data, determining the products of combustion, and/or using material balance calculations.

TABLE 8.1-23
Emissions from New Equipment (Gas Turbines and Cooling Towers)[a]

	NO_x	SO_x	CO	VOC	PM_{10}
Maximum Hourly Emissions (lbs/hr)					
Gas Turbines[b]	193.8	5.2	1,853.4	38.6	36.1
Cooling Towers	--	--	--	--	0.4
Total =	193.8	5.2	1,853.4	38.6	36.3
Maximum Daily Emissions (lbs/day)					
Gas Turbines[b]	2,378.7	126.0	12,897.1	469.0	863.9
Cooling Towers	--	--	--	--	7.2
Total =	2,378.7	126.0	12,897.1	469.0	871.1
Maximum Annual Emissions (tpy)					
Gas Turbines[b]	251.1	21.9	730.8	60.0	157.8
Cooling Towers	--	--	--	--	1.2
Total =	251.1	21.9	730.8	60.0	159.0

[a] See Appendix 8.1B, Tables 8.1B-1 and 8.1B-2 for calculations.
[b] Includes startup emissions.

Noncriteria pollutant emission factors for the analysis of emissions from the gas turbines were obtained from AP-42 (Table 3.1-3, 4/00, and Table 3.4-1 of the Background Document for Section 3.1), from the California Air Resources Board's CATEF database for gas turbines, and from source tests on a similar turbine. Specifically, factors for all pollutants except formaldehyde, hexane, propylene, and naphthalene and other PAHs were taken from AP-42. AP-42 did not contain factors for hexane or propylene, and did not include speciated

[5] These pollutants are regulated under federal and state air quality programs; however, they are evaluated as noncriteria pollutants by the California Energy Commission.

data for PAHs. Factors for these pollutants and for naphthalene were taken from the CATEF database (mean values). The emission factor for formaldehyde is based on a recent determination made by USEPA for a dry low- NO_x combustor-equipped large frame turbine.[6] Noncriteria pollutant emissions from the cooling towers were calculated from an analysis of cooling tower water supplies.

The noncriteria pollutants that may be emitted from the project are shown in Appendix 8.1B, Tables 8.1B-7 and 8.1B-8. Since emissions of each individual HAP are below 10 tons per year and total HAP emissions are below 25 tons per year, the turbines are not subject to the MACT requirements of 40 CFR Part 63.

8.1.5.2.2 Air Quality Impact Analysis

Air Quality Modeling Methodology

An assessment of impacts on ambient air quality of the proposed facility has been conducted using USEPA-approved air quality dispersion models. These models are based on fundamental mathematical descriptions of atmospheric processes in which a pollutant source can be related to a receptor area. The modeling analysis was performed pursuant to a modeling protocol approved by the SMAQMD (see Appendix 8.1C).

The impact analysis was used to determine the worst-case ground-level impacts of the project. The results were compared with established ambient air quality standards and significance levels. If the standards are not violated and significance levels are not exceeded under worst-case conditions, then no exceedances are expected under any conditions. In accordance with the air quality impact analysis guidelines (USEPA, 1998; ARB,1989), the ground-level impact analysis includes the following worst-case dispersion conditions:

- Impacts in simple terrain,
- Impaction of plume on elevated terrain,
- Aerodynamic downwash due to nearby building(s), and
- Impacts from fumigation conditions.

Simple terrain impacts were assessed for meteorological conditions that would cause the plume to loop, cone, or fan out. Looping plumes occur when the atmosphere is very unstable, such as on a bright sunny afternoon when vigorous convective mixing of the air can transport the entire plume to ground level near the source. Coning plumes occur throughout the day when the atmosphere is neutral or slightly unstable. Fanning plumes are most common at night when the atmosphere is stable and vertical motions are suppressed.

Plume impaction on elevated terrain, such as on the slope of a nearby hill, can cause high ground-level concentrations, especially under stable atmospheric conditions. High ground-level pollutant concentrations can also be caused by building downwash. Building downwash occurs when a building is in close proximity to the emission stack and results in plume wake around the building. The stack plume is drawn downward to the ground by the lower pressure region that exists in the turbulent wake on the lee side of an adjacent building.

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6 August 21, 2001, letter from Sims Roy at EPA.

Fumigation conditions occur when a stable layer of air lies a short distance above the release point of the plume and an unstable air layer lies below. The low mixing height that results from this condition allows little diffusion of the stack plume before it is carried downwind to the ground. Although fumigation conditions rarely last as long as an hour, relatively high ground-level concentrations may be reached during that period. Fumigation tends to occur under clear skies and light winds, and is more prevalent in the summer.

The basic model equation used in this analysis assumes that the concentrations of emissions within a plume can be characterized by a Gaussian distribution about the centerline of the plume (see Figure 8.1-19). Concentrations of an emitted substance at any location downwind of a point source such as a stack can be determined from the following equation:

$$C(x,y,z,H) = \left(\frac{Q}{2\pi\sigma_y\sigma_z u}\right) * \left(e^{-1/2(y/\sigma_y)^2}\right) * \left[\left\{e^{-1/2(z-H/\sigma_z)^2}\right\} + \left\{e^{-1/2(z+H/\sigma_z)^2}\right\}\right]$$

where:

C	=	the concentration in the air of the substance or pollutant in question
Q	=	the pollutant emission rate
σ_y,σ_z	=	the horizontal and vertical dispersion coefficients, respectively, at downwind distance x
u	=	the wind speed at the height of the plume center
x,y,z	=	the variables that define the 3-dimensional Cartesian coordinate system used; the downwind, crosswind, and vertical distances from the base of the stack (see Figure 8.1-21)
H	=	the height of the plume above the stack base (the sum of the height of the stack and the vertical distance that the plume rises due to the momentum and/or buoyancy of the plume)

The Gaussian dispersion models approved by USEPA for regulatory use are generally conservative (i.e., the models tend to over-predict actual impacts). The USEPA models were used to determine if ambient air quality standards may be exceeded, and whether a more accurate and sophisticated modeling procedure would be warranted to make the impact determination. The following sections describe the following.

- Screening procedures;
- Refined air quality impact analysis;
- Existing ambient pollutant concentrations and preconstruction monitoring;
- Results of the ambient air quality modeling analyses; and
- PSD increment consumption.

The screening and refined air quality impact analyses were performed using the latest version of the Industrial Source Complex, Short-Term Model ISCST3 (Version 00101). ISCST3 is a versatile Gaussian dispersion model capable of assessing impacts from a variety of separate sources in regions of simple, intermediate, and complex terrain. The model can account for settling and dry deposition of particulate; area, line, and volume sources; plume rise as a function of downwind distance; separation of point sources; and elevated receptors. The model is capable of estimating concentrations for a wide range of averaging times (from one hour to one year). Impacts in simple terrain under downwash conditions, particularly areas close to the stack where building downwash may occur, were also estimated using the ISCST3 model.

Inputs required by the ISCST3 model include the following:

- Model options;
- Meteorological data;
- Source data; and
- Receptor data.

Model options refer to user selections that account for conditions specific to the area being modeled or to the emissions source that needs to be examined. Examples of model options include use of site-specific vertical profiles of wind speed and temperature; consideration of stack and building wake effects; and time-dependent exponential decay of pollutants. The model supplies recommended default options for the user. Except where explicitly stated, such as for building downwash (described in more detail below), default values were used. A number of these default values are required for USEPA and local District approval of model results. The USEPA regulatory default options used include stacktip downwash effects and buoyancy-induced dispersion for heated effluent.

The performance of ISCST3 is improved by the use of actual meteorological data. The USEPA criteria for determining whether the meteorological data are representative are the proximity of the meteorological monitoring site to the area under consideration; the complexity of the terrain; the exposure of the meteorological monitoring site; and the period of time during which the data are collected. The meteorological data set determined to be representative for use for the proposed project consists of data collected by the SMAQMD at the Sacramento Executive Airport for the period 1985 through 1989. These data meet the USEPA criteria (USEPA, On-Site Meteorological Program Guidance for Regulatory Model Applications, August 1995) for representativeness, as follows:

- Proximity: The data were collected within 25 miles of the project site, and thus meet the criteria for proximity.

- Complexity of Terrain and Exposure of Meteorological Monitoring Site: The terrain surrounding the meteorological station is the same as the terrain surrounding the project—fairly flat. There are no terrain features that would cause the meteorological data to be affected differently than the project site, so the exposures of the station and the project are identical.

- Period of Data Collection: The 1985-1989 data set comprises five complete years of data.

The required emission source data inputs to ISCST3 include source locations, source elevations, stack heights, stack diameters, stack exit temperatures and velocities, and emission rates. The source locations are specified for a Cartesian (x,y) coordinate system where x and y are distances East and North in meters, respectively. The stack height that can be used in the model is limited by federal Good Engineering Practice (GEP) stack height restrictions, discussed in more detail below. In addition, ISCST3 requires nearby building dimension data to calculate the impacts of building downwash.

For the purposes of modeling, a stack height beyond what is required by GEP is not allowed (40 CFR 52.21 (h)). However, this requirement does not place a limit on the actual constructed height of a stack. GEP, as used in modeling analyses, is the maximum height allowed to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, or wakes that may be created by the source itself, nearby structures, or nearby terrain obstacles. In addition, the GEP modeling restriction assures that any required regulatory control measure is not compromised by the effect of that portion of the stack that exceeds the GEP. The USEPA guidance (USEPA, 1985) for determining GEP stack height is as follows:

$$H_g = H + 1.5L$$

where

H_g = GEP stack height, measured from the ground-level elevation at the base of the stack

H = height of nearby structure(s) measured from the ground-level elevation at the base of the stack

L = lesser dimension, height or projected width, of nearby structure(s)

In using this equation, the guidance document indicates that both the height and width of the structure are determined from the frontal area of the structure, projected onto a plane perpendicular to the direction of the wind.

For regulatory applications, a building is considered sufficiently close to a stack to cause wake effects when the distance between the stack and the nearest part of the building is less than or equal to five times the lesser of the height or the projected width of the building. The building dimensions were analyzed using software specifically designed for this purpose (program BEE-BPIP (Building Profile Input Program) to derive 36 wind-direction-specific building heights and building widths for use in downwash calculations. The building dimensions used in the GEP analysis are shown in Appendix 8.1D, Table 8.1D-5. This analysis results in a GEP stack height of 213 feet for the new gas turbines. The proposed gas turbine stack height of 160 feet does not exceed GEP stack heights.

Screening Procedures

To ensure the impacts analyzed were for maximum emission levels and worst-case dispersion conditions, a screening procedure was used to determine the inputs to the impact modeling. The screening procedure analyzed the gas turbine operating conditions that would result in the maximum impacts, on a pollutant-specific basis. The operating conditions examined in this screening analysis, along with their exhaust and emission characteristics, are shown in Appendix 8.1D, Table 8.1D-1. These operating conditions represent a range of gas turbine loads (100 percent and 50 percent) at maximum and minimum anticipated operating temperatures [104°F/17 percent relative humidity (RH) and 34°F/59 percent RH].

The operating conditions were screened for worst-case ambient impact using USEPA's ISCST3 model and the meteorological data described above. The results of the screening procedure are presented in Appendix 8.1D, Table 8.1D-2, and are summarized in Table 8.1-24. The stack parameters for the turbine operating condition that produced the maximum modeled screening level impact for each pollutant and averaging period were then used in the refined modeling analysis to evaluate the modeled impacts of the entire project for that pollutant and averaging period.

TABLE 8.1-24
Results of Screening Procedure: New Gas Turbines/HRSGs Operating Conditions Producing Maximum Modeled Ambient Impacts

Pollutant	Average Period	Gas Turbine Load (percent)	Ambient Temperature (°F)
NO_x	1-hour	50%	34
	Annual	50%	34
SO_2	1-hour	50%	34
	3-hour	50%	34
	24-hour	50%	34
	Annual	50%	34
CO	1-hour	50%	34
	8-hour	50%	34
TSP/PM_{10}	24-hour	50%	104
	Annual	50%	104

The screening analysis included both simple and complex terrain. Terrain features were taken from USGS digital elevation model (DEM). For the screening and refined analysis, a coarse Cartesian grid of receptors spaced at 180 meters was used. The coarse grid extended to approximately 10 kilometers in all directions around the facility to ensure that maximum turbine impacts were identified. A refined grid of receptors spaced at 30 meters was used in areas where the coarse grid analysis indicated modeled maxima will be located. Receptors were also placed at 25 meters along the facility fenceline. A map showing the layout of the modeling grid is presented in Figure 8.1-22.

Refined Air Quality Impact Analysis

The modeling input assumptions for each pollutant and averaging period are shown in Appendix 8.1D, Table 8.1D-3. As discussed above, the gas turbine stack parameters used in modeling the impacts for each pollutant and averaging period reflected the worst-case gas turbine operating condition for that pollutant and averaging period identified in the screening analysis.

For the evaluation of ambient impacts under the District NSR/PSD regulations, the new gas turbines were modeled. For the evaluation of ambient impacts under CEQA, operation of the new gas turbines and cooling tower were modeled (i.e., facility-wide emissions).

Specialized Modeling Analyses

- **Fumigation Modeling**: Fumigation occurs when a stable layer of air lies a short distance above the release point of a plume and unstable air lies below. Under these conditions, an exhaust plume may be drawn to the ground with little diffusion, causing high ground-level pollutant concentrations. Although fumigation conditions rarely last as long as one hour, relatively high ground-level concentrations may be reached during that time.

The SCREEN3 model (version 96043) was used to evaluate maximum ground-level concentrations for short-term averaging periods (less than 24-hours). USEPA guidance (1992) was followed in evaluating fumigation impacts. Emission rates and stack parameters for the refined modeling analysis were used in the fumigation analysis. Since SCREEN3 is a single source model, a single gas turbine was modeled and the impacts were multiplied by four to determine total impacts for the gas turbines under fumigation conditions.

Calculations of inversion breakup fumigation impacts are shown in Appendix 8.1D, Table 8.1D-4.

- **Turbine Startup**: Facility impacts were also modeled during the startup of two gas turbines, with the remaining two gas turbines operating at full-load to evaluate short-term impacts under startup conditions. Emission rates during startup were based on an engineering analysis of available data, which included source test data from startups of the GE gas turbine at the Crockett Cogeneration Project. A summary of the data evaluated in developing these emission rates is shown in Appendix 8.1B, Tables 8.1B-3 and 8.1B-4.

  Gas turbine exhaust parameters for the minimum operating load point (50 percent) were used to characterize turbine exhaust during startup. Startup impacts were evaluated for both the one- and 3-hour averaging periods using ISCST3. Emission rates and stack parameters used in the startup modeling analysis for the two gas turbines in the startup mode are shown in Table 8.1-25. The emission rates for the remaining two gas turbines operating at full-load are shown in Table 8.1-19.

TABLE 8.1-25
Emission Rates and Stack Parameters Used in Modeling Analysis for Gas Turbine Startup Emissions Impacts

Parameter	Units	Value
Gas turbine stack temperature	Degrees, K	345
Gas turbine exhaust velocity	Meters per second	11.14
One-Hour Average Impacts		
NO_x emission rate[a]	Grams per second	30.24
CO emission rate	Grams per second	113.75

[a] The startup analysis for NO_x assumes a worst case emission rate from two turbines of 240 lb/hr each.

- **Gas Turbine Commissioning:** Two high emissions scenarios are possible during commissioning. The first would be the period of time prior to SCR system installation when the combustor is being tuned. Under this scenario, NO_x emissions would be high because the NO_x emissions control system would not be functioning and because the combustor would not be tuned for optimum performance. CO emissions would also be high because combustor performance would not be optimized.

The second high emissions scenario would occur when the combustor has been tuned but the SCR catalyst installations are not complete, and other parts of the gas turbine operating system are being checked out. This is likely to occur under transient conditions, characterized by 50 percent load operation.

Results of the Ambient Air Quality Modeling Analyses

Maximum facility impacts for the two scenarios modeled (the gas turbines alone and the gas turbines and cooling tower) are summarized in Table 8.1-26. The highest modeled impacts for the combustion turbines under normal operating conditions were found to occur within 3 kilometers of the facility boundary. The location of maximum modeled impacts under fumigation conditions is approximately 12 kilometers of the facility boundary.

TABLE 8.1-26
Summary of Results from Refined Modeling Analyses Maximum Impacts ($\mu g/m^3$)

		Refined Modeling			
		Gas Turbines[a]	**Entire Facility**[b]	**Fumigation**[a]	**Startup**[c]
NO_2	1-hour	18.7	18.7	2.7	260.8
	Annual	0.24[d]	0.24[d]	--	--
SO_2	1-hour	1.44	1.44	0.21	2.0
	3-hour	1.04	1.04	0.19	1.4
	24-hour	0.4	0.4	0.08	--
	Annual	0.03	0.03	--	--
CO	1-hour	27.4	27.4	3.9	917.7
	8-hour	281.3	281.3	2.8	--
PM_{10}	24-hour	4.65	4.67	0.9	--
	Annual	0.21	0.24	--	--

[a] Gas Turbines only.
[b] Gas Turbines and cooling towers.
[c] Gas Turbines only; two turbines in startup at a worst-case hourly emission rate of 240 lb/hr NO_x each and two turbines at full load.
[d] Ambient Ratio Method (ARM) corrected using USEPA correction factor of 0.75.

Impacts During Gas Turbine Commissioning

As discussed above, there are two potential scenarios during gas turbine commissioning activities under which NO_2 and CO impacts could be higher than under other operating conditions already evaluated.

Scenario 1: Under this scenario, NO_x emissions can be conservatively estimated to be twice the guaranteed gas turbine-out level of 9 ppmvd @ 15 percent O_2, or 18 ppm. If operation under this condition were to continue for one hour, maximum hourly NO_x emissions at full load would be (18 ppm/2.5 ppm) * 16.9 lbs/hr = 122 lbs/hr.

CO emissions would also be high because combustor performance would not be optimized. However, CO emissions during gas turbine commissioning are not expected to be higher than those from gas turbines during startup periods (i.e., approximately 902 lbs/hr).

Scenario 2: Under these lower load conditions, NO_x emissions could be as high as 100 ppm @ 15 percent O_2. Based on the transient nature of the loads, the average operating load would be expected to be equivalent to 50 percent of the baseload level. Worst-case hourly NO_x emissions under this scenario would be (100 ppm/2.5 ppm) * 10.8 lbs/hr = 432 lbs/hr.

Since the combustors would be tuned, CO emissions under this scenario would be expected to be equivalent to the guaranteed gas turbine-out CO level of approximately 9 ppm @ 15 percent O_2. If operation under this condition were to continue for one hour, maximum hourly CO emissions at 50 percent load would be (9 ppm/6 ppm) * 15.7 lbs/hr = 24 lbs/hr.

The results of the gas turbine screening analysis can be used to evaluate modeled NO_x and CO impacts of a single turbine at the above emission rates. The screening analysis showed that the highest one-hour NO_x /CO unit impact is 3.579 $\mu g/m^3$ per g/s. Using the 432 lbs/hr (54.5 g/s) NO_x and the 902 lbs/hr (113.8 g/s) CO emission rates derived above yields a maximum one-hour NO_x impact under either scenario of 195 $\mu g/m^3$ and a maximum one-hour CO impact under either scenario of 407 $\mu g/m^3$. Using the background NO_2 and CO concentrations of 152 and 9,200 $\mu g/m^3$, respectively, the total NO_2 impact will not exceed 347 $\mu g/m^3$ and the total CO impact will not exceed 9,607 $\mu g/m^3$. These impacts are below the state one-hour NO_2 and CO standards of 470 and 23,000 $\mu g/m^3$, respectively. Gas turbine commissioning will continue for a relatively short time, so air quality impacts are expected to be minor. In addition, modeling results are very conservative in that they tend to overestimate impacts. Therefore, it is unlikely that any violation of the one-hour NO_2 or CO standards would actually occur.

Ambient Air Quality Impacts

To determine the maximum ground-level impacts on ambient air quality for comparison to the applicable standards, modeled worst-case impacts were added to maximum observed background concentrations.

For background ambient pollutant concentrations for those pollutants that do not exceed the PSD monitoring exemption levels, USEPA guidelines (Section 2.4, USEPA, 1987) state that the existing monitoring data must be representative of the proposed facility impact area. The District monitors ambient NO_2, CO, SO_2, and PM_{10} concentrations at monitoring stations located in the project area. The Elk Grove monitoring station is located approximately 25 km west of the project site. The Sacramento Stockton Boulevard monitoring station is located approximately 35 km northwest of the project site. The Sacramento Del Paso Manor monitoring station is located approximately 38 km northwest of the site. The Sacramento T Street monitoring station is located approximately 43 km northwest of the site. These monitoring stations are located in areas that are very similar to the project site in terms of terrain and but are more developed. Consequently, concentrations monitored at these locations are expected to be similar to or higher than those at the project site. Table 8.1-27 presents the maximum concentrations of NO_x, SO_2, CO, and PM_{10} recorded for 1998 through 2000 from the monitoring stations in the project area.

TABLE 8.1-27
Maximum Background Concentrations, 1998-2000 (μg/m3)

Pollutant	Averaging Time	1998	1999	2000
NO_2	1-Hour	90.2	152.3	95.9
	Annual	16.9	20.7	18.8
PM_{10}	24-Hour	79	88	86
	Annual (AAM)[a]	23.6	25.1	22.8
	Annual (AGM)[b]	19.8	21.3	20.2
SO_2	1-Hour	78.6	78.6	N/A
	24-hour	47.2	36.7	21.0
	Annual	7.9	10.5	13.1
CO	1-Hour	9,200	9,200	N/A
	8-Hour	8,165	6,589	5,095

[a] Annual Arithmetic Mean
[b] Annual Geometric Mean

Maximum ground-level impacts due to operation of the facility are shown together with the ambient air quality standards in Table 8.1-28. Despite the conservative (overpredictive) assumptions used throughout the analysis, the results indicate that the addition of the new gas turbines will not cause or contribute to violations of any state or federal air quality standards, with the exception of the state PM_{10} standards. For this pollutant, existing concentrations already exceed the state standards; however, as discussed further below, the proposed project will result in an impact that is below PSD significance levels. In addition, offsets will be provided for the net increase in PM_{10} emissions from the project; this is also discussed further below.

TABLE 8.1-28
Modeled Maximum Project Impacts

Pollutant	Averaging Time	Maximum Project Impact[a] (μg/m3)	Background Concentrations (μg/m3)	Total Impact (μg/m3)	State Standard (μg/m3)	Federal Standard (μg/m3)
NO_2	1-hour	260.8[b]	152.3	413.1	470	--
	Annual	0.24[c]	20.7	21.0	--	100
SO_2	1-hour	2.0	78.6	80.6	650	--
	24-hour	0.4	47.2	47.6	109	365
	Annual	0.03	13.1	13.1	--	80
CO	1-hour	917.7	9,200	10,118	23,000	40,000
	8-hour	281.3	8,165	8,446	10,000	10,000
PM_{10}	24-hour	4.7[e]	88	92.7	50	150
	Annual[d]	0.2[e]	21.3	21.5	30	--
	Annual[e]	0.2[e]	25.1	25.3	--	50

[a] Entire facility including gas turbines/HRSGs and cooling towers.
[b] Reflects two turbines in startup at a worst-case NO_x emission rate of 240 lb/hr. Impacts during other operating conditions will not exceed 18.7 μg/m3
[c] ARM corrected using EPA correction factor of 0.75.
[d] Annual Geometric Mean (State).
[e] Annual Arithmetic Mean (Federal).

PSD Requirements

Applicability of PSD Requirements

As discussed in AFC Section 8.1.5, the PSD program requirements apply on a pollutant-specific basis to the following:

- A new major facility that will emit 100 tpy or more, if it is one of the 28 PSD source categories in the federal Clean Air Act (such as the proposed project), or a new facility that will emit 250 tpy or more; or
- A major modification to an existing major facility that will result in net emissions increases in excess of the PSD significant emission thresholds.

The proposed project is a new source with emissions over 100 tons/yr. Therefore, the new project is classified as a new major source. To determine whether the project will trigger PSD review, it is necessary to compare the net emission changes associated with the project to the PSD significant emission levels. The net emission changes summarized in Table 8.1-29 show that the proposed project will have a significant net emissions increase for NO_x and CO. Consequently, the project is subject to PSD review for these pollutants. Since the net emission increase for SO_x is below the PSD significance level, the project does not trigger the PSD requirements for SO_x. As shown in Table 8.1-29, because the project area is classified as a federal nonattainment area for PM_{10} and ozone, the PSD regulations do not apply to these pollutants.

TABLE 8.1-29
Comparison of Net Emissions Increase with PSD Significant Emissions Levels, CPP Project (Tons/Year)

	NO_x	SO_x	CO	VOC	PM_{10}
New Equipment Emissions[a]	251	22	731	N/A[b]	N/A[b]
PSD Significance Levels[c]	40	40	100	N/A[b]	N/A[b]
PSD Review Required?	Yes	No	Yes	N/A[b]	N/A[b]

[a] Emissions from gas turbines/HRSGs.
[b] Because the project area is classified as a federal nonattainment area for these pollutants, PSD does not apply for these pollutants.
[c] Based on 40 CFR 52.21.

Impacts in Class I Areas

PSD regulations limit the degradation of air quality in areas designated Class I by imposing more stringent limits on air quality impacts from new sources and modifications. As discussed above, the project triggers PSD review for NO_x and CO. Consequently, an analysis of the project's impacts on Class I areas located within 100 km of the project site was performed. The following are the areas designated Class I by USEPA within 100 km of the project:

- Desolation Wilderness Area
- Mokelumne Wilderness Area

For each Class I area, receptors were placed along the boundary of the area nearest the project to evaluate the maximum modeled impacts of the project on the area.

The results of the modeling analysis are compared with the Class I increments in Table 8.1-30. These results show that the modeled impacts of the project (combustion equipment only) in the nearby Class I areas are far below the PSD Class I increments and will not significantly degrade air quality.

TABLE 8.1-30
Project Impacts in Class I Area, CPP Project

Pollutant	Averaging Period	Maximum Impact in Class I Area[a] (μg/m^3)	PSD Class I Increment (μg/m^3)
Desolation Wilderness Area			
NO_2	Annual	0.002	2.5
SO_2	Annual	0.0002	2
	24 hours	0.003	5
	3 hours	0.02	25
Mokelumne Wilderness Area			
NO_2	Annual	0.005	2.5
SO_2	Annual	0.0005	2
	24 hours	0.003	5
	3 hours	0.02	25

[a] Impacts associated with gas turbines.

NSR Requirements

Applicability of NSR Requirements

Because the installation of the new gas turbines is considered the construction of a new facility, compliance with NSR requirements must be demonstrated. For the purposes of determining compliance with the requirements of the NSR program, the emissions from new equipment must not prevent or interfere with the attainment or maintenance of any applicable ambient air quality standard. Compliance with these requirements is discussed in detail under “consistency with local requirements: SMAQMD,” p. 8.1-48.

8.1.5.2.3 Health Risk Assessment

The screening health risk assessment (SHRA) was conducted to determine expected impacts on public health of the noncriteria pollutant emissions from the facility. The SHRA was conducted in accordance with the CAPCOA “Air Toxics ‘Hot Spots’ Program Revised 1992, Risk Assessment Guidelines” (October 1993) and the SMAQMD’s “Risk Assessment Guidelines for New and Modified Stationary Sources” (December 2000). The SHRA estimated the offsite cancer risk to the maximally exposed individual (MEI), as well as indicated any adverse effects of non-carcinogenic compound emissions. The CARB/OEHHA Health Risk Assessment computer program was used to evaluate multipathway exposure to toxic substances. Because of the conservatism (overprediction) built into the established risk analysis methodology, the actual risks will be lower than those estimated.

A health risk assessment requires the following information:

- Unit risk factors (or carcinogenic potency values) for any carcinogenic substances that may be emitted;
- Noncancer Reference Exposure levels (RELs) for determining non-carcinogenic health impacts;
- One-hour and annual average emission rates for each substance of concern; and
- The modeled maximum offsite concentration of each of the pollutants emitted.

Pollutant-specific unit risk factors are the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 $\mu g/m^3$ over a 70-year lifetime. The SHRA uses unit risk factors specified by the California Office of Environmental Health Hazard Assessment (OEHHA). The cancer risk for each pollutant emitted is the product of the unit risk factor and the modeled concentration. All of the pollutant cancer risks are assumed to be additive.

An evaluation of the potential noncancer health effects from long-term (chronic) and short-term (acute) exposures has also been included in the SHRA. Many of the carcinogenic compounds are also associated with noncancer health effects and are, therefore, included in the determination of both cancer and noncancer effects. RELs are used as indicators of potential adverse health effects. RELs are generally based on the most sensitive adverse health effect reported and are designed to protect the most sensitive individuals. However, exceeding the REL does not automatically indicate a health impact. The OEHHA reference exposure levels were used to determine any adverse health effects from noncarcinogenic compounds. A hazard index for each noncancer pollutant is then determined by the ratio of the pollutant annual average concentration to its respective REL for a chronic evaluation. The individual indices are summed to determine the overall hazard index for the project. Because noncancer compounds do not target the same system or organ, this sum is considered conservative. The same procedure is used for the acute evaluation.

SHRA results for the project are compared with the established risk management procedures for the determination of acceptability. The established risk management criteria include those listed below.

- If the potential increased cancer risk is less than one in one million, the facility risk is considered “de minimis;” that is, not significant.
- If the potential increased cancer risk is greater than one in one million but less than ten in one million and Toxic Best Available Control Technology (T-BACT) has been applied to reduce risks, the facility risk is considered acceptable.
- If the potential increased cancer risk is greater than ten in one million and there are mitigating circumstances that, in the judgment of a regulatory agency, outweigh the risk, the risk is considered acceptable.
- For noncancer effects, total hazard indices of one or less are considered “de minimis” (i.e., not significant).

- For a hazard index greater than one, T-BACT must be used and the District must conduct a more refined review of the analysis and determine whether the impact is acceptable.

The SHRA includes the noncriteria pollutants listed in Appendix 8.1B, Tables 8.1B-7 and 8.1B-8. The receptor grid described earlier for criteria pollutant modeling was used for the SHRA. No sensitive receptors (such as schools, hospitals, and day care facilities) were identified within a 3-mile radius of the proposed plant site. The nearest residential area is located approximately one mile to the west of the project site.

The SHRA results for the proposed project are presented in Table 8.1-31, and the detailed calculations are provided in Appendix 8.1E. The locations of the maximum modeled risks are shown in Figure 8.1E-1.

The screening HRA results indicate that the acute and chronic hazard indices are well below 1.0, and so are not significant. In addition, the maximum chronic noninhalation exposure is well below the REL so is also considered insignificant. The cancer risk to a maximally exposed individual is less than 3 in one million, more than 3 times below the 1 in one million level. The screening HRA results indicate that, overall, the project will not pose a significant health risk at any location.

TABLE 8.1-31
Screening Health Risk Assessment Results

Cancer Risk to Maximally Exposed Individual	0.28 in one million
Acute Inhalation Hazard Index	0.09
Chronic Inhalation Hazard Index	0.02
Chronic Noninhalation Exposure	2.59×10^{-4}

8.1.5.2.4 Visibility Screening Analysis

Two types of analyses are typically performed to evaluate potential visibility impacts on nearby Class I areas: (1) a regional haze analysis to determine the change in extinction in the Class I areas; and (2) a coherent plume impact analysis. As recommended in the Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report (December 2000), regional haze analyses were performed for the Mokelumne Wilderness Class I area, which is located between 50 and 100 km from the project site.

Desolation Wilderness is also a Class I area, and is approximately 98 km from the project site. Because it is located in the same direction as Mokelumne and at the same elevation but farther away, haze impacts calculated at the Mokelumne Wilderness Area would be representative of those at the Desolation Wilderness Area. Therefore, regional haze impacts at the Desolation Wilderness Area were not modeled independently.

Because there are no Class I areas within 50 km of the project site, no coherent plume impact analysis is required for this project.

Regional Haze Analysis. The CALPUFF model was used in screening mode to evaluate potential visibility impacts (haze) of the proposed project on the nearest Class I area, as discussed above. The modeling followed guidance provided by the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report, by Trent Proctor of the U.S. Forest Service (USFS) and John Notar with the National Park Service (NPS) (Federal Land Managers [FLMs]).

The CALPUFF model requires hourly, single station meteorological data as input, both surface and upper air. Based on the guidance contained in the IWAQM Phase 2 Summary Report, the CALPUFF model in the screening mode requires 5 years of single station meteorology. Five years of surface data from the Sacramento Executive Airport (1985-1989) were used in combination with representative upper air data collected at Oakland International Airport.

As recommended by the IWAQM Phase 2 Report, the PCRAMMET meteorological preprocessor was used to process the surface, precipitation, and upper air data. PCRAMMET was run with wet deposition options as required in the Phase 2 Report. As such, the following domain averaged variables were used based on values expected in the modeling region:

- Minimum Obukhov length = 33 meters
- Anemometer height = 6.1 meters
- Roughness length = 0.73 meters
- Noon time albedo = 6
- Bowen ratio = 0.0
- Fraction of net radiation absorbed by ground = 0.75

CALPUFF also requires domain-averaged background ozone (O_3) and ammonia (NH_3) concentrations for the Mesopuff II chemistry algorithm. For O_3, a domain-averaged value of 60 ppb was used, based on background ozone data collected in the project region. For NH_3, a domain-average value of 10 ppb was selected based on guidance in the IWAQM Phase 2 Report for arid regions and input from the National Park Service.

To assess visibility impacts at the Class I area, the monthly background visual ranges and relative humidity correction factor (f(RH)) were based on guidance found in the Final Flag Report (December 2000).

Model Options

Based on the standard ISCST3 model defaults and IWAQM recommended values, the following model default options were used for the CALPUFF modeling:

- Number of X grid cells = 2
- Number of Y grid cells = 2
- Number of vertical layers = 1
- Grid spacing = 230 km
- Cell face heights = 5000
- Minimum mixing height = 50 meters
- Maximum mixing height = 5000 meters (based on observational data)
- Minimum wind speed allowed for non-calm conditions = 0.5 m/s
- Vertical distribution used in the near field = gaussian
- Terrain adjustment method = partial plume path adjustment

- No puff splitting allowed
- Chemical mechanism = Mesopuff II scheme
- Wet and dry removal modeled
- Dispersion coefficients = PG dispersion coefficients
- PG sigma-y and z not adjusted for roughness
- Partial plume penetration of elevated inversion allowed
- Lateral turbulence not used

Receptor Grid

A polar grid was generated that contained receptors at each one-degree of arclength and that extended throughout the Class I area. The distance of the polar grid or rings was based on the minimum distance and maximum distance to the Class I area. In addition, one ring was placed within the Class I area. Therefore, the Class I area had three rings with 153 receptors. The receptor elevations were determined from topographic maps for the project area. The maximum concentration found at any one receptor within the Class I area was used to represent impacts at the area.

Emissions

As stated earlier, the combustion sources at the proposed project will use advanced NO_x control technology and natural gas fuel to achieve very low emission rates. Emissions from the project include NO_x, SO_2, and PM_{10}, all of which have the potential to interfere with visibility. Emissions used in the modeling analysis of visibility impacts are the same as those used for the criteria pollutant modeling analysis. The parameters modeled for the visibility impacts assume that the particulate nitrate (NO_3-) is in the form of ammonium nitrate (NH_4NO_3) and that particulate sulfate (SO_4-) is in the form of ammonium sulfate ($(NH_4)2SO_4$). The visibility calculation is based on the ambient concentrations of NH_4NO_3, $(NH_4)2SO_4$, and PM_{10}, along with a representative relative humidity adjustment factor.

Impacts

The maximum 24-hour visibility impact was generated by taking the maximum 24-hour average modeled concentration at each receptor, regardless of the season in which it occurred, and assigning it to represent the visibility impact at the Class I areas. To calculate extinction coefficients, the following general equation was used in the CALPOST postprocessing model:

$$b_{ext} = b_{SN} * f(RH) + b_{dry}$$

where:

b_{ext} = particle scattering coefficient
b_{SN} = $3[((NH_4)2SO_4) + (NH_4NO_3)]$
b_{dry} = b_{Coarse}

The quantities in brackets are the masses expressed in μg/m³ and can be further broken down into the following equations:

b_{NO3} = $3[1.29(NO_3)f(RH)]$
b_{SO4} = $3[1.375(SO_4)f(RH)]$
b_{Coarse} $=0.6[PM_{10}]$

Using the above equations to calculate the extinction coefficients and correcting for monthly f(RH), Table 8.1-32 summarizes the maximum extinction coefficients and the total extinction. As shown in Table 8.1-32, during operation of the proposed project, potential visibility impacts to the Mokelumne Wilderness Class I area will be less than the 5-percent level of acceptable change. Included as Appendix 8.1F are the detailed support data for the regional haze analysis.

TABLE 8.1-32
Maximum Predicted 24-Hour Change in Extinction

Class I Area	Model-Predicted Light Extinction	Background Extinction	Percent Change in Extinction
Mokelumne Wilderness	0.816 M^{-1}	16.48M^{-1}	4.95%

8.1.5.2.5 Consistency with Regulatory Requirements

Consistency with Federal Requirements. As discussed in Section 8.1.4, the District has been delegated authority by USEPA to implement and enforce most of the federal requirements that are applicable to the facility, including the new source performance standards and PSD permitting program. Compliance with the District regulations ensures compliance and consistency with the corresponding federal requirements as well. The facility will also be required to comply with the federal acid rain requirements (Title IV). Since the District has received delegation for implementing Title IV through its Title V permit program, SMUD will apply to the District for a Title V permit that will include the necessary requirements for compliance with the Title IV acid rain provisions for the new equipment.

PSD Requirements

As discussed in AFC Section 8.1.4, the PSD program requirements apply on a pollutant-specific basis to the following:

- a new major facility that will emit 100 tpy or more, if it is one of the 28 PSD source categories in the federal Clean Air Act, or a new facility that will emit 250 tpy or more; or
- a major modification to an existing major facility that will result in net emissions increases in excess of the significant emissions levels shown in Table 8.1-29.

The proposed project is a new major facility. Therefore, it is subject to the PSD regulations. The emissions levels summarized in Table 8.1-29 show that the proposed project will have a significant net emissions increase in NO_x and CO emissions and is subject to PSD review for these pollutants.

As discussed above, the proposed project will have a significant net emissions increase in NO_x and CO emissions and, therefore, BACT must be used for these pollutants. The discussion of BACT for these pollutants is provided further below.

The PSD regulations require that the modeling be conducted with appropriate meteorological and topographic data necessary to estimate impacts. The CPP project modeling analyses used U.S. Geological Service topographic data for the surrounding area and weather data gathered at the Sacramento Executive Airport monitoring station.

The PSD regulations also require a demonstration that emission increases subject to the PSD program will not interfere with the attainment or maintenance of any national ambient air quality standards for each applicable pollutant. As shown in Table 8.1-28, the proposed project will not cause or contribute to an exceedance of any federal ambient air quality standard. The modeling analysis is discussed in detail in Section 8.1.5.2.2.

For an application that triggers PSD modeling requirements, the PSD regulations require that ambient monitoring data be gathered for one year preceding the submittal of a complete application, or a District-approved representative time period. However, if the air quality impacts of the facility do not exceed the specified *de minimis* levels on a pollutant-specific basis, the facility is exempted from the preconstruction monitoring requirement. The air quality impacts of the project's NO_2 impacts are below the applicable *de minimis* levels, as shown in Table 8.1-33, and, therefore, the exemption applies to the proposed project. Consequently, the ARB- and District-operated ambient monitoring stations in the project area were used to determine existing ambient concentrations.

TABLE 8.1-33
Comparison of Maximum Modeled Impacts and PSD Preconstruction Monitoring Thresholds CPP Project (Gas Turbines/HRSGs)

Pollutant	Averaging Time	Maximum Modeled Impacts, $\mu g/m^3$	Federal PSD Preconstruction Monitoring Threshold, $\mu g/m^3$	Threshold Exceeded?
NO_2	Annual	0.24	14	No
SO_2	24-Hour	0.4	13	No
CO	8-Hour	281.3	575	No

The PSD regulations require the applicant to provide an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the proposed project. These analyses are provided in Sections 8.1.5.2.4 and 8.9 of the AFC, respectively.

The PSD regulations require applicants to demonstrate that emissions from a new or modified facility will not cause or contribute to the exceedance of any NAAQS or any applicable Class I PSD increment. Impacts on visibility must also be evaluated. The necessary analysis of impacts on the nearby Class I areas is included in Sections 8.1.5.2.2 and 8.1.5.2.4.

National Emission Standards for Hazardous Air Pollutants

USEPA is in the process of establishing a NESHAP for gas turbines. This regulation will apply to new or modified major sources of HAPs (as listed in Section 112 of the Clean Air Act). Because the HAP emissions for the project are below the major source thresholds of 10 tpy for a single HAP and 25 tpy for any combination of HAPs, the project is exempt from the NESHAP for gas turbines. Consequently, this regulation does not apply to the project and will not be addressed further. Note that while Appendix 8.1B shows ammonia emissions greater than 25 tpy for the project, ammonia is not a HAP as defined by Section 112 of the Clean Air Act.

New Source Performance Standards

For the gas turbines, Regulation 8 (New Source Performance Standards), Subpart GG requires monitoring of fuel; imposes limits on the emissions of NO_x and SO_x; and requires source testing of stack emissions, process monitoring, and data collection and recordkeeping. All of the BACT limits imposed on the facility will be more stringent than the requirements of the NSPS emission limits. Monitoring and recordkeeping requirements for BACT will be more stringent than the requirements in this rule. The CPP project will comply with the NSPS Subpart GG regulation.

Title IV and V Requirements

Rule 207 (Title V – Federal Operating Permit Program) applies to facilities that have the potential to emit more than 25 tons for VOC or NO_x in a severe ozone NA area, and 100 tons per year for CO, SO_x, or PM_{10}. As a new major source under this rule, a permit application will be submitted to the District for a Title V permit for the plant. The acid rain requirements of Rule 208 (Title IV program) are also applicable to the facility. As a new acid rain facility, SMUD will be required to provide sufficient allowances for every ton of SO_x emitted during a calendar year. SMUD will obtain any necessary allowances on the current open trade market. The power plant is also required to install and operate continuous monitoring systems on the new units (monitoring of operating parameters such as fuel use and fuel constituents is an allowable alternative to using exhaust CEM systems). The CPP project will comply with the applicable requirements of the Title IV and V regulations.

CAM Requirements

Requires facilities to monitor the operation and maintenance of emissions control systems and report any control system malfunctions to the appropriate regulatory agency. The CAM rule applies to emissions units with uncontrolled potential to emit levels greater than applicable major source thresholds. However, the CAM rule does not apply to the project since the facility will be issued a Title V permit requiring the installation and operation of continuous emissions monitoring systems.

Consistency with State Requirements. State law establishes local air pollution control districts and air quality management districts with the principal responsibility for regulating emissions from stationary sources. As discussed in Section 8.1.4, the facility is under the local jurisdiction of the District, and compliance with District regulations will ensure compliance with state air quality requirements.

Consistency with Local Requirements: SMAQMD. The SMAQMD has been delegated responsibility for implementing local, state, and federal air quality regulations including the NSR and PSD permitting programs in the project area. The facility is subject to SMAQMD regulations that apply to new sources of emissions, to the prohibitory regulations that specify emission standards for individual equipment categories, and to the requirements for evaluation of impacts from toxic air pollutants.

Under the regulations that govern new sources of emissions, SMUD is required to secure a preconstruction permit from the District, as well as demonstrate continued compliance with regulatory limits when the facility becomes operational. The NSR/PSD preconstruction review includes demonstrating that the facility will use BACT, providing any necessary emission offsets, demonstrating that emissions will not interfere with the attainment or maintenance of the applicable AAQS and will not exceed District significance levels, and demonstrating that the emissions will not impair visibility in nearby Class I areas. The following sections include the evaluation of facility compliance with the applicable SMAQMD NSR/PSD requirements.

BACT

SMAQMD Rules 202 and 203 require the gas turbines/HRSGs to be equipped with BACT for an emissions increase of NO_x, VOC, SO_x, CO, and PM_{10} (criteria pollutants). The calculation of facility emissions was discussed in Section 8.1.5.2.1.

BACT for the applicable pollutants was determined by reviewing the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) BACT Guidelines Manual, South Coast, the most recent Compilation of California BACT Determinations, CAPCOA (2nd Ed., November 1993), USEPA's BACT/LAER Clearinghouse, and ARB's Guidance for Power Plant Siting and Best Available Control Technology. A summary of the review is provided in Appendix 8.1F. For the gas turbines, the District considers BACT to be the most stringent level of demonstrated emission control that is feasible. The gas turbines associated with the CPP project will use the BACT measures discussed below at the facility.

As a BACT measure, the Applicant will limit the fuels burned by the gas turbines to natural gas — a clean burning fuel. Burning of liquid fuels in the gas turbine combustors would result in greater criteria pollutant emissions than if the units burned only gaseous fuels. Hence, this measure acts to minimize the formation of all criteria air pollutants.

For the gas turbines, BACT for NO_x emissions will be the use of low-NO_x -emitting equipment and add-on controls. For the CPP project, the Applicant has selected gas turbines equipped with dry low- NO_x combustors. The gas turbine dry low-NO_x combustors will generate 9 ppmvd NO_x, corrected to 15 percent O_2. In addition, the gas turbines will be equipped with SCR systems to further reduce NO_x emissions to 2.5 ppmvd NO_x, corrected to 15 percent O_2 (on a one-hour average basis) and 2.0 ppmvd corrected to 15 percent O_2 (on an annual basis). The 2.5 ppmvd NO_x level has been accepted by the SMAQMD, BAAQMD, and USEPA Region IX as meeting the BACT requirements for NO_x from gas turbines, and is consistent with the SJVUAPCD BACT guideline for larger gas turbines and ARB's adopted BACT guidelines for power plants. The SJVUAPCD BACT Guideline determinations for NO_x from gas turbines are shown in Appendix 8.1F.

For the gas turbines, BACT for CO emissions will be achieved by use of gas turbines equipped with dry, low-NO_x combustors. Dry, low-NO_x combustors emit low levels of combustion CO while still maintaining low NO_x formation. With this technology, the gas turbines will meet a CO limit of 6 ppmvd, corrected to 15 percent O_2 (short-term average). The SJVUAPCD BACT guidelines indicate that BACT from large gas turbines (>3 MW) is an exhaust concentration not to exceed 10 ppmvd CO, corrected to 15 percent O_2. CO emissions from the CPP project gas turbines are consistent with this BACT requirement. A review of recent BACT determinations for CO from gas turbines is provided in Appendix 8.1F.

The ARB BACT guidelines for gas turbines suggest a CO level of 6 ppmvd at 15 percent O_2 (3-hour average), based principally on the use of oxidation catalyst technology, for CO nonattainment areas. In attainment areas, such as the project area for the state standard, ARB has given districts the discretion to set the BACT level for CO. The BACT level for CO in attainment areas is generally considered to be 10 ppm. The applicant's proposed 6 ppm level (short-term average) without the use of oxidation catalyst technology is consistent with this requirement.

For the gas turbines, BACT for VOC emissions will be achieved by use of dry low-NO_x combustors. As in the case of CO emission formation, dry low- NO_x combustors use air-to-fuel ratios that result in low combustion VOC while still maintaining low NO_x levels. BACT for VOC emissions from combustion devices has historically been the use of best combustion practices since the majority of the VOC emissions are low molecular weight compounds that are not susceptible to control by the oxidation catalysts. With the use of the dry low- NO_x combustors, VOC emissions leaving the gas turbine/HRSG stacks will not exceed 1.4 ppmvd at 15 percent O_2 (1-hr average). This level of emissions is consistent with the ARB's BACT guidance for VOC.

For the gas turbines, BACT for PM_{10} is best combustion practices and the use of gaseous fuels. Use of clean burning natural gas fuel will result in minimal particulate emissions. SO_x emissions will also be kept at a minimum by firing natural gas.

For the gas turbines/HRSGs, the appropriate level of control for NH_3 will be limiting ammonia slip to 10 ppmvd @ 15 percent O_2. This level of emissions is consistent with recently permitted ammonia slip levels for gas turbines.

Offset Requirements

In addition to the BACT requirements, District Rule 202 requires SMUD to provide emission reduction credits (ERCs) for all net facility emission increases for NO_x, SO_x, CO, VOC, and PM_{10} that exceed offset threshold levels. A comparison between the maximum expected quarterly emissions for the first phase of the project (i.e., the first two gas turbines) and the District NSR offset trigger levels is shown in Table 8.1-34. As shown in Table 8.1-34, the net emission increases for Phase I of the project are expected to exceed the offset trigger levels for NO_x, CO, VOC, and PM_{10}. Because the maximum expected SO_x emissions for Phase I of the project are less than the offset trigger level for this pollutant, emission offsets will not be required for SO_x. In addition, while the maximum expected CO emissions for Phase I of the project are above the offset trigger level, under the District NSR regulation a project is exempt from offset requirements for CO if maximum modeled ambient impacts are less than 500 $\mu g/m^3$ for an 8-hour average. As shown in Table 8.1-28, the project's maximum modeled 8-hour average CO impacts are less than 500 $\mu g/m^3$. Therefore, the project qualifies for the CO offset exemption.

TABLE 8.1-34

Summary of Offset Requirements

Unit	NO_x (lbs/quarter)	CO (lbs/quarter)	SO_x (lbs/quarter)	VOC (lbs/quarter)	PM_{10} (lbs/quarter)
Net Increase from Gas Turbines (Phase I – two gas turbines)	62,784	182,704	5,480	15,008	39,820
Offset Trigger Level	7,500	49,500	13,650	7,500	7,500
Offsets Required?	Yes	No[a]	No	Yes	Yes
Offset Ratios	1.3:1 to 1.5:1	N/A	N/A	1.3:1 to 1.5:1	1.0:1 to 1.5:1
Offsets Needed	81,619 to 94,176	N/A	N/A	19,510 to 22,512	39,820 to 59,730

[a] Under NSR regulations, exempt from CO offset requirements with maximum modeled impacts less than 500 $\mu g/m^3$ 8-hr average.

As shown in Table 8.1-34, depending on the distance from the project site to the source of the offset, Rule 202 requires offsets to be provided at offset ratios ranging from 1.3:1 to 1.5:1 for NO_x and VOC and from 1.0:1 to 1.5:1 for PM_{10}. The emission offsets are based on expected quarterly average emissions for the two gas turbines associated with the first phase of the project. Construction of the second phase of the project, which will include the installation of the remaining two gas turbines, is expected to occur within the next few years. SMUD will need to obtain additional emission offsets for these remaining two gas turbines prior to their construction. Detailed emission offset calculations are included in Appendix 8.1B, Table 8.1B-6. A separate confidential ERC status document will be filed with the CEC staff concurrently with the AFC. The confidential ERC status document will provide details regarding SMUD's acquisition of the necessary ERCs for the project.

Modeling Analysis

Rules 202 and 203 require project denial if PM_{10}, NO_x, SO_x, or CO air quality modeling results indicate emissions will interfere with the attainment or maintenance of the applicable AAQS. The modeling analyses presented in Section 8.1.5.2.2 show that facility emissions will not interfere with the attainment or maintenance of the applicable air quality standards.

Visibility Analysis

For major facilities, such as the CPP project, Rule 203 requires projects with net emission increases greater than significant levels to perform visibility analyses to determine impacts on nearby Class I areas. The visibility analyses presented in Section 8.1.5.2.4 show that the facility emissions will not cause a significant visibility impact on nearby Class I areas.

General Prohibitory Rules

The general prohibitory rules of the District applicable to the facility and the determination of compliance follow.

<u>Rule 401 (Visible Emissions)</u>. Any visible emissions from the project will not be darker than No. 1 when compared to a Ringlemann Chart for any period(s) aggregating 3 minutes in any hour. Because the facility will burn clean fuels, the opacity standard of not greater than 20 percent for a period or periods aggregating 3 minutes will not be exceeded.

<u>Rule 402 (Public Nuisance)</u>. The facility will emit insignificant quantities of odorous or visible substances; therefore, the facility will comply with this regulation.

<u>Rule 403 (Fugitive Dust)</u>. Since best available control measures will be used during the construction of the project, fugitive dust emissions will be below the limits of this rule. During the operation of the facility, there will be minimal fugitive dust emissions, and the facility will comply with the regulation.

<u>Rule 404 (Particulate Matter)</u>. Because the gas turbines will use only natural gas, the gas turbine emissions will be well below the 0.1 gr/dscf particulate matter limit of the rule.

<u>Rule 406 (Specific Contaminants)</u>. Because the gas turbines will use only natural gas, the Plant emission units rates will be well below the SO_x and particulate matter limits of the rule.

<u>Rule 413 (Stationary Gas Turbines)</u>. Because the gas turbines will be equipped with BACT for NO_x, the gas turbine NO_x emission levels will be well below the 9 ppm @ 15 percent O_2 NO_x limit of the rule.

Rule 420 (Sulfur Content of Fuels). The natural gas used by the facility will have a sulfur content below the limit of this rule.

Air Toxic Rules

District Risk Assessment Guidelines for New and Modified Stationary Sources. These guidelines establish allowable risks for new or modified sources of TAC emissions. The guidelines specify limits for maximum individual cancer risk (MICR) and noncarcinogenic acute and chronic hazard indices (HIs) for new or modified sources of TAC emissions. As shown above and in Section 8.6, the proposed project will not cause toxic air pollutant impacts greater than the guideline significance levels. HRA model output files are included in Appendix 8.1E.

8.1.5.3 Abandonment/Closure

The abandonment/closure phase of the project may include demolition of structures, removal of pavement, and landscaping activities. The maximum air quality impacts associated with these activities are expected to be similar to the construction impacts discussed in Section 8.1.5.1.

8.1.5.4 Cumulative Impacts

To ensure that potential cumulative impacts of the project and other nearby projects are adequately considered, a cumulative impacts analysis will be conducted in accordance with the protocol included as Appendix 8.1G.

8.1.6 Mitigation Measures

Mitigation will be provided for all emissions increases from the project in the form of offsets and the installation of BACT, as required under District regulations.

8.1.7 References

ARB. Emission Inventory Criteria and Guidelines Report for the Air Toxics “Hot Spots” Program, May 15, 1997.

ARB. Proposed Guidance for Power Plant Siting and Best Available Control Technology. June 23, 1999.

ARB. Reference Document for California Statewide Modeling Guideline. April 1989.

CAPCOA. Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines. October 1993.

Office of Environmental Health Hazard Assessment. Acute and Chronic Exposure Levels Developed by OEHHA as of May 2000.

Office of Environmental Health Hazard Assessment. Hot Spots Unit Risk and Cancer Potency Values. June 9, 1999.

Smith, T.B., W.D. Sanders, and D.M. Takeuchi. Application of Climatological Analysis to Minimize Air Pollution Impacts in California, Final Report on ARB Agreement A2-119-32. August 1984.

Sacramento Metropolitan Air Quality Management District. "Risk Assessment Guidelines for New and Modified Sources," December 2000.

USEPA. Compilation of Emission Factors. AP-42. Revised 7/00.

USEPA. Guideline on Air Quality Models, 40 CFR, Part 51, Appendix W. July 1, 1999.

USEPA. On-Site Meteorological Program Guidance for Regulatory Model Applications, EPA-450/4-87-013. August 1995.

USEPA. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised, EPA-454/R-92-019. October 1992.

USEPA. Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), EPA-450/4-87-007. May 1987.

USEPA. Guideline for Determination of Good Engineering Practice Stack Height. June 1985.

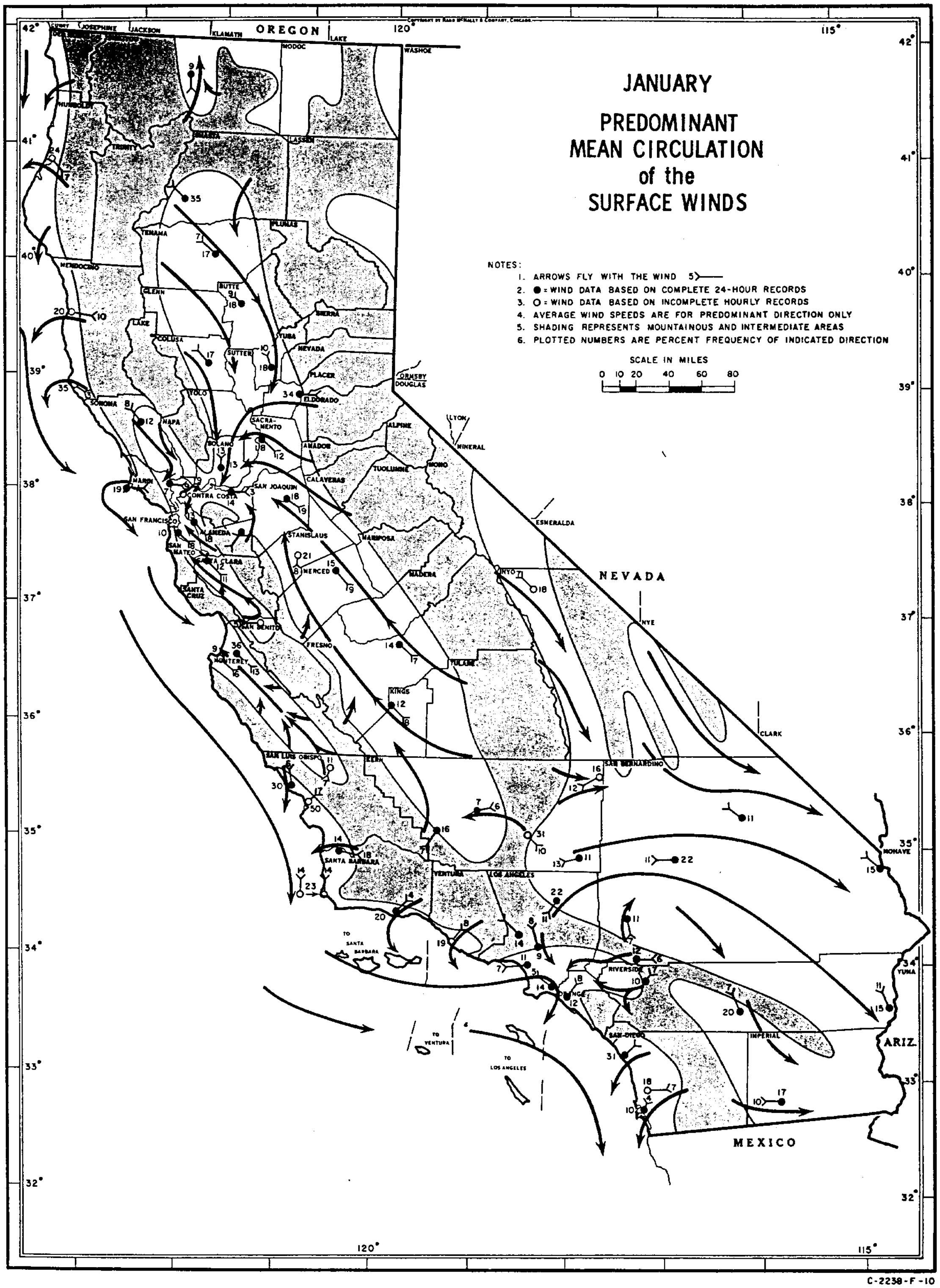
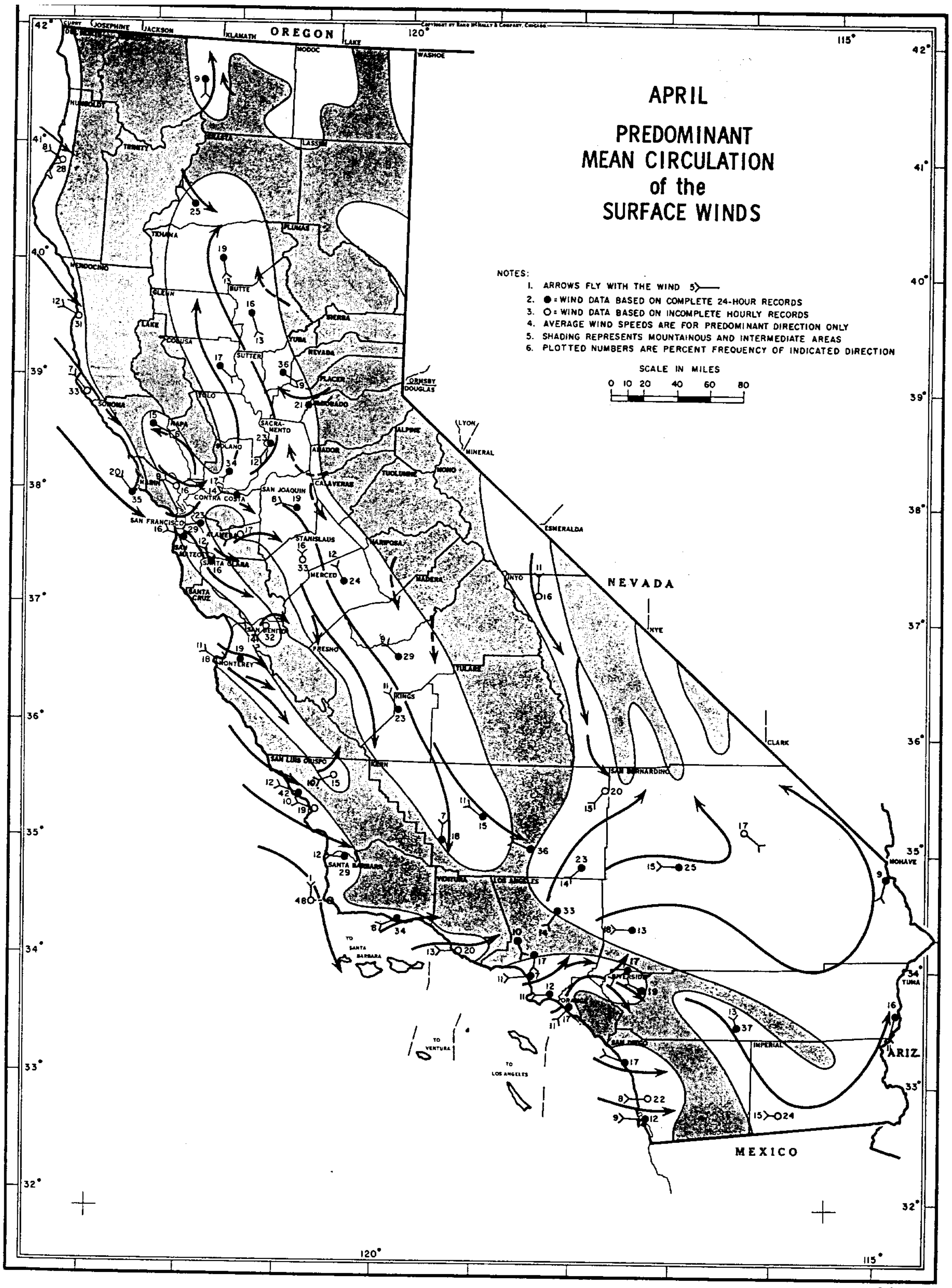
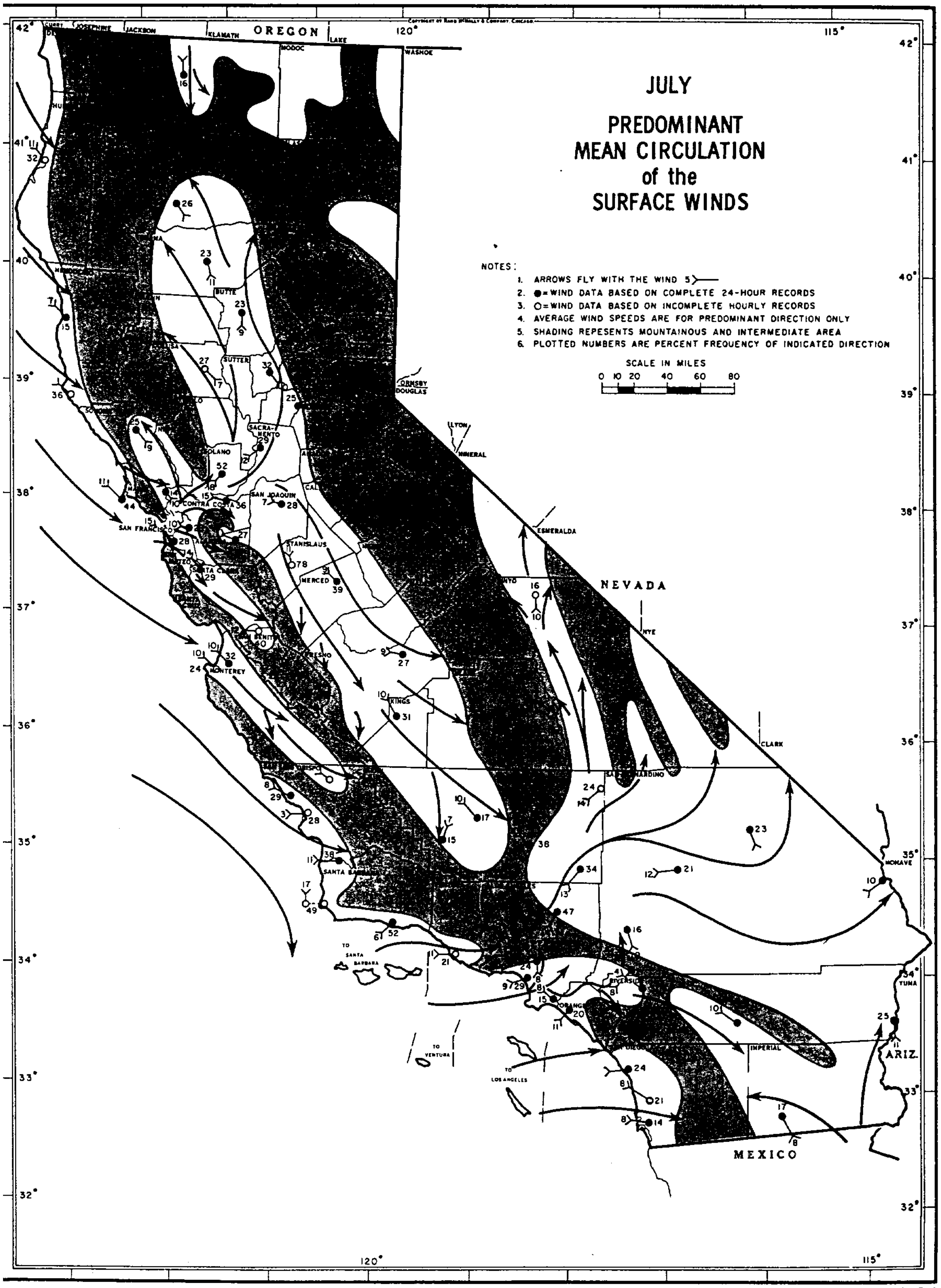


FIGURE 8.1-1
January Predominant Mean Circulation of the Surface Winds



C-2238-F-11

FIGURE 8.1-2
April Predominant Mean Circulation of the Surface Winds



C-2238-F-12

FIGURE 8.1-3
July Predominant Mean Circulation of the Surface Winds

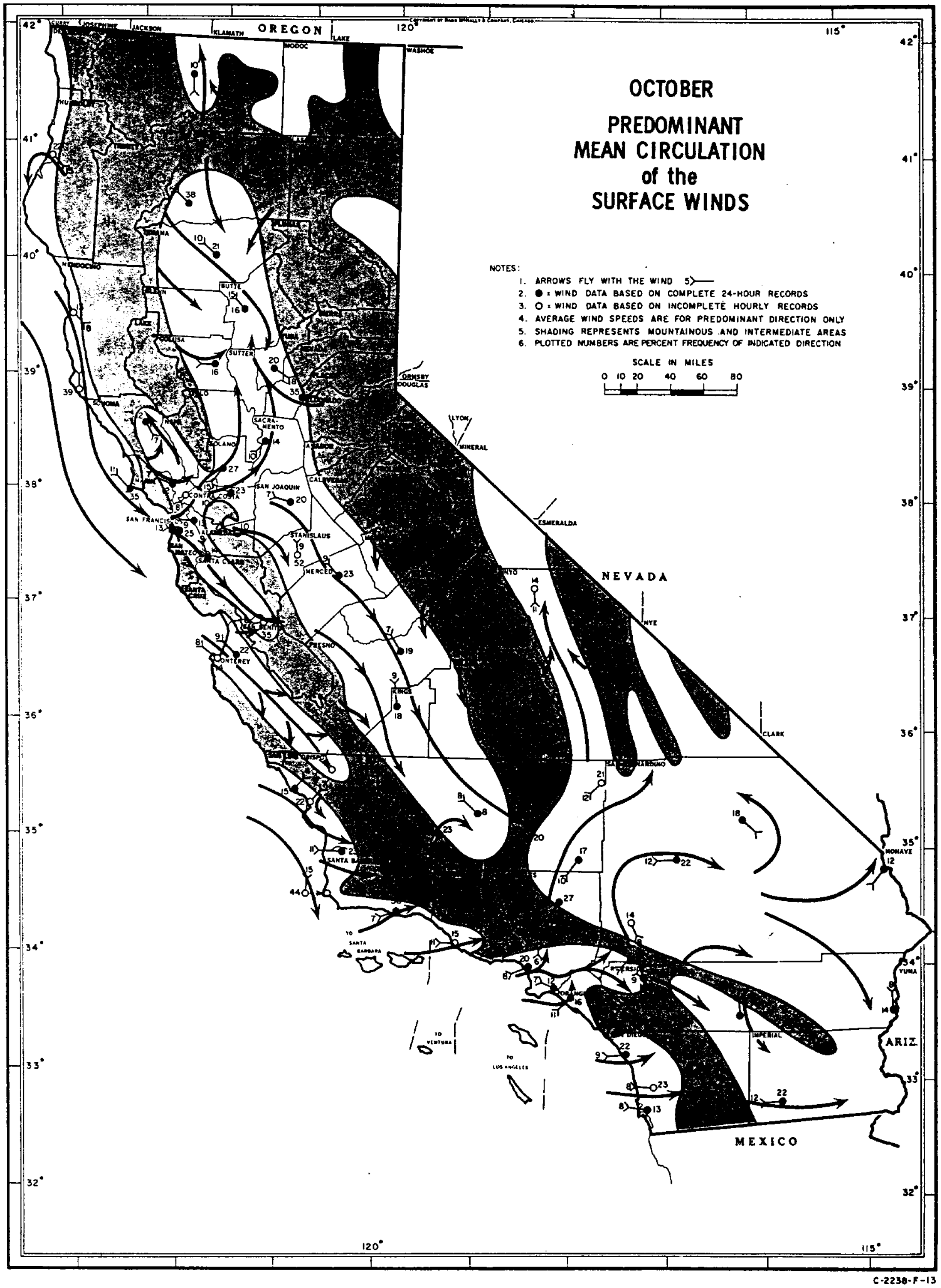


FIGURE 8.1-4
October Predominant Mean Circulation of the Surface Winds

WIND ROSE PLOT

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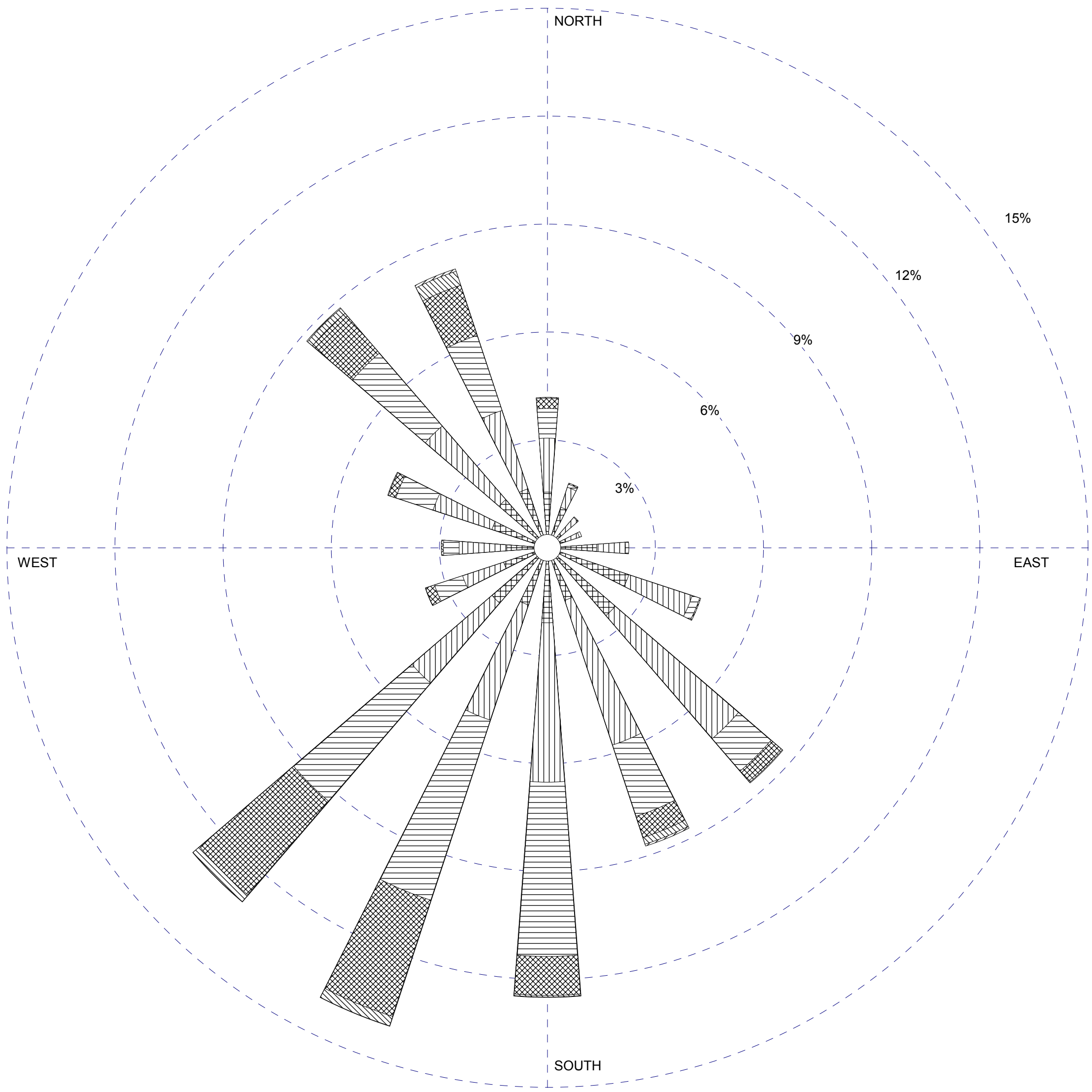
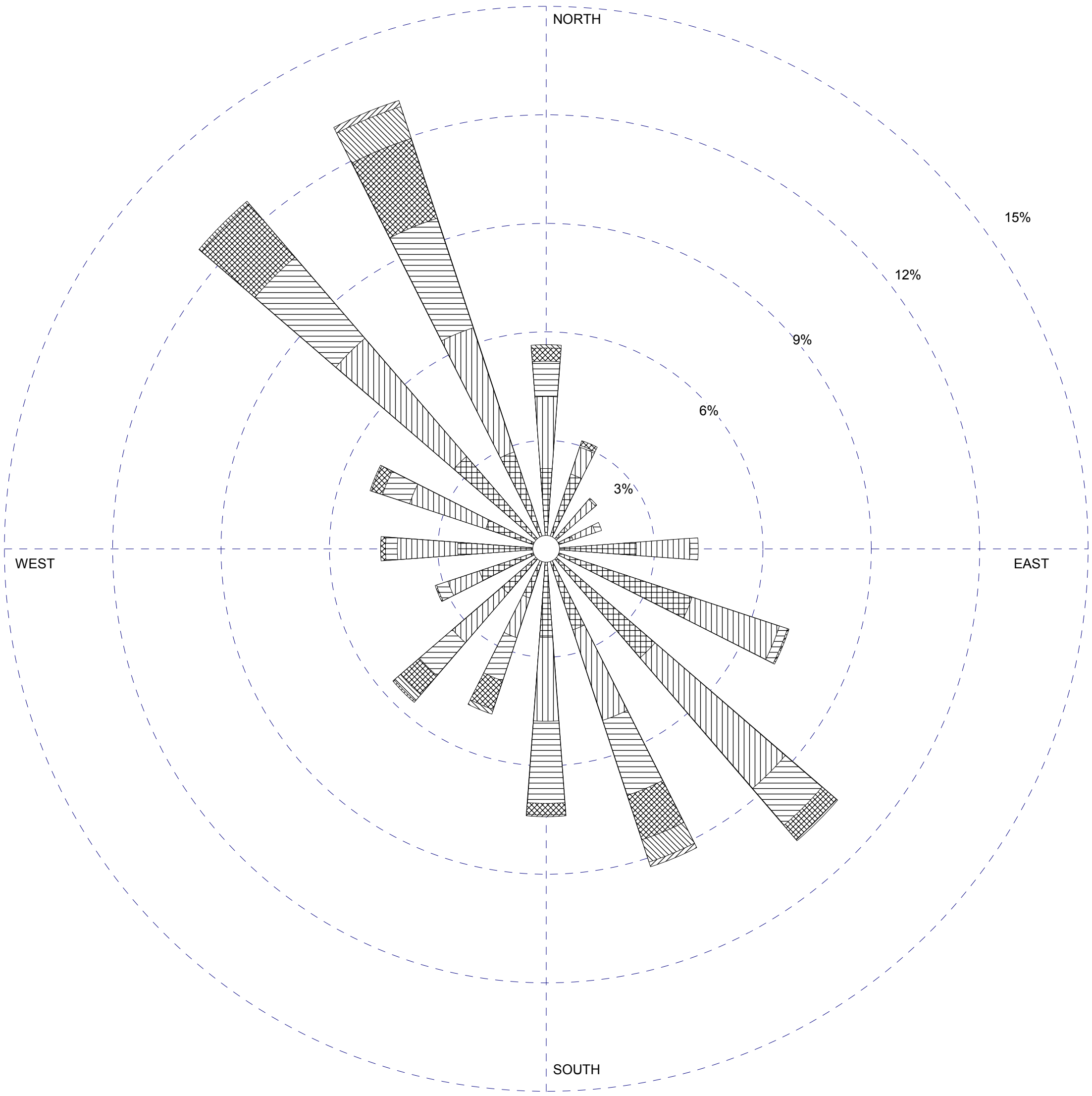


Wind Speed (m/s)			
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Annual Wind Rose - 1985**
	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.28 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1985** **Jan 1 - Dec 31** **Midnight - 11 PM**	**Figure 8.1-5a**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**First Quarter Wind Rose - 1985**
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **2.87 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1985** **Jan 1 - Mar 31** **Midnight - 11 PM**	**Figure 8.1-5b**

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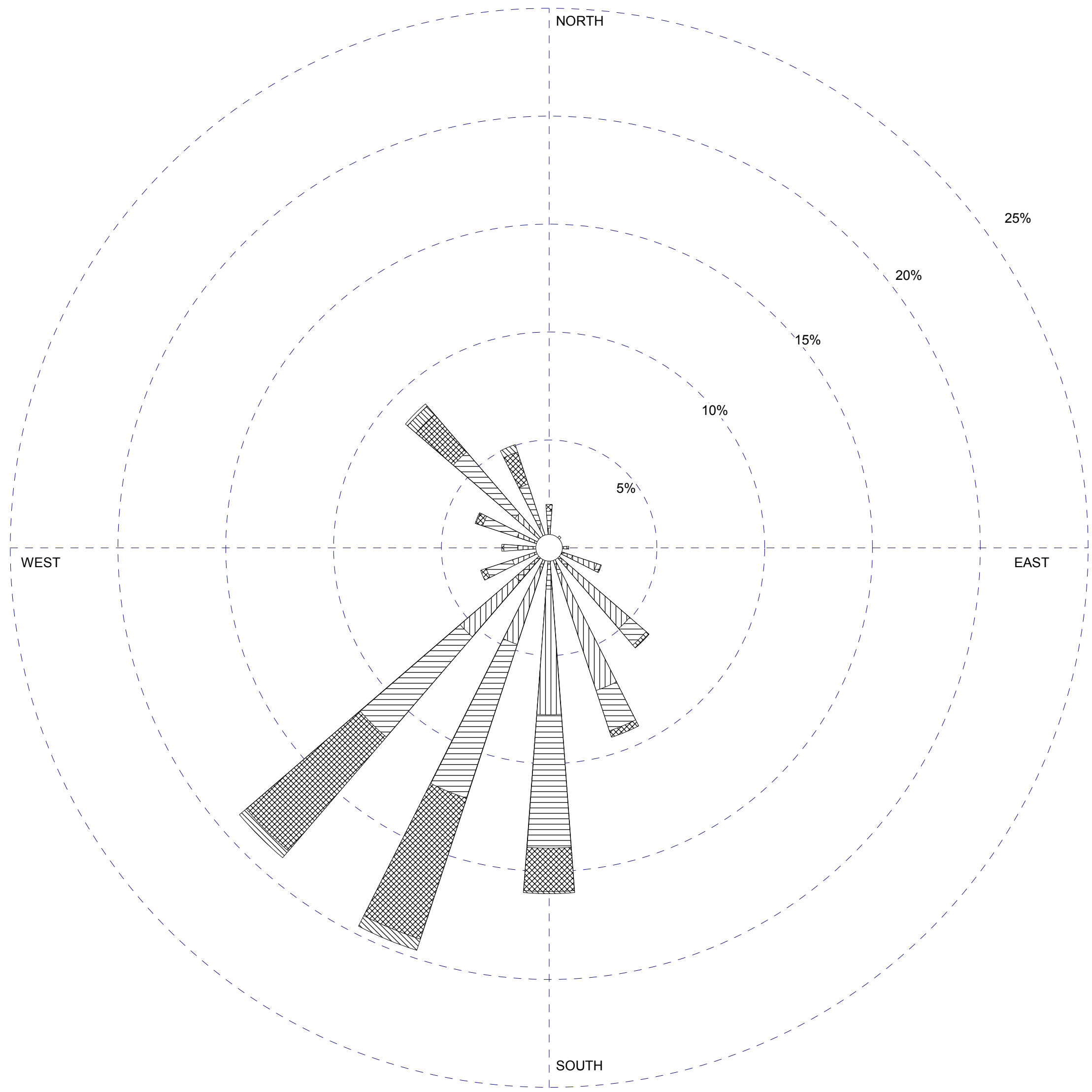
WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)

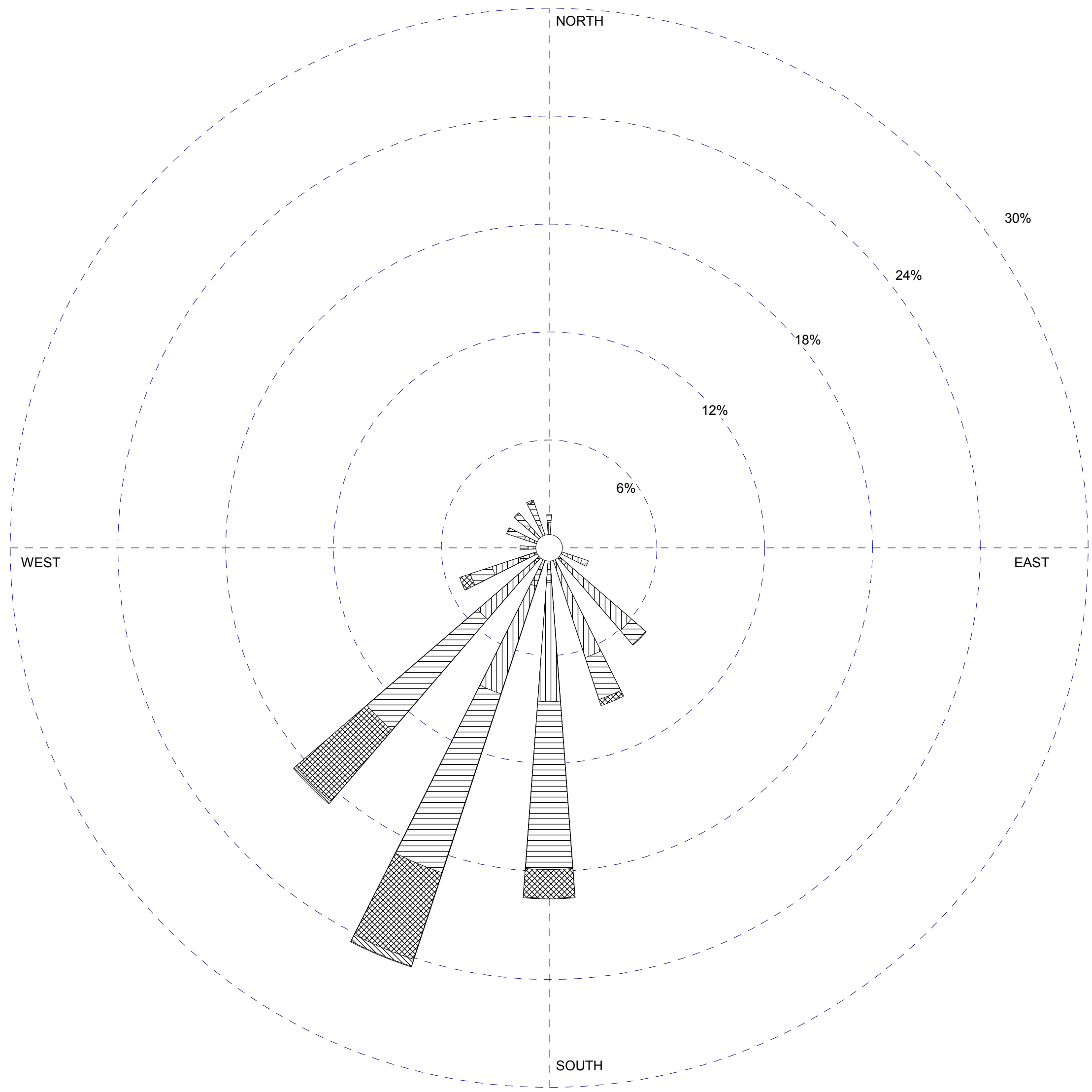
- > 11.00
- 8.50 - 11.00
- 5.50 - 8.50
- 3.50 - 5.50
- 2.00 - 3.50
- 0.50 - 2.00

PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Second Quarter Wind Rose - 1985**
DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
AVG. WIND SPEED **4.01 m/s**	CALM WINDS **0.00%**	
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1985 Apr 1 - Jun 30 Midnight - 11 PM**	**Figure 8.1-5c**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

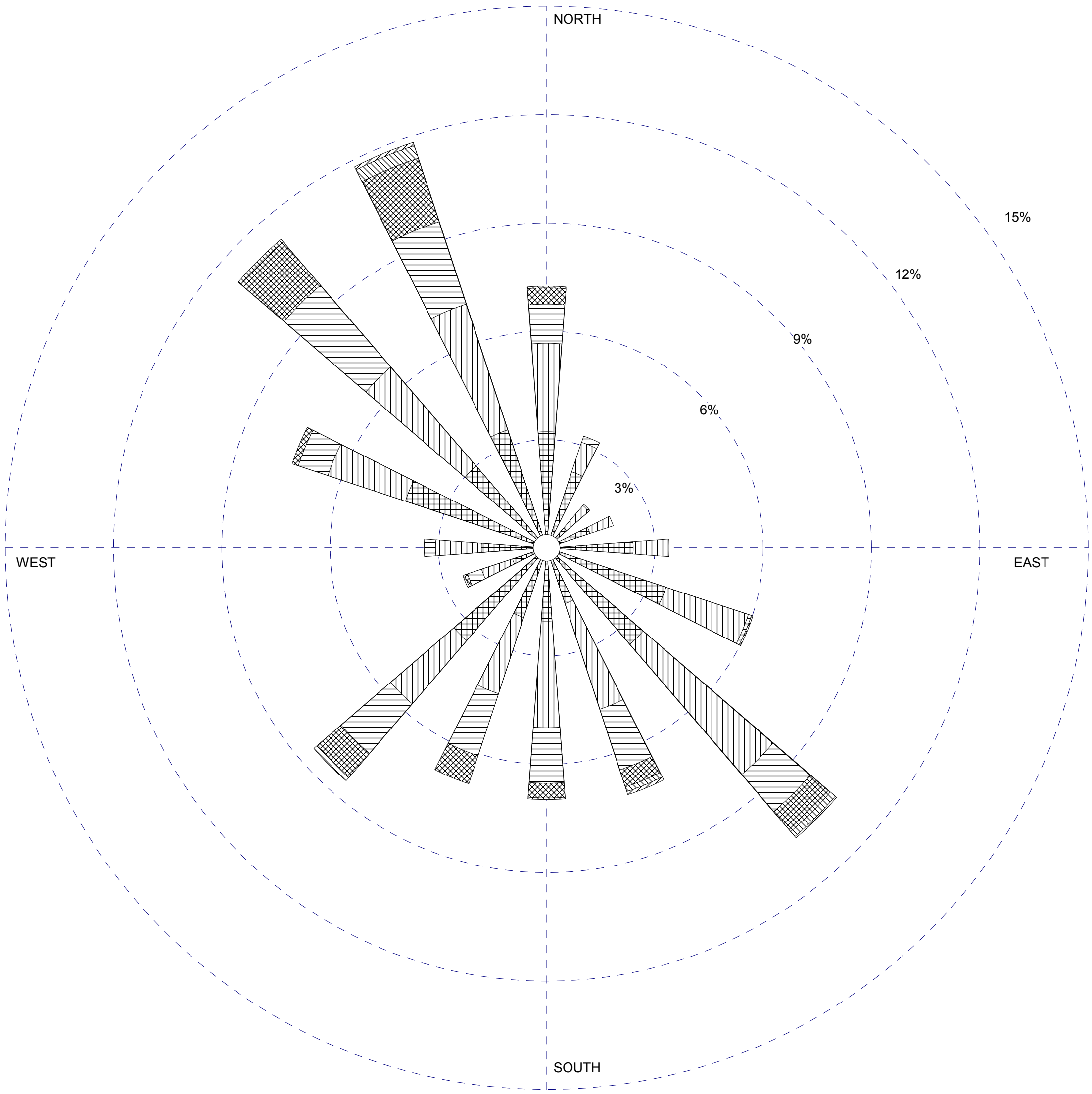


Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Third Quarter Wind Rose - 1985**
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.61 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1985** **Jul 1 - Sep 30** **Midnight - 11 PM**	**Figure 8.1-5d**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Fourth Quarter Wind Rose - 1985**
> 11.00 8.50 - 11.00 5.50 - 8.50	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
3.50 - 5.50	AVG. WIND SPEED **2.64 m/s**	CALM WINDS **0.00%**	
2.00 - 3.50 0.50 - 2.00	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1985** **Oct 1 - Dec 31** **Midnight - 11 PM**	**Figure 8.1-5e**

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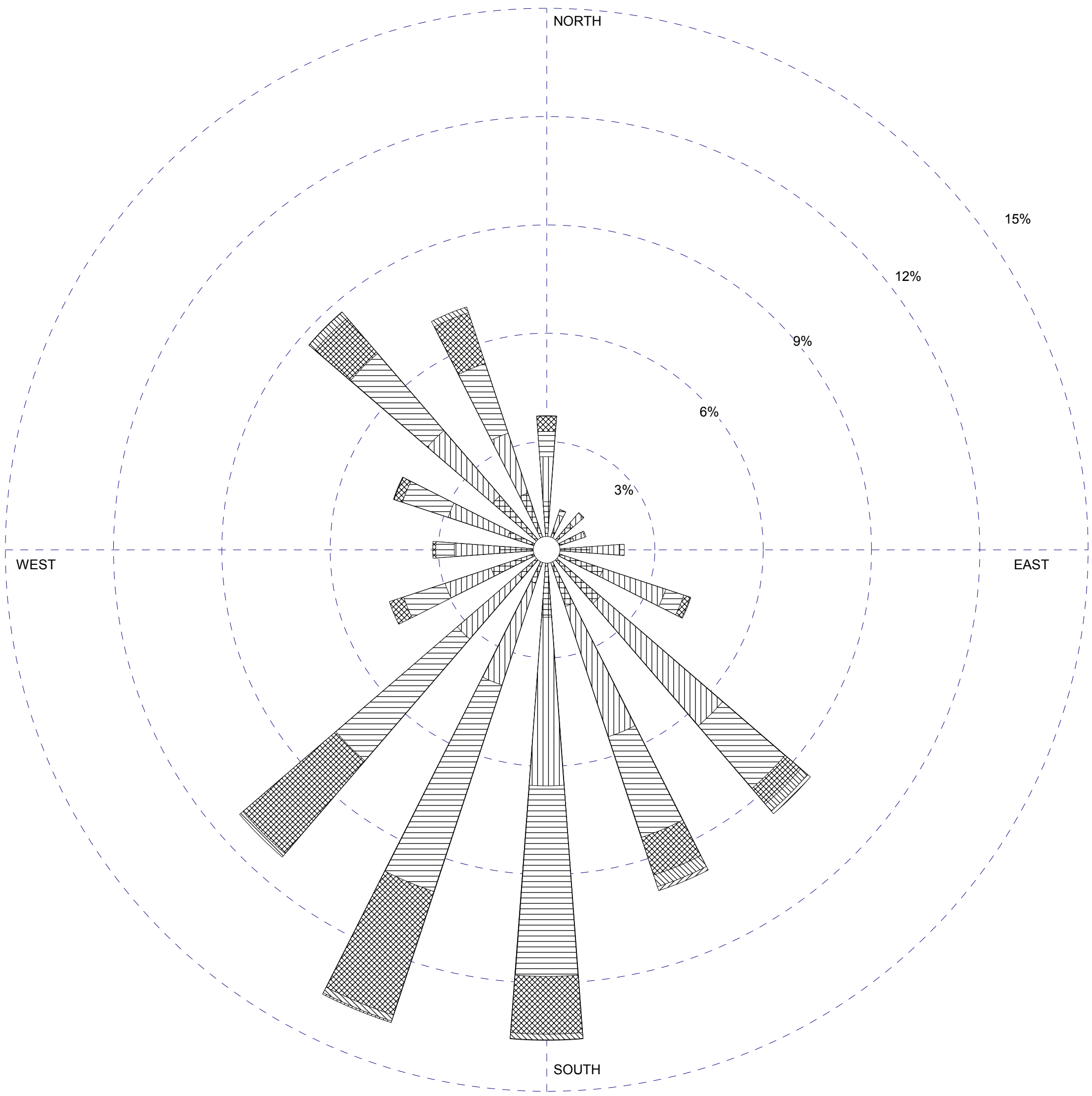
WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)

- > 11.00
- 8.50 - 11.00
- 5.50 - 8.50
- 3.50 - 5.50
- 2.00 - 3.50
- 0.50 - 2.00

PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Annual Wind Rose - 1986**
DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
AVG. WIND SPEED **3.50 m/s**	CALM WINDS **0.00%**	
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1986** **Jan 1 - Dec 31** **Midnight - 11 PM**	**Figure 8.1-6a**

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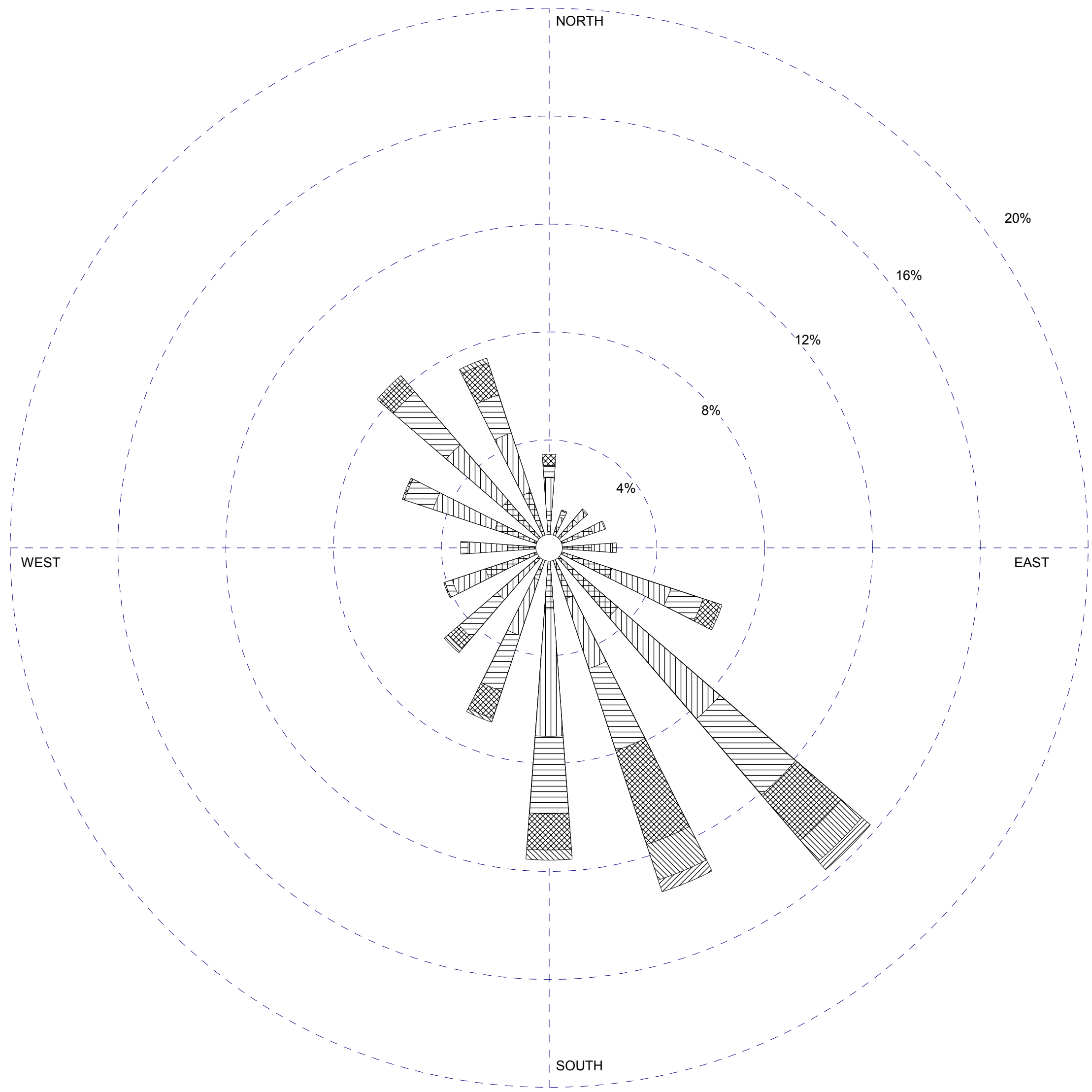
WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s) > 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**First Quarter Wind Rose - 1986**
	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.33 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1986** **Jan 1 - Mar 31** **Midnight - 11 PM**	**Figure 8.1-6b**

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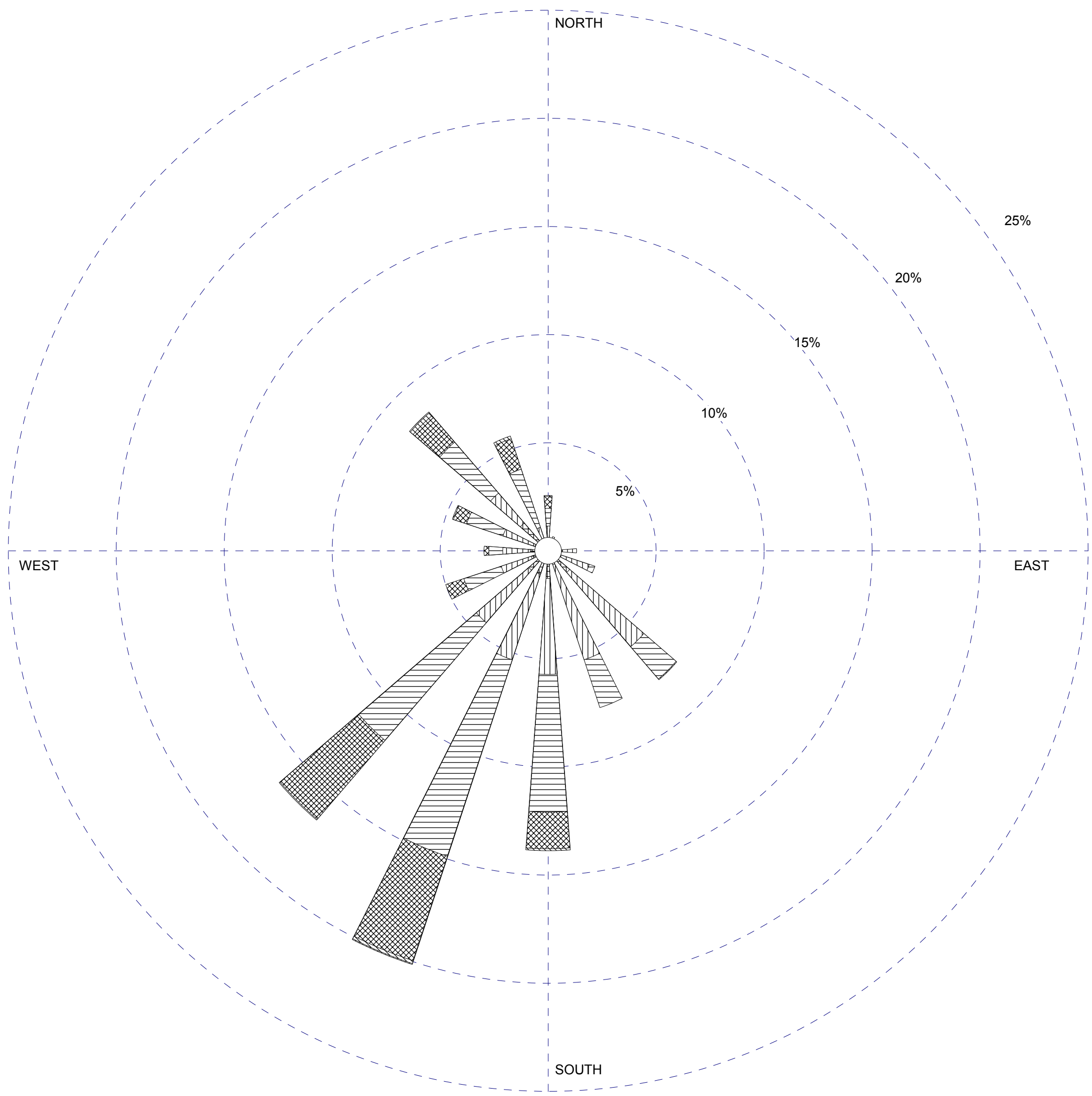
WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

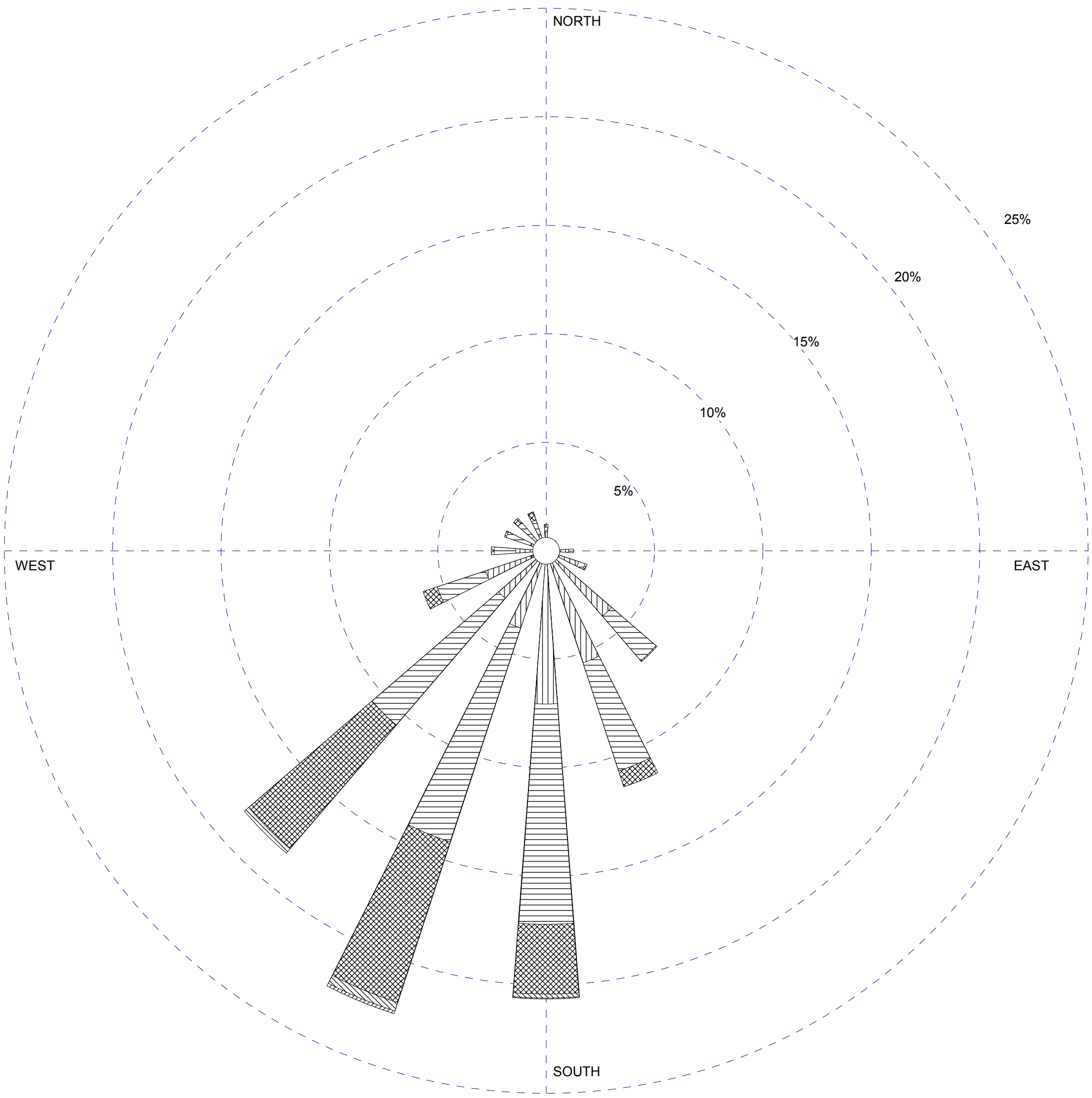


Wind Speed (m/s)	PROJECT	DATE	
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	**Cosumnes Power Plant**	**08/29/2001**	**Second Quarter Wind Rose - 1986**
	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.83 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1986** **Apr 1 - Jun 30** **Midnight - 11 PM**	**Figure 8.1-6c**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

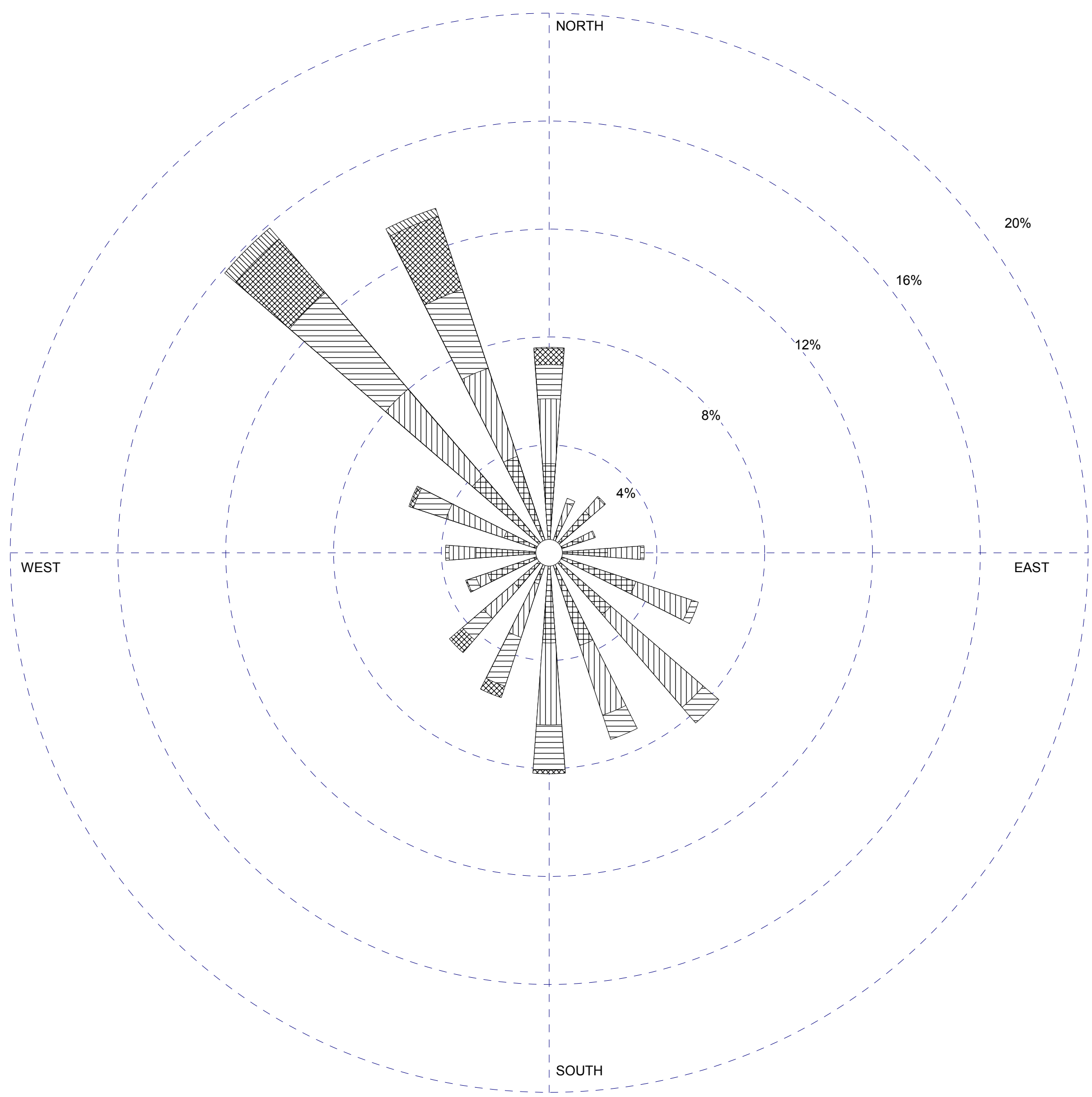


Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Third Quarter Wind Rose - 1986**
> 11.00 8.50 - 11.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
5.50 - 8.50 3.50 - 5.50	AVG. WIND SPEED **4.22 m/s**	CALM WINDS **0.00%**	
2.00 - 3.50 0.50 - 2.00	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1986** **Jul 1 - Sep 30** **Midnight - 11 PM**	**Figure 8.1-6d**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

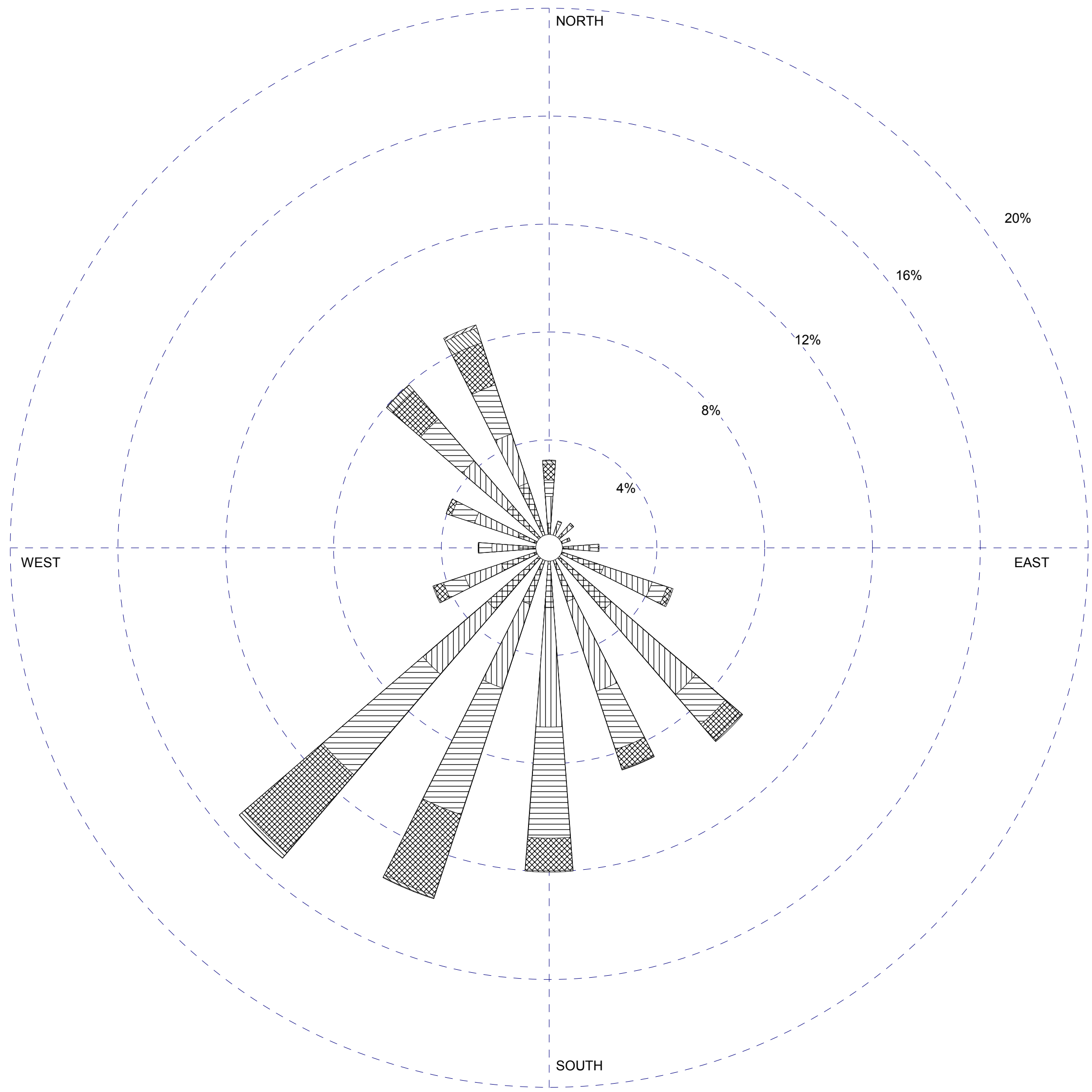


Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Fourth Quarter Wind Rose - 1986**
> 11.00 8.50 - 11.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
5.50 - 8.50 3.50 - 5.50	AVG. WIND SPEED **2.63 m/s**	CALM WINDS **0.00%**	
2.00 - 3.50 0.50 - 2.00	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1986** **Oct 1 - Dec 31** **Midnight - 11 PM**	**Figure 8.1-6e**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)

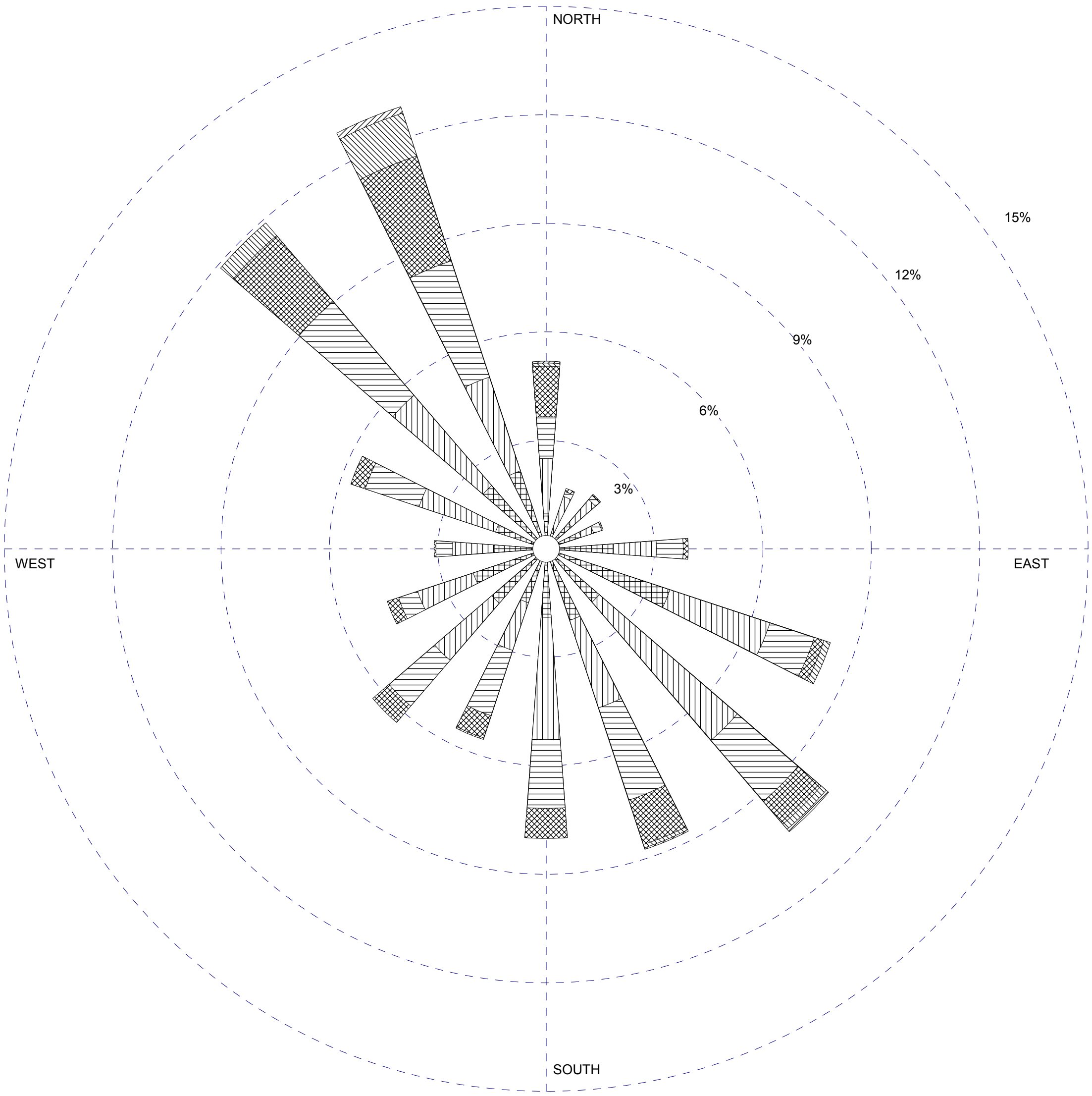
- > 11.00
- 8.50 - 11.00
- 5.50 - 8.50
- 3.50 - 5.50
- 2.00 - 3.50
- 0.50 - 2.00

PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Annual Wind Rose - 1987**
DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
AVG. WIND SPEED **3.32 m/s**	CALM WINDS **0.00%**	
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1987** **Jan 1 - Dec 31** **Midnight - 11 PM**	**Figure 8.1-7a**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)

- > 11.00
- 8.50 - 11.00
- 5.50 - 8.50
- 3.50 - 5.50
- 2.00 - 3.50
- 0.50 - 2.00

PROJECT
Cosumnes Power Plant

DATE
08/29/2001

First Quarter Wind Rose - 1987

DISPLAY
Wind Speed

UNIT
m/s

Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class

AVG. WIND SPEED
3.25 m/s

CALM WINDS
0.00%

ORIENTATION
Direction (blowing from)

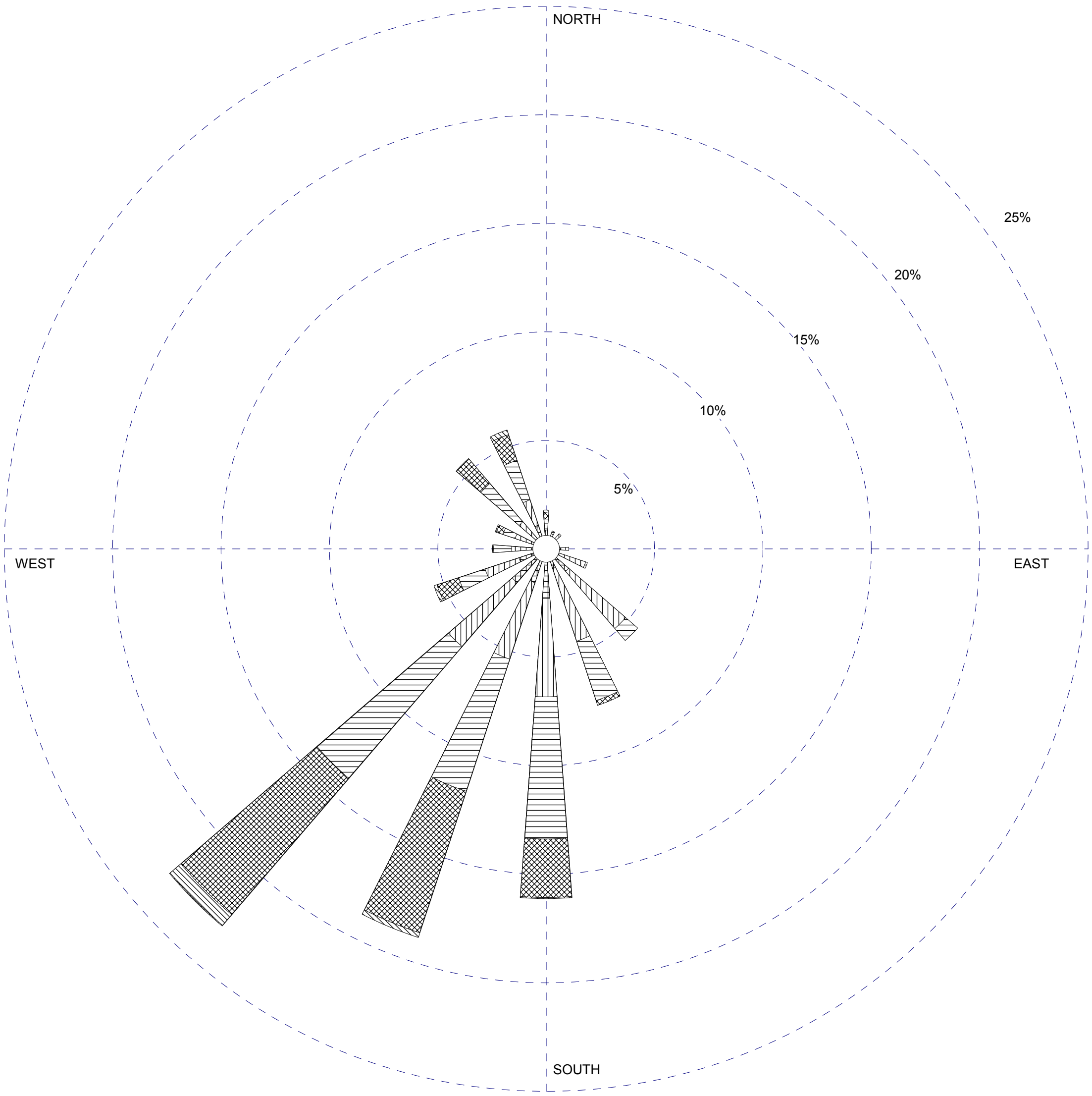
PLOT YEAR-DATE-TIME
1987
Jan 1 - Mar 31
Midnight - 11 PM

Figure 8.1-7b

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

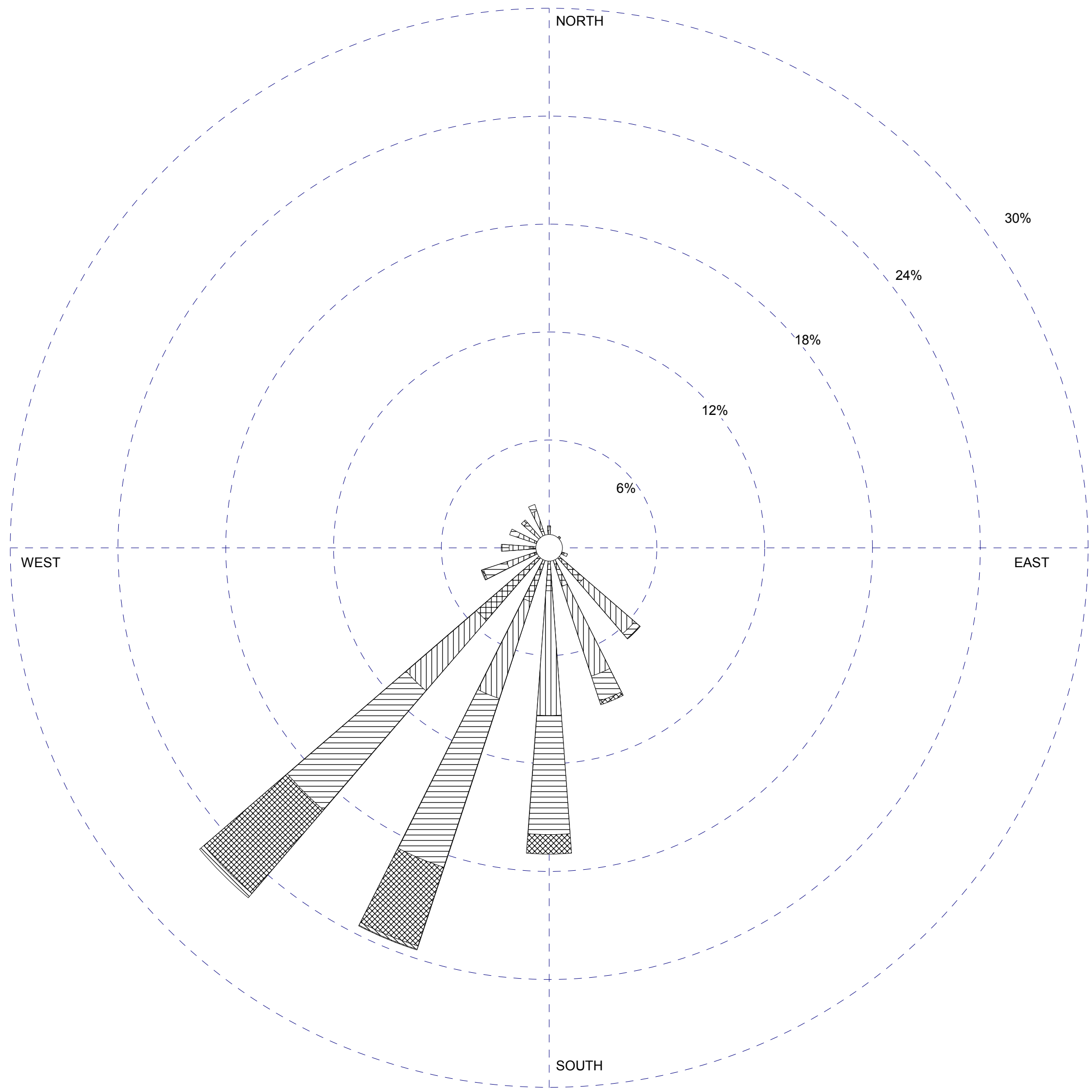


Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Second Quarter Wind Rose - 1987**
> 11.00 8.50 - 11.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
5.50 - 8.50 3.50 - 5.50	AVG. WIND SPEED **3.96 m/s**	CALM WINDS **0.00%**	
2.00 - 3.50 0.50 - 2.00	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1987** **Apr 1 - Jun 30** **Midnight - 11 PM**	**Figure 8.1-7c**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

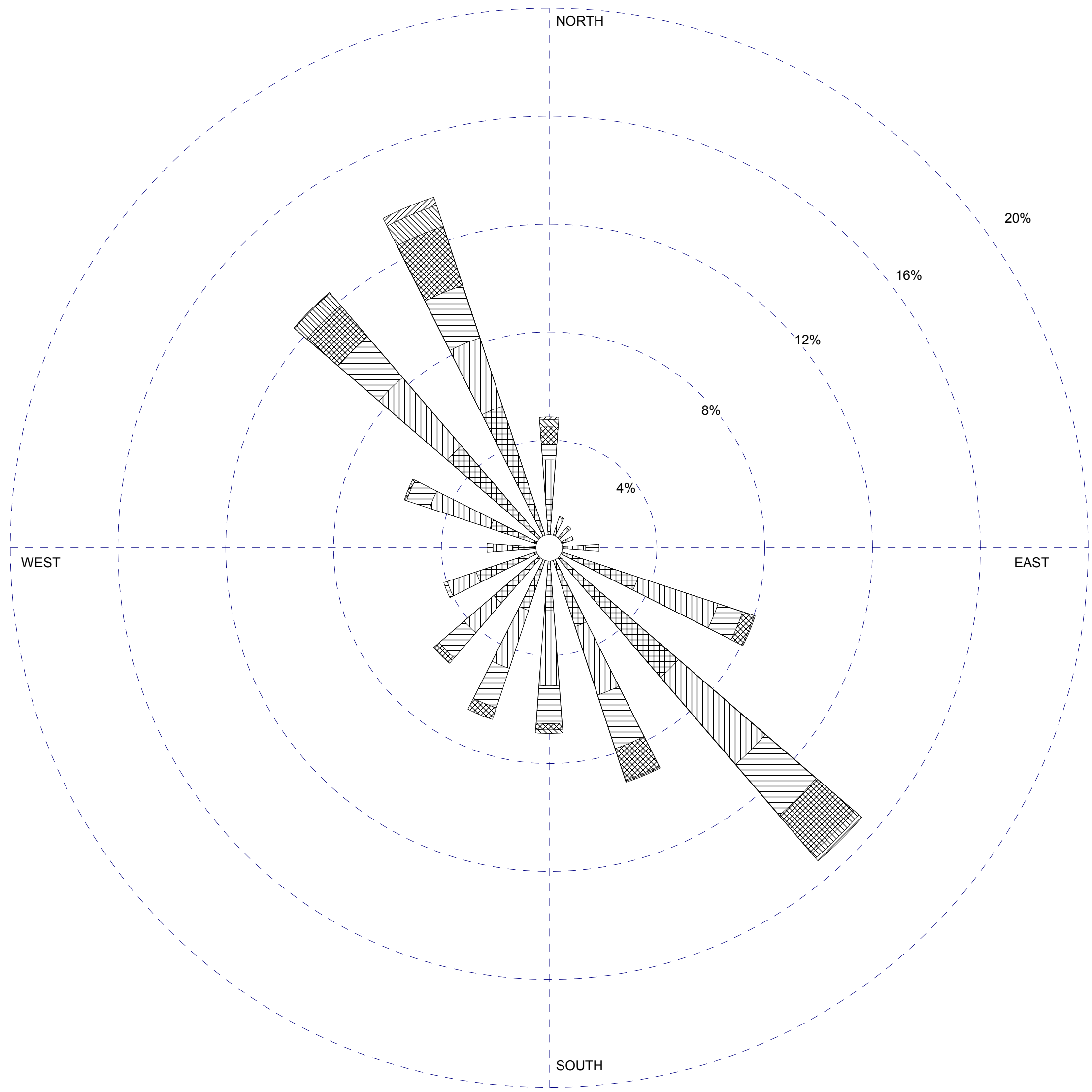


Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Third Quarter Wind Rose - 1987**
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.28 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1987 Jul 1 - Sep 30 Midnight - 11 PM**	**Figure 8.1-7d**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

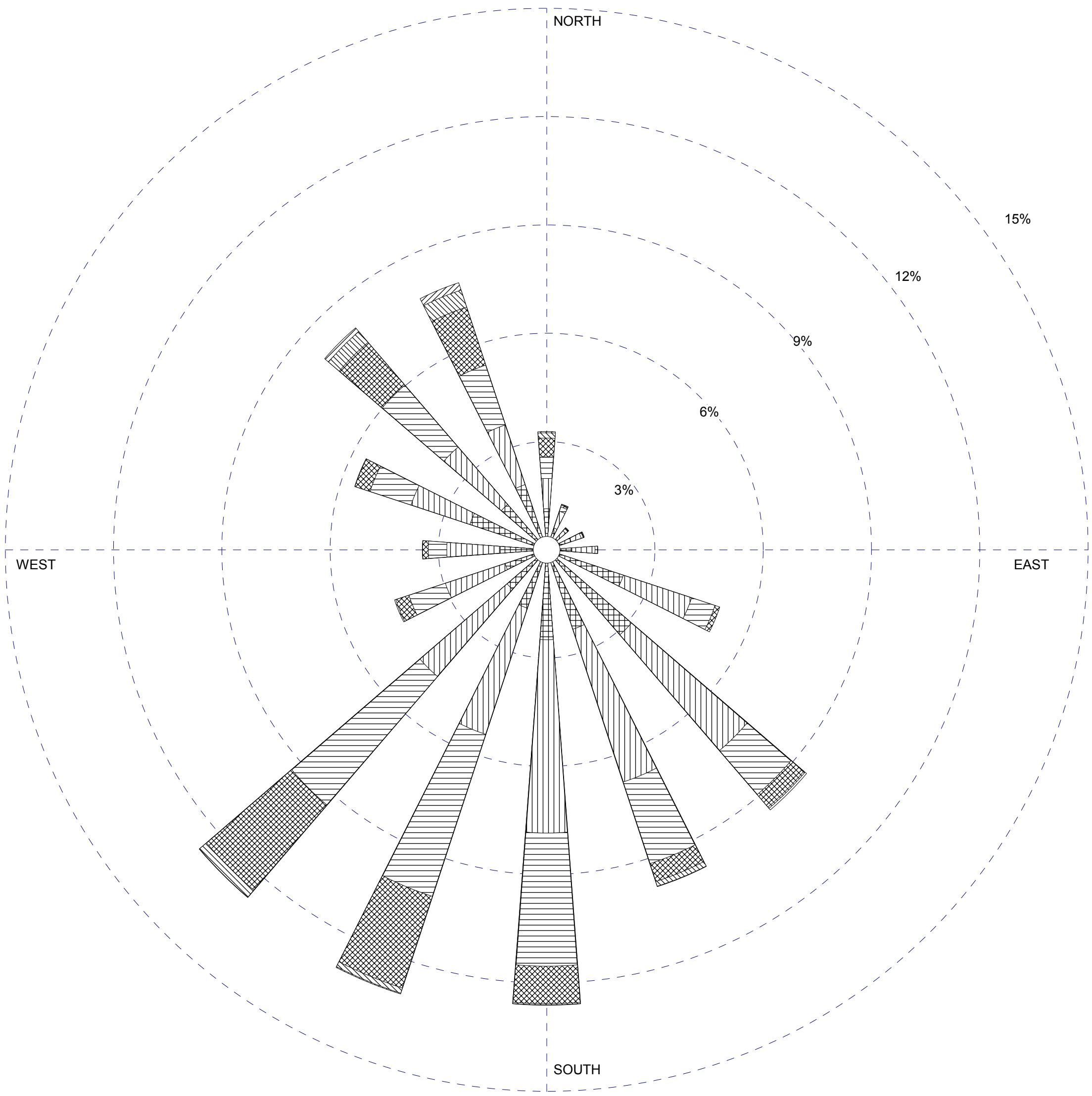


Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Fourth Quarter Wind Rose - 1987**
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **2.78 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1987 Oct 1 - Dec 31 Midnight - 11 PM**	**Figure 8.1-7e**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)

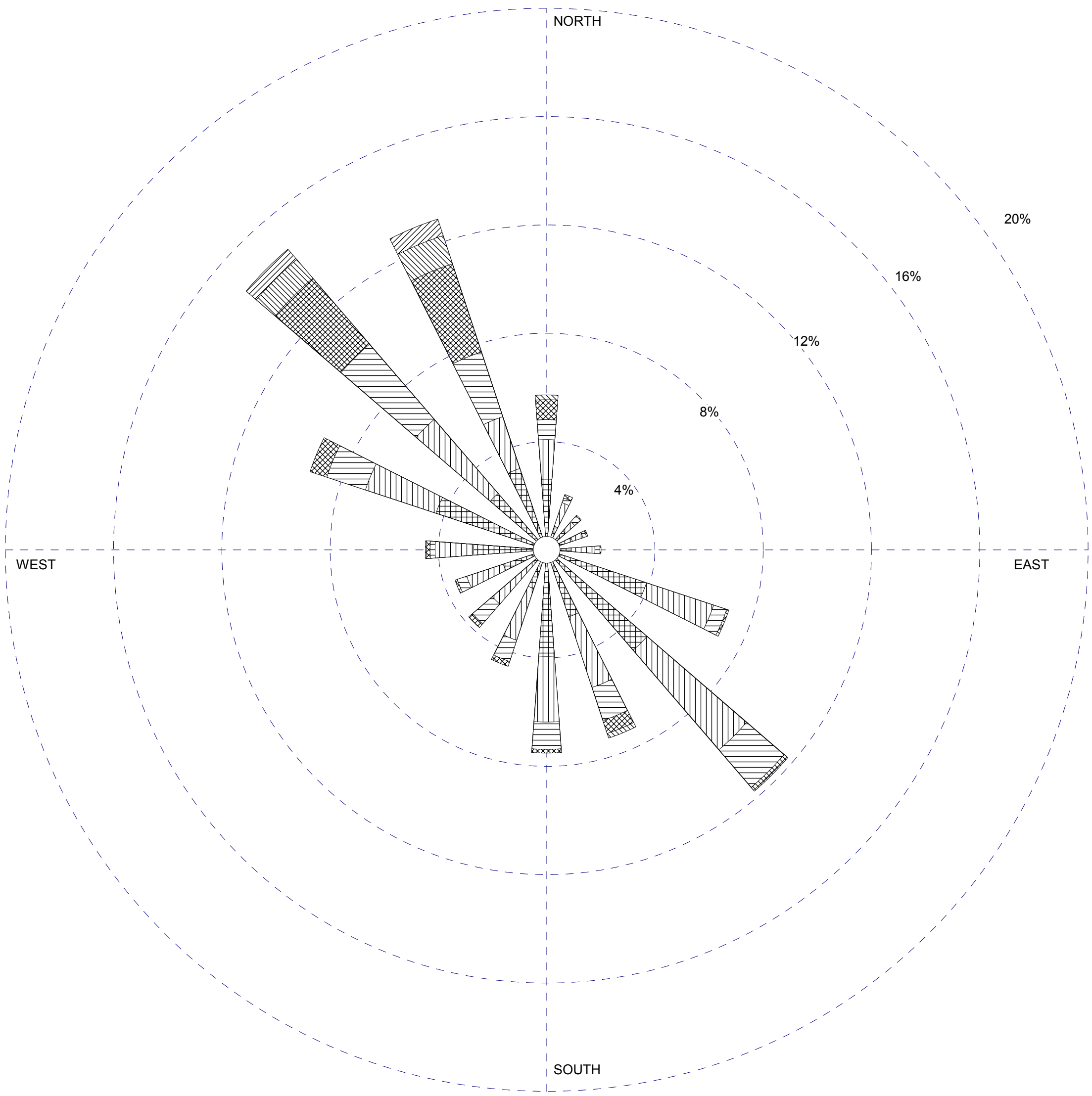
- > 11.00
- 8.50 - 11.00
- 5.50 - 8.50
- 3.50 - 5.50
- 2.00 - 3.50
- 0.50 - 2.00

PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Annual Wind Rose - 1988**
DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
AVG. WIND SPEED **3.33 m/s**	CALM WINDS **0.00%**	
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1988 Jan 1 - Dec 31 Midnight - 11 PM**	**Figure 8.1-8a**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)

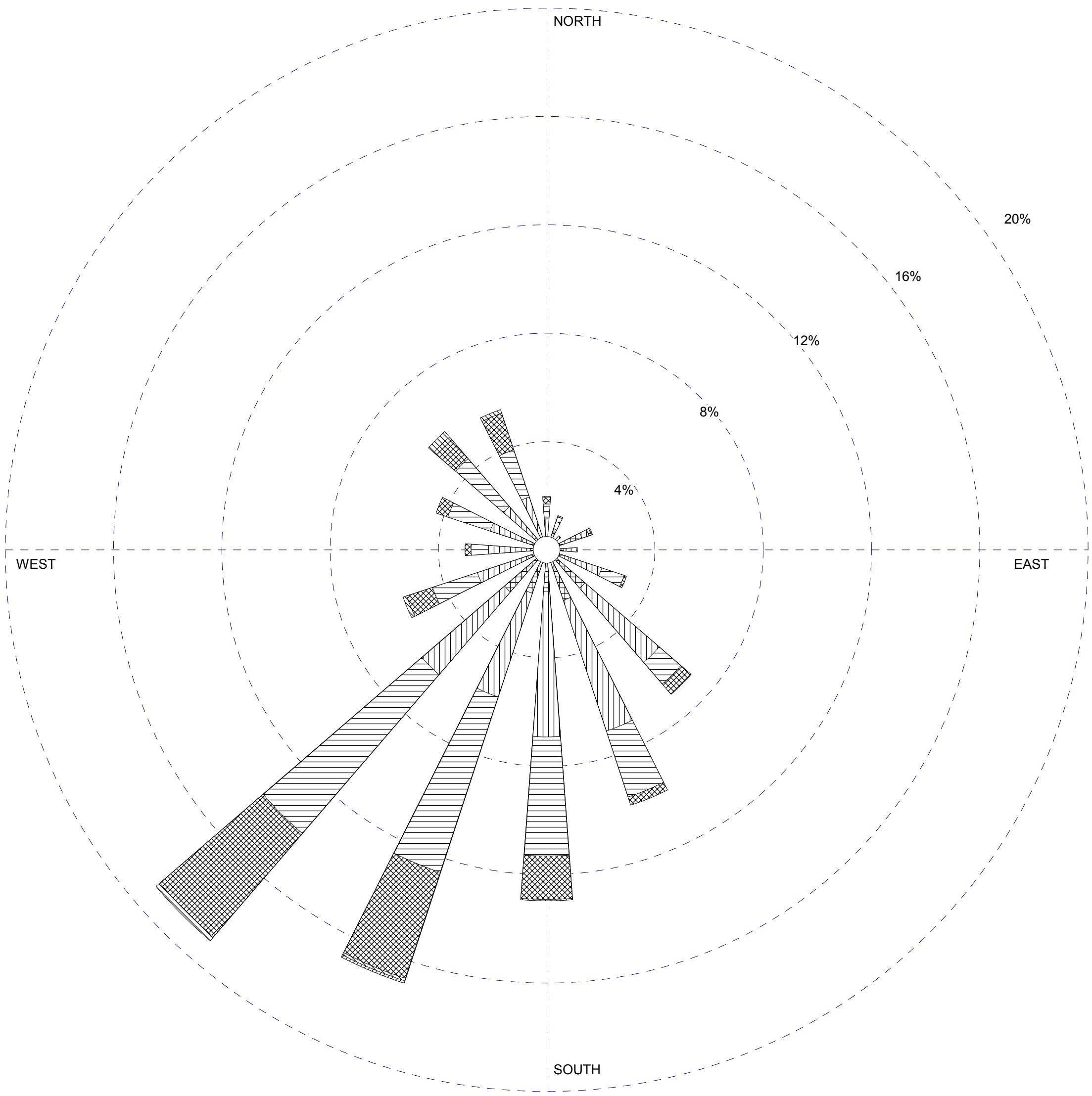
- > 11.00
- 8.50 - 11.00
- 5.50 - 8.50
- 3.50 - 5.50
- 2.00 - 3.50
- 0.50 - 2.00

PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**First Quarter Wind Rose - 1988**
DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
AVG. WIND SPEED **2.97 m/s**	CALM WINDS **0.00%**	
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1988** **Jan 1 - Mar 31** **Midnight - 11 PM**	**Figure 8.1-8b**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

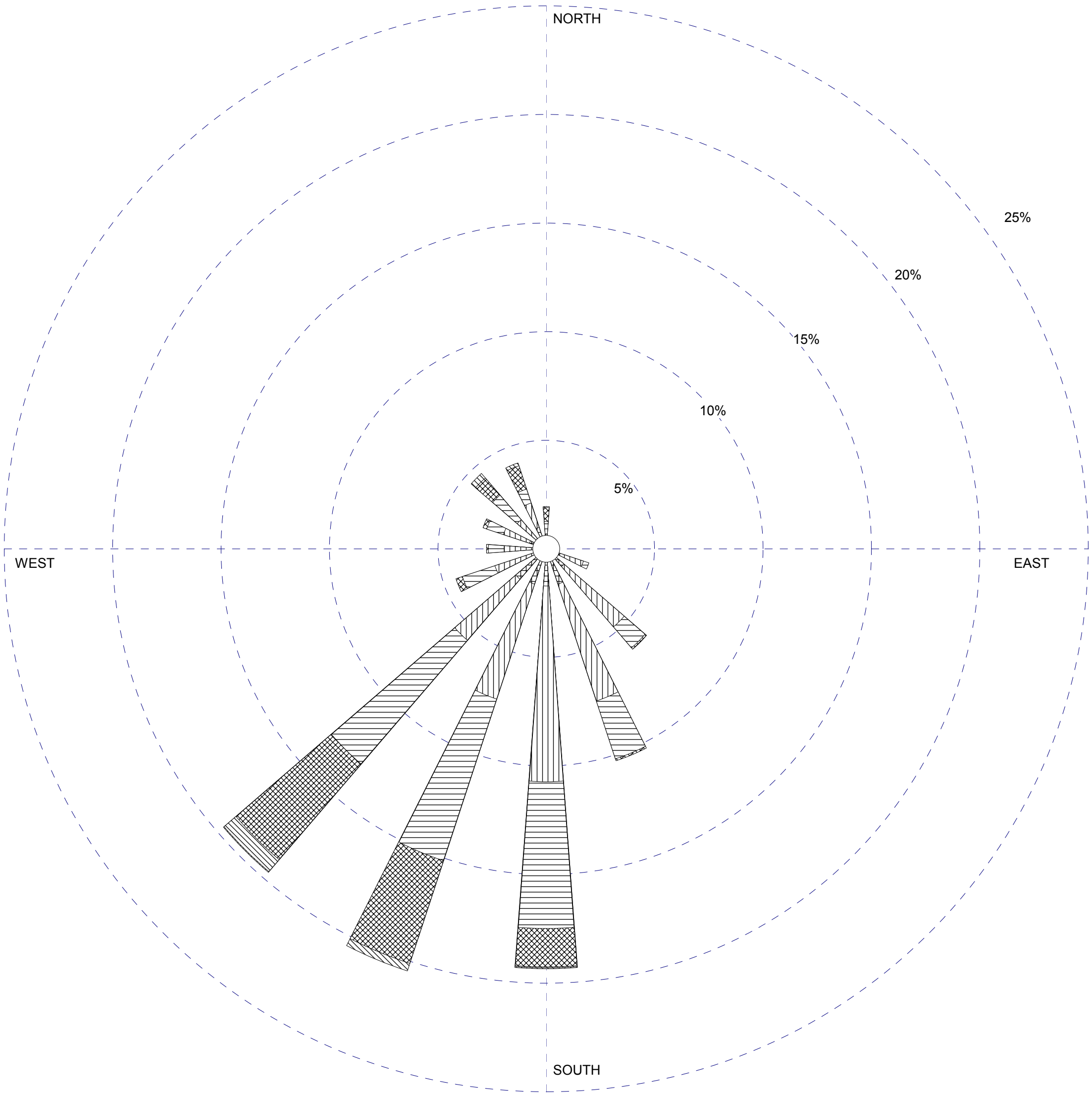


Wind Speed (m/s)			
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Second Quarter Wind Rose - 1988**
	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.63 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1988 Apr 1 - Jun 30 Midnight - 11 PM**	**Figure 8.1-8c**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

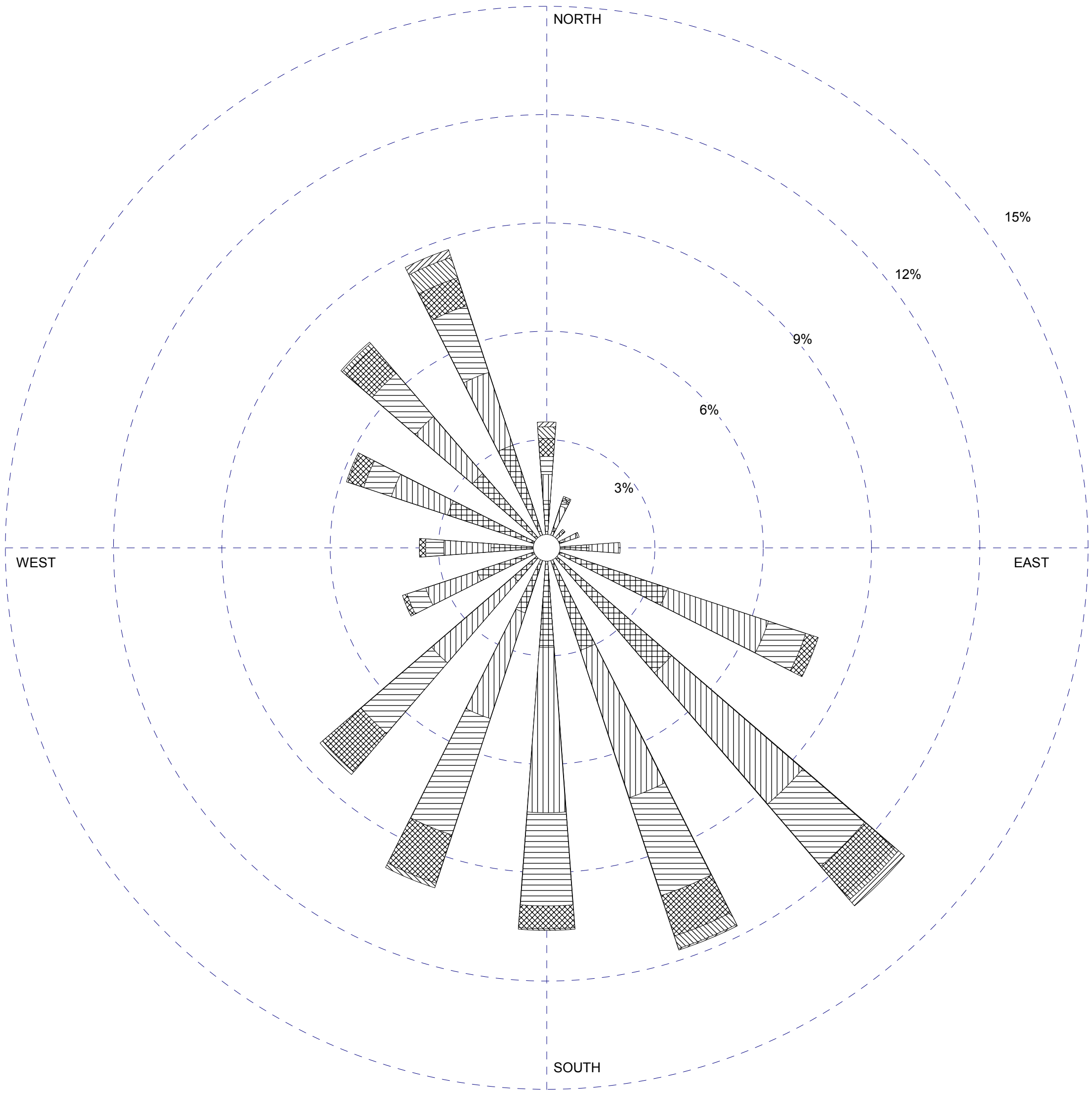


Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Third Quarter Wind Rose - 1988**
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.72 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1988** **Jul 1 - Sep 30** **Midnight - 11 PM**	**Figure 8.1-8d**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)

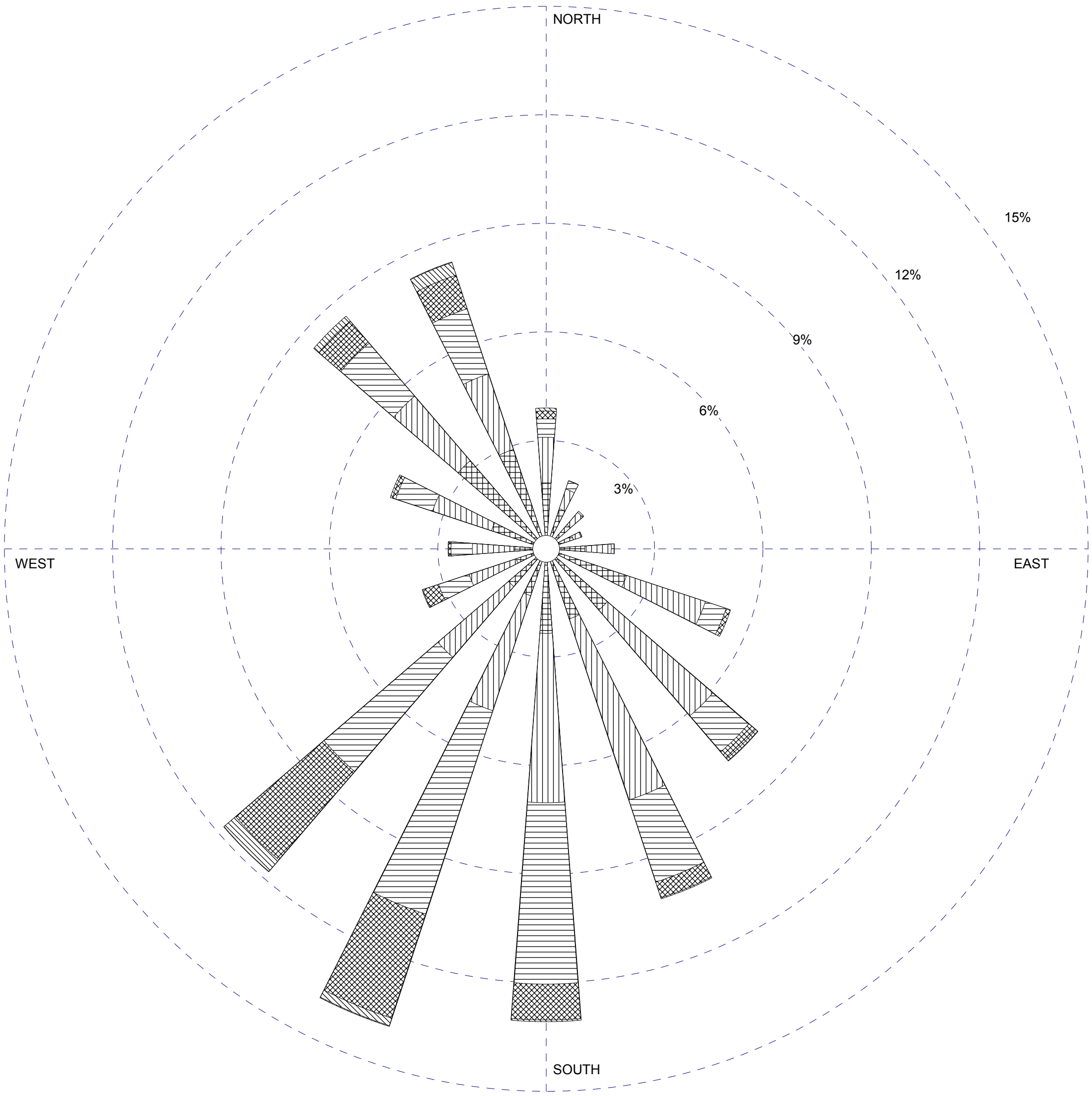
- > 11.00
- 8.50 - 11.00
- 5.50 - 8.50
- 3.50 - 5.50
- 2.00 - 3.50
- 0.50 - 2.00

PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Fourth Quarter Wind Rose - 1988**
DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
AVG. WIND SPEED **3.02 m/s**	CALM WINDS **0.00%**	
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1988** **Oct 1 - Dec 31** **Midnight - 11 PM**	**Figure 8.1-8e**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

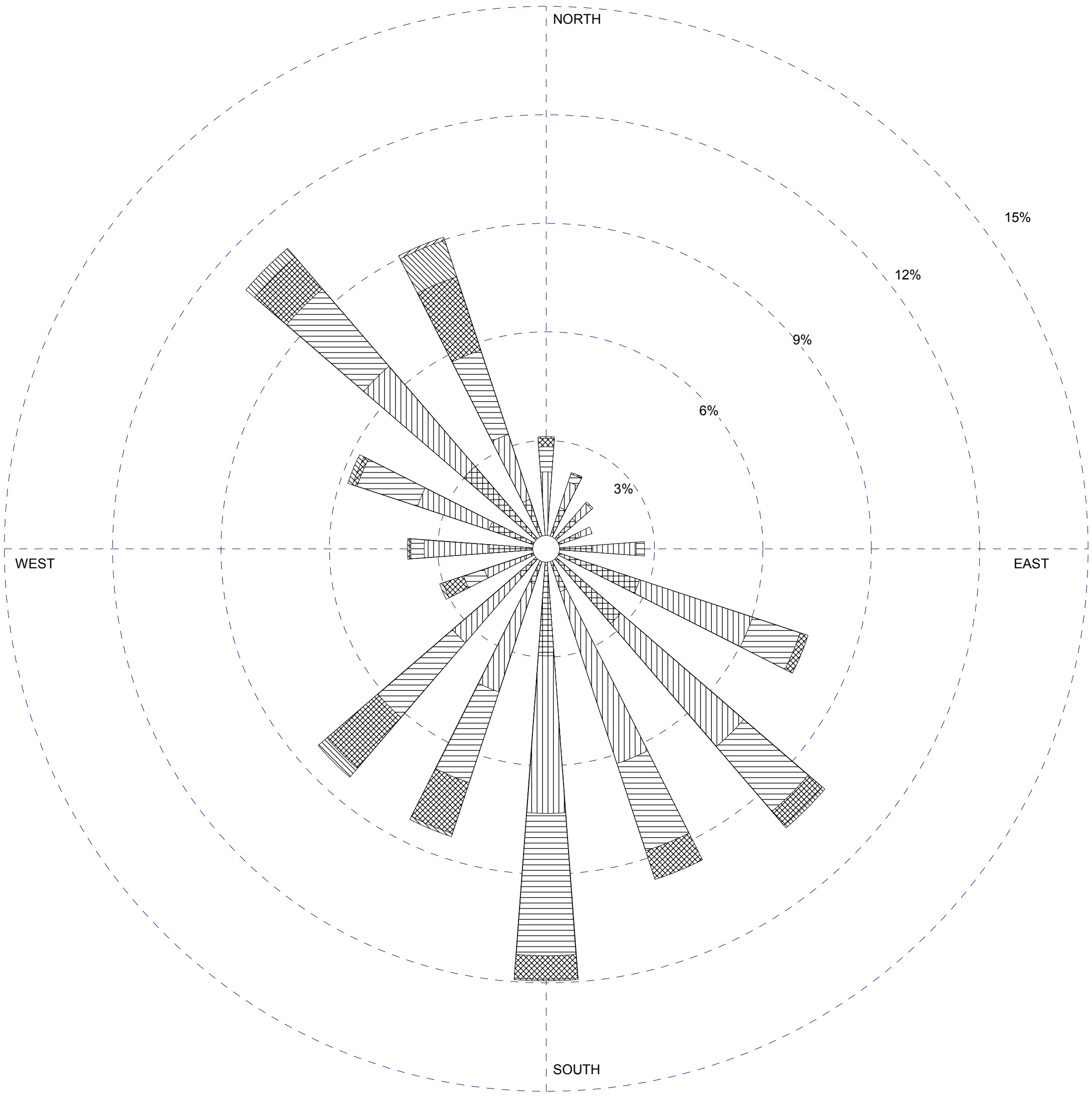


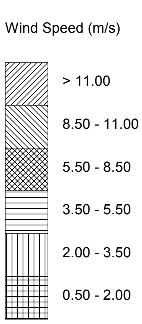
Wind Speed (m/s)			
> 11.00	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Annual Wind Rose - 1989**
8.50 - 11.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
5.50 - 8.50	AVG. WIND SPEED **3.17 m/s**	CALM WINDS **0.00%**	
3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1989 Jan 1 - Dec 31 Midnight - 11 PM**	**Figure 8.1-9a**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



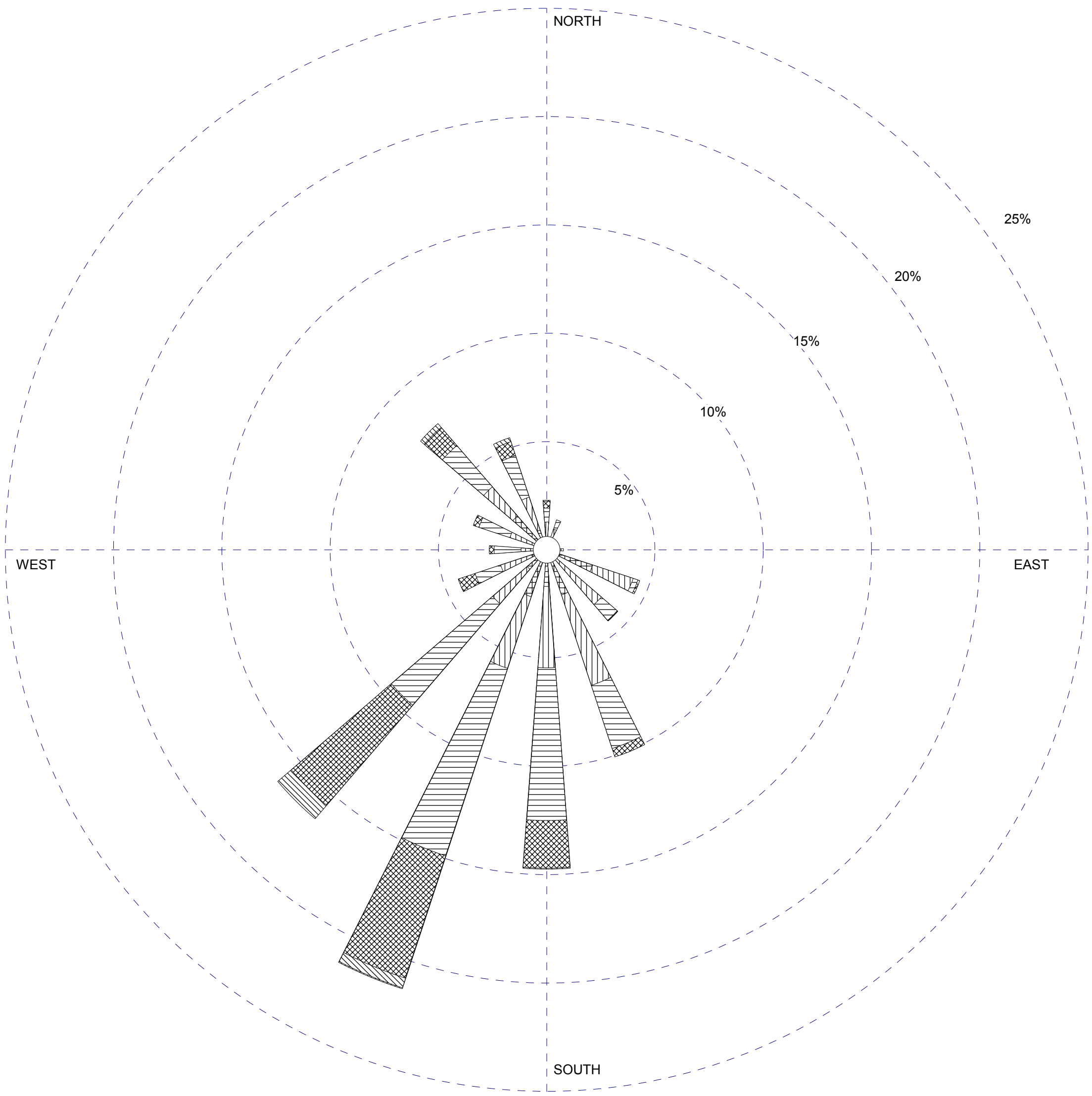


PROJECT	DATE	
Cosumnes Power Plant	**08/29/2001**	**First Quarter Wind Rose - 1989**
DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
AVG. WIND SPEED **3.18 m/s**	CALM WINDS **0.00%**	
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1989** **Jan 1 - Mar 31** **Midnight - 11 PM**	**Figure 8.1-9b**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

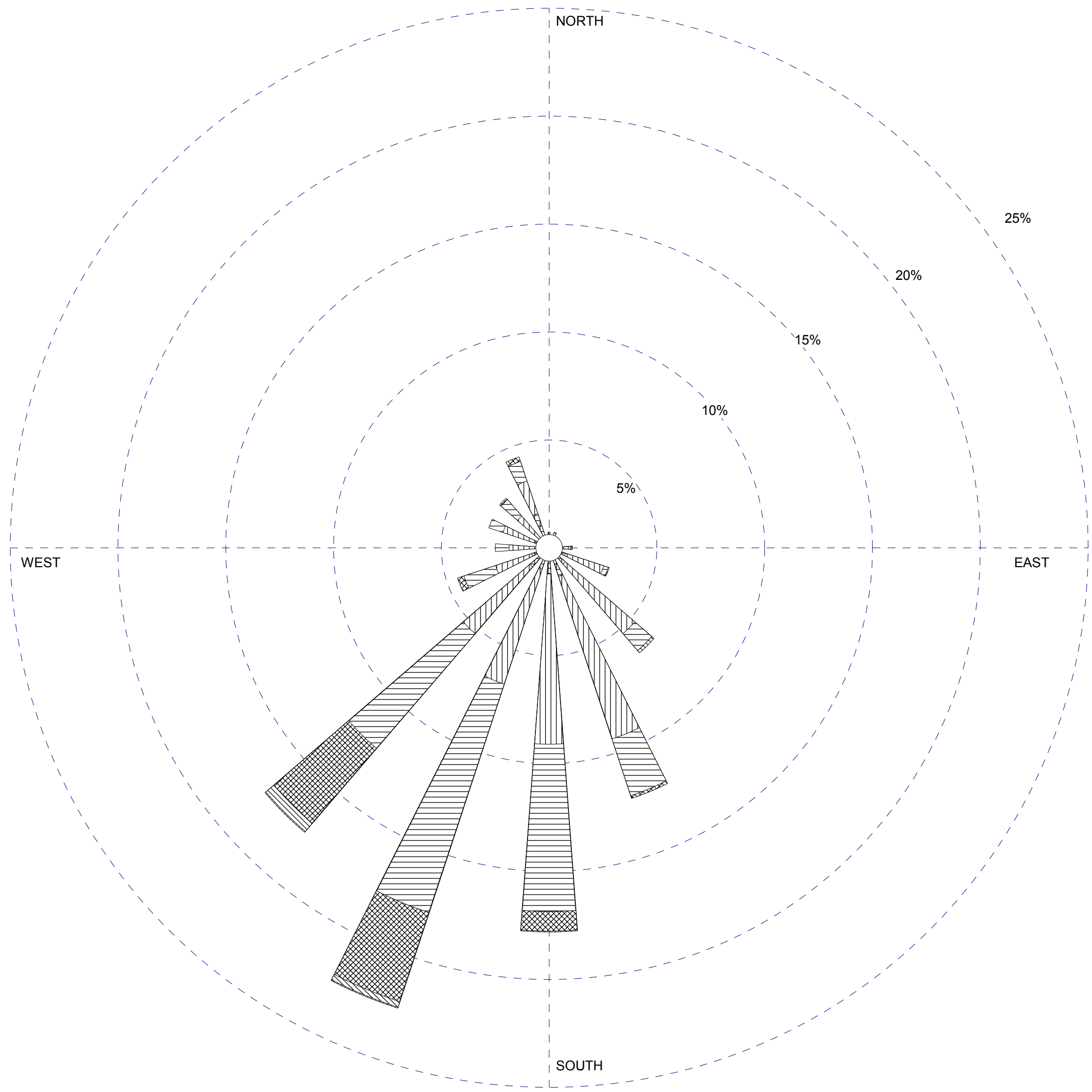


Wind Speed (m/s)			
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Second Quarter Wind Rose - 1989**
	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.87 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1989** **Apr 1 - Jun 30** **Midnight - 11 PM**	**Figure 8.1-9c**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA

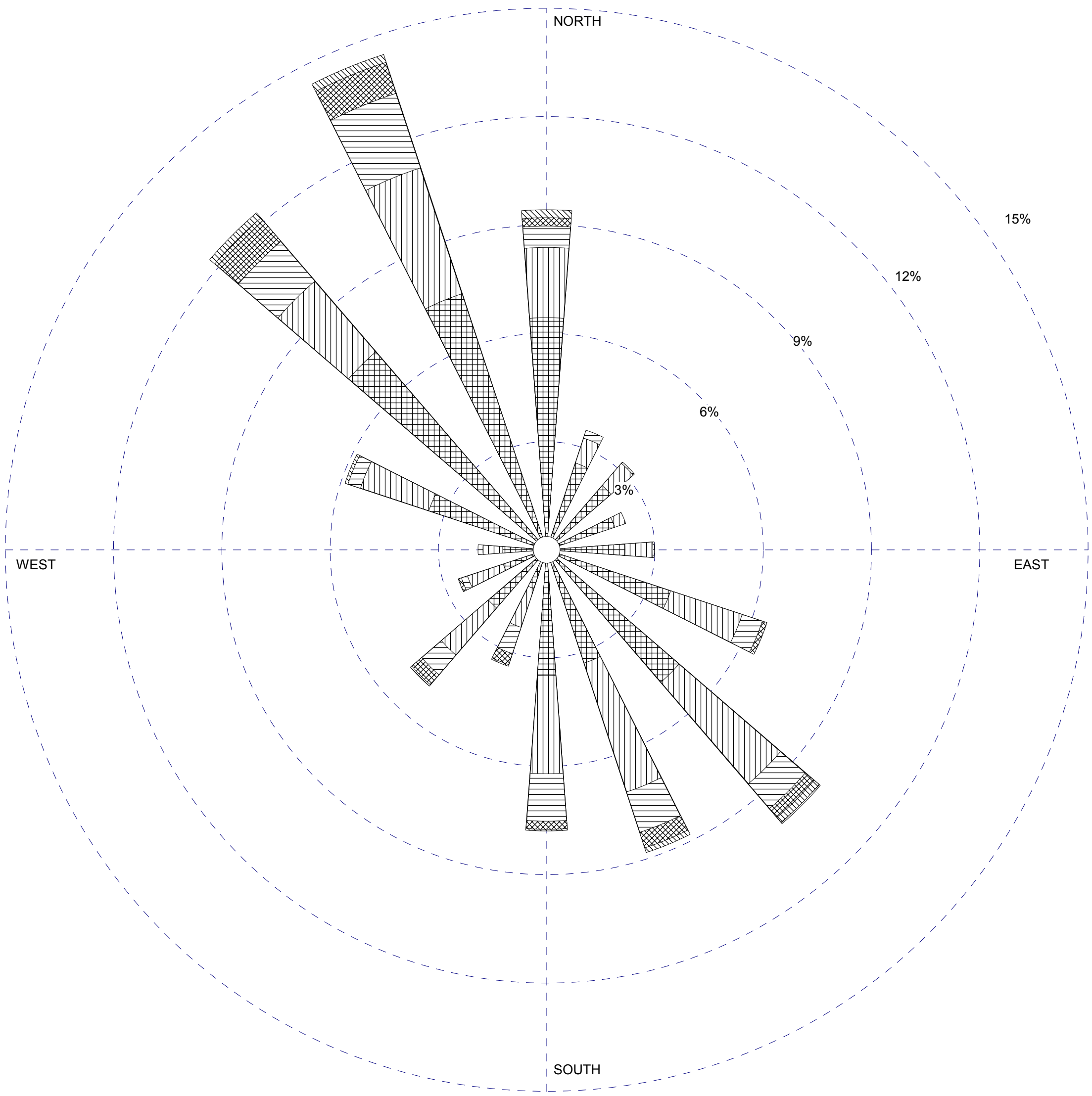


Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Third Quarter Wind Rose - 1989**
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **3.49 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1989** **Jul 1 - Sep 30** **Midnight - 11 PM**	**Figure 8.1-9d**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Station #23232 - SACRAMENTO EXECUTIVE AIRPORT, CA



Wind Speed (m/s)	PROJECT **Cosumnes Power Plant**	DATE **08/29/2001**	**Fourth Quarter Wind Rose - 1989**
> 11.00 8.50 - 11.00 5.50 - 8.50 3.50 - 5.50 2.00 - 3.50 0.50 - 2.00	DISPLAY **Wind Speed**	UNIT **m/s**	**Diagram of the Frequency of Occurrence of Each Wind Direction and Wind Speed Class**
	AVG. WIND SPEED **2.14 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1989** **Oct 1 - Dec 31** **Midnight - 11 PM**	**Figure 8.1-9e**

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

Figure 8.1-10a

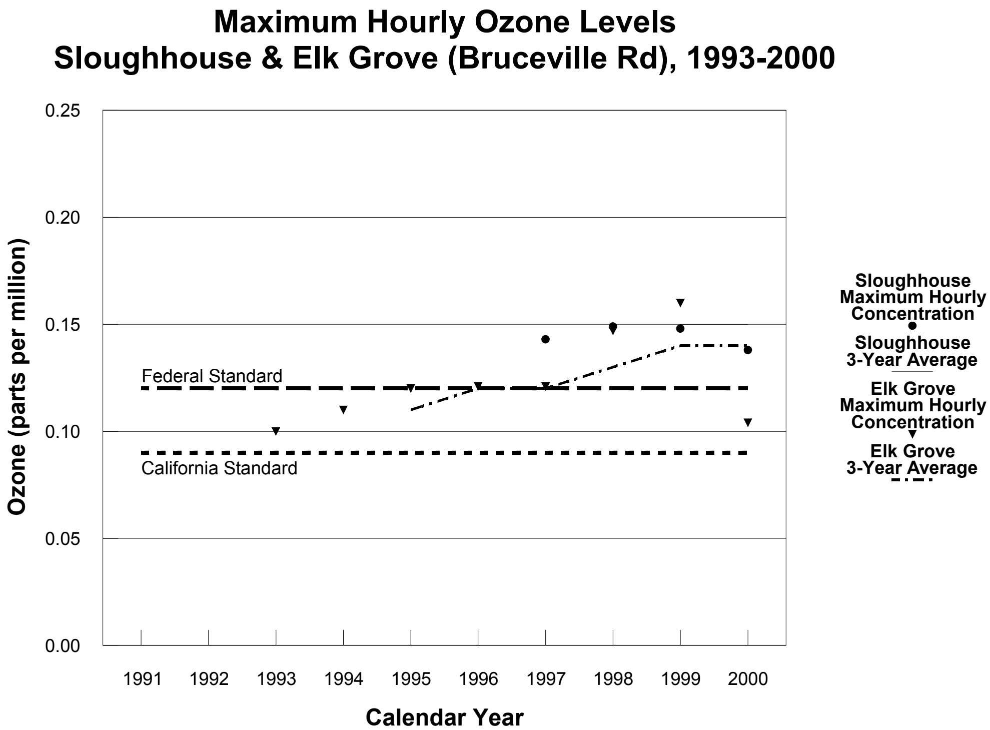


Figure 8.1-10b

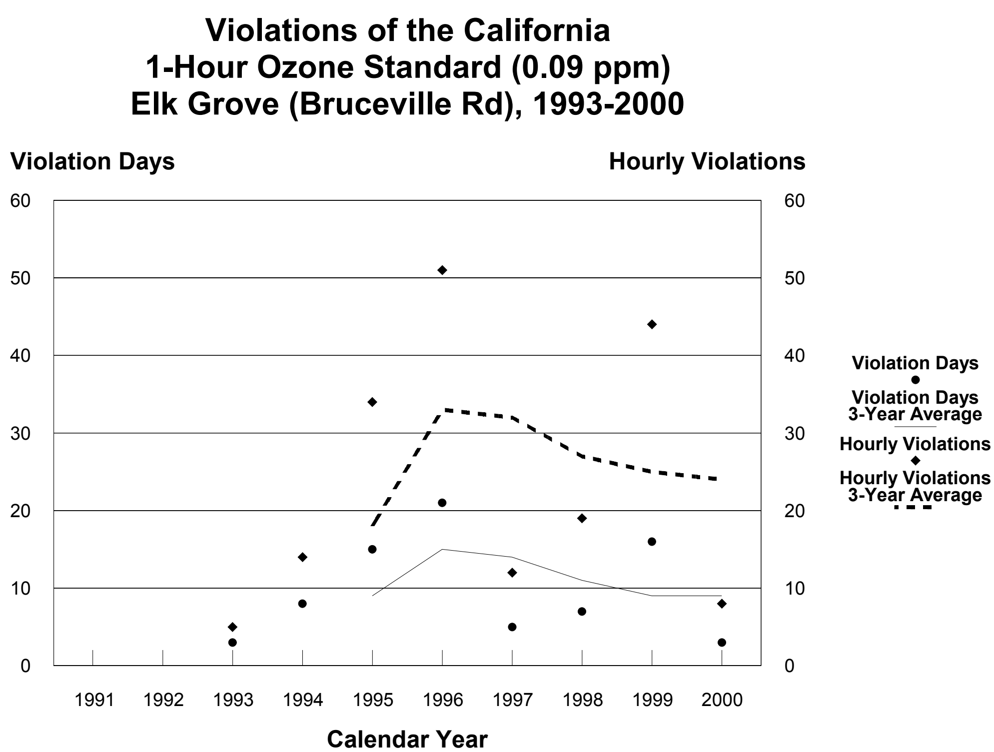


Figure 8.1-11

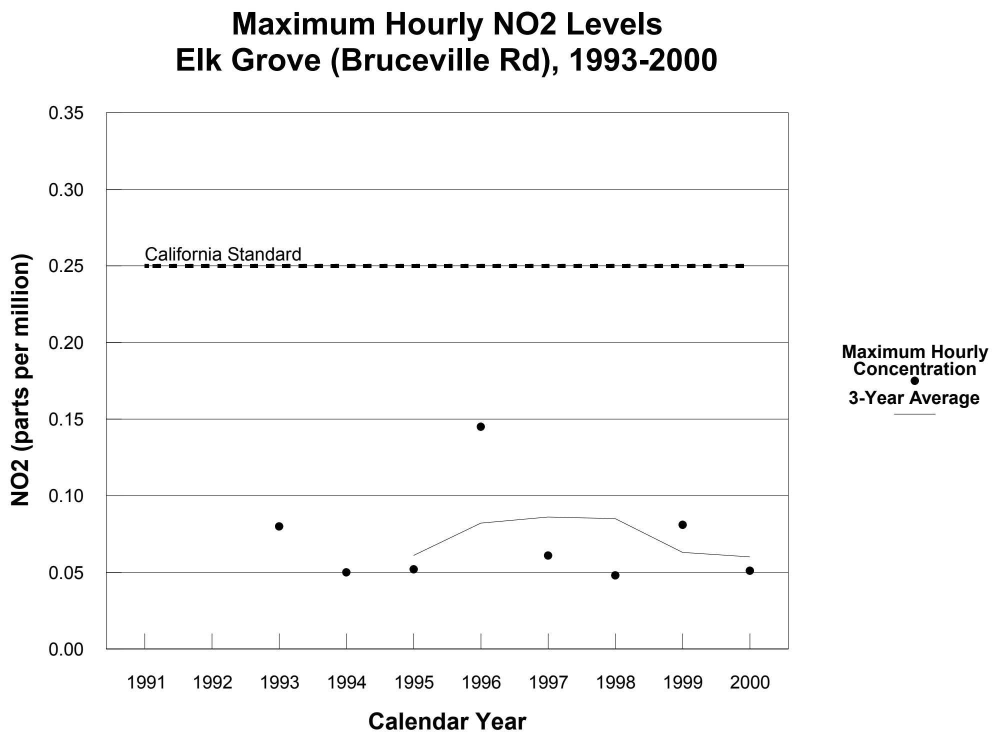


Figure 8.1-12

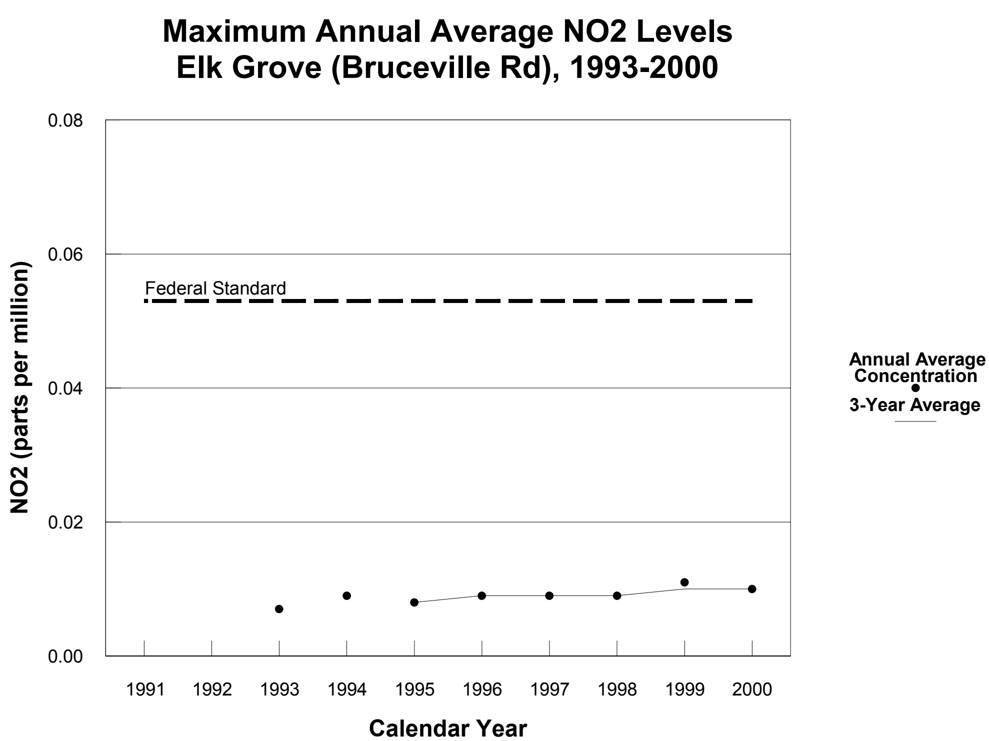


Figure 8.1-13

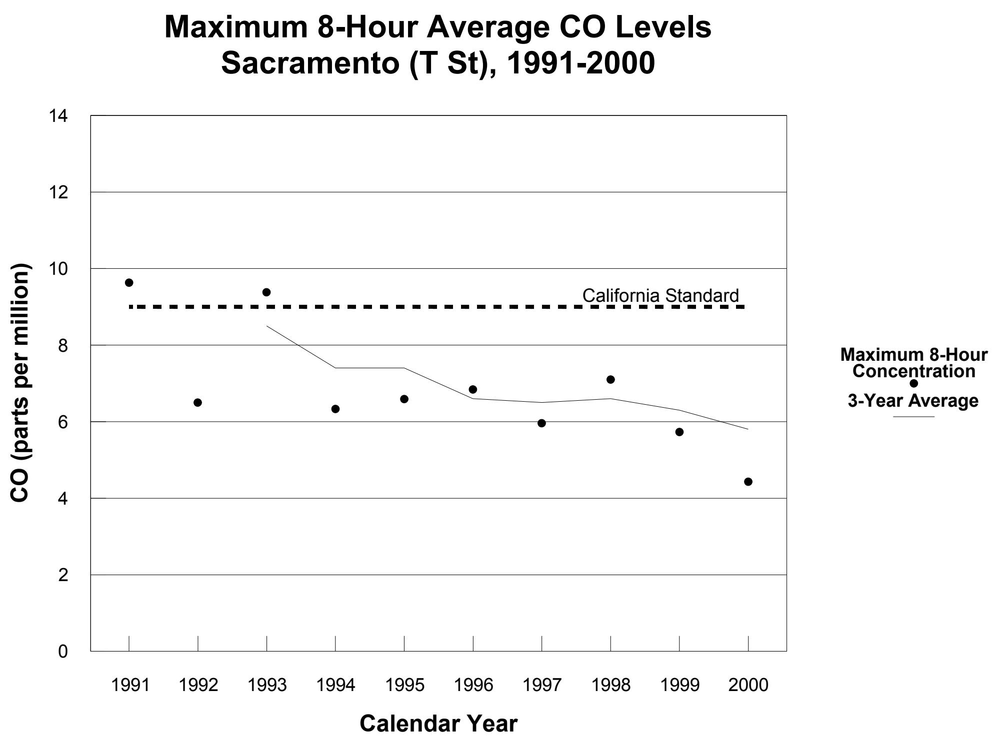


Figure 8.1-14

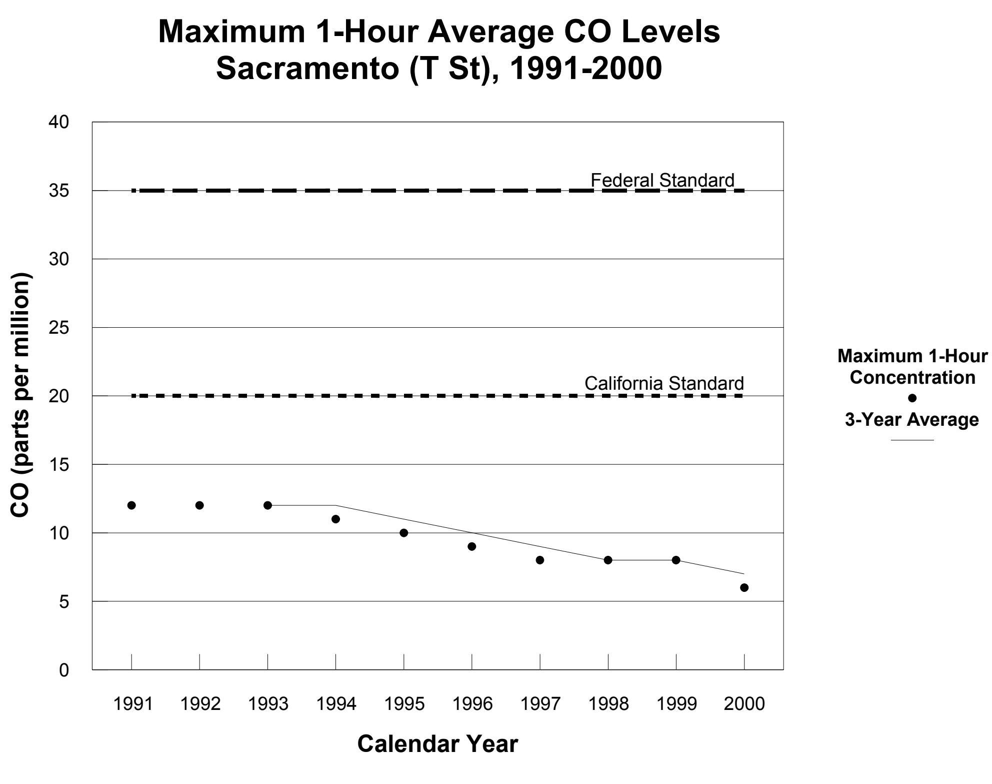


Figure 8.1-15

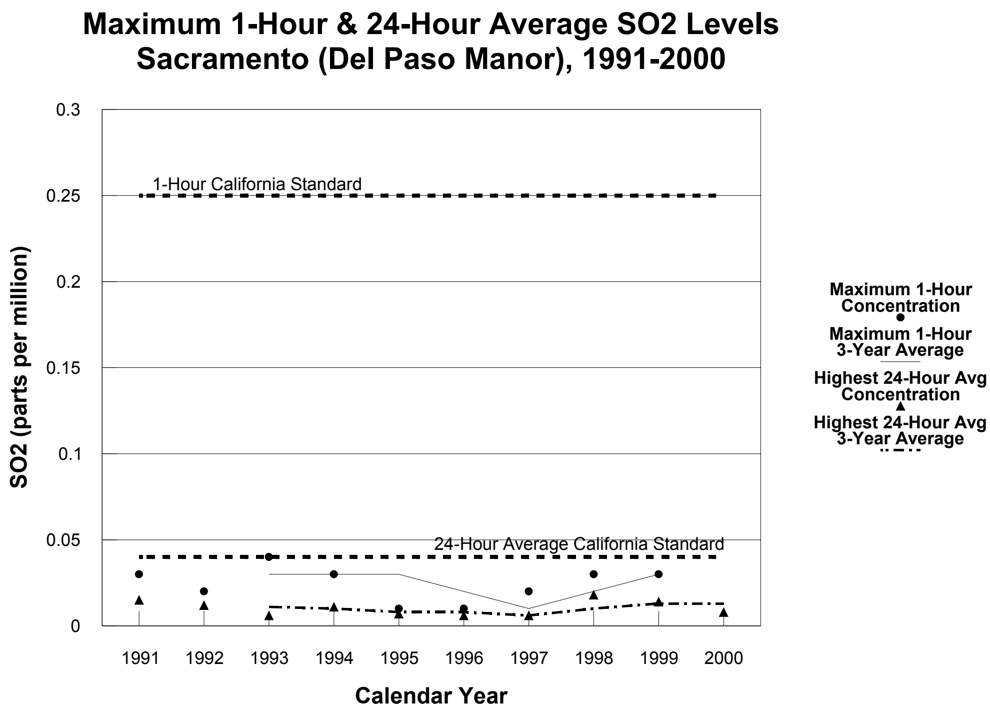


Figure 8.1-16

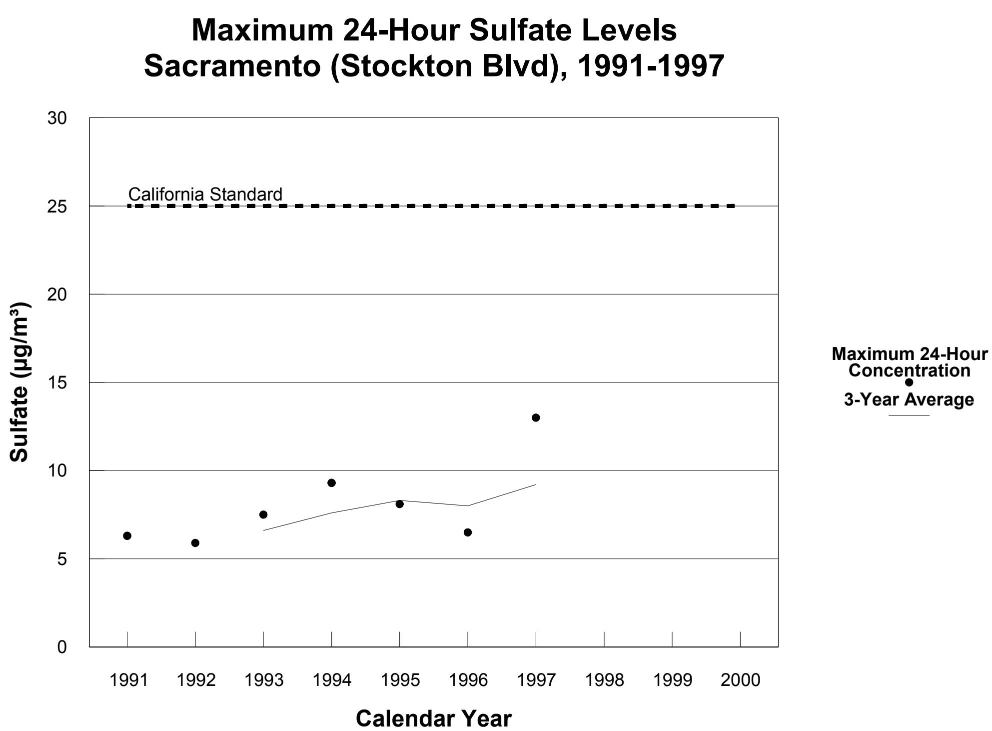


Figure 8.1-17

Maximum 24-Hour PM10 Levels Sacramento (Stockton Blvd), 1993-2000

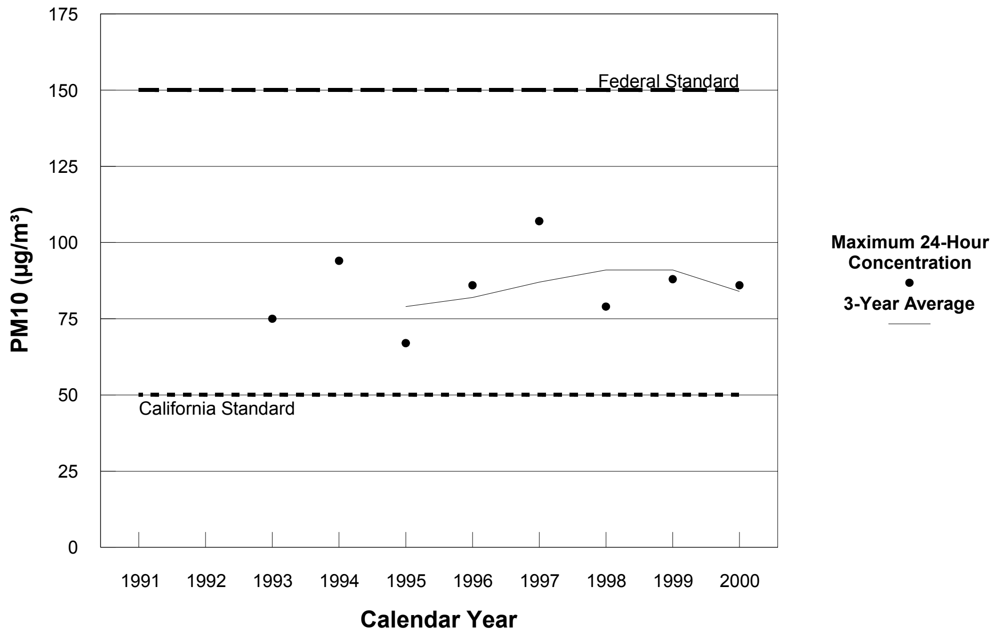


Figure 8.1-18

Expected Violations of the California 24-Hour PM10 Standard (50 µg/m³) Sacramento (Branch Center Rd), 1993-2000

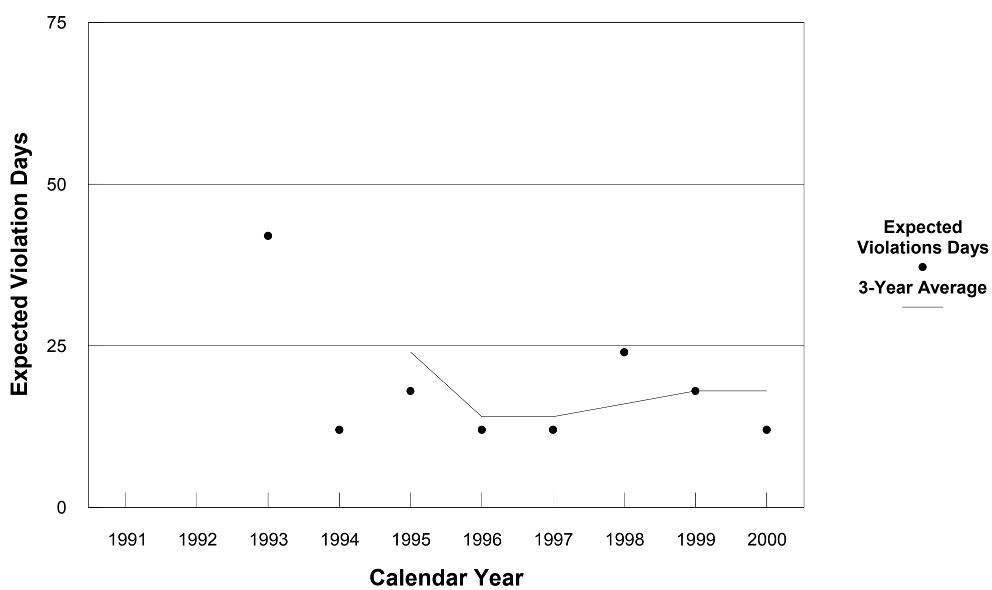


Figure 8.1-19

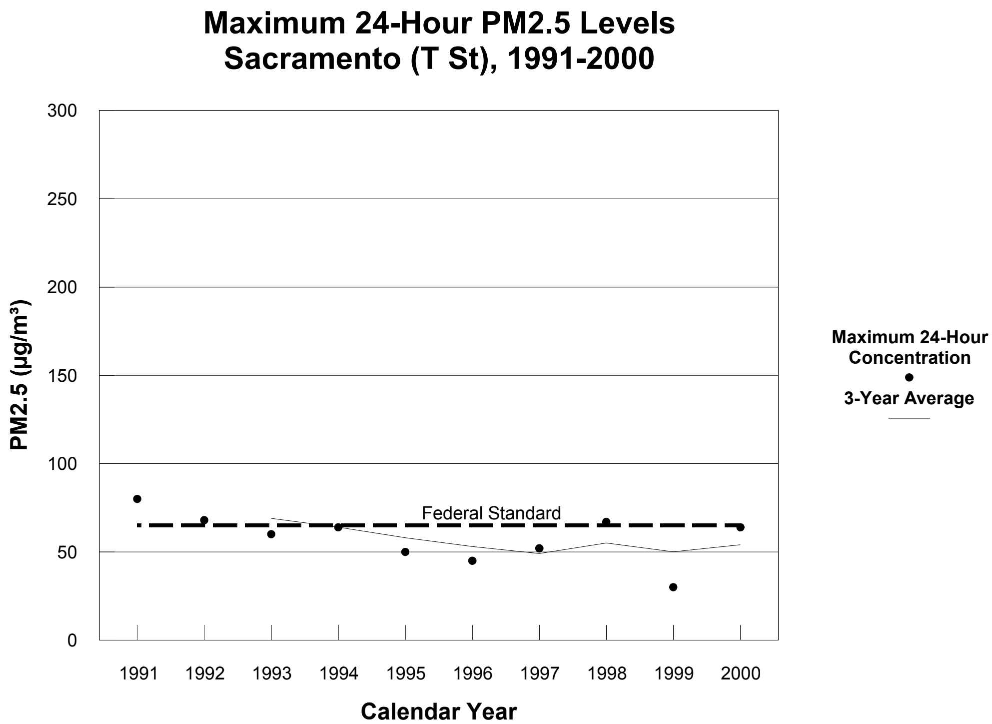
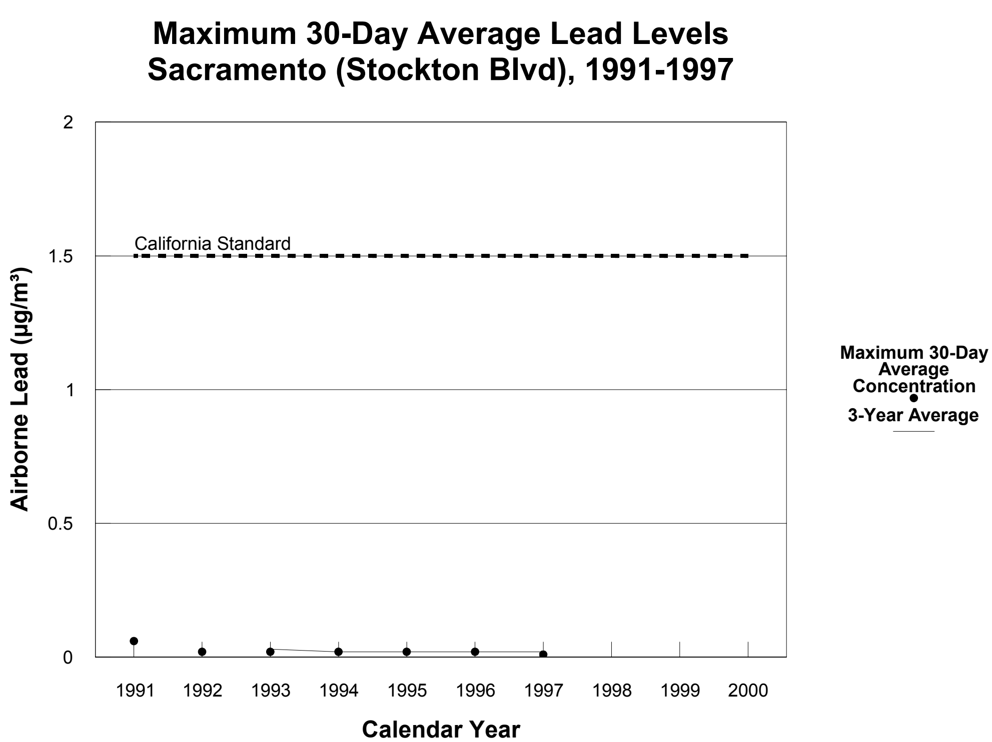
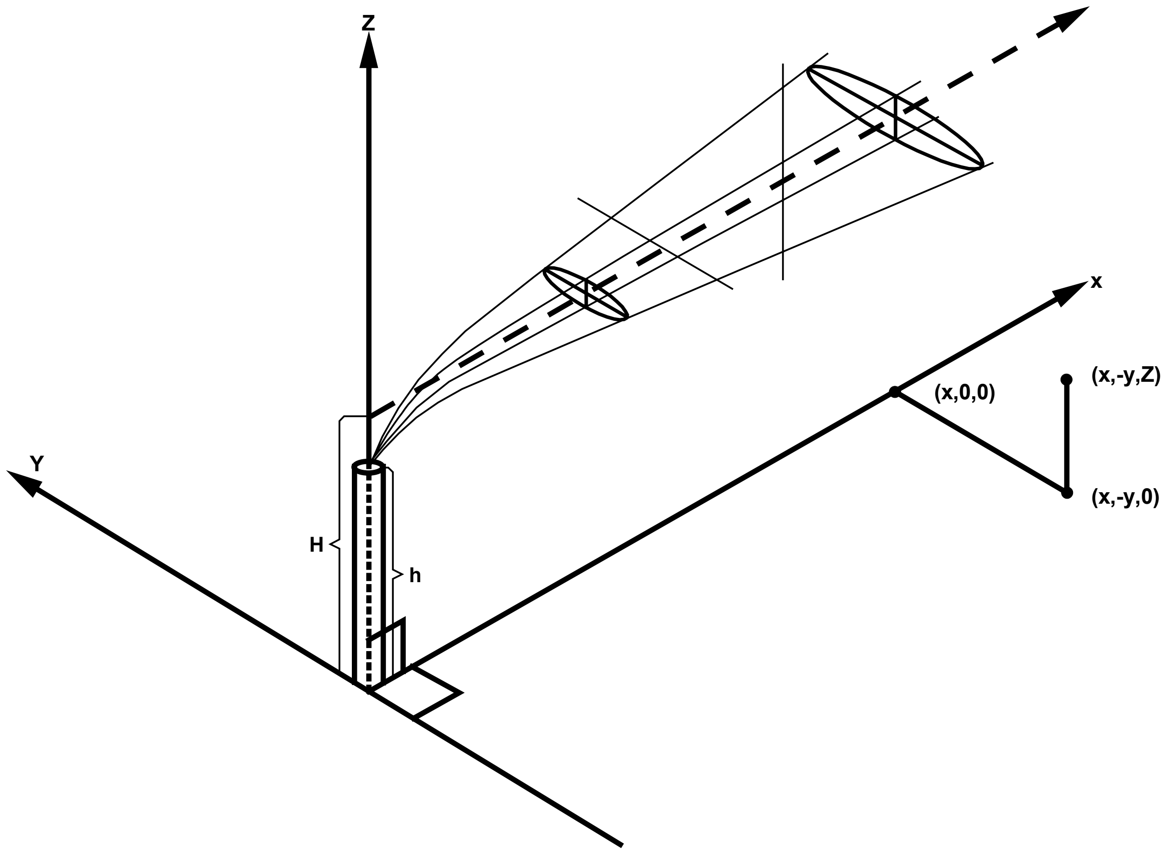


Figure 8.1-20





Coordinate system showing Gaussian distributions in the horizontal and vertical.

FIGURE 8.1-21
Coordinate System Showing Gaussian Distributions

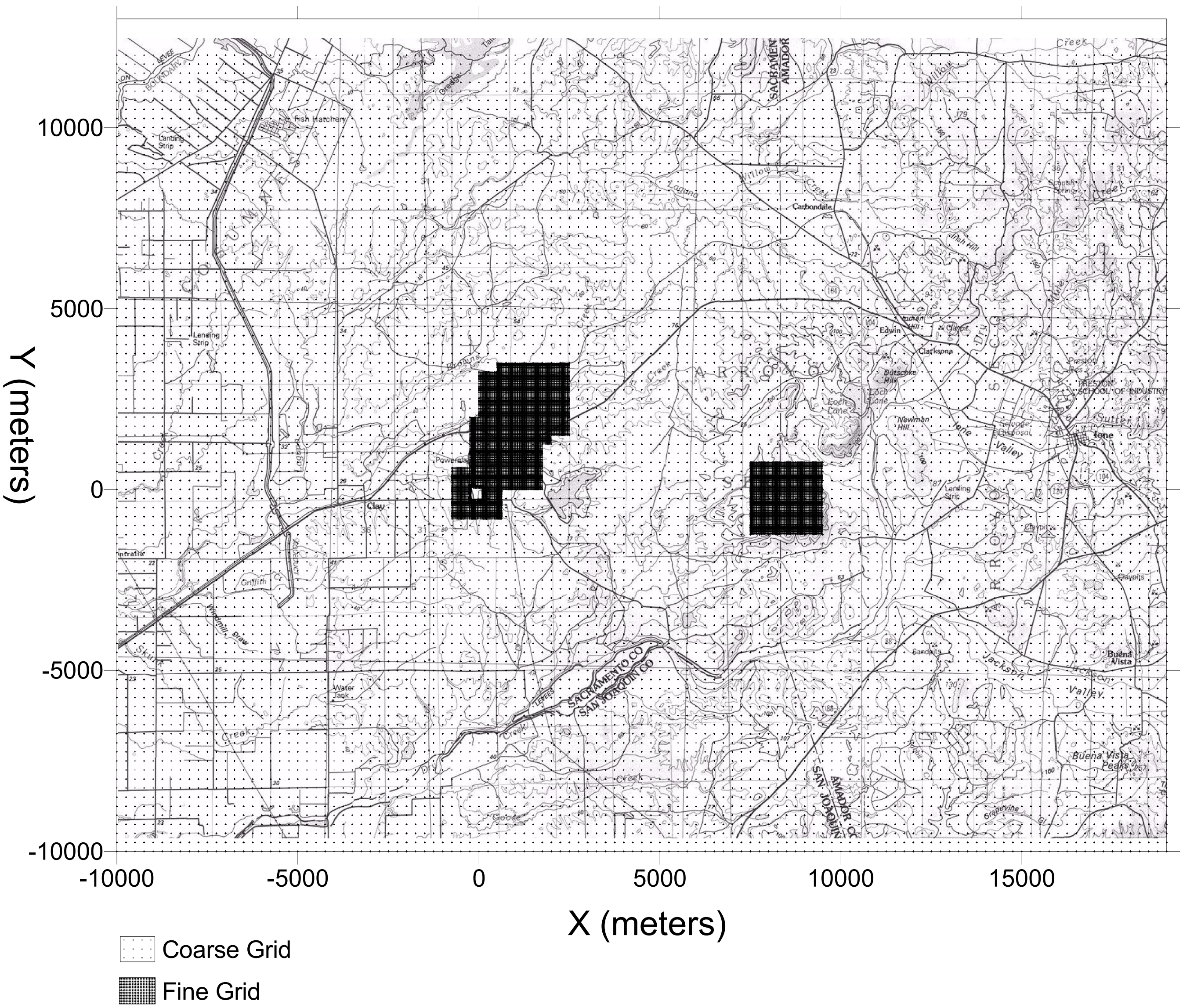

Y (meters)
X (meters)
10000
5000
0
-5000
-10000
15000
Coarse Grid
Fine Grid

FIGURE 8.1-22