SECTION 2

AIR QUALITY DATA

2.0 AIR QUALITY DATA

The Air Quality Data Section covers the ambient particulate matter monitoring and meteorological data. This information is incorporated into the air quality modeling and control strategy analyses along with the emissions inventory data that is covered in subsequent sections of this document. Appendix A summarizes the particulate matter and meteorological data that is discussed in this section.

2.1 PM-10 Monitoring Sites

The District has been operating particulate monitors in Mammoth Lakes on a once-every-sixth-day schedule since 1979. These monitors have been measuring Total Suspended Particulates (TSP), and/or PM-10 (Particulate Matter less than 10 microns) using a Size Selective Inlet (SSI) and a Dichotomous Sampler (Dichot).

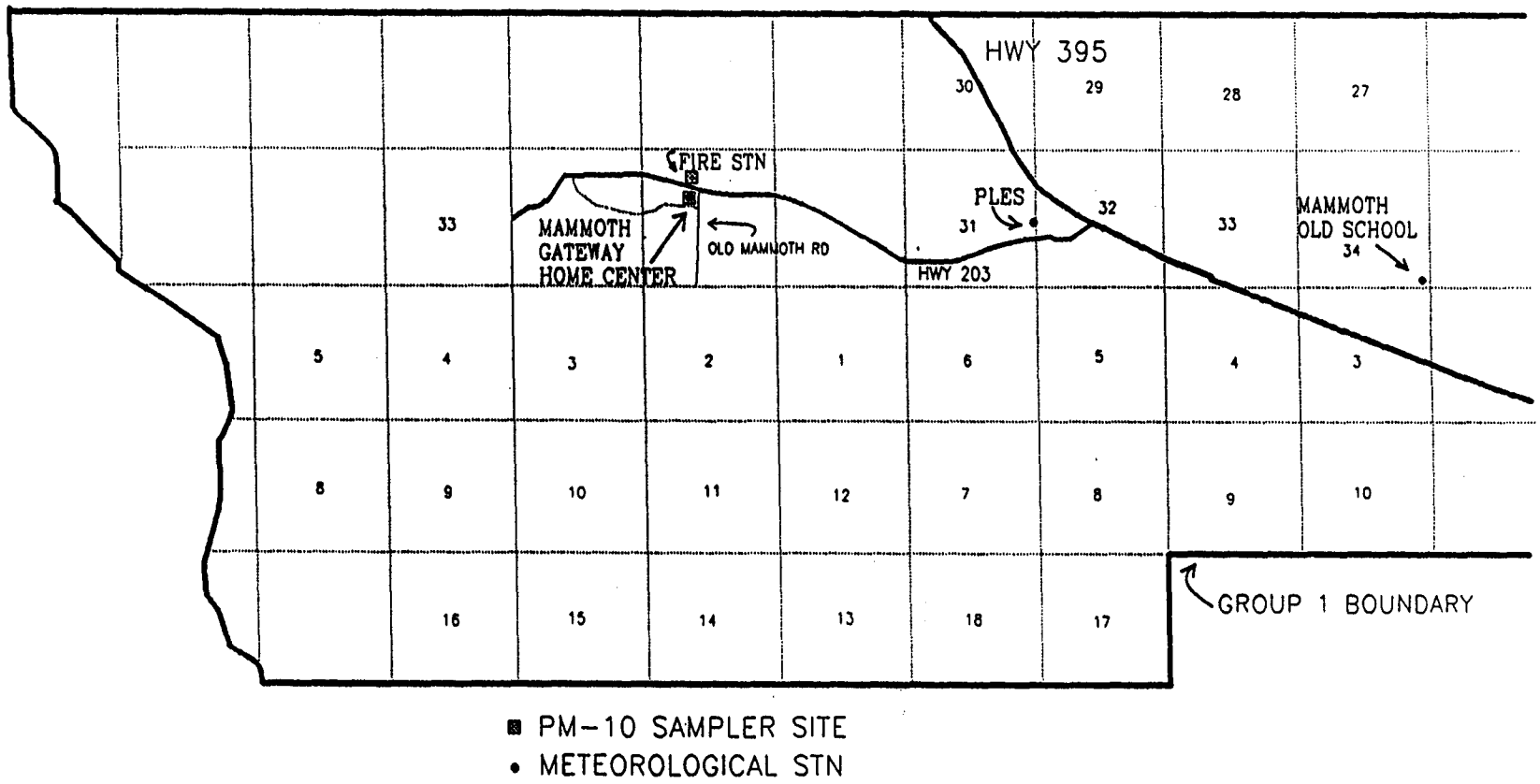
The District has had two monitoring sites in Mammoth Lakes; the Fire Station at the corner of Highway 203 and Forest Trail Road, and the Gateway Home Center at the corner of Highway 203 and Old Mammoth Road (see Figure 2.1). At the Fire Station site, the District started measuring TSP in September 1979 and PM-10 in December 1983. In August 1985, the Fire Station site was discontinued and the monitors were moved to the Gateway Home Center. TSP monitoring was discontinued when the particulate matter standard was changed from TSP to PM-10 in 1987.

A Dichotomous PM-10 Sampler (Anderson Model 240) was also operated at the Gateway Home Center from November 1987 to March 1988 as a special purpose monitor to be used for receptor modeling. The monitor operated on a regular schedule with increased monitoring on weekends and holiday periods to catch the high concentration days. See Section 2.4.

2.2 Meteorological Sites

There are three meteorological sites located in the Mammoth Lakes PM-10 planning area; Gateway Home Center, Pacific Lighting & Energy Systems (PLES) and Mammoth Old School. These sites are shown on the map in Figure 2.1. These meteorological stations measure wind speed, wind direction and temperature. Mammoth Old School and PLES were both started in April 1987, while the Gateway

FIGURE 2.1
PARTICULATE MONITORING AND METEOROLOGICAL SITES



Home Center was started in August 1985. Two of these stations are currently operating; Mammoth Old School was discontinued in February 1989.

2.3 PM-10 and TSP Data Summary

2.3.1 PM-10 Violations

Violations of the 150 $\mu g/m^3$ 24-hour National Ambient Air Quality Standard (NAAQS) for PM-10 were measured on seven occasions at the Gateway Home Center site. These violations occurred during the winter seasons from 1985-86 through 1988-89. The highest measured PM-10 concentration was 210 $\mu g/m^3$. Table 2.1 lists the measured exceedances and the average temperature, wind speed and direction.

All of the measured exceedances occurred during periods of low average wind speed, less than 3.5 miles per hour. Except for January 8, 1986, all violations occurred on weekends (Friday, Saturday, or Sunday) or during the holiday period around Christmas and New Years.

2.3.2 Air Pollution Episodes

It is obvious that the peak concentrations are directly related to the influx of visitors to the area during peak periods of the ski season and to the low wind speeds. The stagnant air conditions, which are indicated by the low wind speeds, allow the ambient particulate levels to build up. This build-up can be seen in Figure 2.2 which shows ambient concentrations and wind speed.

The large influx of visitors during weekends and holidays causes significant emissions increases from particulate sources. The increased particulate air pollution from wood burning, resuspended road dust and cinders, and gas and diesel powered vehicles contributes to air pollution episodes that may last several days or more.

2.3.3 Expected Number of Violations

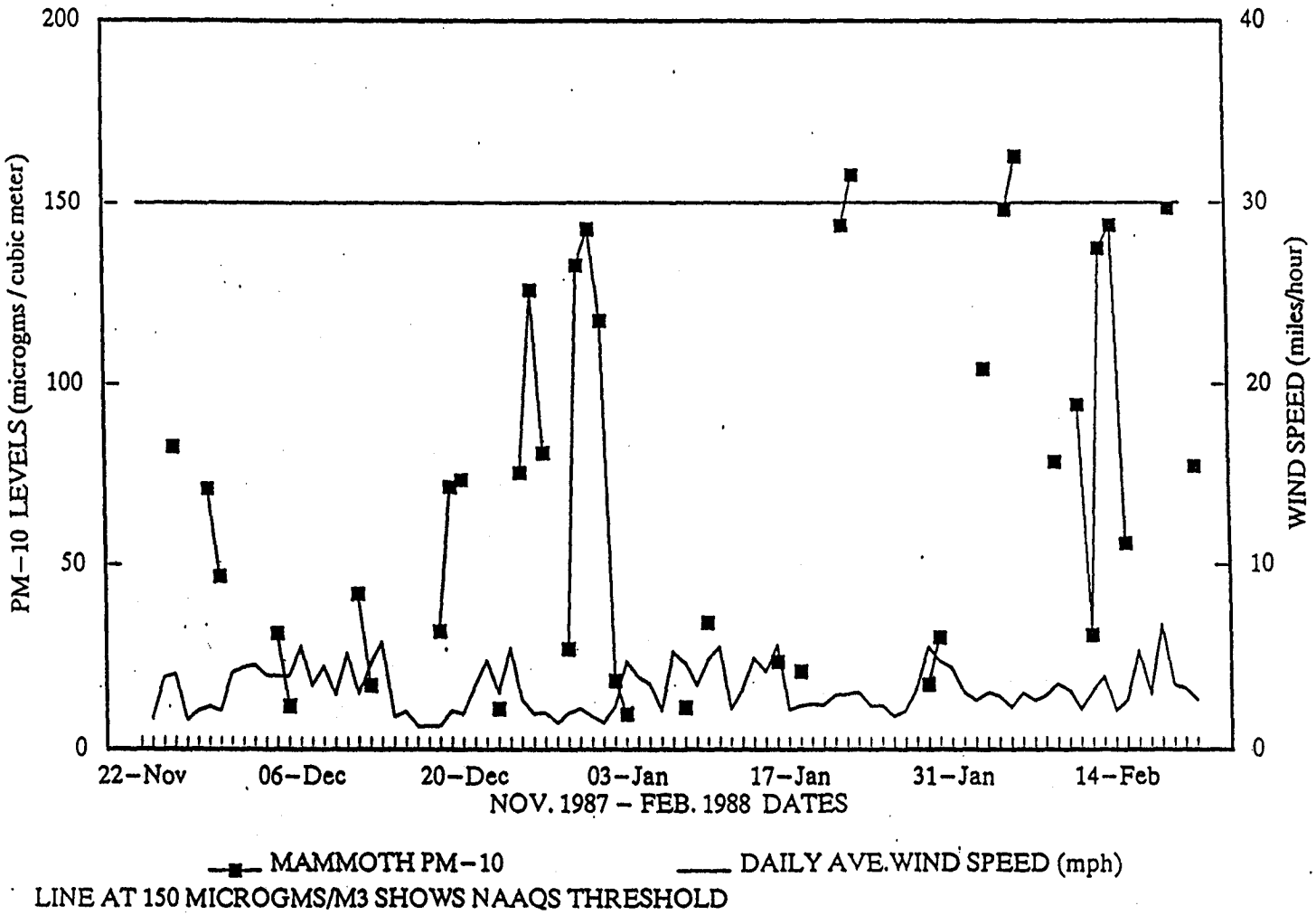
It must be noted that sampling for PM-10 did not occur every day, but rather once every sixth day. Because of this, it is uncertain how many times or by how much the 24-hour PM-10 Standard may have been violated in Mammoth Lakes on the days that were not sampled. It is apparent from visual observations and from data taken on more frequent sampling schedules that multi-day air pollution episodes occur.

TABLE 2.1

EXCEEDANCES OF THE 24-HR PM-10 NATIONAL AMBIENT AIR QUALITY STANDARD

Date/Day	PM-10 Conc. $\mu g/m^3$	Average Temperature °C (°F)	Wind Speed (mi/hr)	Wind Dir.
12/15/85 Sunday	210	-2 (28)	1.8	WSW
12/21/85 Saturday	178	+2 (36)	2.4	W
12/27/85 Friday	185	+2 (36)	2.1	WSW
01/08/86 Wednesday	159	N/A	1.9	W
01/23/88 Saturday	158	+3 (37)	3.1	SSW
02/06/88 Saturday	163	-5 (23)	3.0	WSW
12/29/88 Thursday	166	-10 (14)	3.3	SSW
12/30/89 Saturday	162	-2 (28)	3.0	WSW
01/05/90 Friday	157	-3 (27)	4.0	WSW
02/10/90 Saturday	162	+1 (34)	3.0	WSW

FIGURE 2.2
AIR POLLUTION EPISODES AND WIND SPEED



LINE AT 150 MICROGMS/M3 SHOWS NAAQS THRESHOLD

Periods of high PM-10 concentrations, which approached or exceeded the PM-10 NAAQS, were monitored during a special study conducted from the end of November 1987 to March 1988 (see Section 2.4). A comparison of the one-in-six-day PM-10 data to the data from a monitor at the same site operating on a more frequent schedule is shown in Figure 2.3. This comparison clearly indicates that a number of violations are missed by one-in-six day sampling during the multi-day episodes. During the study period, the one-in-six day monitor did not measure a violation, while the sampler operating more frequently measured two violations.

A simple method to estimate the expected number of violation days is to multiply the number of measured PM-10 violations by the ratio of the number of days in the season (152 days) to the number of samples taken. This results in an estimate of 56 violations or an average of 11.2 violations for each of the last five winter seasons. This simple calculation is shown in Table 2.2.

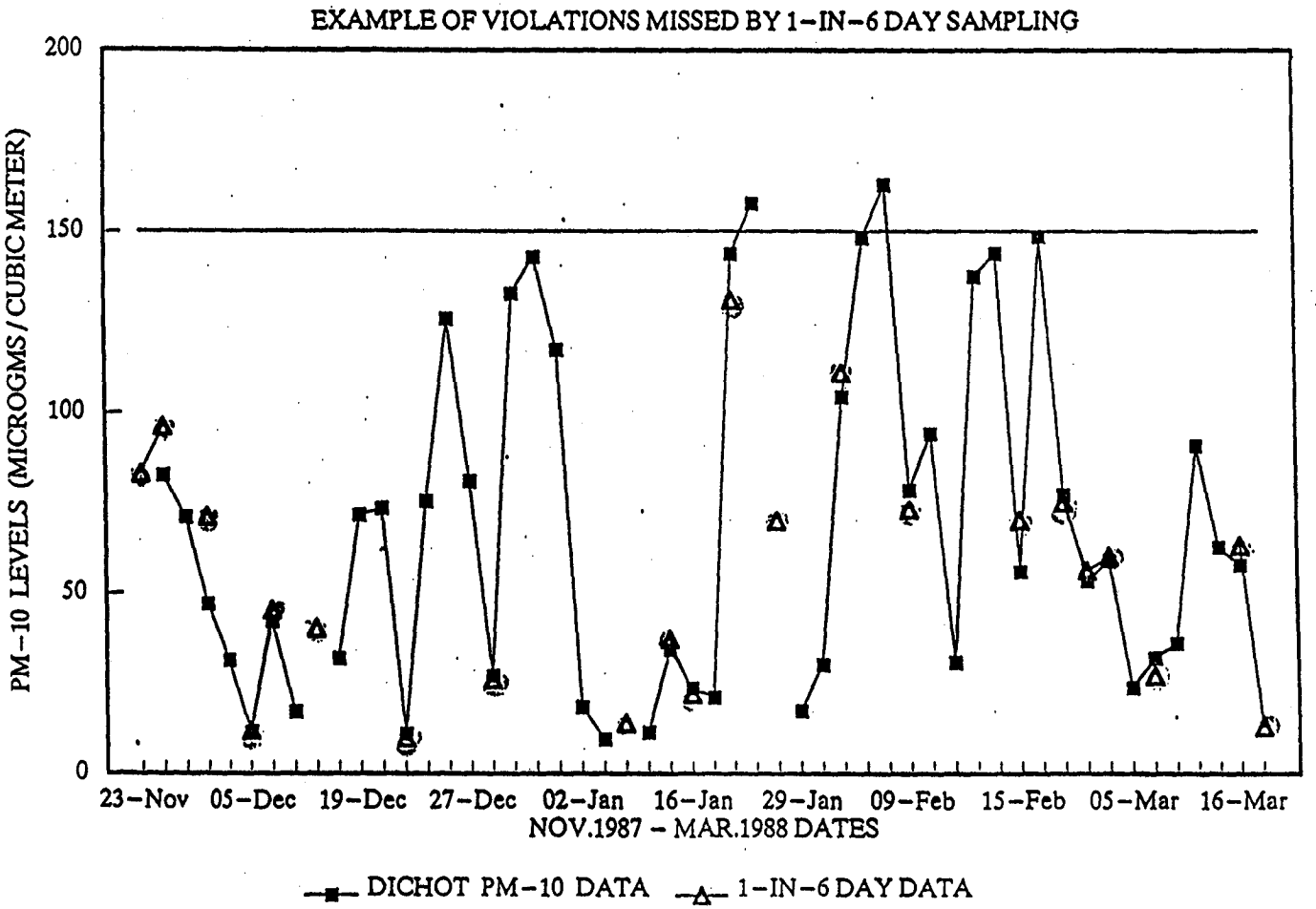
TABLE 2.2

EXPECTED NUMBER OF 24-HOUR PM-10 VIOLATIONS FOR MAMMOTH LAKES (November - March)

Winter Season 152 Days	Num. of Samples	Number > Fed. Std. 150 $\mu g/m^3$	Expected Number > Fed. Std.
1985-86	23	4	26
1986-87	27	0	0
1987-88	53	2	6
1988-89	25	1	6
1989-90	25	3	18
			56

Expected Number of Violations/Season = 11.2

FIGURE 2.3



ONLY DATES OF SAMPLING ARE SHOWN
LINE AT 150 MICROGMS/M3 SHOWS NAAQS THRESHOLD

2.3.4 Particulate Matter Trends

The winter of 1985-86 is noteworthy in having more violations for fewer samples than the other years. This may be partly due to the high number of Mammoth Mountain skiers and other visitors recorded for that year. The short, drought-influenced ski seasons of the three following years resulted in lower overall numbers of tourists as shown in Figure 2.4. In the winter of 1988-89 the number of visitors is fairly high again, but the PM-10 concentrations are probably reduced due to the higher than average wind speeds for that year (see Figure 2.5).

2.3.5 Annual PM-10 Standard

Mammoth Lakes has not violated the 50 $\mu g/m^3$ annual average NAAQS for PM-10. The annual average is calculated by first averaging the quarterly average PM-10 concentrations for each year and then averaging the averages for the last three years (1987-89). This is shown in Table 2.3, which indicates that the annual average for Mammoth Lakes is 36.4 $\mu g/m^3$.

TABLE 2.3

ANNUAL AVERAGE PM-10 CONCENTRATIONS ($\mu g/m^3$)

	QUARTER				
YEAR	1st	2nd	3rd	4th	AVERAGE
1986	71.8	31.1	29.7	45.7	44.6
1987	56.0	25.4	31.7	40.9	38.5
1988	57.8	14.5	24.9	46.0	35.8

ANNUAL AVERAGE FOR NAAQS = 39.6 $\mu g/m^3$

FIGURE 2.4

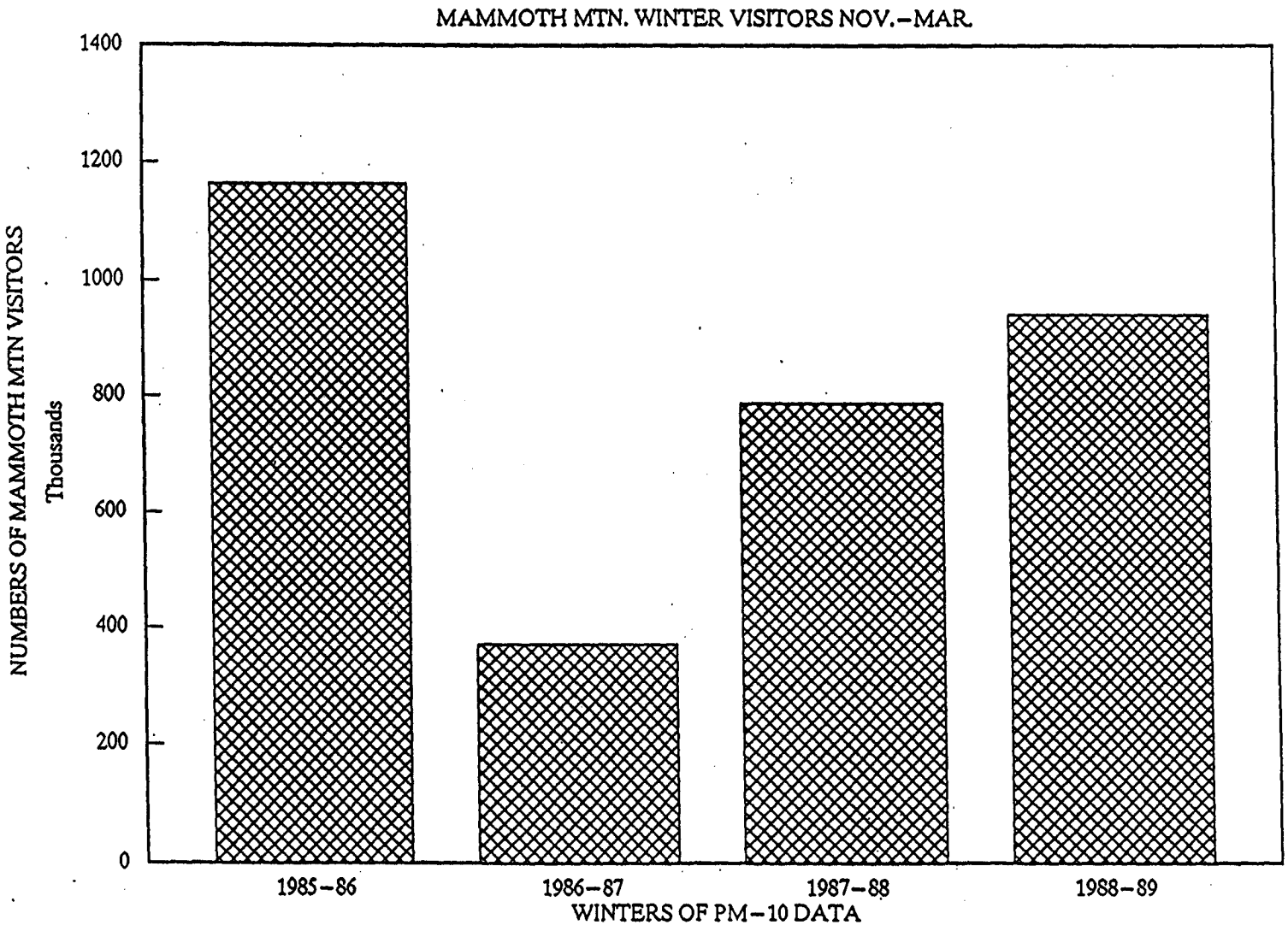
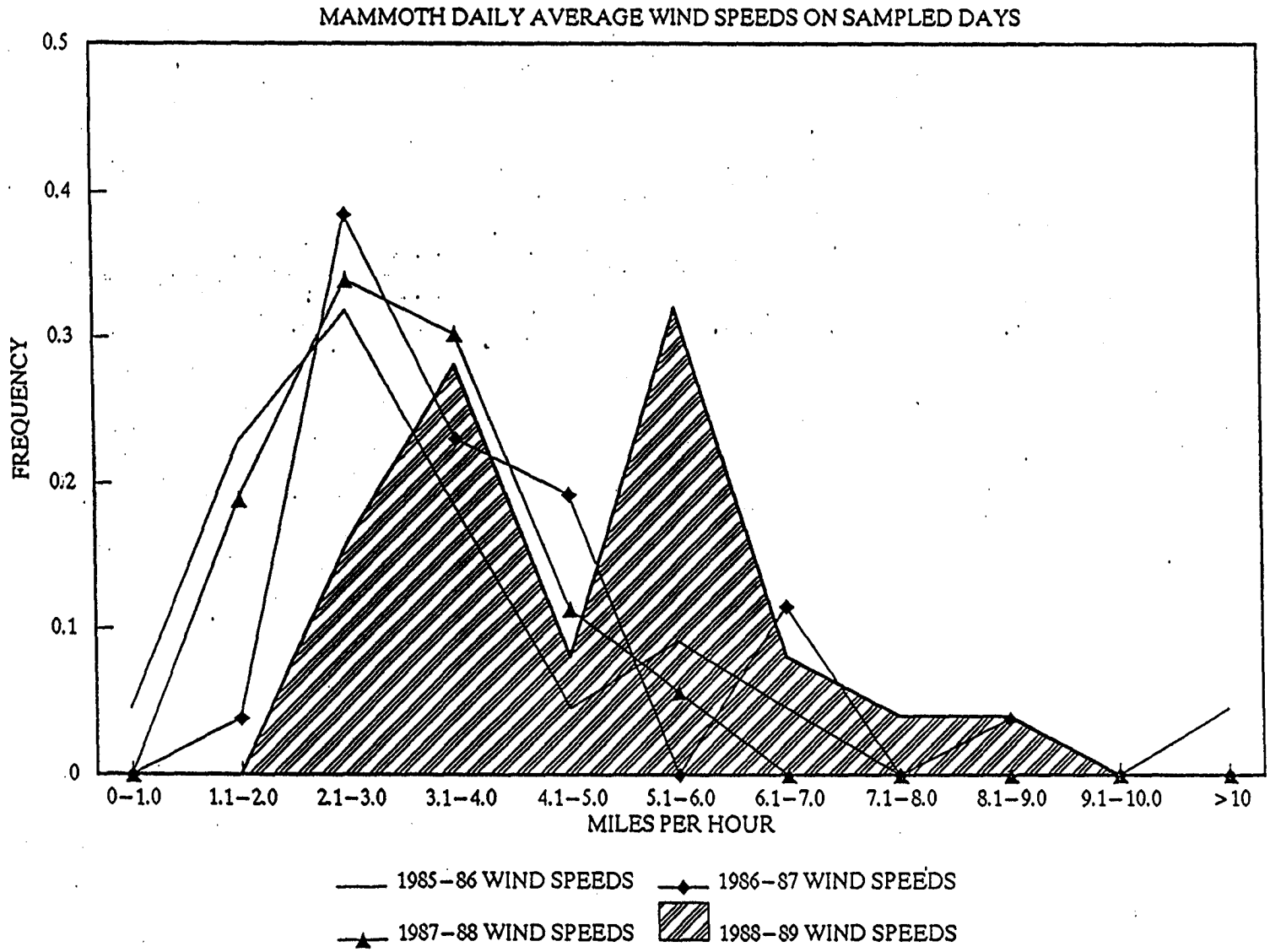

MAMMOTH MTN. WINTER VISITORS NOV.–MAR.
NUMBERS OF MAMMOTH MTN VISITORS
Thousands
1400
1200
1000
800
600
400
200
0
1985–86
1986–87
1987–88
1988–89
WINTERS OF PM–10 DATA

FIGURE 2.5


MAMMOTH DAILY AVERAGE WIND SPEEDS ON SAMPLED DAYS
FREQUENCY
0.5
0.4
0.3
0.2
0.1
0
0–1.0
1.1–2.0
2.1–3.0
3.1–4.0
4.1–5.0
5.1–6.0
6.1–7.0
7.1–8.0
8.1–9.0
9.1–10.0
>10
MILES PER HOUR
1985–86 WIND SPEEDS
1986–87 WIND SPEEDS
1987–88 WIND SPEEDS
1988–89 WIND SPEEDS

2.4 Special Study Using PM-10 Dichots

In order to distinguish among the possible air pollution sources, the District performed a special study from November 1987 through March 1988. Two virtual dichotomous PM-10 samplers (model 240) were borrowed from the Air Resources Board (ARB), and were run on weekends and holidays during that period, as well as on the usual every-sixth-day schedule. Fifty-one 24-hr runs were completed, including five field blanks.

The dichotomous sampler, or dichot, is used to separate particles less than 10 microns into fine and course size fractions. The fine particles are less than 2.5 microns, while the course are less than 10 microns. Chemical analyses of these samples are used with chemical fingerprints from particulate sources to estimate the contribution from those sources to the ambient PM-10 concentrations.

To obtain the widest range of chemical analyses of the samples, teflon filters were run in one dichot while the other used quartz filters. This was necessary because either carbon or silica would not be measured if only one filter type was used. Teflon filters are composed primarily from carbon, and quartz filters from silica. Carbon and silica are important components of the wood smoke and fugitive dust chemical fingerprints.

After sampling, the filters were sent to the Desert Research Institute in Reno, Nevada for chemical analysis. Quality control was done by the ARB's laboratory in El Monte, California. The results were used in the Chemical Mass Balance model to identify the contribution from the various sources.

Source fingerprints were sampled in Mammoth Lakes by OMNI Environmental during the winter of 1987-88. The compositions of the fingerprints and the dichot samples are listed in Appendix B.