AIR QUALITY

MANAGEMENT PLAN

for the

Town of Mammoth Lakes

Prepared for the

PM-10 State Implementation Plan

By
The Great Basin Unified Air Pollution Control District
and The Town of Mammoth Lakes

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EXECUTIVE SUMMARY

Introduction

The Air Quality Management Plan (Plan) for the Town of Mammoth Lakes is an in-depth examination of the problems and solutions to Mammoth Lakes' winter-time air pollution episodes. The Plan is intended to satisfy a Federal Clean Air Act requirement to develop a State Implementation Plan to demonstrate how the Mammoth Lakes area will attain and maintain the National Ambient Air Quality Standard for fine particulate matter, known as PM-10. The Plan includes analyses of PM-10 sources, their impact and the effectiveness of control measures to improve the air quality.

The air pollution problem in the Town of Mammoth Lakes is primarily associated with the large influx of visitors to the area during the winter ski season. With the increase in area population and vehicle traffic, there is a sharp increase in the PM-10 emissions from wood stoves, fireplaces, and from traffic-related road dust and cinders. On occasions when peak visitor periods coincide with extended periods of low wind speeds, the air pollution levels build up to concentrations that violate the National PM-10 Standard. Based on ambient PM-10 monitors, the Town of Mammoth Lakes averages about 12 violations of the 24-Hour PM-10 Standard each winter.

PM-10 Standard and Health Effects

PM-10 stands for particulate matter less that 10 microns in diameter. For comparison a human hair is about 100 microns in diameter. The National Ambient Air Quality Standard for PM-10 was set July 1, 1987 at 150 micrograms per cubic meter ($\mu g/m^3$) for the 24-Hour standard and 50 $\mu g/m^3$ for the annual average standard. The levels for the PM-10 Standard were selected to protect the health of people who are sensitive to exposure to fine particles (OAQPS Staff Paper, 1982 and Addendum, 1986).

Fine particles less than 10 microns are easily inhaled and retained in the deepest parts of the lungs. Children, the elderly, those with cardiovascular and respiratory problems, and those with influenza are especially susceptible to increased respiratory problems and illnesses due to exposure to high levels of PM-10. In addition, some PM-10 sources emit particles which contain toxic and carcinogenic compounds.

Wood smoke, which is a major contributor to the high PM-10 levels in Mammoth Lakes, includes several air pollutants aside from PM-10 that contribute to the health effects problem. These are carbon monoxide, hydrocarbons and polycyclic aromatic hydrocarbons (PAH's). Wood burning is a major source of PAH's which has been identified as a class of compounds containing carcinogens (Davis and Read, Guidance Document for Residential Wood Combustion Emission Control Measures, 1989).

Sources Contributing to Violations of the PM-10 Standard

Through an analysis of ambient filter samples and an inventory of PM-10 sources it was determined that there were only two major sources of PM-10 that contributed to violations; wood burning and resuspended road dust and cinders. Information on the chemical fingerprints of PM-10 sources and the chemical elements found on the filters was used in a Chemical Mass Balance Model (CMB) to determine the contributions from different PM-10 sources. The CMB modeling analysis showed that days with poor air quality could be caused by either;

1) wood burning as the primary contributor with minor contributions from resuspended road dust & cinders and tail pipe emissions, or

2) both wood burning, and resuspended road dust & cinders as major contributors.

Table 1 shows these two cases with their estimated source contributions for the design day concentration. An examination of the high PM-10 days showed that both situations could result in PM-10 violations. As a result of the possibility that either situation could occur, the selected control strategy must consider both peak wood burning days and peak road dust and cinder days to be successful.

Growth Projections

In the General Plan for the Town of Mammoth Lakes, it is anticipated that the peak number of residents and visitors will increase over the next 15 years. Presently the peak winter-time population-at-one-time is estimated at 29,000 residents and visitors. The peak population is expected to reach about 48,000 by the year 2005. This increase in population growth will of course increase the total PM-10 emissions if controls are not implemented.

An analysis was performed to determine the effect of population and traffic increases on the peak PM-10 concentrations. The analysis showed that the uncontrolled peak PM-10 concentration would increase from 210 $\mu g/m^3$ to 381 $\mu g/m^3$ for the worst case road

TABLE 1

DESIGN DAY SOURCE CONTRIBUTIONS FOR WOOD BURNING AND ROAD DUST DOMINATED DAYS

Source	Contributions Assuming: 93% Wood Burning	Contributions Assuming: 44% Road Dust
Fireplaces	94 $\mu g/m^3$	54 $\mu g/m^3$
Wood Stoves/Inserts	101 $\mu g/m^3$	58 $\mu g/m^3$
Road Dust/Cinders	5 $\mu g/m^3$	93 $\mu g/m^3$
Vehicle Tailpipes	5 $\mu g/m^3$	negligible
Background	5 $\mu g/m^3$	5 $\mu g/m^3$
Design Concentration	= 210 $\mu g/m^3$	210 $\mu g/m^3$

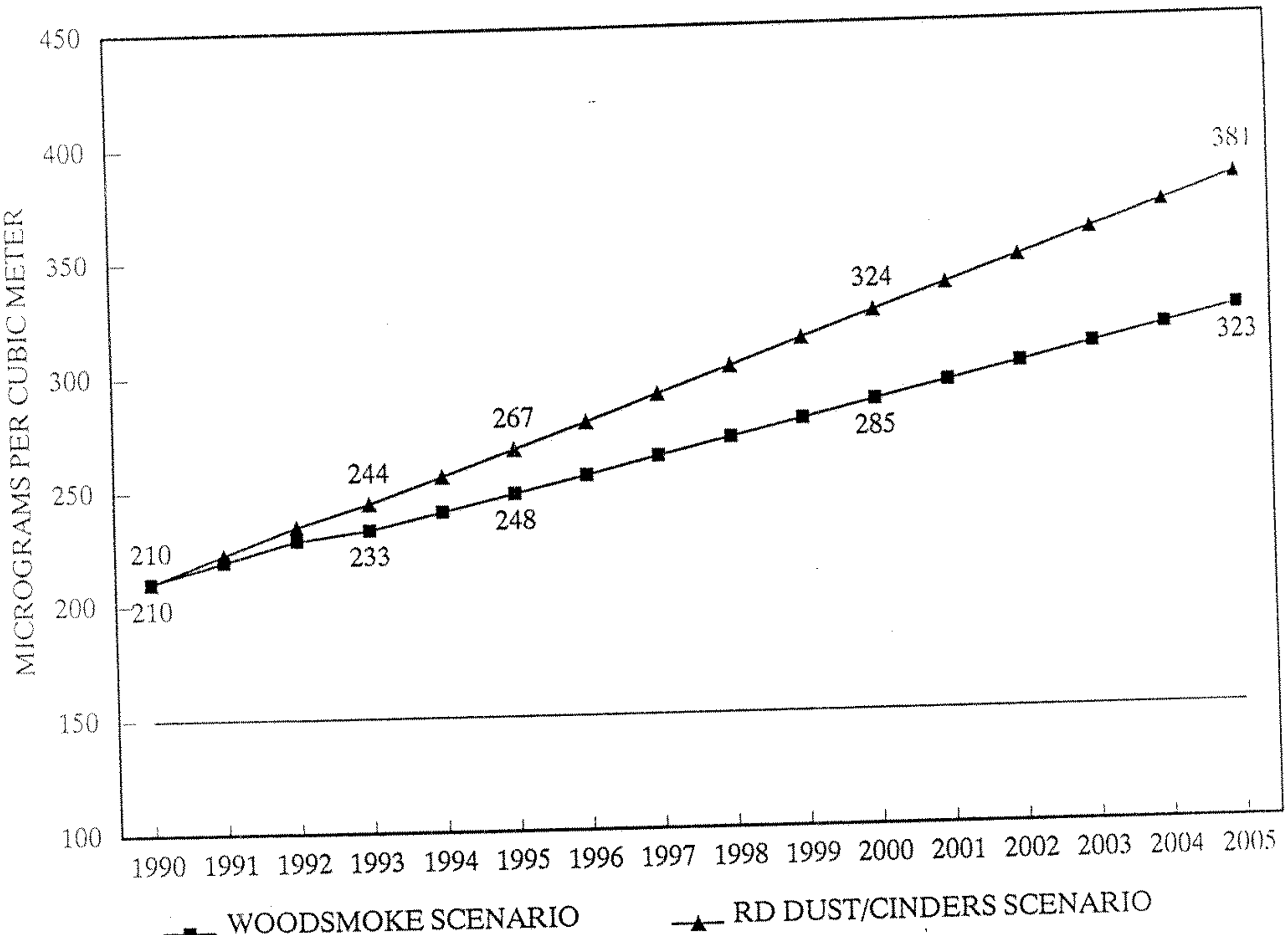
dust and cinders scenario, and from 210 $\mu g/m^3$ to 323 $\mu g/^3$ for the worst case wood burning scenario. The forecasted, uncontrolled PM-10 concentration is shown in Figure 1.

Mammoth Lakes Particulate Emissions Regulations

An ad hoc air quality committee was formed to investigate potential control strategies to be included in a new particulate matter ordinance. The committee included representatives from the wood heating industry, real estate sales, developers, lodging industry, the general public, USDA Forest Service, air pollution control district and the Town planning department. A number of control measures that affected wood burning and resuspended road dust and cinders were investigated. The list of measures that were initially considered for the control strategy is included in Appendix F.

With the ad hoc committee's valuable input the pros and cons of each of the control measures were better understood by all parties. The strategy that was eventually sent to the Town Council for approval was a compromise between competing interests. This strategy formed the foundation of the ordinance that was finally adopted by the Town.

FIGURE 1
FORECASTED AIR QUALITY - UNCONTROLLED



LINE AT 150 MICROGRAMS REPRESENTS FEDERAL STANDARD

The final control strategy was adopted by the Mammoth Lakes Town Council on November 7, 1990. The strategy was incorporated in the Town of Mammoth Lakes Municipal Code as Chapter 8.30, Particulate Emissions Regulations. The regulations will reduce emissions from reentrained road cinders, will phase out non-certified wood burning appliances and will institute wood burning curtailments during periods of high PM-10 concentrations. The regulations include several contingency measures that will enable the Town to meet the Federal 24-hour PM-10 Standard within 3 to 5 years. A summary of the adopted regulations is listed in Table 2.

The regulations' primary measures will result in the eventual phasing out of all non-certified wood stoves and wood burning fireplaces. This will be accomplished by replacing non-certified wood stoves and fireplaces with certified wood stoves, pellet stoves, or gas log fireplaces before the resale of a dwelling. In addition to phasing out non-certified appliances, the Town will rely on a mandatory wood burning curtailment. This mandatory curtailment program will initially exempt certified wood stoves, but may include all wood burning if more reductions are needed to attain the Standard.

As a contingency, the replacement schedule may be accelerated if the Town does not attain the Federal PM-10 Standard by January 1, 1993. The accelerated schedule will require replacement of all non-certified wood burning stoves and fireplaces by November 1, 1994. This contingency measure may be instituted if the primary control strategy is insufficient to bring the Town into attainment with the Standard.

The control strategy relies on vacuum street sweeping to reduce 34% of the PM-10 emissions from re-entrained road dust and cinders. With the expected growth in the Town, the strategy must also address the problem of increasing traffic as it directly increases the road dust emissions. A cap of 106,600 vehicles miles travelled is included in the plan. This cap will provide for 60% growth from the present traffic estimates.

Figures 2 and 3 show the expected air quality impact of the adopted ordinance. The graphs show the projected impacts for each of the contingency measures that can be implemented. Figure 2 shows the air quality impact without the accelerated wood burning appliance change-over schedule. Figure 3 shows the air quality impact with the accelerated change-over, which requires replacement of all non-certified wood burning appliances by November 1, 1994. For each figure the graphs show the impact of the wood burning ban, with and without an exemption for certified wood stoves, as well as for the case where a wood burning ban is not called.

TABLE 2

LIST OF ADOPTED REGULATIONS

SECTION	REGULATION
8.30.020	DEFINITIONS
8.30.030	STANDARDS FOR REGULATION OF SOLID FUEL APPLIANCES - Limits installation of wood burning appliances after January 1, 1991 to EPA Phase II Certified Stoves or Pellet Stoves - Allows 1 wood burning fireplace in hotel/condo common area - Requires the Town to maintain records of certified stoves
8.30.040	DENSITY LIMITATIONS - Limits new wood stoves to one per dwelling, but allows one additional pellet stove per dwelling. - New dwellings cannot use wood heat for primary heating - Requires certified inspection of new installations
8.30.050	REPLACEMENT OF NON-CERTIFIED APPLIANCES UPON SALE OF PROPERTY - Non-certified wood stoves and fireplaces must be replaced, removed or rendered inoperable prior to the sale of property - Requires a written exemption for property that does not include a wood burning appliance
8.30.060	SOLID FUEL BURNING APPLIANCE REPLACEMENT SCHEDULE - Contingency Measure: If monitoring does not show attainment by January 1, 1993, all non-certified solid fuel appliances must be replaced by November 1, 1994
8.30.070	OPACITY LIMITS - Limits wood smoke opacity to 40% till January 1, 1994 and 20% thereafter
8.30.080	PROHIBITED FUELS - Prohibits trash and coal burning
8.30.090	MANDATORY CURTAILMENT - Requires Town Council to appoint an Air Quality Manager - Burn ban shall be called when PM-10 levels reach 130 $\mu g/m^3$ - Notice shall be given on radio, TV, phone message & posted - Requires posting of notice to inform rental unit occupants that curtailments may be called. - Renters shall be responsible on no burn days. - Exempts certified appliances and pellet stoves from curtailment, total ban could be called if air quality compliance is not met

- Continued on next page -

TABLE 2, continued

LIST OF ADOPTED REGULATIONS

SECTION	REGULATION
8.30.100	POLLUTION REDUCTION EDUCATION PROGRAMS
8.30.110	ROAD DUST REDUCTION MEASURES - Requires vacuum street sweeping of the cinders - Requires vehicle miles travelled (VMT) reduction measures for new developments - Limits peak VMT in the Town to 106,600 vehicle miles travelled
8.30.120	FEES
8.30.130	PENALTIES

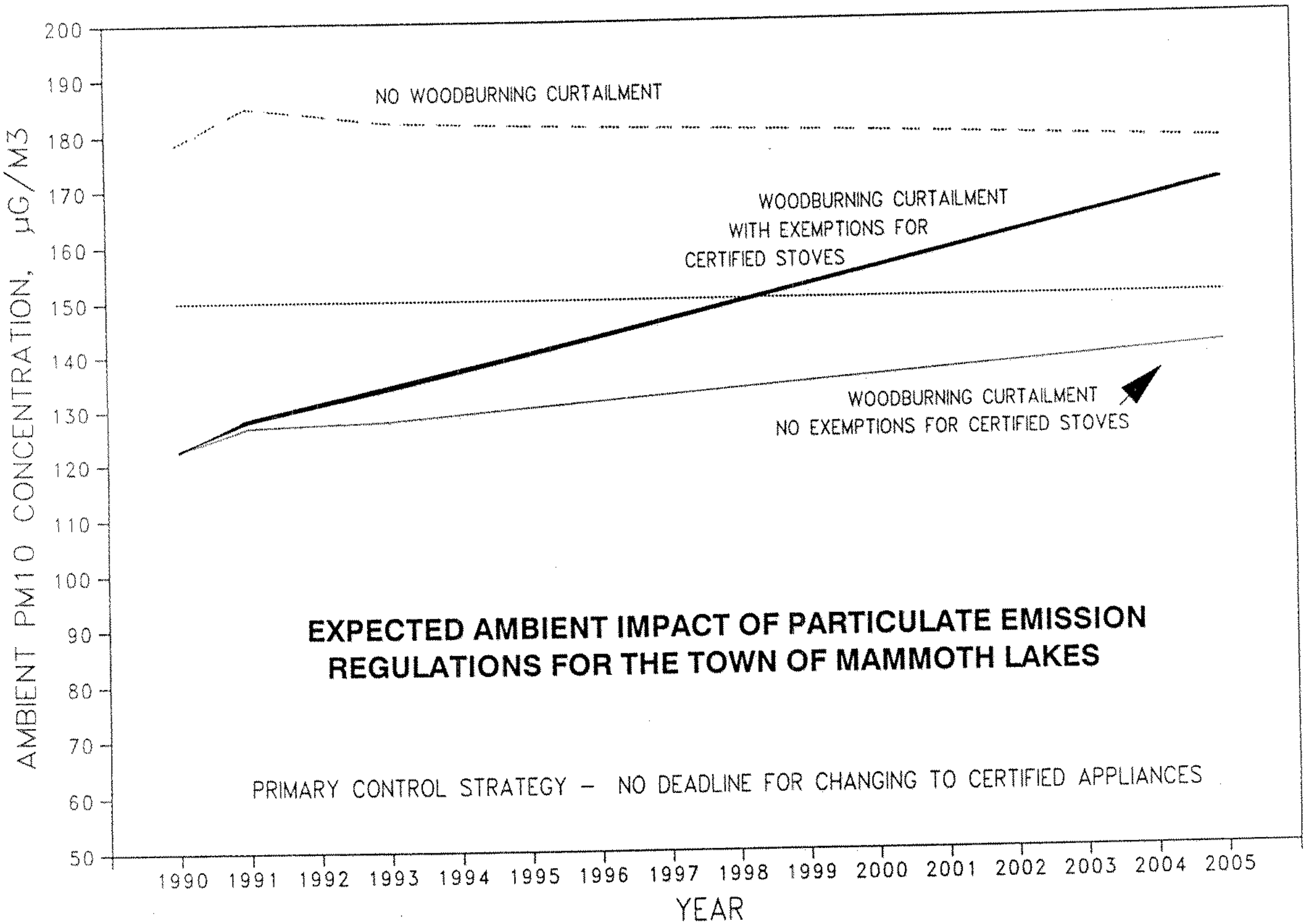
Append H includes an analysis of the effect of the ordinance on days that are dominated by wood smoke. It shows that the adopted strategy is adequate to meet the Federal PM-10 Standard on wood smoke dominated days.

Conclusion

With the implementation of the Particulate Matter Regulations it is anticipated that the Town will be able to attain the National Ambient Air Quality Standard for particulate matter by 1995. Attainment may occur sooner if wood burning is reduced by the expected 50% reduction that can be achieved through the mandatory curtailment ordinance.

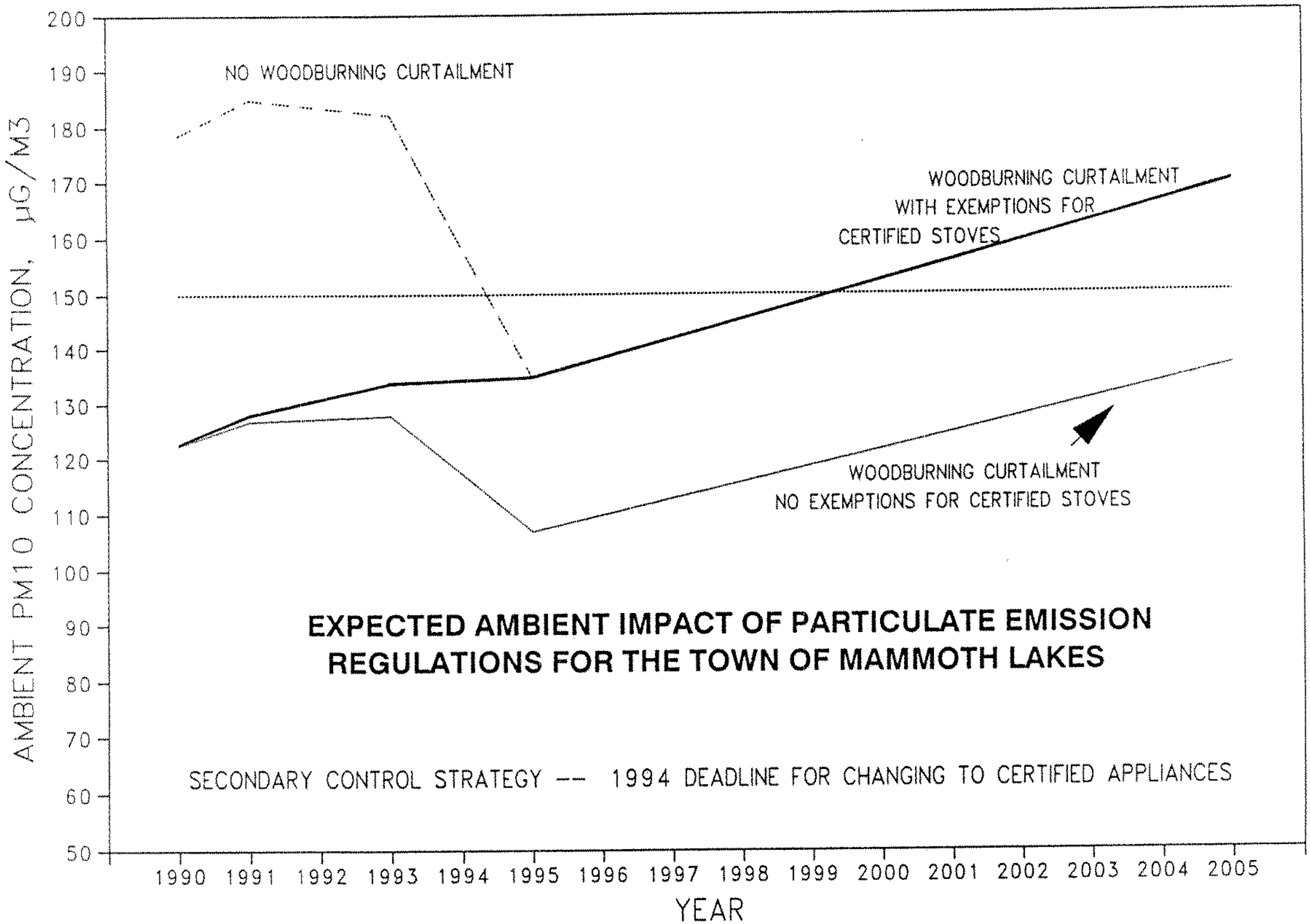
Since the plan also addresses emissions associated with general population growth, projections show that the National Ambient Air Quality Standard for PM-10 will be maintained into the future. The present strategy is expected to provide for maintenance of the Federal PM-10 standard till beyond the year 2005.

FIGURE 2



Adopted 11/7/90

FIGURE 3



Adopted 11/7/90

SECTION 1

INTRODUCTION

1.0 INTRODUCTION

1.1 The Federal Clean Air Act and the SIP

The Air Quality Management Plan for the Town of Mammoth Lakes has been developed in response to a Federal Clean Air Act requirement to develop and implement a PM-10 State Implementation Plan (SIP). All areas that violate the National Ambient Air Quality Standard (Standard) for PM-10 are required to develop a SIP that demonstrates how the area will attain the PM-10 Standard.

In August 1987, the U.S. Environmental Protection Agency (EPA) grouped areas into high, medium and low probabilities of violating the PM-10 Standard (Federal Register, August 7, 1987). The Mammoth Lakes area was classified as Group I. Group I areas have a greater than 95% probability of exceeding the PM-10 Standard or have measured violations, which is the case with the Mammoth Lakes area. As a result of the Group I classification, a PM-10 SIP for the Mammoth Lakes area is required under the Federal Clean Air Act. The Air Quality Management Plan for the Town of Mammoth Lakes is intended to satisfy this requirement for a PM-10 SIP.

Under Section 110 of the Clean Air Act, the SIP was due for submission to the U.S. EPA within nine months of promulgation of the PM-10 Standard, which occured on July 1, 1987. The Town of Mammoth Lakes received an extension from EPA to allow time to collect data necessary to determine source impacts and control strategies. A definite deadline is unknown at this time, but due to a pending National lawsuit concerning the failure of EPA to approve a number of PM-10 SIP's, including Mammoth Lakes, action should be taken by June 1990 to avoid Federal intervention.

1.2 PM-10 Standard and Health Effects

PM-10 stands for particulate matter less that 10 microns in diameter. For comparison a human hair is about 100 microns in diameter. The National Ambient Air Quality Standard (Standard) for PM-10 was set July 1, 1987 at 150 micrograms per cubic meter ($\mu g/m^3$) for the 24-Hour standard and 50 $\mu g/m^3$ for the annual average standard. The levels for the PM-10 Standard were selected to protect the health of people who may be sensitive to exposure to fine particles (OAQPS Staff Paper, 1982 and Addendum, 1986).

Fine particles less than 10 microns are easily inhaled and retained in the deepest parts of the lungs. Children, the elderly, those with cardiovascular and respiratory problems, and those with influenza are especially susceptible to increased respiratory problems and illnesses due to exposure to high levels of PM-10. In addition, some PM-10 sources emit particles which contain toxic and carcinogenic compounds.

Wood smoke, which is a major contributor to the high PM-10 levels in Mammoth Lakes, includes several air pollutants aside from PM-10 that contribute to the health effects problem. These are carbon monoxide, hydrocarbons and polycyclic aromatic hydrocarbons (PAH's). Wood burning is a major source of PAH's which has been identified as a class of compounds containing carcinogens (Davis and Read, Guidance Document for Residential Wood Combustion Emission Control Measures, 1989).

1.3 Area Description and Population

The Town of Mammoth Lakes is located in a valley on the eastern slopes of the Sierra Nevada mountains at an elevation of 7,861 feet (2,396 meters). Figure 1.1 shows the relative location of Mammoth Lakes. The town, which was incorporated in 1984, has grown from a permanent population of 390 in 1960 to about 5,000 in 1987. Included in the Town boundaries is the Mammoth Mountain Ski Area, which attracts about one million skiers each winter. During major winter weekends, there are about 29,000 people in Mammoth Lakes. The Town anticipates that this figure will grow to about 48,000 people within twenty years (Town of Mammoth Lakes General Plan, 1987)

Most homes and rental units in the Town of Mammoth Lakes contain wood stoves or fireplaces. Temperature inversions during the winter season cause a buildup of wood smoke in the stagnant valley air. In addition to wood smoke emissions, particulate emissions from resuspended road dust and cinders adds significantly to the problem during periods when the roads are dry. The combination of major particulate sources and meteorological stagnations, especially during peak periods of the ski season, has caused violations of the PM-10 Standard.

1.4 Boundaries of the PM-10 Planning Area

The U.S. Environmental Protection Agency identified the boudaries in Figure 1.2 as the inital designation for the Group I area or planning area. Through the course of the development of this document it was determined that the boundaries for the Town of Mammoth Lakes are more appropriate for the PM-10 planning area. This is justified by the lack of significant sources outside the

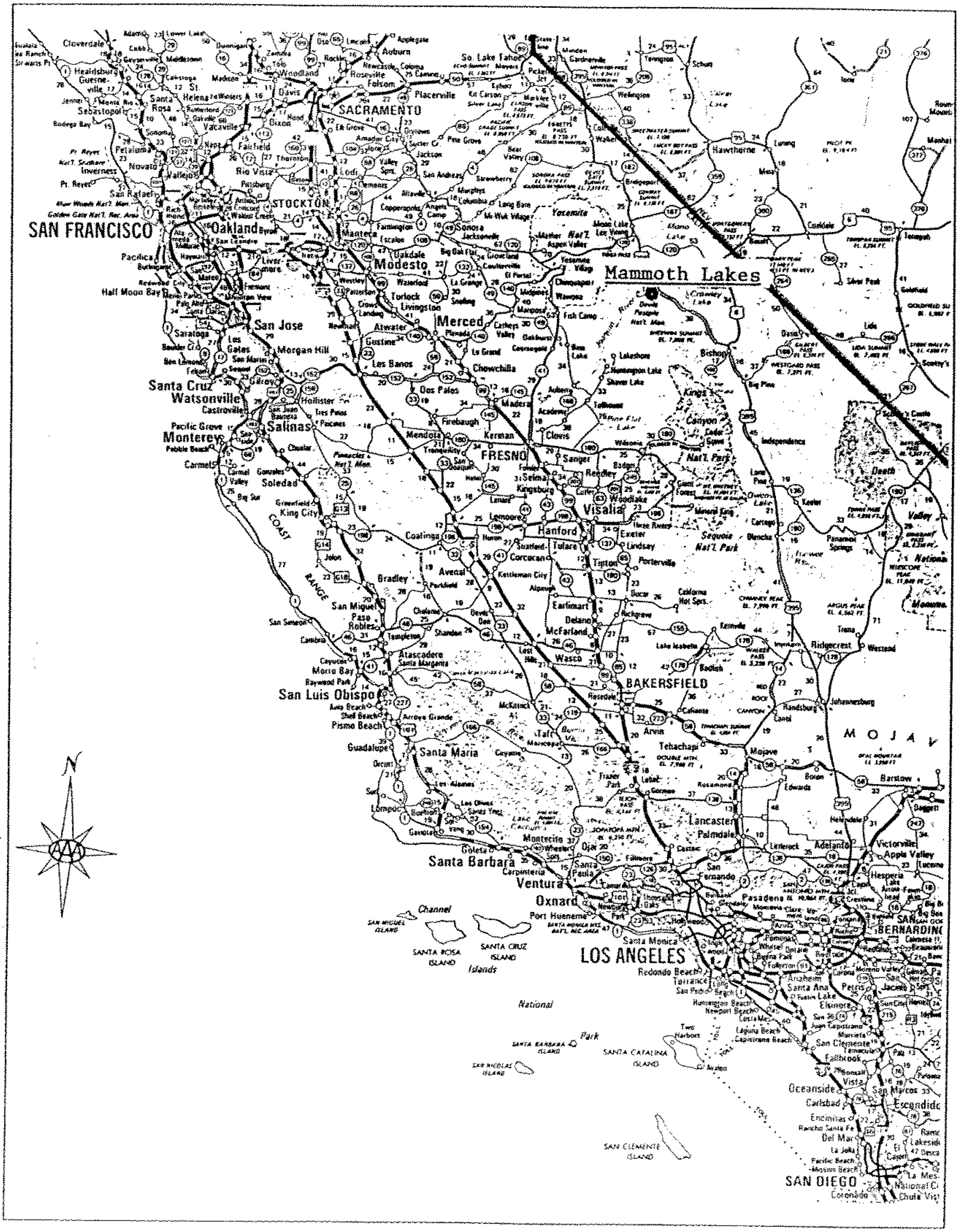
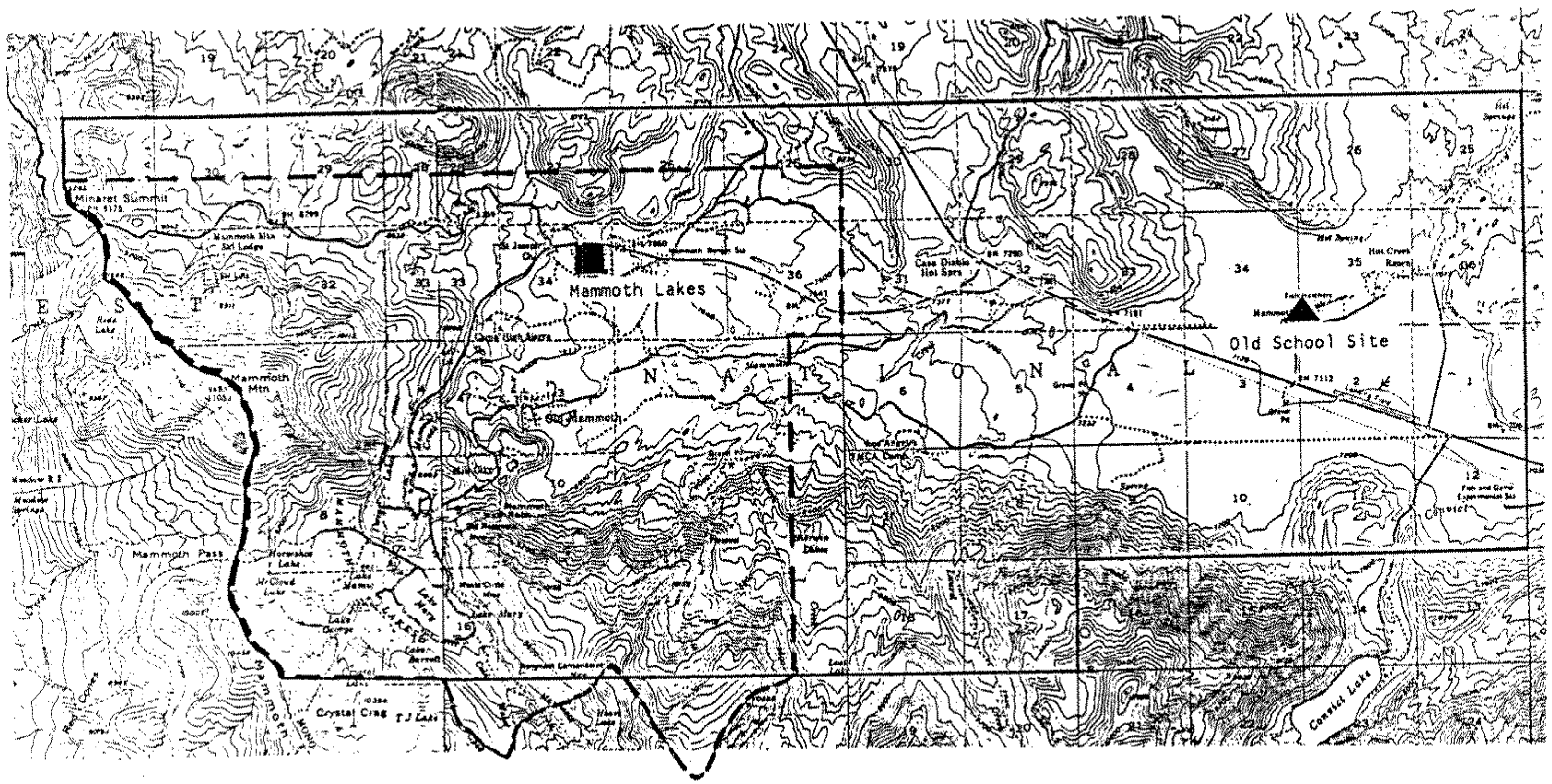


FIGURE 1.1

RELATIVE LOCATION OF MAMMOTH LAKES

FIGURE 1.2

BOUNDARIES OF THE GROUP I AREA AND THE TOWN OF MAMMOTH LAKES



Town boundaries and the extremely low monitored particulate matter levels that have been measured outside the Town boundaries at the Old School site (see Figure 1.2). The shrinking of the planning area boundaries is not expected to have any significant effects on the adequacy of the SIP, since all the sources affected by the controls discussed in the SIP are inside the Town boundaries.

1.5 Elements of the SIP

The SIP includes detailed analyses of the sources of PM-10, their contributions and impacts, the effects of population growth on future PM-10 levels and the effectiveness of controls to attain and maintain the PM-10 Federal Standard.

The PM-10 air quality data that was used for the analyses is discussed in Section 2.0. The data summary includes analyses of pollution episodes, trends and meteorological conditions.

The PM-10 emissions inventory is included in Section 3. This section includes a discussion of the methods and asumptions used to calculate the emissions for wood stoves, fireplaces, vehicle exhaust, resuspended road dust and cinders, as well as industrial point sources.

A Chemical Mass Balance (CMB) Model was run to estimate the contributions from from different PM-10 source types to the ambient PM-10 concentrations on peak days. Section 4 includes the analyses of the contributions from wood burning, road dust and cinders, and vehicle exhaust to the ambient PM-10 concentrations.

The effects of population growth on the air quality is discussed in Section 5. This section considers the effects of increased numbers of visitors, residents and vehicle traffic on the PM-10 concentrations over the next 15 years.

The particulate matter regulations that were adopted by the Town of Mammoth Lakes are included in Section 6. The final control strategy and the demonstation of the attainment with the PM-10 Standard is summarized in this section. A detailed analysis of the numerical calculations is included in Appendix I.

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).

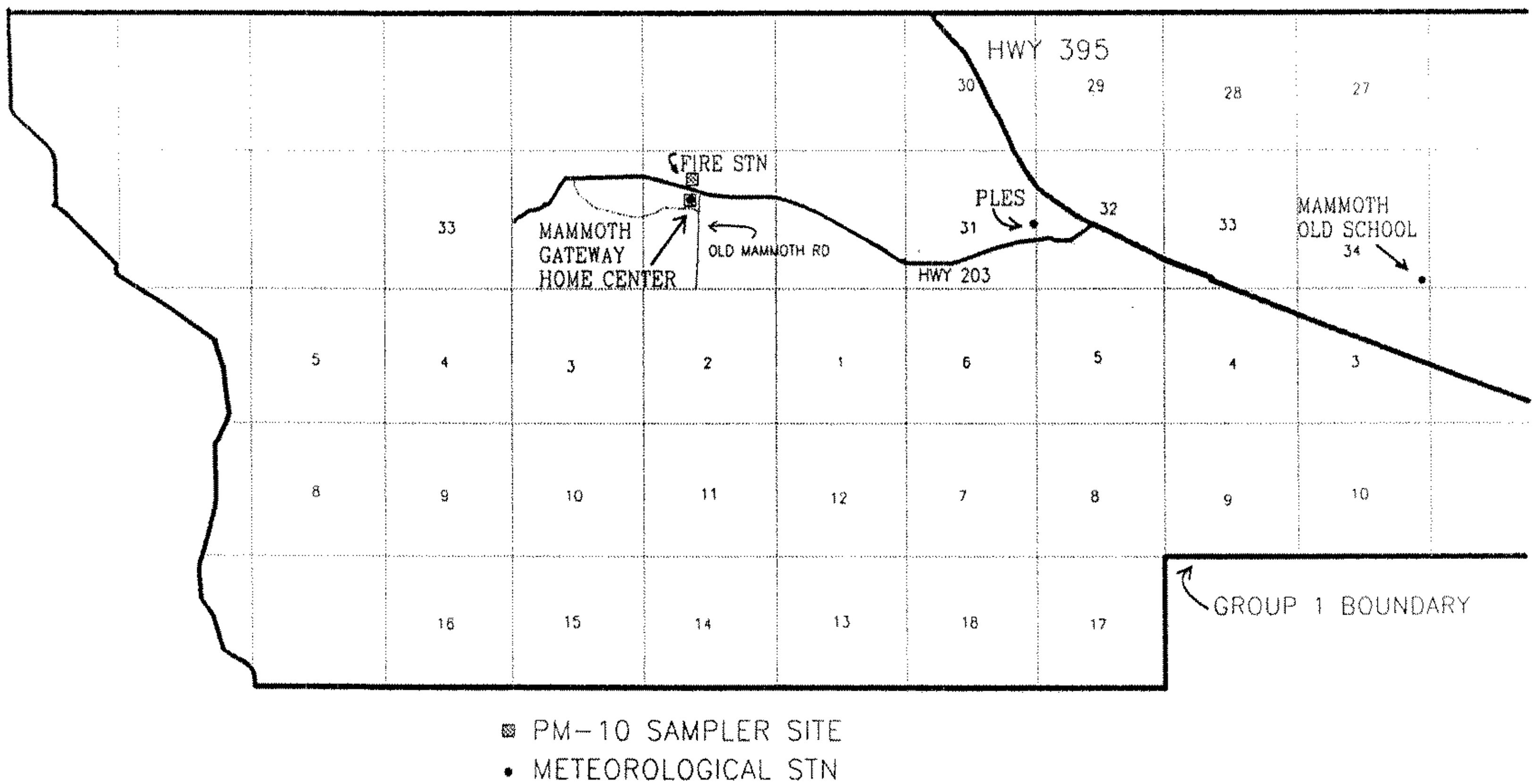
The District has had two monitoring sites in Mammoth Lakes; the Fire Station at the corner of Highway 203 and Forest Trail Road, and the Gateway Home Center at the corner of Highway 203 and Old Mammoth Road (see Figure 2.1). At the Fire Station site, the District started measuring TSP in September 1979 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

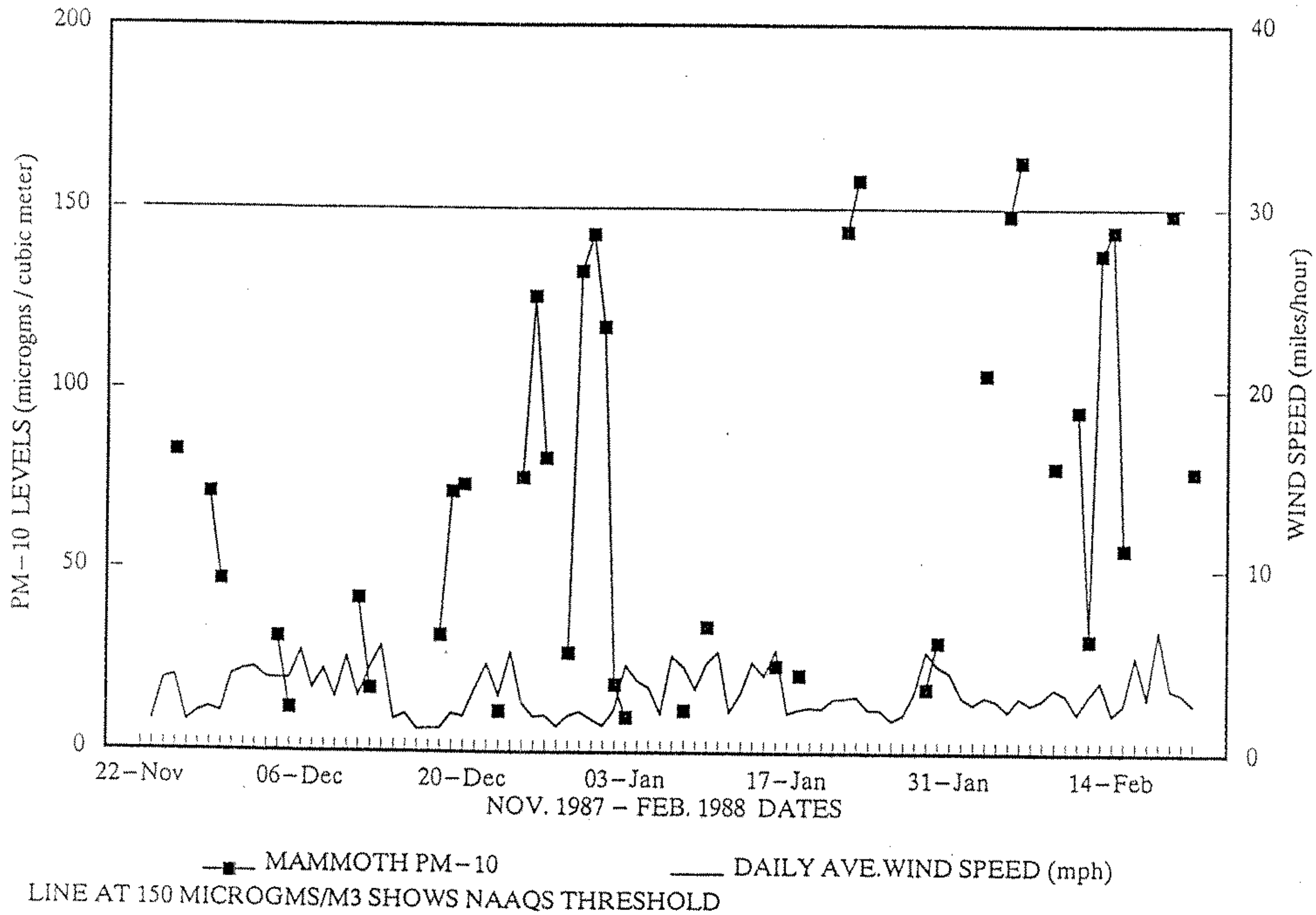
It must be noted that sampling for PM-10 did not occur every day, but rather once every sixth day. Because of this, it is uncertain how many times or by how much the 24-hour PM-10 Standard may have been violated in Mammoth Lakes on the days that were not sampled. It is apparent from visual observations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



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

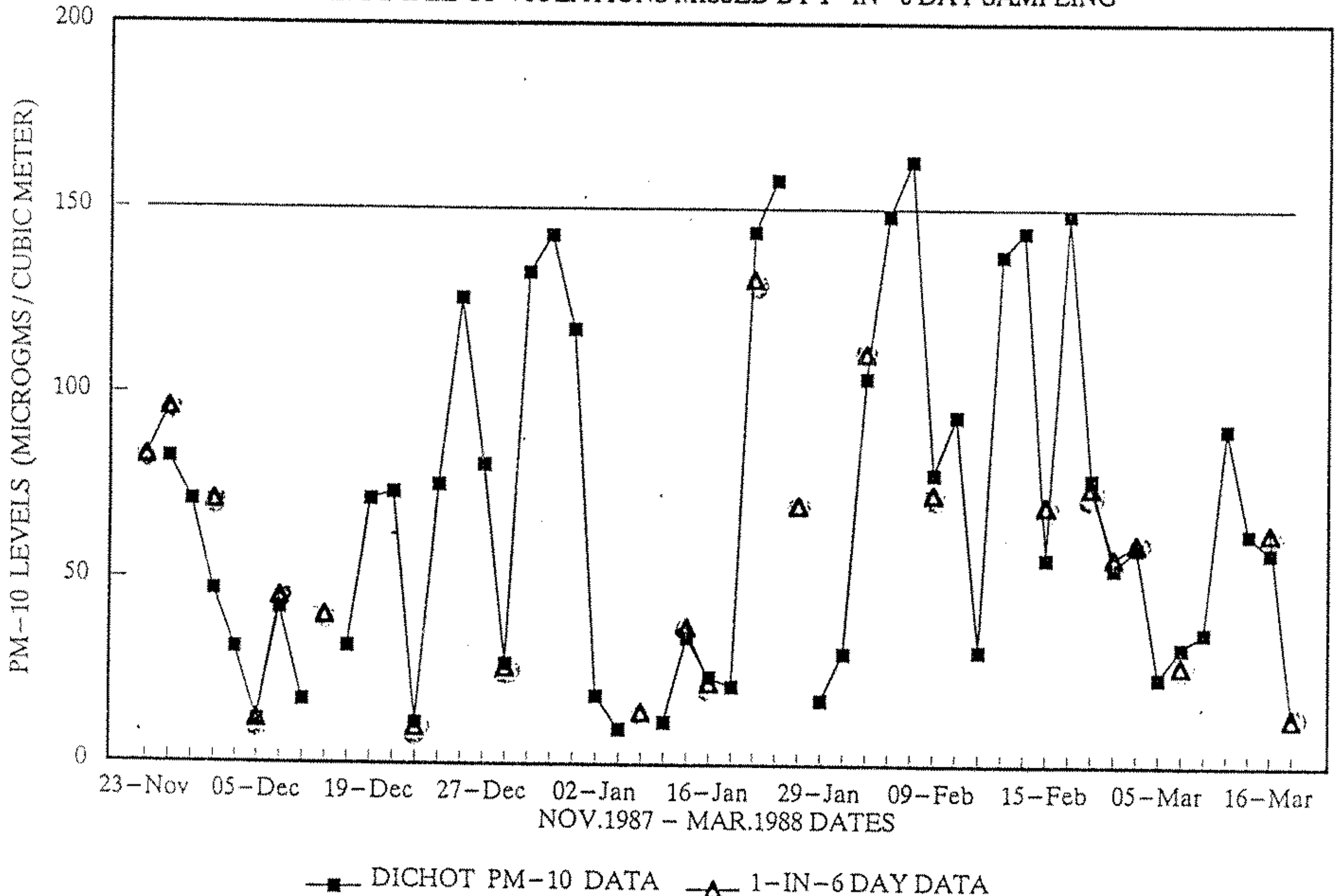
EXPECTED NUMBER OF 24-HOUR PM-10 VIOLATIONS FOR MAMMOTH LAKES (November - March)

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

EXAMPLE OF VIOLATIONS MISSED BY 1-IN-6 DAY SAMPLING



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 ($\mu g/m^3$)

YEAR	QUARTER				AVERAGE
	1st	2nd	3rd	4th	
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.

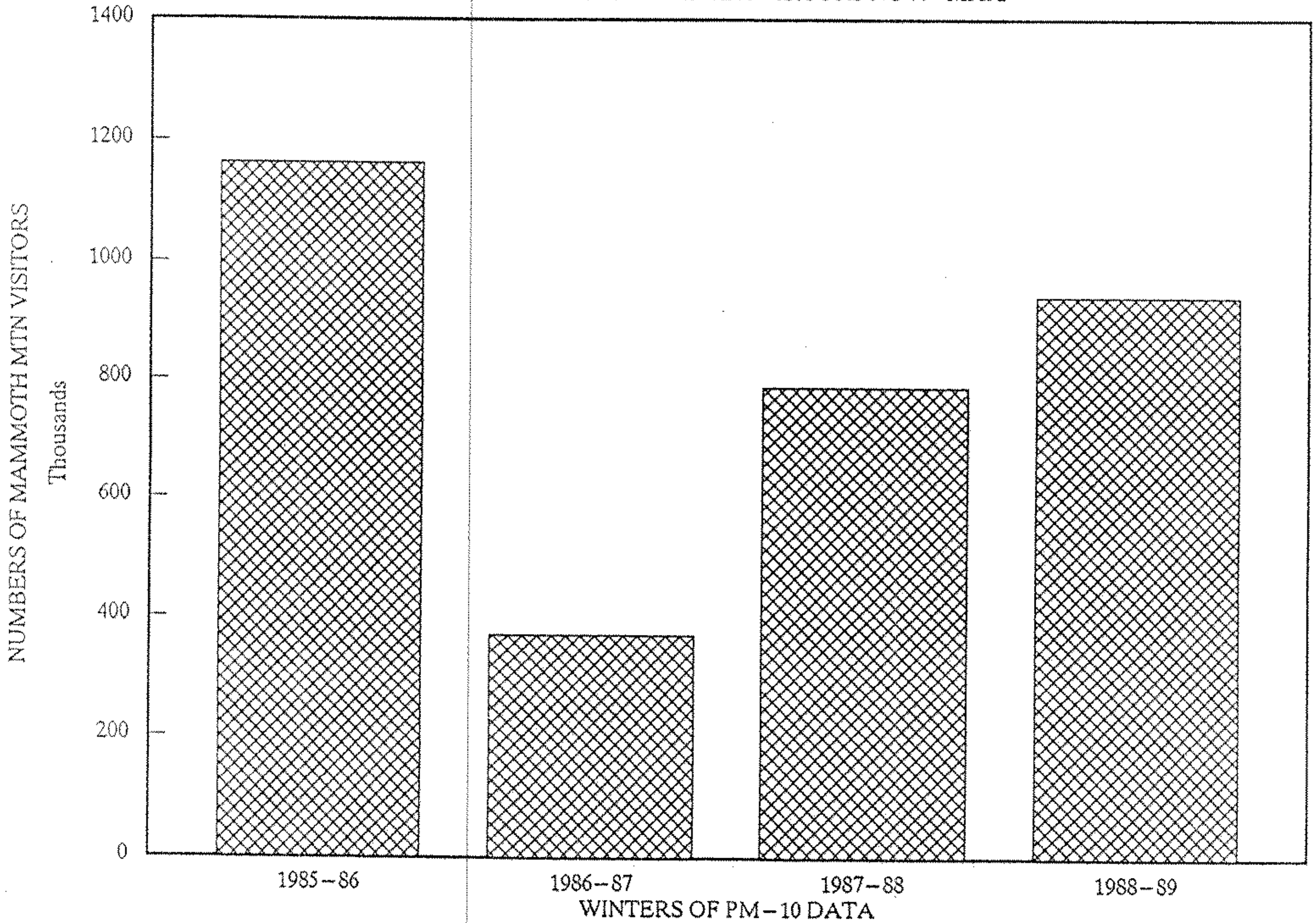
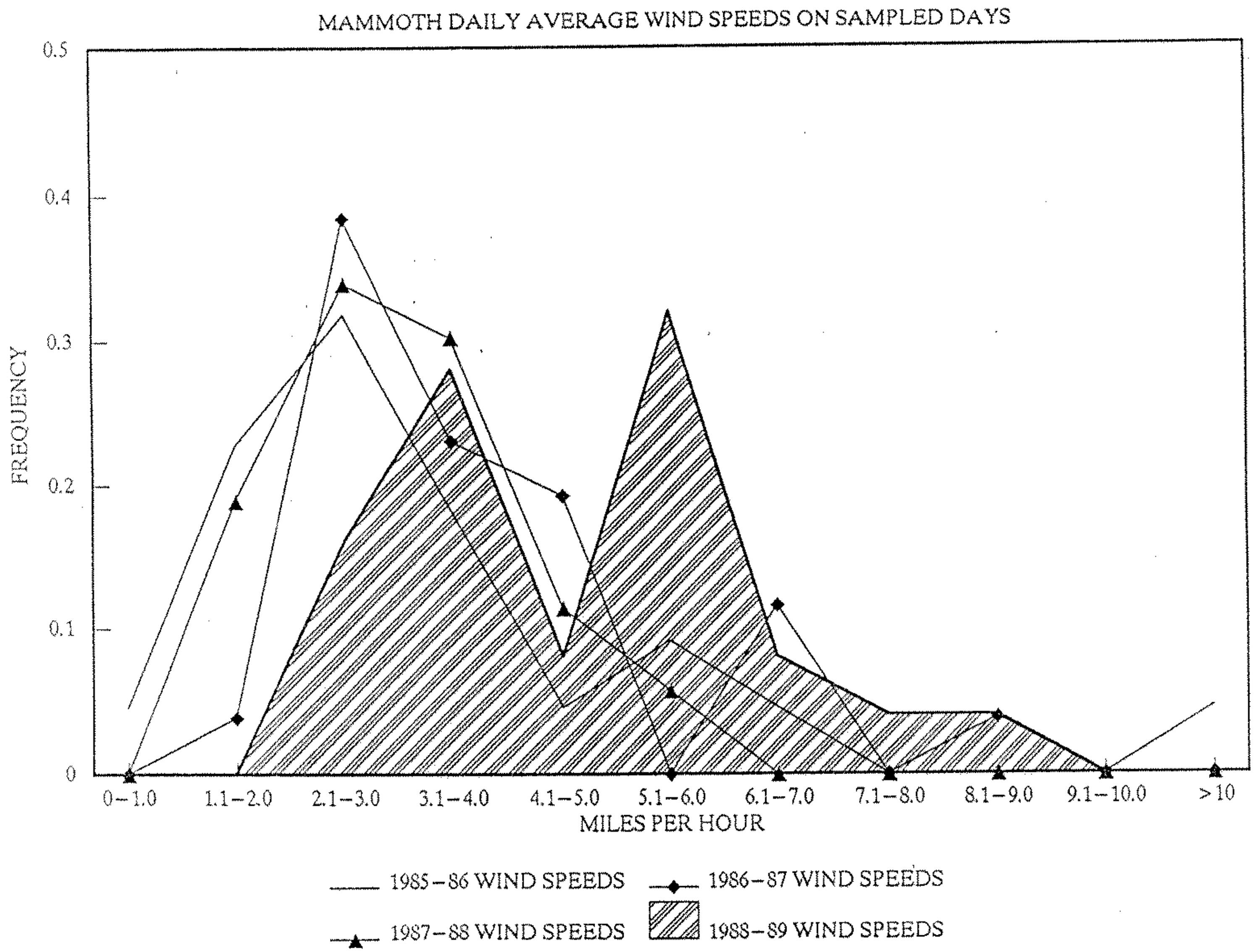


FIGURE 2.5


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.

SECTION 3

EMISSIONS INVENTORY

3.0 EMISSIONS INVENTORY

The Emissions Inventory Section covers the PM-10 emission estimates for residential wood combustion (RWC), resuspended road dirt and cinders, mobile source tail pipe emissions and point sources. The methodology and data used to determine emissions is discussed for each source type. Because Mammoth Lakes exceeds the 24-hour PM-10 Standard, the emissions inventory is estimated for a peak 24-hour period. The estimates will consider the large influx of visitors to Mammoth Lakes during the winter ski season.

3.1 Woodstoves and Fireplaces

Emission rates for wood stoves and fireplaces are based on the type of wood burner, the type of wood burned and the usage rate. The usage rate was based on the different burning habits of 1) condominium residents, 2) permanent residents in single family homes and 3) permanent residents in apartments and mobile homes. An estimate for the annual and 24-hour PM-10 emissions is calculated for wood burning. The annual emissions estimates, which are based on survey data, provide good information to improve the estimate for the peak 24-hour period.

3.1.1 Number of Woodstoves and Fireplaces

The numbers of wood stoves and fireplaces is based on the numbers of condominiums, single family homes, apartments and mobile homes, and the estimated number of wood stoves and fireplaces in each type of housing. Table 3.1 shows the estimated number of wood burning units from surveys for each housing type in the planning area.

3.1.2 Wood Stove and Fireplace Usage

The amount of wood burned is based on two surveys conducted during the winter of 1987-88. One survey was sent to all the condominium managers while the other went to 250 of the 2500 post office boxes in Mammoth Lakes. From the surveys that were sent out 35% of the condominium surveys and 40% of the post office box surveys were returned. Table 3.2 summarizes the average amount of wood burned during the winter heating season in homes that have a wood burning device.

TABLE 3.1

WOOD STOVE AND FIREPLACE COUNT

	Condos	Single Fam. Residents	Mobile Homes & Apartments	Total
Fireplaces	2,941	324	0	3,265
Wood Stoves	1,470	971	240	2,681

TABLE 3.2

AMOUNT OF WOOD BURNED IN HOMES WITH WOODSTOVES OR FIREPLACES (Survey taken Winter 1987-88)

Wood Burning Device	Condos Cords	Condos (%)	Sgl. Fam. Residents Cords	Sgl. Fam. Residents (%)	Mbl. Home & Apts. Cords	Mbl. Home & Apts. (%)
Fireplace	1.25	64%	0.8	18%		
Wood Stoves						
Conventional	1.25	12%	4.3	79%	2.5	100%
Certified			2.5	5%		
FP Insert	1.25	24%	5.3	5%		

Percentage of survey respondents for single family residents is greater than 100%. This accounts for both fireplaces and wood stoves in some homes.

3.1.3 Annual PM-10 Emission Estimates for RWC Devices

The emission estimates for RWC devices are based on the Environmental Protection Agency's emission factors (U.S. EPA, Compilation of Air Pollution Emission Factors, AP-42, 1985). These emission factors are based on in-situ tests of the wood burning devices. The emission factors are given as grams of PM-10 per kilogram of dry wood burned. The emission factors are shown in Table 3.3. This table also summarizes the total emissions for each RWC device and housing type. Emissions for each RWC device are calculated using the following equation:

$$\text{PM-10 emissions/device} = \text{Mass}_{wood} \times \text{e.f.}$$

$$\text{Mass}_{wood} = (\text{\# cords} \times 800 \text{ kg/cord}), \text{ Jeffrey \& Pinion Pine}$$

$$\begin{aligned} \text{e.f.} &= 8.1 \text{ g/kg, certified wood stoves} \\ &= 14.0 \text{ g/kg, fireplaces} \\ &= 15.0 \text{ g/kg, conventional wood stoves \& fireplace inserts} \end{aligned}$$

The cord density (800 kg/cord) is assumed for Ponderosa Pine which has a weight density of 10 kg/ft^3 and a cord is approximately 80 ft^3 of wood per cord (Davis & Read, Guidance Document for Residential Wood Combustion Emission Control Measures, 1989). Based on available data, this is the best approximation for the Jeffrey and Pinon Pine that is primarily burned in Mammoth Lakes. The total number of fireplaces is taken from Table 3.1. The total number of wood stoves is also taken from Table 3.1, but this category is further broken down into conventional, certified and fireplace inserts according to the proportions from the survey shown in Table 3.2.

Table 3.3 shows a summary of the calculations for the Annual PM-10 emissions from RWC devices.

TABLE 3.3

ANNUAL PM-10 EMISSION ESTIMATES FOR RESIDENTIAL WOOD COMBUSTION

Wood Burning Device	Emission Factor (g/kg)	Condos			Single Family Res.			Mobile Homes & Apts			Total Emissions (Mg)
		Cords	Units	PM-10 (Mg)	Cords	Units	PM-10 (Mg)	Cords	Units	PM-10 (Mg)	
Fireplace	14.0	1.25	2,941	41.2	0.8	324	3.0	--	--	--	44.2
Wood Stoves											
Conventional	15.0	1.25	490	7.4	4.3	861	44.4	2.5	240	7.2	59.0
Certified	8.1	--	--	--	2.5	55	0.9	--	--	--	0.9
FP Insert	15.0	1.25	980	14.7	5.3	55	3.5	--	--	--	18.2
				63.3			51.8			7.2	122.3

The annual emission estimate for PM-10 of 125,800 kg (139 tons) is based on well researched data and provides a good basis for comparison with a peak 24-hour emission estimate. The 24-hour emission estimate is critical since wood burning is a significant contributor to the 24-hour PM-10 standard exceedances.

3.1.4 24-hour PM-10 Emissions Estimate for RWC Devices

To estimate the peak 24-hour emission inventory for wood burning, it is assumed that all RWC devices are operating and burn an average of 2.4 cubic feet (or 24 kg) of wood. The amount of wood burned is based on information provided through the woodburning surveys. Table 3.4 shows a summary of the estimates for the PM-10 emissions from each type of wood burning device and from different housing types. With these assumptions, it is estimated that RWC devices contribute about 1,839 kg (2.03 tons) of PM-10 during a peak wood burning day.

TABLE 3.4

PEAK 24-HOUR PM-10 EMISSION ESTIMATE FOR RESIDENTIAL WOOD COMBUSTION

RWC Device	Emission Factor	Condos			Sgl. Family Res.			Mobile Homes & Apts			Total Emissions
	g/kg	Wood kg/d	Units	PM-10 kg	Wood kg/d	Units	PM-10 kg	Wood kg/d	Units	PM-10 kg	kg
Fireplace	14.0	19	2,941	782	22	324	100	--	--	--	882
Wood Stoves											
Conventional	15.0	19	490	141	33	861	426	19	240	68	635
Certified	9.0	--	--	--	19	55	9	--	--	--	9
FP Insert	15.0	19	980	279	41	55	34	--	--	--	313
				1,202			569			68	1,839

Assume the peak wood usage is 25% higher than the average wood usage rate, except for residential fireplaces which were assumed to be used on holidays and half of the weekends.

3.2 Road Cinders

The PM-10 emission estimate for resuspended road cinders is based on the AP-42 methodology for estimating reentrained road dust emissions from paved roads (U.S. EPA, Compilation of Air Pollution Emission Factors, AP-42, 1985).

$$e = 2.28\ (sL/0.5)^{0.8}\ \text{(grams/VKT)}$$

s = silt content (fraction of mass < 75 microns)
L = street loading (grams/m^2)
VKT = vehicle-kilometer traveled

Based upon the Town of Mammoth Lake General Plan and a Caltrans study of road cinders used in Mammoth Lakes the following information is used for the PM-10 emission estimate (Town of Mammoth Lakes General Plan, 1987; Kemp, Comparative Study of Sand Vs. Cinders, 1986):

- Peak Holiday traffic = 66,300 Vehicle-miles-traveled (VMT)
- Unit Weight of Cinders , loose = 68 lbs/cubic foot
- Silt Content (< 200 mesh or 75 microns) = 0.02 before use, 0.08 after use on roads

Assumption: Cinders of average height of 1/16" (1.6 mm) are spread evenly on the road and they cover 1/4th of the surface area.

Silt Loading

Volume of cinders spread on road = (0.0016 m)(m^2)/4 m^2
= 0.0004 m^3/m^2

Street Loading Mass = 0.0004 m^3/m^2 x 68 lb/ft^3 x 454 g/lb x $(3.28\ ft/m)^3$ = 436 g/m^2

Silt Loading Before Use (sL) = 436 g/m^2 x 0.02 = 8.7 g/m^2

The silt content of the cinders will increase as the traffic breaks-up the cinders, but the total mass loading will decrease as the cinders are resuspended and dispersed away from the road. Because of these offsetting effects on the silt loading (sL) value, the initial value of 8.7 g/m^2 is intuitively a good approximation to use for emission estimates.

Emission Calculation

emission = 2.28 ((silt content fraction * street loading)/0.5)$^{0.8}$
e = 2.28 $(8.7/0.5)^{0.8}$ = 22.4 g/VKT

VKT = 66,300 VMT x 1.61 km/mile = 106,700 VKT/day

PM-10 = 22.4 g/VKT x 106,700 VKT/day = 2,390 kg/day

Peak 24-hour PM-10 emission estimate for road cinders = 2,390 kg

3.3 Vehicle Tail Pipe & Tire-wear Emissions

PM-10 emissions from motor vehicle exhaust and tire-wear were determined by the California Air Resources Board (CARB) for Mono County (CARB, Predicted California Vehicle Emissions, 1988). CARB's estimates were adjusted using traffic counts in Mammoth Lakes to determine the peak 24-hour emissions from gas and diesel powered vehicles.

CARB's estimated average daily PM-10 emissions for gas and diesel powered vehicles for the entire Mono County is:

Light Duty Passenger	0.13 T/D	522,000 VMT/D	5.0×10^{-4} lbs/VMT
Light Duty Trucks	0.07 T/D	287,000 VMT/D	4.9×10^{-4} lbs/VMT
Medium Duty Trucks	0.02 T/D	69,000 VMT/D	5.8×10^{-4} lbs/VMT
Heavy Duty Diesel	0.14 T/D	58,000 VMT/D	4.8×10^{-3} lbs/VMT
	0.36 T/D	936,000 VMT/D	

Assume the same vehicle mix in Mammoth Lakes with buses taking the place of diesel trucks and buses. This is very close since the average diesel truck and bus numbers for Mono County was 116 in 1987, that is about the same as the number of charter buses that come into Mammoth Lakes during a winter holiday. (Town of Mammoth Lakes General Plan, 1987)

VMT in Mammoth Lakes = 66,300 VMT/day (See Appendix E)

Light Duty Passenger	37,000 VMT/D	5.0×10^{-4} lbs/VMT	18.50 lbs/D
Light Duty Trucks	20,300 VMT/D	4.9×10^{-4} lbs/VMT	9.90 lbs/D
Medium Duty Trucks	4,900 VMT/D	5.8×10^{-4} lbs/VMT	2.84 lbs/D
Heavy Duty Diesel	4,100 VMT/D	4.8×10^{-3} lbs/VMT	19.80 lbs/D
	66,300 VMT/D		51.04 lbs/D

The assumptions used in this calculation yield a rough estimate for vehicle exhaust and tire-wear of 23 kg/day (51 lbs/day). It should be pointed out that diesel trucks and buses emit a large proportion of the vehicle emissions. Although a concentrated gathering of idling diesel vehicles may have a significant effect on air quality in the immediate area, the quantity of PM-10 is much less than the amount emitted by either road cinders or wood burning.

3.4 Industrial Point Sources

There are two industrial sources located in the Mammoth Lakes Planning area that emit PM-10; Hunewill Ready Mix (6.3 kg/day) and

Mammoth Hospital (1.1 kg/day). Peak 24-hour PM-10 emissions for industrial point sources in Mammoth Lakes is 7.4 kg/day (16.3 lbs/day).

3.5 Summary of PM-10 Emissions

Wood burning and resuspended road cinders comprise almost all of the PM-10 emissions during the winter. Motor vehicle exhaust, tire-wear and industrial sources contribute less than 1% to the area-wide inventory.

SOURCE	Peak 24-Hour PM-10 Emissions (kg/day)	
Fireplaces	882	(20.7%)
Wood Stoves	957	(22.5%)
Resuspended Road Dirt/Cinders	2,390	(56.1%)
Motor Vehicles	23	(0.5%)
Industrial Sources	7	(0.2%)
TOTAL	4,259 kg/day	

SECTION 4
RECEPTOR MODELING

4.0 RECEPTOR MODELING

Receptor modeling is based on the idea that the total mass at the receptor (ambient sample) is a sum of the contributions from the individual sources. Each source has a unique "fingerprint" of the various proportions of chemical elements which comprise it. This fingerprint is expressed in fractions of the total (e.g., 20% Potassium, 30% Silica, 40% Carbon, etc.) Knowing the composition of the ambient sample, and the compositions of the possible sources, one can estimate (using least squares estimation) the fraction of each source contribution to the total ambient mass. This type of data manipulation is called receptor modeling because it bases its analysis of an air pollution scenario on the information gathered at the receptor.

Another air pollution modeling method is dispersion modeling, which starts with precise information about source characteristics, terrain and meteorology to predict the pollutant concentration at the receptor. Dispersion models are especially useful in predicting the effects of point source emissions, such as from industrial smoke stacks. But their predictive accuracy is strained under low wind speed conditions and situations dominated by emissions from numerous small point sources, such as resuspended road dust and residential wood combustion. These are precisely the conditions that characterize the air pollution problem in Mammoth Lakes.

A receptor model doesn't directly consider the wind speed or source characteristics, other than chemical composition to determine the ambient impact of sources. So receptor modeling is particularly useful for performing the air quality analysis for the conditions that exist in Mammoth Lakes.

4.1 Modeling Methodology

To perform the receptor model calculations we used Version 6.0 of EPA's Chemical Mass Balance (CMB) Model run on a standard PC-type 80386 microcomputer. This model uses two main data files: ambient chemical profiles from each day of PM-10 monitoring, and source fingerprints - a chemical analysis of the typical composition of each suspected source (U.S. EPA, Receptor Model Technical Series, 1987).

4.1.1 Ambient Profiles

In the winter of 1987-88 PM-10 was monitored using a dichotomous sampler at the Mammoth Gateway Home Center (location shown on Figure 2.1.) Both quartz and teflon filters were used so that the composition of the filters themselves would not limit what elements could be identified (e.g., using quartz filters with their large amount of silica means one cannot measure the ambient amount of silica present.) The sampler collected PM-10 in two size fractions which were analyzed separately: a fine fraction with particles smaller than or equal to 2.5 microns and a coarse fraction larger than 2.5 microns but smaller than or equal to 10 microns. The Desert Research Institute (DRI) of Reno, Nevada, analyzed the filters in the two size fractions. They used several standard methods of chemical analysis: X-ray Fluorescence Spectometry, Atomic Absorption Spectrometry, Ion Chromatography, Automated Colorimetry, and Thermal/Optical Reflectance. For the 47 days sampled from 11 Nov. 1987 to 16 March 1988, DRI provided concentrations and uncertainty values (a measure of the reliability of the concentration) for 39 chemical species in the two size fractions of our ambient samples. (OMNI and DRI, Determination of Particle Size Distribution and Chemical Composition of Particulate Matter from Selected Sources in California, 1989)

4.1.2 Source Profiles

During the same winter, OMNI collected 3-6 dust or emission samples on teflon and quartz filters for the fine and total PM-10 size fractions from the following sources:

.... Mammoth Lakes road cinder storage
.... Mammoth Lakes paved road dust
.... idling diesel ski tour buses in Mammoth Lakes
.... fireplace burning a typical Mammoth Lakes wood mix
.... a Fisher woodstove with typical Mammoth Lakes wood mix

Analyses were conducted by OMNI Environmental Services, Inc. of Beaverton, Oregon, and DRI (OMNI and DRI, 1989). They used the same types of chemical tests mentioned above to determine the proportions of 43 chemical species in each source sample. Replicate tests assessed the source variablity and provided mean composite values for each species with its corresponding standard deviation and uncertainty.

With these 5 sources an additional chemical fingerprint published by South Coast Air Quality Management District was used. It measured a mix of actual driven vehicles in a tunnel, including autos and trucks using both diesel and non-diesel fuels (South Coast AQMD, Final Air Quality Management Plan, 1989). With this exhaustive and complex source testing available there was no reason to conduct our own vehicle study. Since the majority of Mammoth Lakes winter tourist population comes from Southern California, this source fingerprint would accurately reflect the PM-10 contribution from vehicle traffic.

In the source profiles OMNI identified the predominant size fraction. In Table 4.1 are listed the six sources used and their primary particle size.

TABLE 4.1
SOURCE PROFILE LIST

SOURCE DESCRIPTION	CMB NAME	PARTICLE SIZE
Mammoth road cinder	CINDR	COARSE
Mammoth paved road dust	PAVRD	COARSE
diesel buses in Mammoth	DIESL	FINE
fireplace with typical Mammoth wood	MAMFP	FINE
Fisher woodstove w/typical Mammoth wood	MAMWS	FINE
South Coast vehicle composite	SSCAR	FINE

4.1.3 Modeling Decisions

Typically a few species comprise most of the mass of any one PM-10 sample with the amounts of the remaining species contributing less than 1% of the total mass. In both the ambient and source profiles one can identify the 5-10 chemical species which characterize each profile. In running the CMB Model, one chooses those chemical species which are commonly present and characteristic of the ambient samples and the source signatures to use as "fitting species." The "fitting species" are what the model uses as the important elements in making its calculations. The mathematical scenario it creates attempts to explain the measured ambient mass (either the fine fraction or the coarse - they are run separately) by using the patterns of the "fitting species" concentrations in the sources.

The CMB Model is run on one ambient sample (= 1 day), in one size range at a time. We chose to run all the ambient days in which the PM-10 mass was greater than 100 micrograms per cubic meter. For the 47 days for which we had data in the winter of 1987-88, there were 12 such days. The unsummarized output from the final Model runs is contained in Appendix D.

Source Contribution Estimates (SCE) for each source are generated from the CMB model runs. The SCE data are explained in the Results portion of this Section. In addition, the model provides details to aid in refining the accuracy of the calculations. For example, if two of the source profiles are very similar in chemical composition, the individual Source Contribution Estimates will be erroneous for those sources. The model warns of such similiarity so that one can make changes to separate the estimates for these sources. In general, the model is designed to identify contributions from source categories and not from individual emission sources. Ideally, one uses sources that are significantly different in their composition.

There are three other types of information provided by the model to aid the user in refining the calculations:

(1) Two measures of the "goodness-of-fit" are calculated: R^2 and Chi Square. As these values approach 1, it can be assumed that the Model estimates are a good description of reality.

(2) The percent mass that is explained is given. If the model has explained 99% of the ambient sample mass, one knows that one has used all the applicable sources, and that the model is accurately describing the sample.

(3) Calculated masses of each of the chemical species are listed. This helps the user identify missing sources and/or non-applicable sources. If, for example, one has a lot of Chlorine in the ambient sample but little or no Cl in the sources, then the model will show a negative calculated mass for Cl. When such discrepancies are large, ideally one would want to find the "missing" source for that chemical species to include in subsequent runs.

Taking the above-mentioned factors into consideration, enough CMB trial runs were performed to enable us to make good decisions about model parameters.

4.2 CMB Results

4.2.1 Chemical Species

Our final runs used 11 fitting species for the fine fraction with an additional species used for the coarse fraction. This number of species gave us the most accurate model results as measured by R^2 values and high values for "percent mass explained." These species were also those which characterized the sources and the ambient data, although some such as lead (Pb) were present in only trace amounts.

Despite the importance of such trace chemical species for distinguishing between source categories, the fact which has the most significance in the application of receptor modeling to the Mammoth Lakes PM-10 samples is that very <u>few</u> chemical species account for the majority of the source and ambient data. In Table 4.2 are ranked all chemical species constituting 1% or more of the mass for the largest ambient samples and for the six sources in the fine and coarse fractions.

TABLE 4.2
CHEMICAL COMPOSITIONS

FINE FRACTION

>100 UG/M³ AMBIENT SAMPLES	MAMMOTH ROAD CINDERS	MAMMOTH PAVED RD DUST	MAMMOTH BUS DIESEL	MAMMOTH FIRE-PLACE	MAMMOTH WOOD STOVE	S.COAST COMPOSITE VEHICLES
OC 37-56%	Si 23%	Si 22%	OC 90%	OC 53%	OC 64%	OC 39%
EC 17-23%	Al 9%	OC 15%	EC 10%	EC 26%	EC 11%	EC 38%
NO_3 1- 2%	Fe 7%	Al 8%	–	K 1%	–	Pb 2%
SO_4 ~1%	Ca 6%	Fe 5%	–	–	–	Fe 2%
K ~2%	K 1%	Ca 3%	–	–	–	Br 1%
Si ~1%	Ti 1%	EC 3%	–	–	–	S 1%
–	–	K 2%	–	–	–	–

COARSE FRACTION

>100 UG/M³ AMBIENT SAMPLES	MAMMOTH ROAD CINDERS	MAMMOTH PAVED RD DUST	MAMMOTH BUS DIESEL	MAMMOTH FIRE-PLACE	MAMMOTH WOOD STOVE	S.COAST COMPOSITE VEHICLES
OC 9-59%	Si 21%	Si 24%	OC 90%	OC 53%	OC 64%	OC 39%
Si 3-25%	Al 9%	OC 9%	EC 10%	EC 26%	EC 11%	EC 13%
EC 3-16%	Fe 7%	Al 8%	–	K 1%	–	Fe 11%
Al 1- 8%	Ca 6%	Fe 4%	–	–	–	Si 6%
Ca 1- 4%	K 1%	Ca 3%	–	–	–	Pb 2%
Fe 1- 4%	Ti 1%	K 2%	–	–	–	Ca 1%
K 1- 2%	–	EC 1%	–	–	–	Ba 1%
Cl ~1%	–	–	–	–	–	Al 1%

NOTE 1: OC = Organic Carbon, EC = Elemental Carbon
NOTE 2: The coarse fraction is similar in the way a few species dominate the bulk of the sample. Since a total oxygen quantity was not measured in the chemical analysis and oxygen was present in many molecules such as SiO_2, its absence in the above table explains why the percents do not add up to 100%.

4.2.2 Source Similarities

The most striking thing in Table 4.2 for the fine fraction is that OC (Organic Carbon) and EC (Elemental Carbon) completely dominate the compositions of the ambient data and the sources of Mammoth Lakes diesel, fireplaces, woodstoves, and S.Coast vehicles. Both "dirt" samples are similar to each other in having substantial amounts of Si, Al, Fe and Ca, while having less than half of the OC and EC of the other sources. While one might assume that the OC present in road dust and absent in cinders would be enough to differentiate between these two sources, that is not the case in CMB analysis. The great amounts of OC in the other sources already explain all the OC in the ambient such that 15% OC in paved road dust is no longer a significant factor. Also, the many chemical species that the two "dirt" samples have in common overshadow this one difference.

The coarse fraction shown in the second part of Table 4.2 shows a correspondence between the relatively high percentages for Si and Al in the ambient samples and the "dirt" sources. The source signatures used for the coarse particle analysis of wood burners and Mammoth diesel were the same as that of the fine fraction because these sources were comprised almost exclusively of the smaller particles, < 2.5 microns. Based on the data available, the particles of 2.5 microns and larger in the coarse fraction of these sources were assumed to have the same proportions of chemical species as in the 0-2.5 micron range.

Because of these similarities between sources, the final modeling analysis used a single source in each category: "dirt" particles, vehicle emissions, and woodsmoke emissions. Early trial runs using a variety of source combinations provided information to determine which source fingerprints should be used for the final fine and coarse fraction runs.

4.2.3 Summary of Source Contribution Estimates

Table 4.3 summarizes the contributions of the three source categories to the ambient PM-10 samples. (NOTE: Negative SCE values indicate a similarity between the negative source and the woodsmoke source. For example, for 1/22/88 a correct interpretation of 81.7 and -0.5 gives a SCE of 81.2 for woodsmoke and 0 for S. Coast vehicle exhaust.)

TABLE 4.3

1987-88 DATES >100 UG/M3	MEA-SURED MASS UG/M3	SOURCE CONTRIBUTION ESTIMATES FROM CMB MODEL									
		TOTAL PM-10				FINE FRACTION			COARSE FRACTION		
		EST. MASS UG/M3	RD DUST CINDERS S.C.E. UG/M3	WOOD SMOKE S.C.E. UG/M3	S.COAST VEHICLE S.C.E. UG/M3	RD DUST & CINDERS S.C.E. UG/M3	WOOD-SMOKE S.C.E. UG/M3	S.COAST VEHICLE S.C.E. UG/M3	RD DUST & CINDERS S.C.E. UG/M3	WOOD-SMOKE S.C.E. UG/M3	S.COAST VEHICLE S.C.E. UG/M3
26-Dec	125.9	84.8	1.9	81.9	1.0	-0.0	76.0	0.7	1.9	5.9	0.3
30-Dec	132.8	101.6	1.3	97.0	3.3	-0.0	87.5	0.8	1.3	9.5	2.6
31-Dec	142.8	131.0	3.2	124.5	3.3	-0.1	113.1	0.8	3.2	11.5	2.5
01-Jan	117.4	97.7	9.9	86.6	1.1	0.1	83.0	1.0	9.8	3.7	0.2
22-Jan	143.8	122.7	41.5	81.7	-0.5	0.8	78.8	1.0	40.7	2.9	-1.5
23-Jan	157.8	138.2	57.2	81.6	-0.6	0.9	76.8	1.1	56.3	4.8	-1.8
03-Feb	104.3	98.5	31.2	67.9	-0.6	0.6	61.6	0.5	30.6	6.2	-1.1
05-Feb	148.2	132.7	45.2	88.5	-1.0	1.1	82.4	0.5	44.1	6.1	-1.5
06-Feb	163.0	140.1	44.0	97.1	-1.0	1.1	91.0	0.5	42.9	6.1	-1.5
13-Feb	137.6	126.3	49.3	77.9	-0.9	1.2	72.4	0.6	48.1	5.5	-1.6
14-Feb	144.0	134.2	61.4	74.5	-1.7	3.0	69.5	0.6	58.5	5.0	-2.3
19-Feb	148.5	139.5	40.2	99.8	-0.4	0.9	94.1	0.8	39.3	5.7	-1.2

In 10 of the 12 samples the mass estimated by CMB modeling is within reasonable range (80% or better, as governed by model guidelines) of the actual mass measured (U.S. EPA, Protocol for Applying and Validating the CMB Model, 1987). The mass not included in the model estimate is probably attributable to such secondary compounds as SO_4 and NO_3. Since these species are largely created from the interactive mixture of elements in the atmosphere <u>after</u> the emission from the sources, such compounds are only very small parts of the source fingerprints. The amounts of such compounds in the modeled ambient data as compared to the actual ambient data are thus underestimated by the model.

In the fine fraction results shown in Table 4.3, woodsmoke, ranging from 98% to 99%, is the overwhelming contributor to the estimated ambient mass smaller than 2.5 microns. The coarse fraction particles (those between 2.5-10 microns) are comprised of both woodsmoke and a combination of cinders and paved road dust. The range of values are from 23% woodsmoke, 73% cinders/rd.dust to 4% woodsmoke, 96% cinders/rd.dust. Cinders and road dust account for the majority of the coarse particles according to model estimates.

The measured PM-10 masses of the ambient samples are largely comprised of fine particles as shown in Figure 4.1. Because of this and since the fine fraction is almost entirely due to woodsmoke, even the total PM-10 samples are dominated by woodsmoke. Figure 4.2 reiterates the source contribution estimates for the total PM-10 mass. Early in the winter, woodsmoke is practically the only source of particles. One would expect to have a lot of woodsmoke around the holidays from the influx of tourists into Mammoth Lakes. Some of the largest woodsmoke contributions are Dec. 26, 30, 31, and Jan. 1. The only two days of significant contributions from vehicles are also in this holiday period on Dec. 30 and 31st. From late January through February, cinders and road dust assume a larger proportion. This is reasonable in view of the fact that cinders and dirt on the road are likely to build up through the course of the winter as they are continually added. Even when cinders and road dust are at their highest levels, though, woodsmoke continues to be a major contributor.

4.3 Woodstoves Versus Fireplaces

Although the CMB model could not absolutely distinguish between the source contributions of Mammoth woodstoves and Mammoth fireplaces, the best model accuracy was obtained through using the fireplace signature in the final runs. This is due to the difference in the ratio of Organic Carbon (OC) to Elemental Carbon (EC). From Table 4.2 one can see the extreme importance of this ratio, since OC and EC are practically all that occur in these two sources. For woodstoves the ratio of OC to EC is about 6 to 1 while it is only 2 to 1 for fireplaces. While there is some variability in the OC/EC of the ambient samples, Figure 4.3 illustrates that the ambient data fall closest to the fireplace ratio. A linear regression of the ambient data gives a ratio of 2 to 1 with an R^2 value of .92 (indicating a very good "fit" of the data to that "average" ratio).

FIGURE 4.1
Respective Mass of Fine & Coarse Fractions in Mammoth Ambient

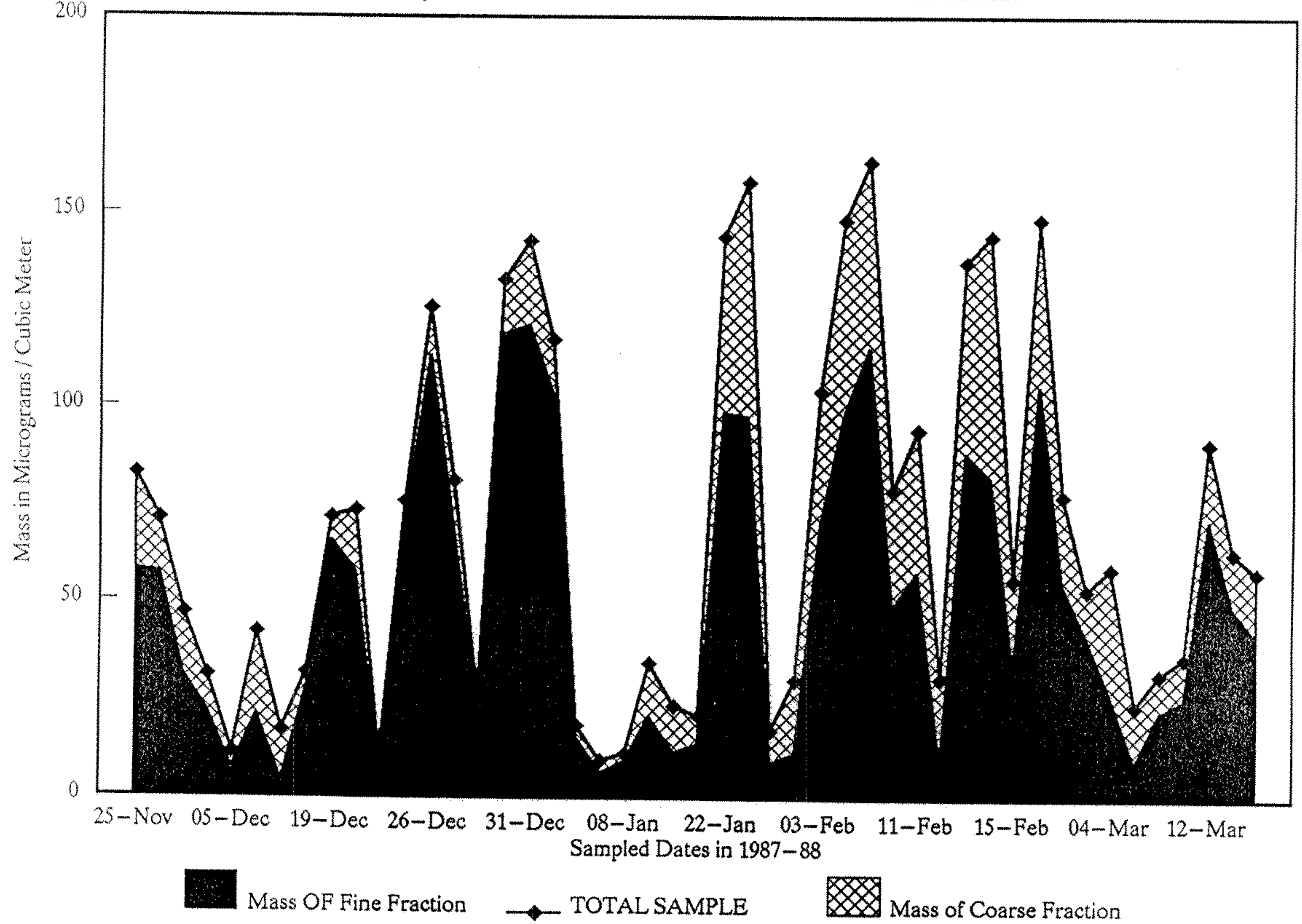
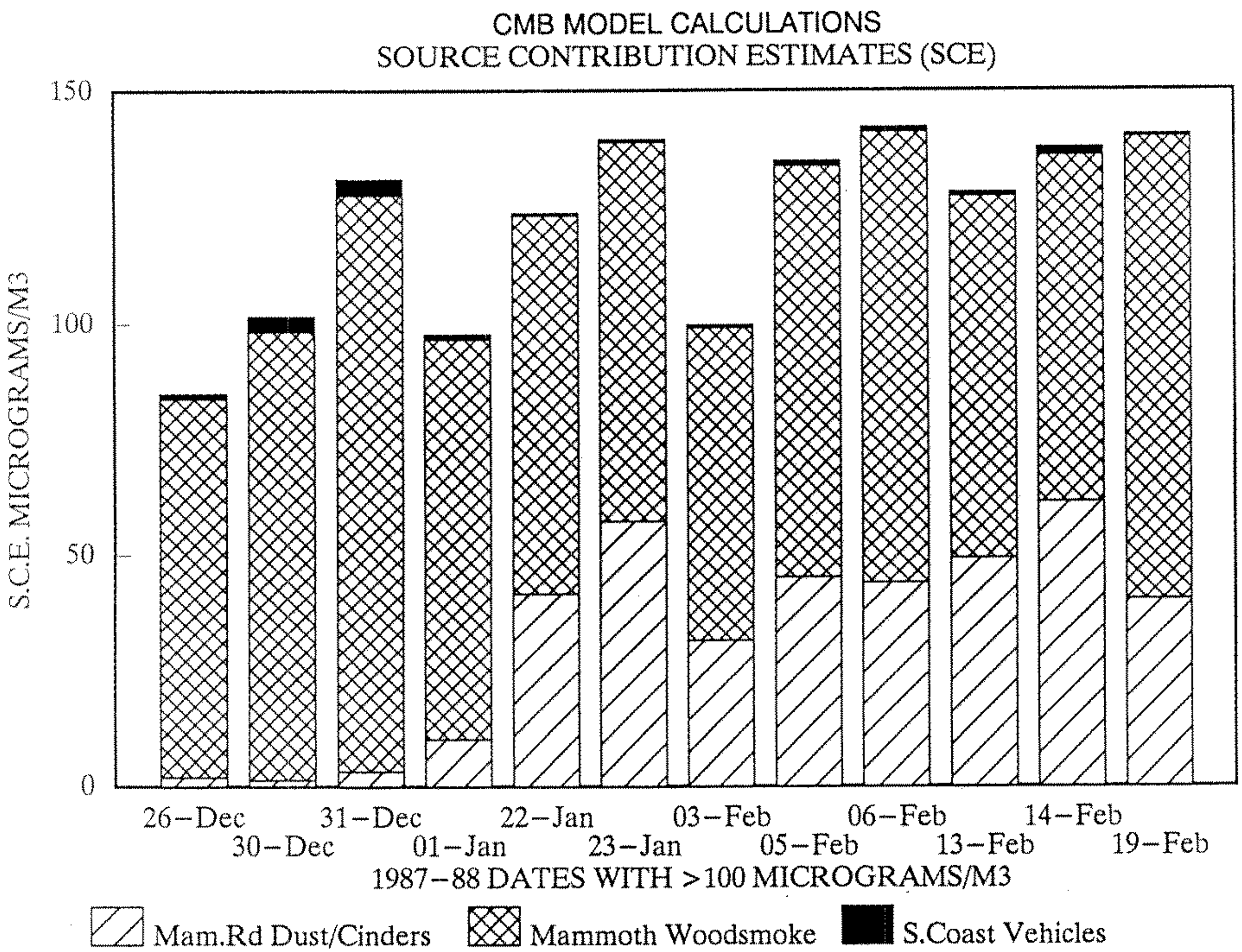


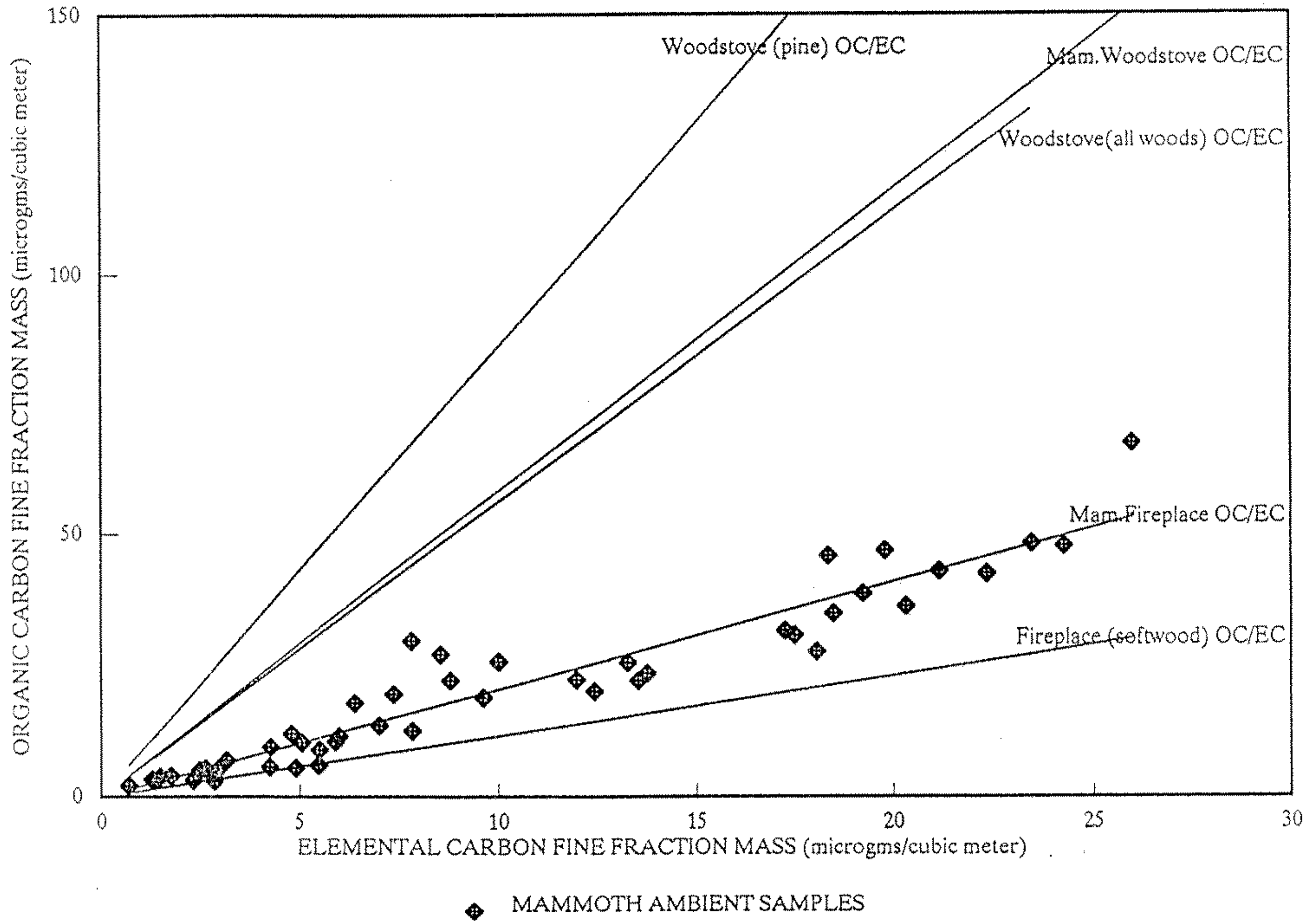
FIGURE 4.2



CMB MODEL CALCULATIONS
SOURCE CONTRIBUTION ESTIMATES (SCE)
S.C.E. MICROGRAMS/M3
150
100
50
0
26-Dec
30-Dec
31-Dec
01-Jan
22-Jan
23-Jan
03-Feb
05-Feb
06-Feb
13-Feb
14-Feb
19-Feb
1987-88 DATES WITH >100 MICROGRAMS/M3
Mam.Rd Dust/Cinders
Mammoth Woodsmoke
S.Coast Vehicles

FIGURE 4.3

COMPARISON OF AMBIENT SAMPLES & OC/EC RATIOS FOR DIFFERENT WOOD BURNING SITUATIONS



SECTION 5

GROWTH PROJECTIONS AND DESIGN CONCENTRATION

5.0 GROWTH PROJECTIONS AND DESIGN CONCENTRATION

This section will cover the effects of increased population and visitors on PM-10 emissions and the selection of an ambient PM-10 design concentration. This information along with receptor modeling results from Section 4 will be used to determine the future ambient PM-10 concentrations that will result from population and visitor growth. In Section 6, these results will be used to evaluate the effectiveness of the adopted control measures to reduce ambient PM-10 concentrations.

5.1 Emissions and Population Growth Projections

The General Plan for the Town of Mammoth Lakes shows that both the number of permanent residents and winter visitors to the area will increase over the next 15 years. The expansion of the present ski areas and the possible addition of new ski areas and other winter activity areas may increase the peak number of people in Mammoth Lakes from 29,000 to 48,800 by the year 2005 (see Town of Mammoth Lakes General Plan, 1987 for population projection methodology). Table 5.1 shows the estimated projections for the permanent resident and transient populations.

It should be noted that emission estimates for 1990 are based on the population and vehicle estimate data for 1985 to 1987. It is assumed that the emission estimates for 1990 are the same as it would be for 1985, since there have been no significant changes to the peak resident and visitor population estimates from 1985 to 1990.

Beyond 1990, population growth will increase emissions of PM-10 from wood burning, resuspended road dust and cinders and vehicle tail pipe emissions. Table 5.2 summarizes the future PM-10 emissions inventory for Mammoth Lakes. Projections are based on population growth estimates and the related increase in vehicle miles traveled (VMT).

The estimate for future VMT is based upon revised information contained in the General Plan (see Appendix D). Upon review of the data contained in the General Plan for traffic estimates, it was found that the traffic volume was incorrectly reported. The estimated future traffic volume was reported for a future population-at-one-time of 76,000, instead of 48,000 which was identified in the General Plan. (Taylor, 1989) The correct VMT projections were used to estimate the future PM-10 emissions from resuspended road dust and cinders.

TABLE 5.1

POPULATION GROWTH PROJECTIONS
Reference: Town of Mammoth Lakes General Plan, 1987

Year	Permanent Residents	Skiers & Visitors	Total
1990	5,000	24,000	29,000
1993 *	5,680	27,280	32,960
1995 *	6,130	29,470	35,600
2000 *	7,270	34,930	42,200
2005	8,400	40,400	48,800

* Determined by interpolating between population estimates for 1990 and 2005.

Wood burning emissions are projected with consideration for the difference in the growth rate for the permanent and the transient populations. The expected increase in the number of skiers and visitors to the area is applied to the emissions for wood burning from condominiums. The increased number of permanent residents is apportioned for the emissions from apartments, single family residences and mobile homes. In addition, the wood stove emissions are adjusted to account for new stoves that are required to be EPA certified wood stoves under the Town ordinance prior to this SIP. This reduces the future emissions for each new stove by 50% (assume Phase II certified).

5.2 PM-10 Design Concentration

The control strategy is dependent upon a selected PM-10 design concentration. Through the development of a successful control strategy it will be shown that the worst case ambient concentration can be reduced from the design concentration to the Federal PM-10 Standard of 150 $\mu g/m^3$. The design concentration in this case will rely on the highest measured PM-10 concentration of 210 $\mu g/m^3$. Although the design concentration in this case is the highest measured value, the value can also be modeled or determined

TABLE 5.2

PROJECTED PEAK 24-HOUR PM-10 EMISSIONS

SOURCE	PM-10 EMISSIONS (kg/day)				
	1990	1993	1995	2000	2005
Fireplaces	882	1,016	1,095	1,283	1,485
Wood Stoves/Inserts	957	1,020	1,054	1,142	1,195
Road Dust/Cinders	2,390	2,972	3,359	4,329	5,298
Vehicle Tail Pipes	23	29	32	42	51
Industrial Sources	7	7	7	7	7
	4,259	5,044	5,547	6,803	8,036

statistically (PM-10 SIP Development Guidelines, 1987). The highest measured value appears to be the most appropriate design concentration because of the lack of an adequate predictive model and the lack of a large data base for a statistical approach.

5.3 Design Day Source Contributions

The control strategy is evaluated using two scenarios; first that the design day is dominated by wood smoke and second, that the design day is impacted by reentrained road dust and cinders. The two scenarios are necessary since they represent the worst case possibilities for sources that can contribute to exceedances of the PM-10 Standard. A single scenario for the worst case source contributions would be inadequate because of the large daily variation in the contributions from wood burning and reentrained road dust and cinders.

The Chemical Mass Balance Model showed that wood smoke from fireplaces and wood stoves can contribute as much as 93% of the PM-10 on a high concentration day (December 31, 1987). The model also showed that reentrained road dust and road cinders can contribute up to 44% of the ambient PM-10 concentration (February 14, 1988). Using these two scenarios, Table 5.3 shows the source contributions

TABLE 5.3

DESIGN DAY SOURCE CONTRIBUTIONS FOR WOOD BURNING AND ROAD DUST DOMINATED DAYS

Source	Contributions Assuming: 93% Wood Burning	Contributions Assuming: 44% Road Dust
Fireplaces	94 $\mu g/m^3$	54 $\mu g/m^3$
Wood Stoves/Inserts	101 $\mu g/m^3$	58 $\mu g/m^3$
Road Dust/Cinders	5 $\mu g/m^3$	93 $\mu g/m^3$
Vehicle Tailpipes	5 $\mu g/m^3$	negligible
Background	5 $\mu g/m^3$	5 $\mu g/m^3$
Design Concentration	= 210 $\mu g/m^3$	210 $\mu g/m^3$

which are apportioned to the design day concentration of 210 $\mu g/m^3$. Although the chemical similarity of the wood stove and fireplace sources caused these two sources to be combined in the CMB, they are separated in Table 5.3 by assuming that the relative contributions were proportional to the emissions inventory estimates shown in Table 5.2. Table 5.3 is also shown graphically in Figures 5.2 and 5.3.

5.4 Proportional Roll-back Method For Control Strategy Analysis

The effect of PM-10 emission increases or decreases on the ambient PM-10 concentration can be determined by using a linear roll-back method of calculation. This method is based on the assumption that the ambient concentration due to a given source is proportional to the emissions from that source. It should be noted that the following form of the roll-back equation includes the background PM-10 concentration. The background concentration for Mammoth Lakes is assumed to be 5 $\mu g/m^3$ based on winter-time PM-10 data from Simis Ranch which shows an average concentration of 5 $\mu g/m^3$.

$$C_T = \Sigma C_i + C_b = \Sigma[C_{di} (E_i/E_{di})] + C_b$$

C_T = Total PM-10 Concentration
C_b = Background PM-10 Concentration, 5 $\mu g/m^3$
C_i = PM-10 Concentration Due to the Source i
C_{di} = Design Day Source Contribution for Source i
E_i = PM-10 Emissions from Source i
E_{di} = Peak PM-10 Emissions from Source i

To determine the ambient source contributions for either design day scenario, use the following emissions for E_{di}:

E_{di} = 1,000 kg/day for fireplaces
= 960 kg/day for wood stoves
= 2,390 kg/day for road dust & cinders
= 23 kg/day for vehicle tailpipes

For the Wood Burning Dominate Design Day use the source contributions estimated using the Chemical Mass Balance model in Section 4:

C_{di} = 94 $\mu g/m^3$ for fireplaces
= 101 $\mu g/m^3$ for wood stoves
= 5 $\mu g/m^3$ for road dust and cinders
= 5 $\mu g/m^3$ for vehicle tailpipes

For the Road Dust and Cinders Dominated Design Day:

C_{di} = 54 $\mu g/m^3$ for fireplaces
= 58 $\mu g/m^3$ for wood stoves
= 93 $\mu g/m^3$ for road dust and cinders
= negligible for vehicle tailpipes

The effect of future emissions changes on the ambient contributions can be estimated by using the emissions data for future years as shown in Table 5.2 for the variable E_i. By summing the concentrations for all sources, the linear roll-back method can be used to estimate the total ambient PM-10 concentration as it changes with growth and controls.

5.5 Effect of Growth on PM-10 Concentrations

Using the linear roll-back method the effect of uncontrolled emissions growth on the ambient PM-10 concentration is shown in Figure 5.1. Using the peak wood smoke and peak road dust and cinder days, Figure 5.1 shows the expected PM-10 concentrations due to growth if controls are not implemented. These results show that uncontrolled growth could result in a 150% to 180% increase in the worst case ambient PM-10 concentrations over the next 15 years.

FIGURE 5.1
FORECASTED AIR QUALITY - UNCONTROLLED

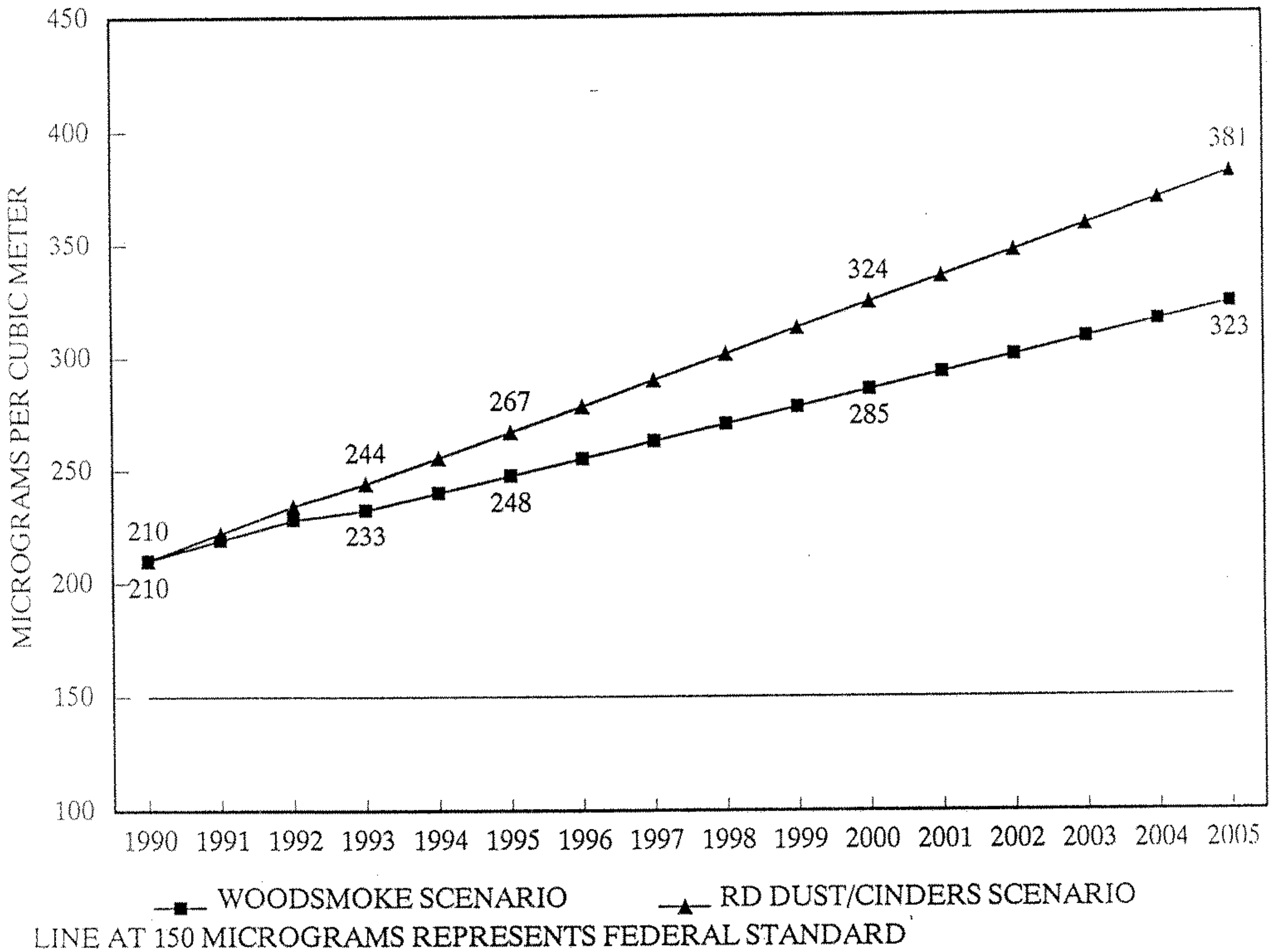
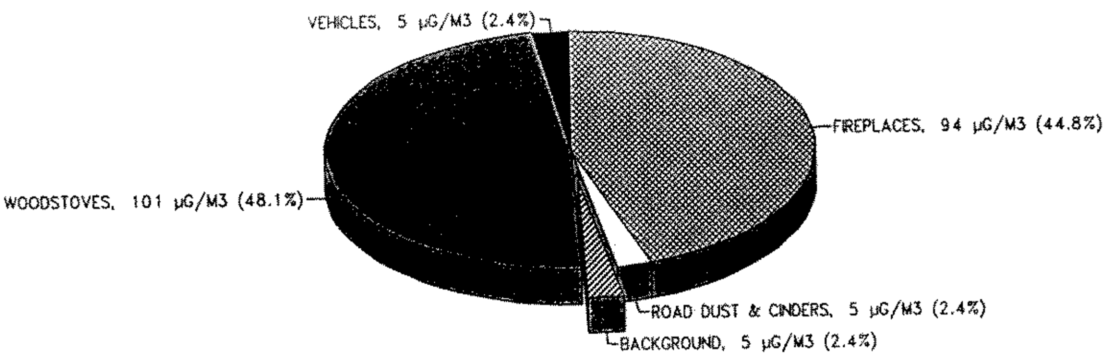


FIGURE 5.2

DESIGN DAY SOURCE CONTRIBUTIONS FOR WOOD SMOKE DOMINATED DAYS

93% OF PM-10 ATTRIBUTED TO WOOD BURNING

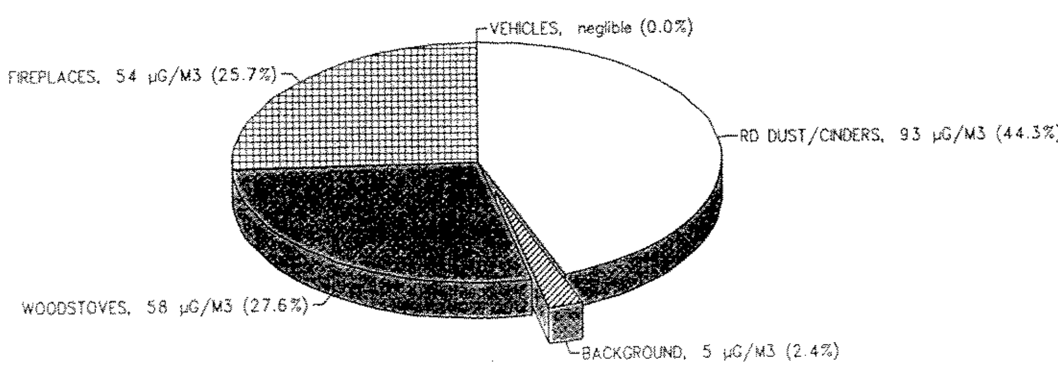


210 TOTAL MICROGRAMS PER CUBIC METER

FIGURE 5.3

DESIGN DAY SOURCE CONTRIBUTIONS FOR ROAD DUST & CINDERS DOMINATED DAYS

44% OF PM-10 ATTRIBUTED TO ROAD DUST & CINDERS



210 TOTAL MICROGRAMS PER CUBIC METER

SECTION 6

SELECTED CONTROL MEASURES & FEDERAL PM-10 STANDARD ATTAINMENT DEMONSTRATION

6.0 SELECTED CONTROL MEASURES & FEDERAL PM-10 STANDARD ATTAINMENT DEMONSTRATION

The final control strategy was adopted by the Mammoth Lakes Town Council on November 7, 1990. The strategy was added to the Town of Mammoth Lakes Municipal Code as Chapter 8.30, Particulate Emissions Regulations. The regulations will reduce emissions from reentrained road cinders, will phase out non-certified wood burning appliances and will institute wood burning curtailments during periods of high PM-10 concentrations. The regulations include several contingency measures that will enable the Town to meet the Federal 24-hour PM-10 Standard within 3 to 5 years. A summary of the adopted regulations is listed in Table 6.1.

The regulations' primary measures will result in the eventual phasing out of all non-certified wood stoves and wood burning fireplaces. This will be accomplished by replacing non-certified appliances with certified wood stoves, pellet stoves, or gas log fireplaces before the resale of a dwelling. In addition to phasing out non-certified appliances, the Town will rely on a mandatory wood burning curtailment. This mandatory curtailment program will initially exempt certified wood stoves, but may include all wood burning if more reductions are needed to attain the Standard.

As a contingency, the replacement schedule may be accelerated if the Town does not attain the Federal PM-10 Standard by January 1, 1993. The accelerated schedule will require replacement of all non-certified wood burning appliances by November 1, 1994. This contingency measure may be instituted if the primary control strategy is insufficient to bring the Town into attainment with the Standard.

The adopted Town ordinance and a discussion of the air quality impact is included in this section. A detailed analysis of the air quality impact is included in Appendix I, "Methodology to Determine Control Effectiveness."

6.1 Particulate Emissions Regulations

Chapter 8.30, Particulate Emissions Regulations, was adopted by the Town Council of the Town of Mammoth Lakes. Enforcement of the following ordinance commences on December 7, 1990.

TABLE 6.1

LIST OF ADOPTED REGULATIONS

SECTION	REGULATION
8.30.020	DEFINITIONS
8.30.030	STANDARDS FOR REGULATION OF SOLID FUEL APPLIANCES - Limits installation of wood burning appliances after January 1, 1991 to EPA Phase II Certified Stoves or Pellet Stoves - Allows 1 wood burning fireplace in hotel/condo common area - Requires the Town to maintain records of certified stoves
8.30.040	DENSITY LIMITATIONS - Limits new wood stoves to one per dwelling, but allows one additional pellet stove per dwelling. - New dwellings cannot use wood heat for primary heating - Requires certified inspection of new installations
8.30.050	REPLACEMENT OF NON-CERTIFIED APPLIANCES UPON SALE OF PROPERTY - Non-certified wood stoves and fireplaces must be replaced, removed or rendered inoperable prior to the sale of property - Requires a written exemption for property that does not include a wood burning appliance
8.30.060	SOLID FUEL BURNING APPLIANCE REPLACEMENT SCHEDULE - Contingency Measure: If monitoring does not show attainment by January 1, 1993, all non-certified solid fuel appliances must be replaced by November 1, 1994
8.30.070	OPACITY LIMITS - Limits wood smoke opacity to 40% till January 1, 1994 and 20% thereafter
8.30.080	PROHIBITED FUELS - Prohibits trash and coal burning
8.30.090	MANDATORY CURTAILMENT - Requires Town Council to appoint an Air Quality Manager - Burn ban shall be called when PM-10 levels reach 130 $\mu g/m^3$ - Notice shall be given on radio, TV, phone message & posted - Requires posting of notice to inform rental unit occupants that curtailments may be called. - Renters shall be responsible on no burn days. - Exempts certified appliances and pellet stoves from curtailment, total ban could be called if air quality compliance is not met

- Continued on next page -

TABLE 6.1, continued

LIST OF ADOPTED REGULATIONS

SECTION	REGULATION
8.30.100	POLLUTION REDUCTION EDUCATION PROGRAMS
8.30.110	ROAD DUST REDUCTION MEASURES - Requires vacuum street sweeping of the cinders - Requires vehicle miles travelled (VMT) reduction measures for new developments - Limits peak VMT in the Town to 106,600 vehicle miles travelled
8.30.120	FEES
8.30.130	PENALTIES

Chapter 8.30

PARTICULATE EMISSIONS REGULATIONS

Sections:

Section 8.30.010, PURPOSE

The purpose of this chapter is to improve and maintain the level of air quality of the Town of Mammoth Lakes so as to protect and enhance the health of its citizens by controlling the emissions of particulate matter into the air of the community of Mammoth Lakes.

Section 8.30.020, DEFINITIONS

A. "EPA" shall mean the United States Environmental Protection Agency.

B. "EPA-Certified Appliance" means any wood or other solid fuel burning appliance utilized for space or water heating or cooking that meets the performance and emission standards as set forth in Part 60, Title 40, Subpart AAA Code of Federal Regulations, February 26, 1988. Phase I appliances must meet the emission requirements of no more than 5.5 grams per hour particulate matter emission for catalytic and 8.5 grams per hour for non-catalytic appliances. Phase II requirements are 4.1 and 7.5 grams per hour respectively. For existing appliances, Oregon Department of Environmental Quality (DEQ) certification shall be equivalent to EPA certification. All other solid fuel appliances, including fireplaces, shall be considered non-certified.

C. "Pellet Fueled Wood Heater" means any wood heater designed to heat the interior of a building that operates on pelletized wood and has an automatic feed.

D. "Permanently Inoperable" means modified in such a way that the appliance can no longer function as a solid fuel heater or easily be remodified to function as a solid fuel heater. Conversion to other fuels, such as gas, is permitted.

E. "Solid Fuel Burning Appliance, Heater, or Device" means any fireplace, wood heater, or coal stove or structure that burns wood, coal, or any other nongaseous or nonliquid fuels, or any similar device burning any solid fuel used for aesthetic, water heating, or space heating purposes.

Section 8.30.030, STANDARDS FOR REGULATION OF SOLID FUEL APPLIANCES

A. After December 7, 1990 (the effective date of this ordinance), no solid fuel burning appliance shall be permitted to be installed within the Town of Mammoth Lakes unless said device is certified as meeting the emission requirements of the U. S. Environmental Protection Agency (EPA) for Phase II certification. This shall not prohibit retailers from selling, prior to January 1, 1991, stock on hand as of the date of this ordinance as long as that stock meets EPA certification for Phase I and the seller can document through invoices or other means that the device was acquired prior to the adoption of this ordinance. After January 1, 1991, all appliances installed in the Town of Mammoth Lakes must meet EPA Phase II certification.

B. The restrictions of this section shall apply to all solid fuel devices including unregulated fireplaces. Exceptions will be made for fireplaces supplied with gas and fitted with artificial logs and for one fireplace located in a hotel/motel lobby or similar common area lobby or in the common area of a condominium project. Said fireplaces shall be subject to burning curtailment episodes as administered under Section 8.30.100.

C. For the purposes of enforcing this chapter, the Town shall keep a record of all certified appliances installed in Mammoth Lakes in accordance with this Chapter and of properties which have been determined to conform to the requirements of this Chapter.

Section 8.30.040, DENSITY LIMITATIONS

A. No more than one solid fuel appliance may be installed in any new dwelling or nonresidential property. Existing properties with one or more existing solid fuel appliances may not install additional solid fuel appliances. One pellet fueled wood heater per dwelling shall be excepted from the provisions of this paragraph.

B. Solid fuel appliances shall not be considered to be the primary form of heat in any new construction.

C. In addition to any inspections required by Title 15 of the Town of Mammoth Lakes Municipal Code, all new and replacement appliances shall be inspected by an inspector or installed by an installer certified by the Wood Heating Education and Research Foundation for installation of solid fuel appliances or equivalent certification. Said installer or inspector shall verify in writing that the installation has been performed in accordance with all requirements for the appliance having been installed and file the certification with the Town of Mammoth Lakes. Said installers or inspectors shall verify their qualifications with the Town of Mammoth Lakes Building Department before appliance certification will be accepted by the Town.

Section 8.30.050, REPLACEMENT OF NON-CERTIFIED APPLIANCES UPON SALE OF PROPERTY

A. Prior to the completion of the sale of any real property within the Town of Mammoth Lakes, all existing non-certified solid fuel appliances shall be replaced, removed, or rendered permanently inoperable. The Building Department, or a qualified inspector as designated by the Building Department, shall inspect the appliance(s) in question to assure that they meet the requirements of this chapter. Within five working days from the date of the inspection, the Building Department shall issue a written certification of compliance or non-compliance for the affected property. If the inspection reveals that the subject property does not comply with the requirements of this chapter, all noncomplying solid fuel appliances shall be replaced, removed, or rendered permanently inoperable. In this event reinspection shall be required prior to certification of compliance.

B. If real property is to be sold which does not contain a solid fuel appliance, a form approved by the Building Department, containing the notarized signatures of the seller, the buyer, and the listing real estate agent attesting to the absence of any solid fuel device, may be accepted in lieu of an inspection. A written exemption shall be issued by the Building Department.

C. No appliances removed under the provisions of this Section may be replaced except as provided by this Chapter.

D. This section shall not be applicable to sales or other transfers of real property which have been completed prior to February 15, 1991.

Section 8.30.060, SOLID FUEL BURNING APPLIANCE REPLACEMENT SCHEDULE

The Town shall review emissions levels by January 1, 1993. Should emissions not have reached attainment of the NAAQS, as determined by monitoring by the Great Basin Air Pollution Control District or the Town, by that January 1, 1993, all non-certified solid fuel appliances within the Town shall be replaced by November 1, 1994.

Section 8.30.070, OPACITY LIMITS

No person shall cause or permit emissions from a solid fuel appliance to exceed an opacity greater than 40%, as identified by the shade designated number two on the Ringelmann Chart, for a period or period aggregating more than three minutes in any one hour period. Emissions created during a 15 minute start-up period are exempt from this regulation. This regulation shall remain in effect until January 1, 1994, at which time, the opacity limit shall be 20% as designated by the shade number one on the Ringelmann Chart.

Section 8.30.080, PROHIBITED FUELS

Burning of the the following fuels within the Town of Mammoth Lakes shall be in violation of this ordinance:

1. Treated wood
2. Plastic products
3. Rubber products
4. Waste petroleum products
5. Paints and solvents
6. Colored paper products including magazines and wrapping paper.
7. Coal

Section 8.30.090, MANDATORY CURTAILMENT

A. The Town Council shall appoint an Air Quality Manager. The duty of the Air Quality Manager shall be to determine when curtailment of solid fuel combustion in the Town of Mammoth Lakes is necessary and to notify the community that curtailment is required.

B. Determination that curtailment is required shall be made when PM-10 levels have reached 130 micrograms/m^3 or when adverse meteorological conditions are predicted to persist. Should it be determined that 130 micrograms/m^3 is not a low enough threshold to prevent the Town from violating the National Ambient Air Quality Standard for 24 hours (NAAQS, 24hr), that threshold may be lowered by resolution of the Town Council of the Town of Mammoth Lakes.

C. Upon the determination that curtailment is required, the Air Quality Manager shall contact all radio stations and television stations in Mammoth Lakes and have them broadcast that it is required that there be no wood or other solid fuel burning. The Air Quality Manager shall also record a notice on a telephone line dedicated to this purpose and post a notice in the Town Offices. Upon such notice, all wood and other solid fuel combustion shall cease.

D. All dwelling units being rented on a transient basis which contain a non-certified solid fuel appliance shall post, in a conspicuous location near said appliance, the following notice:

> "The burning of wood in the fireplace or stove is not permitted on days designated as burning curtailment days by the Town of Mammoth Lakes. To determine if burning is allowed, turn to channel 5 on the television, 106.3 FM on the radio, or call the manager. The information will be updated twice daily, if necessary."

E. All persons renting units for transient occupancy shall include in their rental agreement a notice that solid fuel burning may be prohibited on certain days and that the person signing the rental agreement shall be responsible for assuring that the no-burn requirements are obeyed during the rental period identified on the rental agreement.

F. For residences where a solid fuel appliance is the sole means of heat, these curtailment regulations do not apply. For a residence to be considered as having solid fuel as its sole source of heat, the owner must apply to the Building Department for an exemption and the Department must inspect the residence and certify that, in fact, no other adequate source of heat is available to the structure. Adequate source shall mean that the alternate source of heat cannot produce sufficient heat for the residence without causing a hazard. A written exemption will then be granted. Where an adequate alternate source of heat is determined to have been removed from the structure in violation of building codes, a sole source exemption shall not be issued. Sole source exemptions shall not be granted for non-residential uses. The sole source exemptions shall expire one year from the date that the Town adopts a financing or incentive program for replacement of non-certified appliances or on November 1, 1994, whichever date is earlier.

G. Households with very low income levels as defined by the Department of Housing and Urban Development may apply to the

Air Quality Manager for exemption from no-burn days. The low income exemptions shall expire one year from the date that the Town adopts a financing or incentive program for replacement of non-certified appliances or on November 1, 1994, whichever date is earlier.

H. Appliances certified as meeting the emission requirements of the EPA as defined in Section 8.30.020 B. and pellet fueled wood heaters shall not be subject to the provisions of this section. Should future monitoring show that exempting certified appliances results in violations of the NAAQS, 24hr, the Town shall implement a total ban on solid fuel burning based upon the thresholds identified above.

Section 8.30.100, POLLUTION REDUCTION EDUCATION PROGRAMS

The Town Manager or his designee is hereby directed to undertake such public education programs as are reasonably calculated to reduce particulate air pollution within the Town of Mammoth Lakes, including particulate emissions from sources other than solid fuel burning devices. In addition to the notification measures listed in Section 8.3.010, the public education programs shall include additional measures to inform the public of burning curtailment requirements.

Section 8.30.110, ROAD DUST REDUCTION MEASURES

A. The Director of Public Works is hereby directed to undertake a vacuum street sweeping program to reduce PM-10 emissions resulting from excessive accumulations of cinders and dirt.

B. The Town shall, in its review of development projects, incorporate such measures which reduce total vehicle miles travelled. Examples of such measures include, but are not limited to, circulation system improvements, mass transit facilities, private shuttles, and design and location of facilities to encourage pedestrian circulation. The goal of the Town's review shall be to limit peak vehicle miles travelled to 106,600 on any given day.

Section 8.30.120, FEES

A fee shall be charged for the inspection and permitting services of the Town of Mammoth Lakes. Said fee shall be established in the Town Master Fee Schedule.

Section 8.30.130, PENALTIES

A. It is illegal to violate any requirements of this chapter. Any owner of any property which is in violation of the requirements of this chapter shall be guilty of an infraction. Any person operating a solid fuel appliance in violation of this chapter is guilty of an infraction. The third violation by the same person within a 12 month period shall constitute a misdemeanor. Prosecution of any violation of Subsections 8,30.090 F and G, relating to exemptions from curtailment, may be against the property owner, the occupant, or both.

B. Violation of any portion of this chapter may result in assessment of civil penalties against the property and against an individual person or persons as follows:
First violation within a 12 month period, $50.
Second violation within a 12 month period, $100.
Third violation within a 12 month period, $250.
Four or more violations within a 12 month period $500. per violation.

C. Each and every day a violation exists is a new and separate violation. Right of appeal, hearings, and collection of civil penalties shall be pursuant to the procedures set forth in Chapter 7.20, "Nuisances," of the Municipal Code of the Town Of Mammoth Lakes.

D. Nothing in this section shall prevent the Town from pursuing criminal penalties or using any other means legally available to it in addressing violations of this chapter.

E. Whenever necessary to make an inspection to enforce any of the provisions of this code, or whenever the Air Quality Manager or his authorized representative has reasonable cause to believe that there exists in any building or upon any premises any condition which violates the provisions of this chapter, the Air Quality Manager or his authorized representative may enter such building or premises at all reasonable times to inspect the same or to perform any duty imposed upon the Air Quality Manager by this code, provided that if such building or premises be occupied, he shall first present proper credentials and request entry; and if such building or premises be unoccupied, he shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry. If such entry is refused, or if the owner or person having charge or control of the building or premises cannot be contacted, the Air Quality Manager or his authorized representative shall have recourse to every remedy provided by law to secure entry.

6.2 Summary of the Air Quality Impact

This section summarizes the results of the detailed air quality analysis presented in Appendix I. As discussed in previous sections, the final control strategy must be successful for both wood smoke (Case A) and road dust/cinders (Case B) dominated days. The analysis in Appendix I is based on a road dust and cinder dominated design day. Since the two cases are algebraically related by the source contributions from road dust and wood burning, a translation of the calculated Case B air quality impact is used to determine the Case A impact. The results, which are shown in Tables H-1 and H-2 in Appendix H, show that the adopted regulations are adequate to attain the standard on wood smoke dominated days (Case A).

6.2.1 Wood Burning Regulations

The wood burning regulations include; banning the installation of non-certified appliances, phasing out existing non-certified wood burning devices, requiring certified inspectors, and instituting a mandatory wood burning curtailment. The wood burning curtailment initially includes an exemption for certified wood stoves. (See Appendix G for a list of EPA Certified wood heaters.) This exemption may be dropped if it is determined that more emission reductions are needed. The primary strategy relies on the change-out of non-certified wood burning appliances before a property can be sold. A contingency regulation is also included in the ordinance to accelerate the rate of change-over of the non-certified appliances if the Town has not attained the Standard by January 1, 1993. The decision making process to change the primary strategy for wood burning is shown in Figure 6.1.

For the primary control strategy, the estimates of the ambient impact of wood burning on no burn days is shown below. It is shown with and without the exemptions for certified wood stoves. For comparison, a strategy that does not include the mandatory curtailment is also shown. These estimates are based on the road dust and cinder dominated design day (Case B).

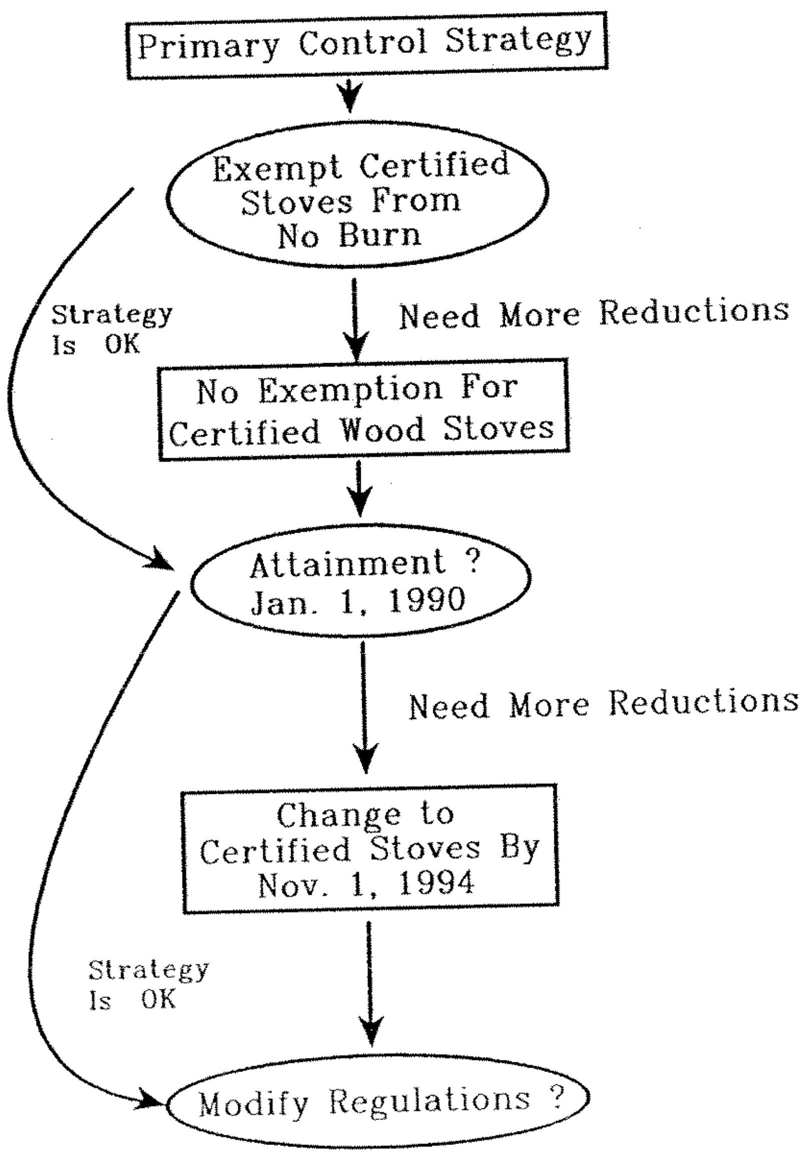
Primary Control Strategy for Wood Burning:

	Wood Burning Ambient PM-10 Contribution* ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Mandatory No Burn						
Exempt Cert Stoves	56.2	58.9	59.7	60.8	63.7	66.5
No Exemption	56.0	58.0	54.1	51.2	44.2	37.0
W/O Mandatory No Burn						
Wood Burning	112.0	116.0	108.2	102.4	88.4	74.0

* Based on the road dust and cinder dominated design day.

Figure 6.1

DECISION TREE TO MODIFY THE PRIMARY CONTROL STRATEGY FOR WOOD BURNING



A similar estimate for the secondary control strategy is shown below. The secondary control strategy or contingency measure, requires the change-out of non-certified wood burning appliances by November 1, 1994. This is in addition to the measures that are included in the primary strategy.

Secondary Control Strategy for Wood Burning:

	Wood Burning Ambient PM-10 Contribution* ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
<u>Mandatory Curtailment</u>						
Exempt Cert. Stove	56.3	58.9	59.7	55.7	60.8	65.8
No Exemption	56.0	58.0	54.1	27.9	30.4	32.9
<u>W/O Mandatory Curtailment</u>						
Wood Burning	112.0	116.0	108.2	55.7	60.8	65.8

* Based on the road dust and cinder dominated design day.

6.2.2 Vacuum Sweeping and Traffic Reduction

The control strategy relies on vacuum street sweeping to reduce 34% of the PM-10 emissions from re-entrained road dust and cinders. With the expected growth in the Town, the strategy must also address the problem of increasing traffic as it directly increases the road dust emissions. A cap of 106,600 vehicles miles travelled is included in the plan. This cap will provide for 60% growth from the present traffic estimates.

	Traffic - Reentrained Road Dust Ambient PM-10 Contribution* ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Traffic	61.4	63.9	68.8	73.9	86.3	98.7

* Based on the road dust and cinder dominated design day.

6.2.3 Summary of Ambient PM-10 Contributions

Figures 6.2 and 6.3 show the combined estimates of the ambient contributions for wood burning and traffic to the overall PM-10 concentration. The two figures show the estimates for the primary and the secondary control strategies. For either strategy the analysis shows that the Town can attain the PM-10 Standard by 1995 and maintain the air quality till beyond the year 2005.

FIGURE 6.2

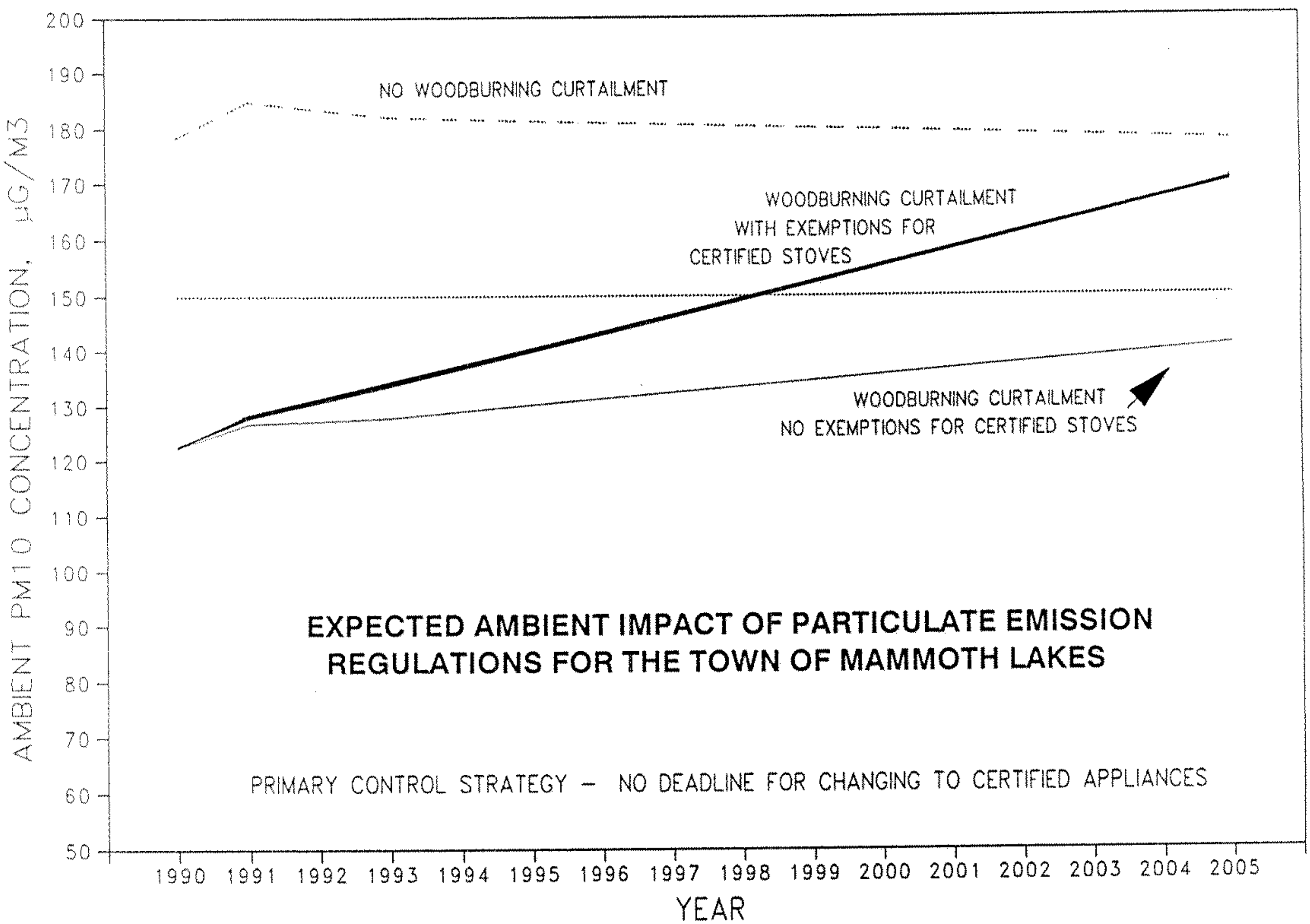
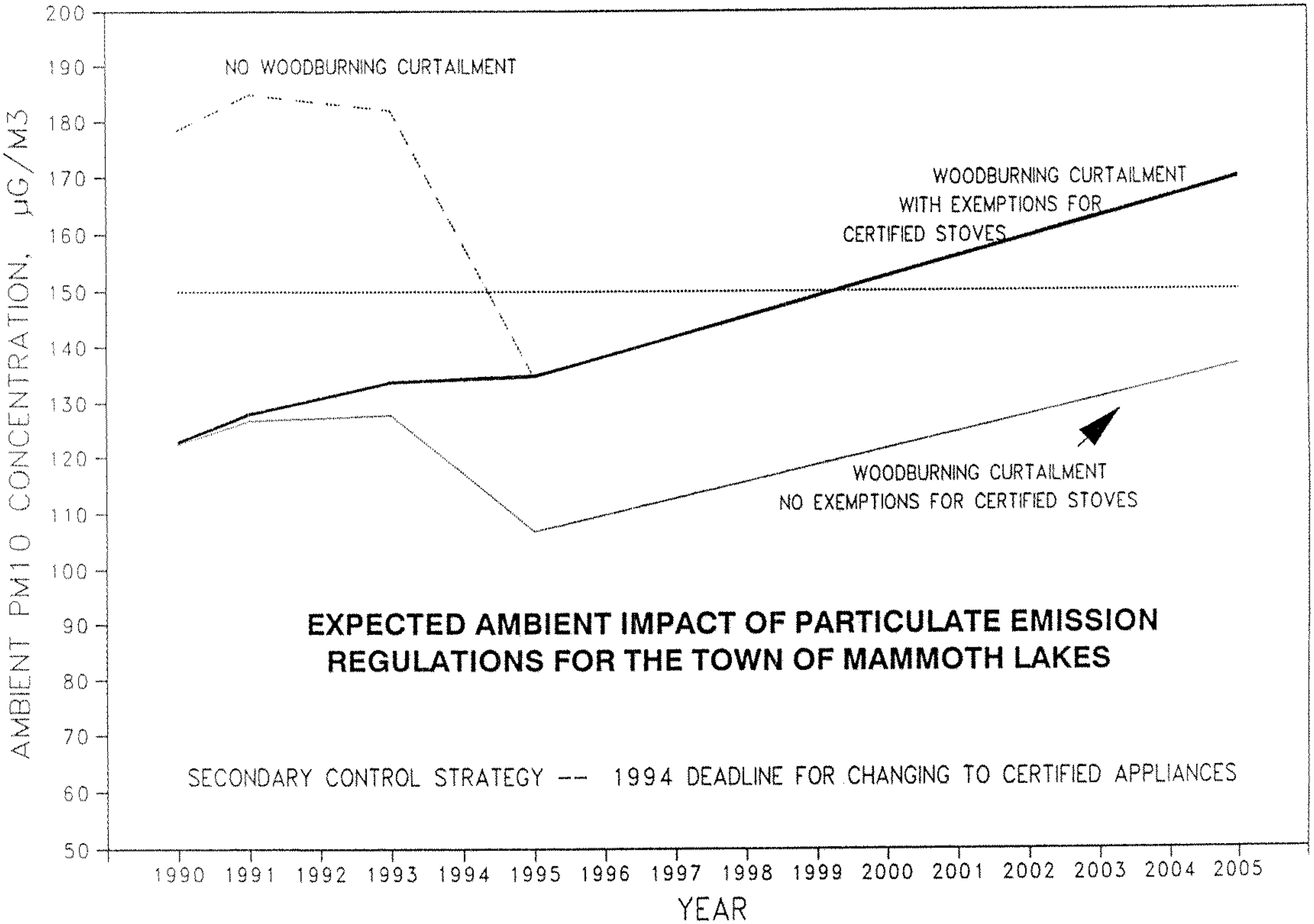

NO WOODBURNING CURTAILMENT
WOODBURNING CURTAILMENT
WITH EXEMPTIONS FOR
CERTIFIED STOVES
WOODBURNING CURTAILMENT
NO EXEMPTIONS FOR CERTIFIED STOVES
EXPECTED AMBIENT IMPACT OF PARTICULATE EMISSION
REGULATIONS FOR THE TOWN OF MAMMOTH LAKES
PRIMARY CONTROL STRATEGY – NO DEADLINE FOR CHANGING TO CERTIFIED APPLIANCES
AMBIENT PM10 CONCENTRATION, µG/M3
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
YEAR

FIGURE 6.3



NO WOODBURNING CURTAILMENT
WOODBURNING CURTAILMENT
WITH EXEMPTIONS FOR
CERTIFIED STOVES
WOODBURNING CURTAILMENT
NO EXEMPTIONS FOR CERTIFIED STOVES
EXPECTED AMBIENT IMPACT OF PARTICULATE EMISSION
REGULATIONS FOR THE TOWN OF MAMMOTH LAKES
SECONDARY CONTROL STRATEGY -- 1994 DEADLINE FOR CHANGING TO CERTIFIED APPLIANCES
AMBIENT PM10 CONCENTRATION, µG/M3
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005
YEAR

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GLOSSARY OF TERMS

CARB	-	California Air Resources Board
CMB	-	Chemical Mass Balance (air quality model)
Coarse	-	Particles greater than 2.5 microns but less than 10 microns in diameter
Dichot	-	Dichotomous Sampler
DRI	-	Desert Research Institute
EPA	-	U.S. Environmental Protection Agency
Fine	-	Particles less than 2.5 microns in diameter
NAAQS	-	National Ambient Air Quality Standard
OAQPS	-	Office of Air Quality Planning and Standards (U.S. Environmental Protection Agency)
OMNI	-	OMNI Environmental Services, Inc
PAH's	-	Polycyclic Aromatic Hydrocarbons
PM-10	-	Particulate Matter less than 10 microns in diameter
RWC	-	Residential Wood Combustion
SCE	-	Source Contribution Estimate
SIP	-	State Implementation Plan
SSI	-	Size Selective Inlet (PM-10 monitor)
TSP	-	Total Suspended Particulate
VMT	-	Vehicle Miles Travelled

<u>Chemical Terms</u>

Al	-	Aluminum
Ba	-	Barium
Br	-	Bromine
Ca	-	Calcium
Cl	-	Chlorine
EC	-	Elemental Carbon
Fe	-	Iron
K	-	Potassium
NO_3	-	Nitrates
OC	-	Organic Carbon
Pb	-	Lead
S	-	Sulfur
Si	-	Silica
SiO_2	-	Silica Dioxide
SO_4	-	Sulfates
Ti	-	Titanium

<u>Numerical Units</u>

kg	-	Kilogram (1000 grams = 1 kg = 2.2 pounds)
Mg	-	Megagrams (1000 kilograms)
microgram	-	1 millionth of a gram (1×10^{-6} grams)
micron	-	1 millionth of a meter (1×10^{-6} meters)
$\mu g/m^3$	-	micrograms per cubic meter
μm	-	micron

APPENDIX A

PARTICULATE MATTER AND METEOROLOGICAL DATA

MAMMOTH LAKES PARTICULATE DATA - GATEWAY HOME CENTER

YEAR	MONTH	DAY	PM-10 UG/M3	TEMP	TSP UG/M3	PM10/TSP	SULFATE UG/M3	NITRATE UG/M3	WND SPD (MPH)	WND DIR	DAY OF WK
1985	8	23	51		79	0.65	2.8	0.6			F
1985	8	29	22		42	0.52	0.9	0.5			TH
1985	9	4	30		31	0.97	0.9	0.5			W
1985	9	10	22		28	0.79	0.5	0.6			T
1985	9	16	19		19	1.00	0.5	0.3			M
1985	9	22	31		38	0.82	0.5	0.5			SUN
1985	9	28	35		49	0.71	0.5	0.4			SAT
1985	10	4	35	13	51	0.69	0.5	0.1	3.0	WSW	F
1985	10	10	48	2	67	0.72	0.5	0.5	2.1	WNW	TH
1985	10	16	57	7	80	0.71	0.5	0.2	2.3	WSW	W
1985	10	22	24	4	30	0.80	0.5	0.1	3.4	SW/WSW	T
1985	10	28	52	6	73	0.71	0.5	0.2	2.3	WNW	M
1985	11	3	41	9	67	0.61	0.5	0.2	2.1	W	SUN
1985	11	9	51	-2	156	0.33	2.6	1.4	10.3	W	SAT
1985	11	15	44	1	59	0.75	0.5	0.2	3.3	W	F
1985	11	21	21	2	40	0.53	0.7	0.1	5.8	WSW	TH
1985	11	27	19	4	27	0.70	0.5	0.3	5.8	W	W
1985	12	4	120	-1	139	0.86	1.0	1.0	1.7	W	W
1985	12	9	21	-9	32	0.66	1.0	1.0	2.2	N	M
1985	12	15	210	-2	302	0.70	1.0	1.1	1.8	WSW	SUN
1985	12	21	178	2	251	0.71	1.0	1.0	2.4	W	SAT
1985	12	27	185	2	255	0.73	1.0	1.5	2.1	WSW	F
1986	1	2	65		141	0.46	1.0	1.0	3.5	SW	TH
1986	1	8	159		244	0.65	1.0	1.1	1.9	W	W
1986	1	14	62		95	0.65	1.3	1.0	6.3	SSW	T
1986	1	20	90		158	0.57	1.0	1.0	3.4	SW	M
1986	1	26	114		160	0.71	1.0	1.0	0.7	WSW	SUN
1986	2	1	27	0	36	0.75	1.0	1.0	2.6	W	SAT
1986	2	7	85	-10	150	0.57	1.0	1.0	1.6	SE	F
1986	2	13	7	1			1.0	1.0	4.9	SW	TH
1986	3	3	65		103	0.63	1.4	1.0			M
1986	3	9	29	-2			1.0	1.0	3.9	SW/W	SUN
1986	3	15	57	-4			1.0	1.0	2.1	SW	SAT
1986	3	21	89	4	175	0.51	1.0	1.0	2.4	W	F
1986	3	27	85	-3	142	0.60	1.1	1.0	1.9	W/WNW	TH
1986	4	2	22	-5	47	0.47	1.0	1.0	4.4	NE	W
1986	4	8	24	2	43	0.56	1.0	1.0	2.6	SSW/SW	T
1986	4	14	34	2	62	0.55	1.0	1.0	2.1	W	M
1986	4	20	49	8	79	0.62	1.0	1.0	2.5	W	SUN

MAMMOTH LAKES PARTICULATE DATA - GATEWAY HOME CENTER

YEAR	MONTH	DAY	PM-10 UG/M3	TEMP	TSP UG/M3	PM10/TSP	SULFATE UG/M3	NITRATE UG/M3	WND SPD (MPH)	WND DIR	DAY OF WK
1986	5	2	34	11	58	0.59	1.0	1.0	5.9	W	F
1986	5	8	31	5	51	0.61	1.0	1.0	4.0	N	TH
1986	5	14	23	14	40	0.58	1.0	1.0	4.8	SW/NW	W
1986	5	20	37	14	96	0.39	1.0	1.0	5.9	WSW	T
1986	5	26	41	21	57	0.72	1.1	1.0	3.8	SW	M
1986	6	1	18	19	26	0.69	1.0	1.0	2.5	NW	SUN
1986	6	7	22	14	39	0.56	1.0	1.0	4.6	NW	SAT
1986	6	13	30	20	43	0.70	1.0	1.0	3.9	WSW/W	F
1986	6	25	39	21	77	0.51	1.4	1.0	4.1	WNW	W
1986	7	2	30	24	63	0.48	1.5	1.0	4.6	NW	W
1986	7	7	24	18	54	0.44	1.8	1.0	4.0	NW	M
1986	7	13	30	22	69	0.43	2.5	1.0	5.0	WSW	SUN
1986	7	19	23	20	43	0.53	1.0	1.0	3.4	SW/WNW	SAT
1986	7	25	35	16	86	0.41	2.8	1.0	3.2	SW	F
1986	7	31	31	22	68	0.46	1.4	1.0	3.7	WNW	W
1986	8	6	33	24	51	0.65	2.3	1.0	5.0	WSW/W	T
1986	8	12	34	23	79	0.43	2.6	1.0	3.7	SW/WNW	M
1986	8	18	36	18	74	0.49	1.2	1.0	2.9	SE	SUN
1986	8	30	21	20	51	0.41	1.0	1.0	4.4	WSW	SAT
1986	9	6	35	22	63	0.56	2.0	1.2	3.3	NW	SAT
1986	9	11	38	14			0.7	0.9	3.7	WSW	TH
1986	9	17	13	8	35	0.37	0.1	0.7	7.0	WSW/W	W
1986	9	23	29	6	44	0.66	0.9	1.0	3.6	SW	T
1986	9	29	33	8	51		0.1	0.5	2.5	W	M
1986	10	5	53	10			0.0	0.0	4.4	E	SUN
1986	10	11	46	8			0.0	0.0	3.6	NNE	SAT
1986	10	17	21	7			1.2	1.3	5.5	W	F
1986	10	23	42	9			1.1	0.7	3.4	WSW	TH
1986	10	29	17	13			0.3	0.5	6.1	WSW	W
1986	11	10	69	4			0.4	0.7	2.6	W	M
1986	11	16	14	9			0.4	0.3	4.5	NW	SUN
1986	11	22	20	2			0.5	0.4	4.0	NE	SAT
1986	11	28	20	9			0.4	0.4	6.2	WSW	F
1986	12	4	41	6			0.5	0.6	3.7	WSW	TH
1986	12	10	95	0			0.5	0.9	3.1	W	W
1986	12	16	63	-1			0.9	1.3	2.9	NW	T
1986	12	22	34	4			0.5	0.2	6.8	WSW/W	M
1986	12	28	105	-1			0.6	1.3	2.6	W	SUN

MAMMOTH LAKES PARTICULATE DATA - GATEWAY HOME CENTER

YEAR	MONTH	DAY	PM-10 UG/M3	TEMP	TSP UG/M3	PM10/TSP	SULFATE UG/M3	NITRATE UG/M3	WND SPD (MPH)	WND DIR	DAY OF WK
1987	1	3	20	2			0.5	0.3	4.3	SW	SAT
1987	1	9	110	-6			1.2	1.2	2.7	W	F
1987	1	15	17	-12			0.9	0.4	6.2	E	TH
1987	1	21	95	2			0.7	1.1	2.1	WNW	W
1987	1	25	69								SUN
1987	1	27	16	10			0.6	0.6	8.3	WSW	T
1987	1	30	22	3					3.4	WSW/W	F
1987	2	4	89	1					2.4	W	W
1987	2	8	82	4			1.1	1.1	2.1	W	SUN
1987	2	11	33	5					1.8	NW	W
1987	2	19	43	-5			0.7	0.5	4.9	V	TH
1987	2	21	68	-1			1.1	1.6	3.4	W	SAT
1987	2	26	88	-7			1.3	0.8	2.8	WNW	TH
1987	3	4	40						4.3		W
1987	3	10	38	2					4.5	WNW	T
1987	3	16	54						2.6	SSE	M
1987	3	22	26	0					3.4	NNE/NW	SUN
1987	3	28	98	2					3.0	WNW	SAT
1987	4	3	27	3					3.4	WSW	F
1987	4	7	34	9					3.1	W	T
1987	4	9	27	10					2.5	W	TH
1987	4	11	20	10					4.8	W	SAT
1987	4	15	41	14					3.4	NW	W
1987	4	18	34	5					7.3	W	SAT
1987	4	21	30	12					3.6	SE	T
1987	4	24	31	14					3.8	SW/NW	F
1987	4	27	20	14					3	NW	M
1987	4	30	13	7					6.1	W	TH
1987	5	3	27	12					3.1	W	SUN
1987	5	7	29	15					2.6	NW	TH
1987	5	12	16	16					3.2	NW	T
1987	5	15	16	14					2.7	NW	F
1987	5	21	22	8					2.5	NW	TH
1987	5	23	24	11					3.5	WSW	SAT
1987	5	27	17	10					3	SW/NW	W
1987	5	30	26	16					4.9	W	SAT

MAMMOTH LAKES PARTICULATE DATA - GATEWAY HOME CENTER

YEAR	MONTH	DAY	PM-10 UG/M3	TEMP	TSP UG/M3	PM10/TSP	SULFATE UG/M3	NITRATE UG/M3	WND SPD (MPH)	WND DIR	DAY OF WK
1987	6	2	22	20					3.1	W	T
1987	6	5	29	20					3.3	W	F
1987	6	8	12	16					2.8	NW	M
1987	6	14	23	19					5	W	SUN
1987	6	17	20	18					5.5	W	W
1987	6	20	22	21					5.5	W	SAT
1987	6	24	34	21					3.8	NW	W
1987	6	26	34	21					3.9	NW	F
1987	6	30	35	19					4.1	W/NW	T
1987	7	2	23	15					4.3	WSW/NW	TH
1987	7	8	28	23					4.1	WSW	W
1987	7	14	29	23					3.9	WNW	T
1987	7	20	19	14					4.1	WSW	M
1987	7	26	16	18					4.5	WNW	SUN
1987	8	1	21								SAT
1987	8	7	23								F
1987	8	13	29								TH
1987	8	19	35								W
1987	8	25	38								T
1987	8	31	39								M
1987	9	6	86								SUN
1987	9	12	38								SAT
1987	9	18	30	14					3.7	SW/WNW	F
1987	9	24	31	14					3.3	W	TH
1987	9	30	23	14					3.5	WSW	W
1987	10	6	27	16					3.5	SW	T
1987	10	12	16								M
1987	10	18	34						2.6	W	SUN
1987	10	24	34						1.6	WSW	SAT
1987	10	30	38						1.9	W	F
1987	11	23	83	0					1.6	W	M
1987	11	25	96	-6					4	ENE	W
1987	11	29	71	-3					2.1	W	SUN
1987	12	5	12	2					3.9	WSW	SAT
1987	12	11	45	0					3	NNW	F
1987	12	17	40	-8					1.3	W	TH
1987	12	23	10	-13					3	NE	W
1987	12	29	26	-8					2	SE	T

MAMMOTH LAKES PARTICULATE DATA - GATEWAY HOME CENTER

YEAR	MONTH	DAY	PM-10 UG/M3	TEMP	TSP UG/M3	PM10/TSP	SULFATE UG/M3	NITRATE UG/M3	WND SPD (MPH)	WND DIR	DAY OF WK
1988	1	4	14	1					3.9	SW	M
1988	1	10	37	4					4.8	SW	SUN
1988	1	16	22	-5					5.6	WSW	SAT
1988	1	22	131	0					3	W	F
1988	1	28	70	3					3.3	SW	TH
1988	2	3	111	-6					3.1	W	W
1988	2	9	73	6					3.5	W	T
1988	2	15	70	5					2.6	SW	M(H)
1988	2	21	75	3					2.7	W	SUN
1988	2	27	56	2					1.5	ENE	SAT
1988	3	4	60	5					3.1	W	F
1988	3	10	27	-6					3.5	NNE	TH
1988	3	16	63	-1					3.1	W	W
1988	3	22	13	8					5.2	WSW	T
1988	3	28	45	2					3.3	W	M
1988	4	3		7					5.1	SW/WSW	
1988	4	9		7					3.4	WSW/W	
1988	4	15	7	3					4.3	N	
1988	4	21	19	-2					3.5	WNW	
1988	4	27	22	12					3.5	SW	
1988	5	3	14								
1988	5	9	15								
1988	5	15	14								
1988	5	21	16								
1988	5	27	17								
1988	6	2	7								
1988	6	8	12								
1988	6	14	21								
1988	6	22	8								
1988	6	26	16								
1988	7	2	20								
1988	7	8	24								
1988	7	14	22								
1988	7	20	29								
1988	7	26	22								
1988	8	1	20								
1988	8	7	20								
1988	8	13	16								
1988	8	19	31								
1988	8	25	21								

MAMMOTH LAKES PARTICULATE DATA - GATEWAY HOME CENTER

YEAR	MONTH	DAY	PM-10 UG/M3	TEMP	TSP UG/M3	PM10/TSP	SULFATE UG/M3	NITRATE UG/M3	WND SPD (MPH)	WND DIR	DAY OF WK
1988	9	6	41								
1988	9	12	29								
1988	9	18	29								
1988	9	24	23								
1988	9	30	26								
1988	10	6	35								
1988	10	12	31								
1988	10	18	20								
1988	10	24	38								
1988	10	30	43								
1988	11	5	17								
1988	11	11	21								
1988	11	17	15								
1988	11	23	8								
1988	11	29	88								
1988	12	5	76								
1988	12	11	81								
1988	12	17	17								
1988	12	23	34								
1988	12	29	166								
1989	1	4	64								
1989	1	10	14								
1989	1	16	147								
1989	1	22	22								
1989	1	28	88								
1989	2	3	31								
1989	2	9	42								
1989	2	15	150								
1989	2	21	54								
1989	2	27	22								

MAMMOTH LAKES PARTICULATE DATA - GATEWAY HOME CENTER

YEAR	MONTH	DAY	PM-10 UG/M3	TEMP	TSP UG/M3	PM10/TSP	SULFATE UG/M3	NITRATE UG/M3	WND SPD (MPH)	WND DIR	DAY OF WK
1989	3	5	28								
1989	3	11	21								
1989	3	17	11								
1989	3	23	17								
1989	3	29	13								
1989	4	4	26								
1989	4	10	29								
1989	4	16	9								
1989	4	22	13								
1989	4	28	23								
1989	5	4	17								
1989	5	10	12								
1989	5	16	13								
1989	5	22	17								
1989	5	28	12								
1989	6	3	6								
1989	6	9	12								
1989	6	15	22								
1989	6	21	27								
1989	6	27	26								
1989	7	3	22								
1989	7	9	21								
1989	7	15	11								
1989	7	21	21								
1989	7	27	17								
1989	8	2	11								
1989	8	8	18								
1989	8	14	11								
1989	8	20	16								
1989	8	26	19								
1989	9	7	25								
1989	9	13	21								
1989	9	19	9								
1989	9	25	12								

SUMMARY OF WINTER 89/90 PM-10 DATA AT MAMMOTH LAKES GATEWAY HOME CENTER

NOVEMBER 1989		$\mu g/m^3$
06	Monday	18
12	Sunday	7
18	Saturday	71
24	Friday	26
30	Thursday	105
DECEMBER 1989		
06	Wednesday	81
12	Tuesday	91
18	Monday	62
24	Sunday	130
30	Saturday	162
JANUARY 1990		
05	Friday	157
11	Thursday	85
18	Thursday	65
23	Tuesday	115
29	Monday	13
FEBRUARY 1990		
04	Sunday	69
10	Saturday	162
16	Friday	45
22	Thursday	121
28	Wednesday	51
MARCH 1990		
06	Tuesday	75
12	Monday	49
18	Sunday	32
24	Saturday	31
30	Friday	38

Dichot Data Analysis for Days
Exceeding 100 ug/m3

Date	Total ug/m3	Fine ug/m3	Coarse ug/m3	Coarse %Crs	Cinders on Road? & Comments	Wind MPH	Wind Dir
12/26/87	125.9	113.2	12.7	10%	yes, hvy traffic	0-3	S
12/30/87	132.8	118.7	14.1	11%	yes	2-4	SE
12/31/87	142.8	121.1	21.7	15%	yes, inv. noon	2-4	SE
01/01/88	117.4	103.0	14.4	12%	yes	1-4	ESE
01/22/88	143.8	98.6	45.2	31%	yes	2-4	NE
01/23/88	157.8	97.4	60.4	38%	yes, light OMR	5	NNW
02/03/88	104.3	69.8	34.5	33%	light 203 & OMR	4-6	SE
02/05/88	148.2	98.1	50.1	34%	light 203 & OMR	3-5	NW
02/06/88	163.0	115.2	47.8	29%	no cinders	4	SW
02/13/88	137.6	88.0	49.6	36%	no cinders	4-7	ENE
02/14/88	144.0	81.7	62.3	43%	no cinders	2-4	ESE
02/19/88	148.5	105.4	43.1	29%	no cinders	7-10	NNE

APPENDIX B

WOOD BURNING SURVEY

SUMMARY OF SURVEY RESULTS

Survey Number	Fireplaces #	Fireplaces Cords/yr	FP Inserts #	FP Inserts Cords/yr	Wood Stoves #	Wood Stoves Cords/yr	Cert. Stoves #	Cert. Stoves Cords/yr
Single Family Residents								
55	8	0.83	2	5.3	45	4.3	3	2.5
Apartments & Mobile Homes								
24	0	0	0	0	20	2.5	0	0
Condominiums								
1,894	1,469	1.27	198	1.27	227	1.27	0	0

Raw data is on file with the District.

ESTIMATE OF WOOD USAGE ON PEAK DAYS
Mammoth Lakes - Based on Survey Results

Condos (Responded to Survey)

NO. UNITS	Winter Occupancy Rate HOLIDAYS	WEEKENDS	WEEKDAYS	AVG DAYS	NUMBER OF CORDS	VOL WOOD ft^3/unit	TOTAL VOL ft^3
44.00	0.95	0.85	0.60	103.20	1.00	0.78	34.11
52.00	1.00	0.80	0.50	92.00	1.50	1.30	67.83
19.00	0.95	0.90	0.10	48.20	0.50	0.83	15.77
80.00	1.00	1.00	0.40	84.80	1.00	0.94	75.47
12.00	0.75	0.50	0.05	30.60	1.50	3.92	47.06
56.00	1.00	0.95	0.50	95.00	1.00	0.84	47.16
82.00	0.95	0.75	0.10	45.20	2.00	3.54	290.27
46.00	1.00	0.50	0.05	35.60	1.50	3.37	155.06
78.00	0.98	0.70	0.30	67.20	1.00	1.19	92.86
41.00	1.00	1.00	0.50	96.00	2.00	1.67	68.33
27.00	0.80	0.80	0.50	88.00	2.00	1.82	49.09
4.00	1.00	1.00	1.00	152.00	2.00	1.05	4.21
33.00	1.00	1.00	0.50	96.00	2.00	1.67	55.00
210.00	1.00	1.00	0.50	96.00	1.50	1.25	262.50
56.00	0.60	0.40	0.20	42.40	0.50	0.94	52.83
10.00	1.00	0.80	0.20	58.40	1.00	1.37	13.70
32.00	0.90	0.75	0.25	61.00	0.75	0.98	31.48
100.00	0.98	0.98	0.60	106.40	1.50	1.13	112.78
51.00	0.85	0.75	0.30	65.60	1.50	1.83	93.29
61.00	1.00	1.00	0.30	73.60	2.00	2.17	132.61
10.00	1.00	1.00	0.20	62.40	2.00	2.56	25.64
24.00	1.00	1.00	0.70	118.40	2.50	1.69	40.54
109.00	0.90	0.78	0.40	78.40	1.00	1.02	111.22
133.00	1.00	0.90	0.30	71.60	1.50	1.68	222.91
39.00	0.99	0.95	0.40	83.60	1.50	1.44	55.98
37.00	0.80	0.70	0.10	41.20	0.50	0.97	35.92
56.00	0.90	0.80	0.20	56.40	0.50	0.71	39.72
80.00	0.80	0.80	0.30	65.60	2.00	2.44	195.12
48.00	0.90	0.90	0.15	52.80	1.00	1.52	72.73
128.00	1.00	0.90	0.60	105.20	1.50	1.14	146.01
1758.00						47.76	2647.18

Average wood use for condos = 1.51 ft^3/day/unit

Single Family Residence/Mobile Homes & Apartments

NO. UNITS	Winter Occupancy Rate HOLIDAYS	WEEKENDS	WEEKDAYS	AVG DAYS	NUMBER OF CORDS	VOL WOOD ft^3/unit	TOTAL VOL ft^3
Single Family Residence							
Fireplace							
324.00	1.00	0.50	0.00	30.00	0.83	2.20	712.80
Conventional Wood Stove							
861.00	1.00	1.00	0.80	129.60	4.30	2.65	2285.37
Certified Wood Stove							
55.00	1.00	1.00	0.80	129.60	2.50	1.54	84.88
Fireplace Inserts							
55.00	1.00	1.00	0.80	129.60	5.30	3.27	179.94
Mobile Homes & Apartments							
Conventional Wood Stoves							
240.00	1.00	1.00	0.80	129.60	2.50	1.54	370.37
1535.00						11.20	4262.99

Average wood use for SFR/Mbl. Homes & Apts = 2.78 ft^3/day

MAMMOTH WOOD HEATING SURVEY

The Federal Environmental Protection Agency (EPA) has required that Mammoth reduce particulate air pollution. The Great Basin Air Pollution Control District will be doing computer modeling of pollution from wood burning in order to predict the effects of suggested controls.

It is important to everyone that the data used in the model be correct, so that we can avoid costly mistakes, and suggest only those controls that will be effective. Please help us by answering the following questions as fully and accurately as you can. Then fold with our address on the outside and drop in the mail. Thank you.

1) Do you ( )own or ( )rent your home in Mammoth? *(Please check box in front of answer.)*

2) What type of residence is it? ( )Single Family Home ( )Apartment ( )Condominium ( )Mobile Home ( )Other ________

3) Is it a ( )permanent residence, ( )second home, or ( )short-term rental?

4) If it is a second home, is it occupied on ( )winter weekends, ( )holidays ( )winter weekdays, ( )summer

5) Which of the following fuel types do you use to heat your home?

( )Propane ( )Wood ( )Electricity ( )Oil ( )Solar
( )Other ______________*Please specify*

IF YOU BURN WOOD, PLEASE ANSWER THE FOLLOWING QUESTIONS. IF YOU DON'T USE WOOD, PLEASE GO TO QUESTION 19.

6) Do you burn wood primarily for your ( )only source of heat, ( )main source of heat, ( )supplemental source of heat, or ( )enjoyment?

7) How many cords of wood do you burn in an average year? __________

8) Which of the following devices do you have, how many of each, and how much wood do you burn in each per year:

Device	Number	Cords Burned
FIREPLACE (NO INSERT)	________	__________
FIREPLACE WITH INSERT	________	__________
WOODSTOVE	________	__________
WOODSTOVE WITH CATALYTIC CONVERTER	________	__________

9) If you have a WOODSTOVE or fireplace insert, in which position is the intake air control set most of the time?

( )LOW - 0 to 1/3 open ( )MEDIUM - 1/3 to 2/3 open
( )HIGH - 2/3 TO fully open

10) What percent of the following types of firewood do you burn most years? *(Circle the numbers of all answers that apply and indicate the approximate percent.)*

1. Jeffrey Pine ______%
2. Lodgepole Pine ______%
3. Red or White Fir______%
4. Other ______% *(Identify)* _______________

11) Do you burn ( )trash or ( )coal in your WOODSTOVE? *(Check those that apply)*

12) How long is your wood seasoned before you burn it? ( )a few weeks
( )one month ( )a few months ( )six months ( )a year or more
( )not at all ( )don't know

13) How old is your WOODSTOVE? _____years. Do you have any plans to replace it in the next three years? ( )yes ( )no

14) What are the four most frequent times you burn wood? *(Please put the corresponding number in the appropriate space below.)*

1. Midnight to 6 a.m., weekdays
2. 6 a.m. to noon, weekdays
3. Noon to 6 p.m., weekdays
4. 6 p.m. to Midnight, weekdays
5. All day, weekdays
6. Midnight to 6 a.m. weekends
7. 6 a.m. to noon, weekends
8. Noon to 6 p.m., weekends
9. 6 p.m. to Midnight, weekends
10. All day, weekends

MOST FREQUENT TIME ______

SECOND MOST FREQUENT TIME ______

THIRD MOST FREQUENT TIME ______

FOURTH MOST FREQUENT TIME _______

15) Approximately how many days did you burn this heating season (October 1987-April 1988) ( )under 60 days ( )60 -99 days ( )100-200 days

16) What was the average time in hours you burned during those days? Include any time there was a fire in your stove.

____________ hours

17) Where do you obtain most of your firewood? ( )firewood dealer
( )cut on private land ( )cut on Forest Service land ( )friends
( )cut on DWP lands ( )other *(Please specify)* __________________

18) Are you saving money on your heating bills by burning wood?
( )yes ( )no

19) Are you planning to install a new wood heater in your home in the next two years?
( )yes ( )no

20) If controls must be instituted on wood burning in Mammoth, which of the following would you prefer: *(Rank in order of preference, #1 being most preferred - #5 being least preferred)*

___ A ban on all burning on days when pollution is predicted to exceed standards.

___ A ban on all burning on days when pollution is predicted to exceed standards, with exemptions for economic hardship, sole source of heat, and certified stoves.

___ A requirement that stoves and fireplaces must be replaced with new clean-burning stoves or inserts when a residence is sold or put up for rent.

___ A ban on fireplaces

___ Other ____

____

____

21) Is there anything else you would like to tell us about home heating and the use of wood burning equipment?

Thank you for filling out this questionnaire. It is our goal to meet the EPA Clean Air Act requirements while causing the least possible inconvenience and expense to the residents of Mammoth. If you have any suggestions, please write them here. If you have questions, call 872-8211 and ask for Ellen Hardebeck.
Please fold this questionnaire with our address out, and drop into the mail.

QUESTIONNAIRE FOR CONDOMINIUM MANAGERS

The Federal Environmental Protection Agency (EPA) has required that Mammoth reduce particulate air pollution. The Great Basin Air Pollution Control District will be doing computer modeling of pollution from wood burning in order to predict the effects of suggested controls.

It is important to everyone that the data used in the model be correct, so that we can avoid costly mistakes, and suggest only those controls that will be effective. Please help us by answering the following questions as fully and accurately as you can. Then fold with our address on the outside and drop in the mail. Thank you.

CONDOMINIUM NAME ______________________

Total Number of Units 109

Form filled out by: ______________________

Were your units orginally equipped with (*check all that apply*)

Fireplaces (no inserts) ✓ How many per unit? 1

Fireplaces with inserts ___ How many per unit? ___

Zero-clearance fireplaces ___ How many per unit? ___

Wood Stoves ___ How many per unit? ___

Manufacturers Name and Model Number for Stoves if known N/A

____

If all units were originally equipped with fireplaces, how many have been converted to wood stoves? 18

How many units were vacant all winter? 1

What percent of those units that are not vacant all winter are occupied on

Winter Holidays 90%

Winter Weekends 78%

Winter Weekdays 40%

Approximately how many cords of wood does the average owner use over the winter? 1 cord

APPENDIX C

CHEMICAL SPECIATION OF SOURCES AND AMBIENT SAMPLES

SOURCE 26

Sample ID : SOIL26
Filter ID : AT070582/AQ070582
Size : 2.5
Analysis flags: TFFLG QFFLG XFLG AFLG CAFLG N4FLG KPFLG NAFLG
15

Mass 10543.6599 1745.5674 ug/m3

	Conc (%)	Uncert (%)
Na	0.5210	0.2972
Al	9.3553	1.0665
Si	22.7233	2.5936
P	0.1318	0.0150
S	0.0343	0.0079
SO4	0.0922	0.1288
Cl	0.0975	0.0123
K-x	1.0960	0.1246
K-a	0.4542	0.1641
Ca	6.1064	0.6939
Ti	0.9927	0.1129
V	0.0356	0.0234
Cr	0.0222	0.0027
Mn	0.1246	0.0142
Fe	7.0699	0.8033
Co	0.0211	0.1005
Ni	0.0070	0.0012
Cu	0.0049	0.0014
Zn	0.0110	0.0010
Ga	0.0001	0.0035
As	0.0022	0.0032
Se	0.0001	0.0016
Br	0.0011	0.0012
Rb	0.0034	0.0007
Sr	0.0897	0.0067
Y	0.0035	0.0021
Zr	0.0195	0.0022
Mo	0.0003	0.0053
Pd	0.0009	0.0109
Ag	0.0017	0.0128
Cd	0.0069	0.0136
In	0.0012	0.0159
Sn	0.0011	0.0213
Sb	0.0031	0.0241
Ba	0.0522	0.0778
La	0.0000	0.0916
Hg	0.0019	0.0060
Pb	0.0017	0.0048
NO3	0.0000	0.3556
NH4	0.0030	0.0059
OC	0.1600	0.6782
EC	0.0000	0.1659
CO3	0.4475	0.3274
Sum	49.1556	2.7122

SOURCE 26

Sample ID : SOIL26
Filter ID : /
Size : 3
Analysis flags: TFFLG QFFLG XFLG AFLG CAFLG N4FLG KPFLG NAFLG

Mass 55565.8887 30618.4553 ug/m3

	Conc (%)	Uncert (%)
Na	0.1583	0.0408
Al	9.1838	1.3046
Si	20.9363	3.0055
P	0.1212	0.0198
S	0.0096	0.0034
SO4	0.0279	0.0826
Cl	0.0785	0.0116
K-x	1.0223	0.1461
K-a	0.1433	0.0809
Ca	6.2486	0.8788
Ti	0.9584	0.1359
V	0.0355	0.0256
Cr	0.0199	0.0029
Mn	0.1103	0.0159
Fe	6.7585	0.9609
Co	0.0231	0.1203
Ni	0.0071	0.0014
Cu	0.0055	0.0014
Zn	0.0095	0.0010
Ga	0.0010	0.0023
As	0.0002	0.0023
Se	0.0003	0.0011
Br	0.0011	0.0003
Rb	0.0038	0.0005
Sr	0.0974	0.0087
Y	0.0025	0.0006
Zr	0.0188	0.0025
Mo	0.0016	0.0035
Pd	0.0017	0.0075
Ag	0.0020	0.0086
Cd	0.0042	0.0092
In	0.0022	0.0107
Sn	0.0028	0.0143
Sb	0.0000	0.0158
Ba	0.0658	0.0221
La	0.0041	0.0607
Hg	0.0020	0.0037
Pb	0.0026	0.0023
NO3	0.0000	0.2286
NH4	0.0003	0.0038
OC	0.2936	0.4372
EC	0.0000	0.1064
CO3	0.0635	0.1503
Sum	46.2576	3.7570

SOURCE 27

Sample ID : SOIL27
Filter ID : AT070660/AQ070660
Size : 2.5
Analysis flags: TFFLG QFFLG XFLG AFLG CAFLG N4FLG KPFLG NAFLG
15

Mass 3787.9041 337.5506 ug/m3

	Conc (%)	Uncert (%)
Na	0.2862	0.1231
Al	7.9449	0.9045
Si	21.6749	2.4660
P	0.2802	0.0319
S	0.3576	0.0408
SO4	0.2143	0.1132
Cl	0.2251	0.0414
K-x	2.1655	0.2463
K-a	0.2100	0.0666
Ca	2.9197	0.3324
Ti	0.4405	0.0500
V	0.0298	0.0067
Cr	0.0292	0.0033
Mn	0.1241	0.0141
Fe	4.6976	0.5340
Co	0.0114	0.0669
Ni	0.0116	0.0012
Cu	0.0586	0.0054
Zn	0.1195	0.0089
Ga	0.0007	0.0031
As	0.0033	0.0137
Se	0.0001	0.0014
Br	0.0034	0.0005
Rb	0.0149	0.0013
Sr	0.0316	0.0025
Y	0.0028	0.0008
Zr	0.0161	0.0019
Mo	0.0011	0.0042
Pd	0.0005	0.0087
Ag	0.0047	0.0104
Cd	0.0045	0.0109
In	0.0003	0.0127
Sn	0.0131	0.0156
Sb	0.0028	0.0194
Ba	0.1507	0.0256
La	0.0021	0.0763
Hg	0.0016	0.0049
Pb	0.0830	0.0069
NO3	0.0187	0.3100
NH4	0.0179	0.0310
OC	15.4521	1.5192
EC	2.5462	0.9643
CO3	0.2184	0.2042
Sum	59.9671	3.2049

SOURCE 27

Sample ID : SOIL27
Filter ID : /
Size : 3
Analysis flags: TFFLG QFFLG XFLG AFLG CAFLG N4FLG KPFLG NAFLG

Mass 19638.3703 1522.3391 ug/m3

	Conc (%)	Uncert (%)
Na	0.3063	0.1119
Al	7.8376	1.0602
Si	24.2245	3.2184
P	0.2336	0.0325
S	0.3559	0.0905
SO4	0.2025	0.2162
Cl	0.2787	0.1465
K-x	2.1858	0.2942
K-a	0.1888	0.0882
Ca	3.1452	0.4405
Ti	0.4329	0.0584
V	0.0301	0.0091
Cr	0.0224	0.0032
Mn	0.1018	0.0142
Fe	3.9935	0.5513
Co	0.0089	0.0699
Ni	0.0074	0.0012
Cu	0.0500	0.0093
Zn	0.0829	0.0075
Ga	0.0030	0.0052
As	0.0017	0.0142
Se	0.0002	0.0024
Br	0.0033	0.0013
Rb	0.0134	0.0015
Sr	0.0350	0.0032
Y	0.0019	0.0031
Zr	0.0164	0.0022
Mo	0.0023	0.0072
Pd	0.0016	0.0151
Ag	0.0034	0.0180
Cd	0.0085	0.0193
In	0.0006	0.0222
Sn	0.0050	0.0299
Sb	0.0042	0.0334
Ba	0.1373	0.0418
La	0.0037	0.1354
Hg	0.0016	0.0082
Pb	0.0633	0.0064
NO3	0.0000	0.5963
NH4	0.0164	0.0285
OC	9.4612	2.6894
EC	1.2976	1.4371
CO3	0.3422	0.3930
Sum	54.7214	4.6054

SOURCE 29

Sample ID : MAMAJC
Filter ID : AT070106/AQ070106
Size : 2.5
Analysis flags: TFFLG QFFLG XFLG AFLG CAFLG N4FLG KPFLG NAFLG f1

Mass 17694.4958 2782.9911 ug/m3

****

	Conc (%)	Uncert (%)
Na	0.0301	0.0070
Al	0.0022	0.0093
Si	0.0000	0.0051
P	0.0000	0.0074
S	0.1789	0.0540
SO4	0.6087	0.1790
Cl	0.3480	0.1356
K-x	0.7908	0.5619
K-a	1.3687	0.2553
Ca	0.0235	0.0126
Ti	0.0000	0.0074
V	0.0000	0.0031
Cr	0.0000	0.0008
Mn	0.0017	0.0016
Fe	0.0000	0.0005
Co	0.0001	0.0003
Ni	0.0000	0.0003
Cu	0.0000	0.0003
Zn	0.0613	0.0375
Ga	0.0000	0.0011
As	0.0002	0.0010
Se	0.0000	0.0005
Br	0.0027	0.0003
Rb	0.0009	0.0009
Sr	0.0000	0.0006
Y	0.0000	0.0007
Zr	0.0000	0.0010
Mo	0.0000	0.0016
Pd	0.0000	0.0028
Ag	0.0000	0.0033
Cd	0.0003	0.0036
In	0.0000	0.0042
Sn	0.0000	0.0056
Sb	0.0008	0.0065
Ba	0.0066	0.0227
La	0.0113	0.0258
Hg	0.0000	0.0018
Pb	0.0000	0.0015
NO3	0.1739	0.0405
NH4	0.0566	0.0460
OC	52.5089	21.6074
EC	25.5264	6.0874
CO3	0.0069	0.0374
Sum	79.7321	22.4562

SOURCE 30

Sample ID : MAFISC
Filter ID : AT070137/AQ070137
Size : 2.5
Analysis flags: TFFLG QFFLG XFLG AFLG CAFLG N4FLG KPFLG NAFLG 18

Mass 25698.5650 2560.4583 ug/m3

	Conc (%)	Uncert (%)
Na	0.0151	0.0046
Al	0.0000	0.0061
Si	0.0000	0.0031
P	0.0000	0.0034
S	0.0793	0.0152
SO4	0.1933	0.0292
Cl	0.0928	0.0250
K-x	0.2222	0.0865
K-a	0.2222	0.0865
Ca	0.0086	0.0033
Ti	0.0000	0.0060
V	0.0000	0.0025
Cr	0.0000	0.0006
Mn	0.0007	0.0003
Fe	0.0016	0.0023
Co	0.0000	0.0002
Ni	0.0000	0.0002
Cu	0.0000	0.0004
Zn	0.0202	0.0078
Ga	0.0000	0.0008
As	0.0000	0.0008
Se	0.0000	0.0004
Br	0.0009	0.0003
Rb	0.0004	0.0003
Sr	0.0000	0.0005
Y	0.0000	0.0006
Zr	0.0001	0.0008
Mo	0.0000	0.0012
Pd	0.0000	0.0022
Ag	0.0006	0.0027
Cd	0.0001	0.0028
In	0.0001	0.0034
Sn	0.0000	0.0045
Sb	0.0014	0.0052
Ba	0.0050	0.0181
La	0.0082	0.0207
Hg	0.0000	0.0014
Pb	0.0000	0.0011
NO3	0.0278	0.0042
NH4	0.0273	0.0057
OC	63.6038	7.5369
EC	10.8602	1.2350
CO3	0.0000	0.0144
Sum	74.9764	7.6380

SOURCE 50

(taken from South Coast Air Quality Management District Final Air Quality Management Plan, March 1989, Appendix V-G: PM10 Source Profile Library for the South Coast Air Basin)

srce code	part size	revsion date	source description	reference	date
5476	FC	07/14/87	Tunnel On-Road Motor Vehicle	1	06/87

PERCENT COMPOSITION

SPECIES	FINE	COARSE	TOTAL
Al	.3377 +- .1307	.8160 +- 2.1543	
Si	.3827 +- .2245	6.0532 +-14.0863	
P	.2929 +- .0536	.2405 +- .5216	
S	.7314 +- .3035	.0920 +- 1.6431	
Cl	.3631 +- .3242	.0000 +-20.7482	
K	.0193 +- .0210	.0000 +- .7843	
Ca	.1250 +- .0480	1.3272 +- 2.7186	
Ti	.0041 +- .0111	.0082 +- .1319	
V	.0000 +- .0038	.0000 +- .0686	
Cr	.0044 +- .0039	.0184 +- .0473	
Mn	.1340 +- .0171	.2008 +- .4262	
Fe	2.2183 +- .2765	11.3379 +-23.0810	
Ni	.0096 +- .0028	.0559 +- .1106	
Cu	.1118 +- .0143	.2909 +- .6112	
Zn	.2465 +- .0307	.6064 +- 1.1496	
Ga	.0027 +- .0051	.0033 +- .0117	
As	.0390 +- .0817	.0000 +- .1080	
Se	.0000 +- .0024	.0023 +- .0070	
Br	1.3551 +- .1644	.2688 +- .6335	
Rb	.0000 +- .0110	.0176 +- .0500	
Sr	.0000 +- .0054	.0000 +- .4804	
Y	.0000 +- .0078	.0000 +- .0145	
Zr	.0000 +- .0258	.0000 +- .0654	
Mo	.0195 +- .0179	.0389 +- .0617	
Pd	.0000 +- .0159	.0000 +- .0365	
Ag	.0000 +- .0208	.0000 +- .0479	
Cd	.0000 +- .0275	.0000 +- .0639	
In	.0000 +- .0345	.0000 +- .0797	
Sn	.0000 +- .0418	.0000 +- .0963	
Sb	.0000 +- .0918	.0000 +- .2155	
Ba	.3282 +- .0560	1.0768 +- 1.9048	
La	.0000 +- .3176	.0000 +- .7222	
Hg	.0000 +- .0031	.0016 +- .0070	
Pb	2.4366 +- .2975	2.0488 +- 3.9517	
OC	38.5859 +- 5.5504	39.1636 +-61.7037	
EC	38.1189 +- 4.9093	12.6561 +-24.2750	
Sum	85.8667	76.3252	

Ambient Data Collected From Mammoth Lakes For CMB Analysis

Great Basin Data Summary

Fine Teflon:GBT025	17.40m3	Quartz:GBQ025	19.40m3
Coarse Teflon:GBT026	1.84m3	Quartz:GBQ026	1.92m3

Fine Flags: TF:Q3 QF: M: X: C:
Coarse Flags: TF:Q3 QF: M: X: C:

Site: 26785 Date: 871226 Time: 1215-1220

Species	Fine Conc.	+- Unc.	Coarse Conc.	+- Unc.
Mass	113.1609	5.6653	12.6512	1.2209
NO3-	1.1094	0.0631	0.0418	0.0283
SO4=	0.4939	0.0307	0.0417	0.0172
EC	21.1469	2.1951	1.1962	0.2278
OC	42.7387	3.0785	4.8816	0.5982
Al	0.0000	0.0133	0.1029	0.0324
Si	0.0000	0.0071	0.4255	0.1348
P	0.0000	0.0076	0.0017	0.0063
S	0.1483	0.0078	0.0413	0.0147
Cl	0.3909	0.0207	0.1231	0.0367
K	0.4350	0.0223	0.0821	0.0175
Ca	0.0089	0.0027	0.1271	0.0215
Ti	0.0000	0.0143	0.0110	0.0128
V	0.0000	0.0060	0.0008	0.0054
Cr	0.0005	0.0017	0.0010	0.0016
Mn	0.0037	0.0005	0.0054	0.0006
Fe	0.0112	0.0008	0.1081	0.0056
Co	0.0000	0.0008	0.0000	0.0018
Ni	0.0001	0.0008	0.0000	0.0007
Cu	0.0006	0.0012	0.0115	0.0007
Zn	0.0247	0.0014	0.0042	0.0005
Ga	0.0000	0.0017	0.0000	0.0014
As	0.0008	0.0035	0.0000	0.0024
Se	0.0000	0.0010	0.0000	0.0008
Br	0.0077	0.0005	0.0019	0.0003
Rb	0.0005	0.0011	0.0000	0.0008
Sr	0.0000	0.0011	0.0004	0.0009
Y	0.0000	0.0013	0.0000	0.0011
Zr	0.0000	0.0016	0.0011	0.0014
Mo	0.0000	0.0027	0.0000	0.0023
Pd	0.0000	0.0056	0.0002	0.0052
Ag	0.0000	0.0063	0.0000	0.0057
Cd	0.0021	0.0069	0.0000	0.0061
In	0.0000	0.0080	0.0007	0.0073
Sn	0.0000	0.0111	0.0000	0.0101
Sb	0.0000	0.0127	0.0000	0.0115
Ba	0.0000	0.0435	0.0000	0.0387
La	0.0178	0.0511	0.0198	0.0456
Hg	0.0000	0.0035	0.0000	0.0030
Pb	0.0175	0.0014	0.0088	0.0010

Concentrations in ug/m3

Great Basin Data Summary

Fine Teflon:GBT031 17.40m3 Quartz:GBQ031 19.79m3
Coarse Teflon:GBT032 1.84m3 Quartz:GBQ032 1.94m3
Fine Flags: TF:Q3 QF: M: X: C:
Coarse Flags: TF:Q3 QF: M: X: C:

Site: 26785 Date: 871230 Time: 1130-1134

Concentrations in ug/m3

Species	Fine Conc.	Fine +- Unc.	Coarse Conc.	Coarse +- Unc.
Mass	118.7356	5.9437	14.1237	1.3199
NO3-	1.6044	0.0855	0.1065	0.0299
SO4=	0.7383	0.0410	0.1136	0.0188
EC	19.7908	2.0555	2.2944	0.2634
OC	46.7767	3.3623	8.3572	1.0030
Al	0.0000	0.0136	0.1023	0.0327
Si	0.0000	0.0076	0.6662	0.2110
P	0.0000	0.0104	0.0021	0.0068
S	0.2256	0.0116	0.0404	0.0150
Cl	0.3836	0.0203	0.0285	0.0101
K	0.4561	0.0233	0.1009	0.0212
Ca	0.0139	0.0029	0.1188	0.0202
Ti	0.0000	0.0145	0.0026	0.0127
V	0.0000	0.0061	0.0000	0.0053
Cr	0.0010	0.0017	0.0007	0.0015
Mn	0.0038	0.0005	0.0068	0.0006
Fe	0.0133	0.0009	0.0896	0.0047
Co	0.0006	0.0008	0.0002	0.0016
Ni	0.0002	0.0008	0.0001	0.0007
Cu	0.0031	0.0004	0.0238	0.0013
Zn	0.0269	0.0015	0.0058	0.0006
Ga	0.0000	0.0017	0.0000	0.0016
As	0.0002	0.0038	0.0000	0.0112
Se	0.0000	0.0010	0.0000	0.0008
Br	0.0104	0.0007	0.0015	0.0003
Rb	0.0002	0.0011	0.0000	0.0008
Sr	0.0000	0.0011	0.0010	0.0009
Y	0.0000	0.0013	0.0000	0.0013
Zr	0.0000	0.0016	0.0004	0.0014
Mo	0.0000	0.0027	0.0000	0.0023
Pd	0.0000	0.0056	0.0000	0.0048
Ag	0.0001	0.0062	0.0000	0.0055
Cd	0.0000	0.0067	0.0007	0.0060
In	0.0000	0.0079	0.0000	0.0069
Sn	0.0000	0.0110	0.0000	0.0098
Sb	0.0000	0.0127	0.0000	0.0111
Ba	0.0246	0.0436	0.0127	0.0383
La	0.0000	0.0500	0.0270	0.0447
Hg	0.0000	0.0035	0.0000	0.0029
Pb	0.0197	0.0015	0.0681	0.0038

Great Basin Data Summary

Fine Teflon:GBT033 17.40m3 Quartz:GBQ033 19.60m3
Coarse Teflon:GBT034 1.84m3 Quartz:GBQ034 1.92m3
Fine Flags: TF:Q3 QF: M: X: C:
Coarse Flags: TF:Q3 QF: M: X: C:

Site: 26785 Date: 871231 Time: 1200-1209

Concentrations in ug/m3

Species	Fine Conc.	Fine +- Unc.	Coarse Conc.	Coarse +- Unc.
Mass	121.0920	6.0614	21.6856	1.7030
NO3-	1.8153	0.0955	0.1139	0.0308
SO4=	0.9711	0.0518	0.1265	0.0199
EC	25.9974	2.6940	2.8006	0.3121
OC	67.3224	4.8099	9.3496	1.2121
Al	0.0000	0.0145	0.1721	0.0535
Si	0.0000	0.0080	1.0898	0.3450
P	0.0000	0.0117	0.0000	0.0074
S	0.2631	0.0135	0.0304	0.0126
Cl	0.4566	0.0240	0.0839	0.0256
K	0.5264	0.0268	0.1905	0.0391
Ca	0.0130	0.0032	0.1986	0.0336
Ti	0.0000	0.0142	0.0191	0.0043
V	0.0000	0.0060	0.0007	0.0053
Cr	0.0000	0.0017	0.0009	0.0015
Mn	0.0031	0.0005	0.0080	0.0007
Fe	0.0095	0.0007	0.1576	0.0080
Co	0.0004	0.0008	0.0001	0.0025
Ni	0.0000	0.0008	0.0004	0.0007
Cu	0.0004	0.0012	0.0008	0.0010
Zn	0.0296	0.0016	0.0089	0.0007
Ga	0.0000	0.0016	0.0000	0.0019
As	0.0001	0.0043	0.0000	0.0181
Se	0.0000	0.0010	0.0000	0.0009
Br	0.0201	0.0011	0.0018	0.0004
Rb	0.0007	0.0013	0.0001	0.0009
Sr	0.0000	0.0011	0.0015	0.0003
Y	0.0000	0.0013	0.0000	0.0015
Zr	0.0000	0.0016	0.0010	0.0014
Mo	0.0000	0.0027	0.0000	0.0023
Pd	0.0000	0.0055	0.0000	0.0048
Ag	0.0000	0.0064	0.0000	0.0055
Cd	0.0000	0.0067	0.0017	0.0060
In	0.0000	0.0080	0.0028	0.0071
Sn	0.0000	0.0112	0.0000	0.0097
Sb	0.0000	0.0127	0.0000	0.0111
Ba	0.0000	0.0433	0.0004	0.0380
La	0.0111	0.0507	0.0148	0.0445
Hg	0.0000	0.0034	0.0000	0.0030
Pb	0.0234	0.0016	0.1120	0.0059

Great Basin Data Summary

Fine Teflon:GBT035 18.37m3 Quartz:GBQ035 19.21m3
Coarse Teflon:GBT036 1.97m3 Quartz:GBQ036 1.94m3
Fine Flags: TF: QF: M: X: C:
Coarse Flags: TF: QF: M: X: C:I5

Site: 26785 Date: 880101 Time: 1230-1230

Concentrations in ug/m3

Species	Fine Conc.	Fine +- Unc.	Coarse Conc.	Coarse +- Unc.
Mass	102.9940	5.1653	14.4484	1.2618
NO3-	1.4356	0.0779	0.0347	0.0289
SO4=	0.6198	0.0360	0.0492	0.0176
EC	18.3597	1.9086	1.1964	0.2184
OC	45.6262	3.2817	2.6802	0.5296
Al	0.0000	0.0134	0.7233	0.2164
Si	0.0297	0.0031	2.7948	0.8847
P	0.0000	0.0106	0.0046	0.0073
S	0.2362	0.0122	0.0378	0.0137
Cl	0.3454	0.0184	0.1766	0.0521
K	0.5164	0.0264	0.2105	0.0430
Ca	0.0336	0.0036	0.4521	0.0762
Ti	0.0000	0.0130	0.0397	0.0046
V	0.0000	0.0054	0.0016	0.0054
Cr	0.0000	0.0015	0.0026	0.0005
Mn	0.0045	0.0005	0.0119	0.0009
Fe	0.0241	0.0014	0.4018	0.0204
Co	0.0000	0.0008	0.0000	0.0060
Ni	0.0000	0.0007	0.0008	0.0002
Cu	0.0022	0.0004	0.0140	0.0008
Zn	0.0317	0.0017	0.0100	0.0008
Ga	0.0000	0.0015	0.0000	0.0013
As	0.0013	0.0048	0.0002	0.0030
Se	0.0000	0.0009	0.0000	0.0008
Br	0.0178	0.0010	0.0011	0.0003
Rb	0.0012	0.0004	0.0004	0.0008
Sr	0.0000	0.0010	0.0038	0.0004
Y	0.0000	0.0012	0.0000	0.0010
Zr	0.0001	0.0015	0.0015	0.0005
Mo	0.0000	0.0024	0.0000	0.0022
Pd	0.0000	0.0050	0.0000	0.0047
Ag	0.0000	0.0056	0.0006	0.0053
Cd	0.0000	0.0061	0.0001	0.0057
In	0.0000	0.0071	0.0003	0.0067
Sn	0.0000	0.0099	0.0000	0.0094
Sb	0.0000	0.0113	0.0010	0.0108
Ba	0.0172	0.0391	0.0175	0.0366
La	0.0131	0.0453	0.0063	0.0422
Hg	0.0000	0.0031	0.0000	0.0029
Pb	0.0270	0.0017	0.0128	0.0012

Great Basin Data Summary

Fine Teflon:GBT053 17.29m3 Quartz:GBQ053 19.50m3
Coarse Teflon:GBT054 2.01m3 Quartz:GBQ054 1.90m3
Fine Flags: TF: QF: M: X: C:
Coarse Flags: TF: QF: M: X: C:I5

Site: 26785 Date: 880122 Time: 0000-2400

Species	Fine Conc.	Fine +- Unc.	Coarse Conc.	Coarse +- Unc.
Mass	98.6119	4.9134	45.2047	2.7725
NO3-	0.8195	0.0508	0.0831	0.0284
SO4=	0.4219	0.0279	0.0501	0.0171
EC	19.2374	2.0013	1.4891	0.2308
OC	38.4744	2.7855	4.2347	0.5559
Al	0.0054	0.0164	3.3013	0.9841
Si	0.2018	0.0108	10.6755	3.3795
P	0.0000	0.0085	0.0267	0.0116
S	0.1781	0.0092	0.0952	0.0335
Cl	0.2669	0.0144	0.4505	0.1313
K	0.4591	0.0234	0.7548	0.1511
Ca	0.0588	0.0042	1.5859	0.2670
Ti	0.0000	0.0127	0.1814	0.0105
V	0.0000	0.0053	0.0107	0.0029
Cr	0.0018	0.0005	0.0077	0.0008
Mn	0.0078	0.0006	0.0358	0.0024
Fe	0.0836	0.0043	1.5993	0.0809
Co	0.0000	0.0015	0.0000	0.0234
Ni	0.0003	0.0007	0.0023	0.0004
Cu	0.0015	0.0004	0.0035	0.0004
Zn	0.0273	0.0015	0.0153	0.0010
Ga	0.0000	0.0014	0.0000	0.0014
As	0.0001	0.0040	0.0000	0.0031
Se	0.0000	0.0008	0.0000	0.0008
Br	0.0062	0.0004	0.0012	0.0003
Rb	0.0010	0.0003	0.0036	0.0004
Sr	0.0004	0.0009	0.0171	0.0010
Y	0.0000	0.0010	0.0009	0.0012
Zr	0.0002	0.0013	0.0053	0.0006
Mo	0.0000	0.0021	0.0012	0.0024
Pd	0.0000	0.0047	0.0000	0.0052
Ag	0.0000	0.0052	0.0025	0.0060
Cd	0.0020	0.0058	0.0022	0.0064
In	0.0000	0.0067	0.0000	0.0072
Sn	0.0000	0.0094	0.0000	0.0100
Sb	0.0014	0.0109	0.0000	0.0116
Ba	0.0232	0.0379	0.0416	0.0134
La	0.0116	0.0439	0.0021	0.0449
Hg	0.0000	0.0028	0.0000	0.0030
Pb	0.0223	0.0015	0.0136	0.0012

Concentrations in ug/m3

Great Basin Data Summary

Fine Teflon:GBT055	17.56m3	Quartz:GBQ055	19.31m3	
Coarse Teflon:GBT056	2.04m3	Quartz:GBQ056	1.92m3	

Fine Flags: TF: QF: M: X: C:
Coarse Flags: TF: QF: M: X: C:15

Site: 26785 Date: 880123 Time: 1400-1400

Concentrations in ug/m3

Species	Fine Conc.	Fine +- Unc.	Coarse Conc.	Coarse +- Unc.
Mass	97.4374	4.8913	60.4485	3.5118
NO3-	0.7108	0.0467	0.0930	0.0286
SO4=	0.3926	0.0269	0.0790	0.0177
EC	20.3242	2.1129	2.2736	0.2659
OC	36.1636	2.6231	6.4491	0.6328
Al	0.0199	0.0062	4.4691	1.3316
Si	0.2799	0.0147	14.0396	4.4438
P	0.0000	0.0080	0.0292	0.0128
S	0.1572	0.0083	0.1468	0.0513
Cl	0.2303	0.0127	0.5540	0.1613
K	0.4348	0.0223	1.0032	0.2004
Ca	0.0832	0.0052	2.1613	0.3636
Ti	0.0000	0.0146	0.2567	0.0140
V	0.0000	0.0061	0.0104	0.0106
Cr	0.0000	0.0016	0.0113	0.0010
Mn	0.0050	0.0006	0.0517	0.0034
Fe	0.0998	0.0051	2.2557	0.1134
Co	0.0004	0.0018	0.0000	0.0329
Ni	0.0002	0.0008	0.0031	0.0005
Cu	0.0015	0.0004	0.0067	0.0005
Zn	0.0268	0.0015	0.0233	0.0014
Ga	0.0000	0.0016	0.0000	0.0015
As	0.0007	0.0046	0.0010	0.0045
Se	0.0000	0.0010	0.0000	0.0008
Br	0.0081	0.0005	0.0014	0.0003
Rb	0.0003	0.0010	0.0045	0.0004
Sr	0.0005	0.0011	0.0246	0.0013
Y	0.0000	0.0013	0.0009	0.0012
Zr	0.0004	0.0016	0.0060	0.0007
Mo	0.0000	0.0027	0.0011	0.0023
Pd	0.0000	0.0055	0.0040	0.0057
Ag	0.0020	0.0063	0.0000	0.0060
Cd	0.0000	0.0067	0.0010	0.0065
In	0.0024	0.0080	0.0034	0.0078
Sn	0.0000	0.0108	0.0000	0.0104
Sb	0.0009	0.0126	0.0000	0.0118
Ba	0.0336	0.0432	0.0594	0.0140
La	0.0236	0.0499	0.0149	0.0460
Hg	0.0000	0.0034	0.0000	0.0030
Pb	0.0257	0.0017	0.0232	0.0016

Great Basin Data Summary

Fine Teflon:GBT063 19.27m3 Quartz:GBQ063 19.21m3
Coarse Teflon:GBT064 1.92m3 Quartz:GBQ064 1.99m3
Fine Flags: TF: QF: M: X: C:
Coarse Flags: TF: QF: M: X: C:I5

Site: 26785 Date: 880203 Time: 0000-2400

Concentrations in ug/m3

Species	Fine Conc.	Fine +- Unc.	Coarse Conc.	Coarse +- Unc.
Mass	69.7976	3.4869	34.4998	2.0884
NO3-	0.8338	0.0515	0.1212	0.0293
SO4=	0.5150	0.0316	0.0775	0.0179
EC	13.2525	1.3838	2.2871	0.2389
OC	25.5357	1.8743	4.7033	0.5287
Al	0.0188	0.0048	2.6233	0.7818
Si	0.1936	0.0103	8.1714	2.5865
P	0.0000	0.0090	0.0290	0.0125
S	0.2028	0.0104	0.1132	0.0397
Cl	0.1702	0.0095	0.1418	0.0417
K	0.3416	0.0175	0.5624	0.1126
Ca	0.0512	0.0035	1.1298	0.1902
Ti	0.0058	0.0114	0.1353	0.0079
V	0.0005	0.0048	0.0092	0.0023
Cr	0.0008	0.0014	0.0056	0.0006
Mn	0.0037	0.0005	0.0283	0.0019
Fe	0.0619	0.0032	1.1278	0.0568
Co	0.0000	0.0012	0.0008	0.0165
Ni	0.0005	0.0007	0.0016	0.0003
Cu	0.0016	0.0003	0.0025	0.0003
Zn	0.0205	0.0011	0.0161	0.0010
Ga	0.0000	0.0012	0.0001	0.0011
As	0.0002	0.0025	0.0000	0.0021
Se	0.0000	0.0007	0.0001	0.0006
Br	0.0040	0.0003	0.0007	0.0002
Rb	0.0009	0.0002	0.0030	0.0003
Sr	0.0005	0.0008	0.0136	0.0008
Y	0.0000	0.0009	0.0008	0.0009
Zr	0.0004	0.0011	0.0040	0.0005
Mo	0.0005	0.0019	0.0005	0.0018
Pd	0.0008	0.0044	0.0018	0.0043
Ag	0.0008	0.0049	0.0000	0.0046
Cd	0.0000	0.0052	0.0018	0.0051
In	0.0006	0.0062	0.0021	0.0060
Sn	0.0012	0.0088	0.0000	0.0080
Sb	0.0013	0.0100	0.0000	0.0093
Ba	0.0077	0.0344	0.0234	0.0321
La	0.0050	0.0401	0.0057	0.0367
Hg	0.0000	0.0025	0.0002	0.0023
Pb	0.0123	0.0010	0.0086	0.0009

Great Basin Data Summary

Fine Teflon:GBT065	17.40m3	Quartz:GBQ065	18.93m3		
Coarse Teflon:GBT066	1.84m3	Quartz:GBQ066	1.97m3		
Fine Flags:	TF:Q3	QF:	M:	X:	C:
Coarse Flags:	TF:Q3	QF:	M:	X:	C:I5

Site: 26785 Date: 880205 Time: 1200-1143

Concentrations in ug/m3

Species	Fine		Coarse	
	Conc.	+- Unc.	Conc.	+- Unc.
Mass	98.1034	4.9136	50.0639	2.9962
NO3-	0.9233	0.0556	0.1461	0.0302
SO4=	0.4736	0.0302	0.1651	0.0199
EC	22.3391	2.3205	2.1624	0.2700
OC	42.2240	3.0497	6.5372	0.6620
Al	0.0442	0.0066	3.6917	1.1001
Si	0.3243	0.0169	11.6327	3.6820
P	0.0000	0.0069	0.0436	0.0186
S	0.1310	0.0069	0.1588	0.0554
Cl	0.3067	0.0165	0.1821	0.0536
K	0.4514	0.0231	0.8246	0.1649
Ca	0.0799	0.0051	1.6477	0.2772
Ti	0.0125	0.0126	0.1903	0.0107
V	0.0000	0.0053	0.0108	0.0028
Cr	0.0005	0.0015	0.0077	0.0008
Mn	0.0055	0.0006	0.0384	0.0025
Fe	0.1047	0.0054	1.6572	0.0833
Co	0.0000	0.0018	0.0000	0.0243
Ni	0.0004	0.0007	0.0027	0.0004
Cu	0.0017	0.0004	0.0038	0.0004
Zn	0.0230	0.0013	0.0211	0.0013
Ga	0.0000	0.0013	0.0002	0.0012
As	0.0005	0.0026	0.0013	0.0026
Se	0.0000	0.0008	0.0001	0.0007
Br	0.0046	0.0004	0.0015	0.0002
Rb	0.0013	0.0003	0.0042	0.0004
Sr	0.0024	0.0003	0.0205	0.0011
Y	0.0000	0.0010	0.0012	0.0003
Zr	0.0014	0.0004	0.0056	0.0006
Mo	0.0000	0.0021	0.0007	0.0019
Pd	0.0000	0.0049	0.0010	0.0044
Ag	0.0012	0.0055	0.0011	0.0049
Cd	0.0015	0.0060	0.0016	0.0053
In	0.0032	0.0071	0.0014	0.0062
Sn	0.0000	0.0096	0.0000	0.0086
Sb	0.0000	0.0110	0.0000	0.0098
Ba	0.0000	0.0378	0.0478	0.0118
La	0.0000	0.0439	0.0000	0.0388
Hg	0.0000	0.0028	0.0004	0.0025
Pb	0.0123	0.0011	0.0114	0.0010

Great Basin Data Summary

Fine Teflon:GBT075 16.06m3 Quartz:GBQ075 16.09m3
Coarse Teflon:GBT076 1.59m3 Quartz:GBQ076 1.58m3
Fine Flags: TF: QF: M: X: C:
Coarse Flags: TF: QF: M: X: C:I5

Site: 26785 Date: 880213 Time: 1430-1030

Concentrations in ug/m3

Species	Fine Conc.	+- Unc.	Coarse Conc.	+- Unc.
Mass	87.9826	4.3937	49.6074	2.9262
NO3-	1.3584	0.0766	0.2256	0.0375
SO4=	0.4978	0.0331	0.2511	0.0250
EC	18.4935	1.9244	2.0520	0.2704
OC	34.6955	2.5251	6.4891	0.6779
Al	0.0734	0.0075	4.0406	1.2039
Si	0.3292	0.0171	12.3722	3.9159
P	0.0000	0.0080	0.0369	0.0161
S	0.1628	0.0085	0.2063	0.0719
Cl	0.2364	0.0130	0.2725	0.0797
K	0.4047	0.0207	0.9395	0.1876
Ca	0.0917	0.0055	1.8131	0.3051
Ti	0.0103	0.0137	0.1999	0.0113
V	0.0001	0.0057	0.0124	0.0031
Cr	0.0002	0.0016	0.0086	0.0008
Mn	0.0066	0.0006	0.0417	0.0027
Fe	0.1121	0.0057	1.7933	0.0901
Co	0.0005	0.0019	0.0000	0.0263
Ni	0.0004	0.0008	0.0035	0.0004
Cu	0.0016	0.0004	0.0054	0.0005
Zn	0.0221	0.0012	0.0260	0.0015
Ga	0.0000	0.0014	0.0008	0.0013
As	0.0026	0.0031	0.0010	0.0027
Se	0.0000	0.0008	0.0005	0.0008
Br	0.0055	0.0004	0.0017	0.0003
Rb	0.0014	0.0003	0.0047	0.0004
Sr	0.0009	0.0009	0.0200	0.0011
Y	0.0003	0.0011	0.0014	0.0004
Zr	0.0001	0.0014	0.0059	0.0006
Mo	0.0000	0.0023	0.0013	0.0020
Pd	0.0000	0.0052	0.0007	0.0050
Ag	0.0024	0.0060	0.0000	0.0055
Cd	0.0027	0.0065	0.0039	0.0062
In	0.0019	0.0076	0.0040	0.0072
Sn	0.0000	0.0105	0.0000	0.0098
Sb	0.0000	0.0118	0.0000	0.0111
Ba	0.0052	0.0412	0.0478	0.0131
La	0.0029	0.0479	0.0000	0.0433
Hg	0.0000	0.0030	0.0005	0.0027
Pb	0.0150	0.0012	0.0120	0.0011

Great Basin Data Summary

Fine Teflon:GBT077	17.75m3	Quartz:GBQ077	17.70m3	
Coarse Teflon:GBT078	1.72m3	Quartz:GBQ078	1.75m3	

Fine Flags: TF: QF: M: X: C:I5
Coarse Flags: TF: QF: M: X: C:I5

Site: 26785 Date: 880214 Time: 1400-1200

Concentrations in ug/m3

Species	Fine		Coarse	
	Conc.	+- Unc.	Conc.	+- Unc.
Mass	81.7465	4.1085	62.3210	3.5226
NO3-	0.8863	0.0554	0.3221	0.0362
SO4=	0.5732	0.0351	0.8342	0.0480
EC	17.2763	1.8018	1.9431	0.2504
OC	31.4791	2.3034	6.8185	0.6506
Al	0.2161	0.0138	4.7297	1.4091
Si	0.6900	0.0352	13.9717	4.4226
P	0.0000	0.0095	0.0172	0.0244
S	0.2039	0.0105	0.4344	0.1512
Cl	0.2567	0.0140	0.5967	0.1737
K	0.4364	0.0224	1.1597	0.2315
Ca	0.2572	0.0135	2.5910	0.4361
Ti	0.0177	0.0044	0.2316	0.0126
V	0.0000	0.0054	0.0150	0.0033
Cr	0.0014	0.0016	0.0094	0.0009
Mn	0.0085	0.0007	0.0474	0.0031
Fe	0.2194	0.0111	2.0585	0.1038
Co	0.0000	0.0034	0.0000	0.0302
Ni	0.0008	0.0003	0.0035	0.0004
Cu	0.0029	0.0004	0.0048	0.0004
Zn	0.0209	0.0012	0.0254	0.0015
Ga	0.0002	0.0014	0.0003	0.0013
As	0.0009	0.0031	0.0003	0.0034
Se	0.0000	0.0008	0.0000	0.0007
Br	0.0063	0.0004	0.0017	0.0003
Rb	0.0016	0.0003	0.0066	0.0005
Sr	0.0033	0.0004	0.0278	0.0015
Y	0.0003	0.0010	0.0021	0.0004
Zr	0.0009	0.0013	0.0081	0.0007
Mo	0.0001	0.0021	0.0000	0.0020
Pd	0.0024	0.0049	0.0015	0.0049
Ag	0.0015	0.0054	0.0000	0.0053
Cd	0.0000	0.0057	0.0027	0.0059
In	0.0009	0.0068	0.0009	0.0068
Sn	0.0013	0.0097	0.0000	0.0092
Sb	0.0008	0.0109	0.0000	0.0107
Ba	0.0198	0.0378	0.0413	0.0123
La	0.0172	0.0440	0.0000	0.0407
Hg	0.0000	0.0027	0.0002	0.0026
Pb	0.0157	0.0012	0.0171	0.0013

Great Basin Data Summary

Fine Teflon:GBT067 17.40m3 Quartz:GBQ067 19.40m3
Coarse Teflon:GBT068 1.81m3 Quartz:GBQ068 1.94m3
Fine Flags: TF:Q3 QF: M: X: C:
Coarse Flags: TF:Q3 QF: M: X: C:I5

Site: 26785 Date: 880206 Time: 1245-1245

Concentrations in ug/m3

Species	Fine Conc.	Fine +- Unc.	Coarse Conc.	Coarse +- Unc.
Mass	115.2299	5.7687	47.8110	2.9745
NO3-	1.3211	0.0725	0.1638	0.0310
SO4=	0.4334	0.0283	0.1276	0.0186
EC	24.2675	2.5160	2.2855	0.2829
OC	47.5320	3.4159	6.1301	0.6663
Al	0.0438	0.0065	3.6230	1.0796
Si	0.3120	0.0163	11.3460	3.5913
P	0.0000	0.0069	0.0289	0.0126
S	0.1288	0.0068	0.1388	0.0485
Cl	0.3354	0.0179	0.1877	0.0553
K	0.4654	0.0238	0.7921	0.1585
Ca	0.0872	0.0054	1.6208	0.2728
Ti	0.0090	0.0126	0.1880	0.0106
V	0.0000	0.0053	0.0101	0.0028
Cr	0.0008	0.0015	0.0075	0.0007
Mn	0.0064	0.0006	0.0385	0.0025
Fe	0.1076	0.0055	1.6111	0.0812
Co	0.0002	0.0018	0.0000	0.0236
Ni	0.0003	0.0007	0.0025	0.0004
Cu	0.0017	0.0004	0.0044	0.0004
Zn	0.0251	0.0014	0.0205	0.0012
Ga	0.0000	0.0014	0.0011	0.0012
As	0.0010	0.0026	0.0000	0.0026
Se	0.0000	0.0008	0.0001	0.0007
Br	0.0049	0.0004	0.0013	0.0002
Rb	0.0011	0.0003	0.0044	0.0004
Sr	0.0013	0.0003	0.0204	0.0011
Y	0.0000	0.0011	0.0011	0.0003
Zr	0.0000	0.0013	0.0055	0.0006
Mo	0.0000	0.0022	0.0021	0.0006
Pd	0.0000	0.0048	0.0003	0.0045
Ag	0.0013	0.0055	0.0000	0.0049
Cd	0.0008	0.0059	0.0011	0.0054
In	0.0000	0.0068	0.0023	0.0064
Sn	0.0000	0.0097	0.0000	0.0088
Sb	0.0000	0.0111	0.0000	0.0099
Ba	0.0000	0.0381	0.0469	0.0119
La	0.0091	0.0446	0.0000	0.0393
Hg	0.0000	0.0029	0.0011	0.0025
Pb	0.0123	0.0011	0.0121	0.0010

Great Basin Data Summary

Fine Teflon:GBT081 16.06m3 Quartz:GBQ081 16.09m3
Coarse Teflon:GBT082 1.59m3 Quartz:GBQ082 1.62m3
Fine Flags: TF:T6 QF:T6 M: X: C:
Coarse Flags: TF:T6 QF:T6 M: X: C:I5

Site: 26785 Date: 880219 Time: 1440-2200

Concentrations in ug/m3

Species	Fine Conc.	Fine +- Unc.	Coarse Conc.	Coarse +- Unc.
Mass	105.3549	5.2573	43.0527	2.6873
NO3-	1.0849	0.0649	0.2332	0.0370
SO4=	0.4969	0.0331	0.2297	0.0244
EC	23.4556	2.4337	1.9004	0.2840
OC	48.1038	3.4623	6.2479	0.7218
Al	0.0337	0.0068	3.3670	1.0032
Si	0.2551	0.0135	10.2837	3.2549
P	0.0000	0.0084	0.0340	0.0148
S	0.1645	0.0086	0.1945	0.0679
Cl	0.3844	0.0204	0.2019	0.0595
K	0.5883	0.0299	0.7533	0.1509
Ca	0.0767	0.0054	1.4892	0.2506
Ti	0.0000	0.0145	0.1667	0.0098
V	0.0000	0.0061	0.0075	0.0082
Cr	0.0000	0.0017	0.0069	0.0007
Mn	0.0058	0.0006	0.0347	0.0023
Fe	0.0913	0.0047	1.4407	0.0724
Co	0.0003	0.0017	0.0000	0.0211
Ni	0.0005	0.0008	0.0023	0.0004
Cu	0.0022	0.0004	0.0048	0.0005
Zn	0.0366	0.0019	0.0239	0.0015
Ga	0.0000	0.0015	0.0000	0.0013
As	0.0007	0.0035	0.0010	0.0027
Se	0.0000	0.0009	0.0000	0.0008
Br	0.0063	0.0005	0.0019	0.0003
Rb	0.0018	0.0003	0.0040	0.0004
Sr	0.0008	0.0010	0.0174	0.0010
Y	0.0000	0.0012	0.0009	0.0010
Zr	0.0003	0.0015	0.0053	0.0006
Mo	0.0000	0.0024	0.0019	0.0021
Pd	0.0004	0.0055	0.0008	0.0051
Ag	0.0002	0.0061	0.0004	0.0056
Cd	0.0003	0.0066	0.0005	0.0060
In	0.0000	0.0076	0.0046	0.0073
Sn	0.0000	0.0109	0.0000	0.0098
Sb	0.0000	0.0123	0.0026	0.0114
Ba	0.0308	0.0428	0.0435	0.0132
La	0.0268	0.0495	0.0032	0.0441
Hg	0.0000	0.0031	0.0000	0.0027
Pb	0.0177	0.0013	0.0114	0.0011

APPENDIX D

CHEMICAL MASS BALANCE MODEL RUNS

RESULTS FOR CMB SITE: 26785 YEAR: 87 DATE: 1226 VERSION: 6.0

FINE PARTICULATE FRACTION

SAMPLING DURATION: 24 HRS. WITH START HOUR: 12

R-SQUARE: .97

CHI SQUARE: .48

DF: 7

#	TYPE	UG/M3	%
1	CINDR	-.037+- .029	-.033+- .025
3	MAMFP	81.917+- 24.042	72.390+-21.553
4	MAMWS	-5.895+- 42.461	-5.209+-37.524
6	SCCAR	.666+- .091	.588+- .086
	TOTAL:	76.651+- 24.895	67.736+-22.259

LEGEND

SOURCE CODES AND NAMES

1	CINDR	CINDERS	SOURCE 26
2	PAVRD	PAVED RD DUST	SOURCE 27
3	MAMFP	FIREPLACES	SOURCE 29
4	MAMWS	WOODSTOVES	SOURCE 30
6	SSCAR	VEHICLES	SOURCE 50

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	76.022+- 24.908
29 30	76.022+- 24.908

SPECIES		INCL	MISS FLG	FINE MEAS. UG/M3	SUSPENDED PARTICULATE PERCENT	CALC. UG/M3	RATIO R/U	
1	TOTAL			113.16090+- 5.66530	100.00000+- 7.08013	76.65089+- 24.89480	-1.4	TOTAL
13	AL	*		< .00000	< .01175	.00058+- .00769	.0	AL
14	SI	*		< .00000	< .00627	-.00587+- .00454	.0	SI
15	P			< .00000	< .00672	.00190+- .00608	.0	P
16	S	*		.14830+- .00780	.13105+- .00952	.14673+- .04429	.0	S
17	CL	*		.39090+- .02070	.34544+- .02517	.28198+- .11111	-1.0	CL
19	K	*		.43500+- .02230	.38441+- .02754	.63442+- .46032	.4	K
20	CA	*		.00890+- .00270	.00786+- .00242	.01731+- .01033	.8	CA
22	TI			< .00000	< .01264	-.00034+- .00607	.0	TI
23	V			< .00000	< .00530	-.00001+- .00254	.0	V
24	CR			< .00050	< .00150	.00002+- .00066	-.3	CR
25	MN			.00370+- .00050	.00327+- .00047	.00220+- .00132	-1.1	MN
26	FE	*		.01120+- .00080	.00990+- .00086	.01205+- .00191	.4	FE
27	CO			< .00000	< .00071	.00007+- .00025	.0	CO
28	NI			< .00010	< .00071	.00006+- .00025	.0	NI
29	CU			< .00060	< .00106	.00074+- .00026	.1	CU
30	ZN	*		.02470+- .00140	.02183+- .00165	.05066+- .03072	.8	ZN
33	AS			< .00080	< .00309	.00042+- .00098	-.1	AS
34	SE			< .00000	< .00088	.00000+- .00041	.0	SE
35	BR			.00770+- .00050	.00680+- .00056	.01118+- .00112	2.8	BR
37	RB			< .00050	< .00097	.00071+- .00074	.2	RB
38	SR			< .00000	< .00097	-.00003+- .00049	.0	SR
39	Y			< .00000	< .00115	.00000+- .00058	.0	Y
40	ZR			< .00000	< .00141	-.00001+- .00084	.0	ZR
42	MO			< .00000	< .00239	.00013+- .00132	.0	MO
46	PD			< .00000	< .00495	.00000+- .00230	.0	PD
47	AG			< .00000	< .00557	-.00004+- .00271	.0	AG
48	CD			< .00210	< .00610	.00024+- .00296	-.2	CD
56	BA			< .00000	< .03844	.00728+- .01863	.0	BA
82	PB	*		.01750+- .00140	.01546+- .00146	.01622+- .00233	-.5	PB
91	OC	*		42.73870+- 3.07850	37.76808+- 3.31303	39.52124+- 17.70570	-.2	OC
92	EC	*		21.14690+- 2.19510	18.68746+- 2.15363	20.52404+- 4.98724	-.1	EC
94	NO3			1.10940+- .06310	.98037+- .07429	.14081+- .03318	-13.6	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 113.2+- 5.7 COARSE: 12.7+- 8.1 TOTAL: 125.8+- 5.8

RESULTS FOR CMB SITE: 26785 YEAR: 87 DATE: 1231 VERSION: 6.0
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 12
R-SQUARE: .93
CHI SQUARE: 1.12
DF: 7

#	TYPE	UG/M3	%
1	CINDR	-.079+- .035	-.065+- .029
3	MAMFP	109.553+- 32.032	90.471+-26.837
4	MAMWS	3.538+- 56.760	2.922+-46.874
6	SCCAR	.795+- .111	.656+- .097
	TOTAL:	113.807+- 33.350	93.984+-27.940

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	113.091+- 33.368
29 30	113.091+- 33.368

SPECIES		INCL	MISS FLG	FINE MEAS. UG/M3		SUSPENDED PARTICULATE PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			121.09200+-	6.06140	100.00000+-	7.07901	113.80720+-	33.35004	-.2	TOTAL
13	AL	*		<	.00000	<	.01197	-.00227+-	.01028	.0	AL
14	SI	*		<	.00000	<	.00661	-.01484+-	.00621	.0	SI
15	P			<	.00000	<	.00966	.00222+-	.00812	.0	P
16	S	*		.26310+-	.01350	.21727+-	.01557	.20458+-	.05921	-1.0	S
17	CL	*		.45660+-	.02400	.37707+-	.02737	.38734+-	.14858	-.5	CL
19	K	*		.52640+-	.02680	.43471+-	.03104	.87350+-	.61559	.6	K
20	CA	*		.01300+-	.00320	.01074+-	.00270	.02224+-	.01382	.7	CA
22	TI			<	.00000	<	.01173	-.00075+-	.00811	.0	TI
23	V			<	.00000	<	.00495	-.00003+-	.00340	.0	V
24	CR			<	.00000	<	.00140	.00002+-	.00088	.0	CR
25	MN			.00310+-	.00050	.00256+-	.00043	.00285+-	.00176	-.1	MN
26	FE	*		.00950+-	.00070	.00785+-	.00070	.01212+-	.00235	1.1	FE
27	CO			<	.00040	<	.00066	.00009+-	.00034	-.4	CO
28	NI			<	.00000	<	.00066	.00007+-	.00033	.0	NI
29	CU			<	.00040	<	.00099	.00088+-	.00035	.4	CU
30	ZN	*		.02960+-	.00160	.02444+-	.00180	.06982+-	.04108	1.0	ZN
33	AS			<	.00010	<	.00355	.00053+-	.00127	.1	AS
34	SE			<	.00000	<	.00083	.00000+-	.00055	.0	SE
35	BR			.02010+-	.00110	.01660+-	.00123	.01376+-	.00135	-3.6	BR
37	RB			<	.00070	<	.00107	.00100+-	.00099	.2	RB
38	SR			<	.00000	<	.00091	-.00007+-	.00066	.0	SR
39	Y			<	.00000	<	.00107	.00000+-	.00077	.0	Y
40	ZR			<	.00000	<	.00132	-.00001+-	.00111	.0	ZR
42	MO			<	.00000	<	.00223	.00015+-	.00176	.0	MO
46	PD			<	.00000	<	.00454	.00000+-	.00307	.0	PD
47	AG			<	.00000	<	.00529	.00002+-	.00362	.0	AG
48	CD			<	.00000	<	.00553	.00033+-	.00395	.0	CD
56	BA			<	.00000	<	.03576	.00997+-	.02488	.0	BA
82	PB	*		.02340+-	.00160	.01932+-	.00164	.01936+-	.00288	-1.2	PB
91	OC	*		67.32240+-	4.80990	55.59608+-	4.84998	60.08204+-	23.67312	-.3	OC
92	EC	*		25.99740+-	2.69400	21.46913+-	2.47072	28.65211+-	6.66919	.4	EC
94	NO3			1.81530+-	.09550	1.49911+-	.10886	.19150+-	.04437	-15.4	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 121.1+- 6.1 COARSE: 21.7+- 8.7 TOTAL: 142.8+- 6.3

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0101 VERSION: 6.0
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 13
R-SQUARE: .96
CHI SQUARE: .95
DF: 7

#	TYPE	UG/M3		%	
1	CINDR	.092+-	.027	.089+-	.027
3	MAMFP	97.589+-	28.523	94.752+-	28.098
4	MAMWS	-14.605+-	50.553	-14.181+-	49.088
6	SCCAR	.953+-	.115	.925+-	.121
	TOTAL:	84.028+-	29.590	81.586+-	29.020

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES	
29 30	82.984+-	29.606
29 30	82.984+-	29.606

FINE SUSPENDED PARTICULATE

SPECIES		INCL	MISS FLG	MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			102.99400+-	5.16530	100.00000+-	7.09249	84.02847+-	29.58987	-.6	TOTAL
13	AL	*		<	.00000	<	.01301	.01393+-	.00926	.0	AL
14	SI	*		.02970+-	.00310	.02884+-	.00334	.02446+-	.00593	-.8	SI
15	P			<	.00000	<	.01029	.00291+-	.00726	.0	P
16	S	*		.23620+-	.01220	.22933+-	.01651	.17001+-	.05282	-1.2	S
17	CL	*		.34540+-	.01840	.33536+-	.02454	.32961+-	.13242	-.1	CL
19	K	*		.51640+-	.02640	.50139+-	.03591	.74047+-	.54850	.4	K
20	CA	*		.03360+-	.00360	.03262+-	.00386	.02846+-	.01233	-.4	CA
22	TI			<	.00000	<	.01262	.00095+-	.00728	.0	TI
23	V			<	.00000	<	.00524	.00003+-	.00305	.0	V
24	CR			<	.00000	<	.00146	.00006+-	.00079	.0	CR
25	MN			.00450+-	.00050	.00437+-	.00053	.00295+-	.00157	-.9	MN
26	FE	*		.02410+-	.00140	.02340+-	.00180	.02738+-	.00280	1.0	FE
27	CO			<	.00000	<	.00078	.00012+-	.00031	.0	CO
28	NI			<	.00000	<	.00068	.00010+-	.00030	.0	NI
29	CU			.00220+-	.00040	.00214+-	.00040	.00107+-	.00033	-2.2	CU
30	ZN	*		.03170+-	.00170	.03078+-	.00226	.05923+-	.03661	.8	ZN
33	AS			<	.00130	<	.00466	.00057+-	.00125	-.1	AS
34	SE			<	.00000	<	.00087	.00000+-	.00049	.0	SE
35	BR			.01780+-	.00100	.01728+-	.00130	.01542+-	.00159	-1.3	BR
37	RB			.00120+-	.00040	.00117+-	.00039	.00082+-	.00089	-.4	RB
38	SR			<	.00000	<	.00097	.00008+-	.00059	.0	SR
39	Y			<	.00000	<	.00117	.00000+-	.00069	.0	Y
40	ZR			<	.00010	<	.00146	.00000+-	.00101	-.1	ZR
42	MO			<	.00000	<	.00233	.00019+-	.00158	.0	MO
46	PD			<	.00000	<	.00485	.00000+-	.00276	.0	PD
47	AG			<	.00000	<	.00544	-.00009+-	.00325	.0	AG
48	CD			<	.00000	<	.00592	.00028+-	.00355	.0	CD
56	BA			<	.01720	<	.03797	.00889+-	.02232	-.2	BA
82	PB	*		.02700+-	.00170	.02622+-	.00211	.02322+-	.00319	-1.0	PB
91	OC	*		45.62620+-	3.28170	44.29986+-	3.88439	42.32140+-	21.11530	-.2	OC
92	EC	*		18.35970+-	1.90860	17.82599+-	2.05749	23.68808+-	5.94357	.9	EC
94	NO3			1.43560+-	.07790	1.39387+-	.10299	.16565+-	.03953	-14.5	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 103.0+- 5.2 COARSE: 14.4+- 7.4 TOTAL: 117.4+- 5.3

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0122 VERSION: 6.0
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 0
R-SQUARE: .94
CHI SQUARE: 2.51
DF: 7

#	TYPE	UG/M3	%
1	CINDR	.760+- .068	.770+- .079
3	MAMFP	70.284+- 21.212	71.273+-21.802
4	MAMWS	8.499+- 37.154	8.618+-37.680
6	SCCAR	.964+- .134	.978+- .144
	TOTAL:	80.507+- 21.633	81.640+-22.312

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	78.783+- 21.638
29 30	78.783+- 21.638

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			98.61190+-	4.91340	100.00000+-	7.04641	80.50675+-	21.63308	-.8	TOTAL
13	AL	*		<	.00540	<	.01663	.07587+-	.01050	3.6	AL
14	SI	*		.20180+-	.01080	.20464+-	.01496	.17631+-	.02014	-1.1	SI
15	P			<	.00000	<	.00862	.00383+-	.00524	.0	P
16	S	*		.17810+-	.00920	.18061+-	.01296	.13979+-	.03809	-1.0	S
17	CL	*		.26690+-	.01440	.27066+-	.01988	.25672+-	.09538	-.1	CL
19	K	*		.45910+-	.02340	.46556+-	.03318	.58320+-	.39500	.3	K
20	CA	*		.05880+-	.00420	.05963+-	.00519	.06484+-	.01032	.5	CA
22	TI			<	.00000	<	.01288	.00758+-	.00530	.0	TI
23	V			<	.00000	<	.00537	.00027+-	.00220	.0	V
24	CR			.00180+-	.00050	.00183+-	.00052	.00021+-	.00057	-2.1	CR
25	MN			.00780+-	.00060	.00791+-	.00072	.00349+-	.00114	-3.3	MN
26	FE	*		.08360+-	.00430	.08478+-	.00607	.07523+-	.00667	-1.1	FE
27	CO			<	.00000	<	.00152	.00023+-	.00079	.0	CO
28	NI			<	.00030	<	.00071	.00015+-	.00021	-.2	NI
29	CU			.00150+-	.00040	.00152+-	.00041	.00112+-	.00025	-.8	CU
30	ZN	*		.02730+-	.00150	.02768+-	.00205	.04726+-	.02637	.8	ZN
33	AS			<	.00010	<	.00406	.00053+-	.00106	.1	AS
34	SE			<	.00000	<	.00081	.00000+-	.00035	.0	SE
35	BR			.00620+-	.00040	.00629+-	.00051	.01505+-	.00160	5.4	BR
37	RB			.00100+-	.00030	.00101+-	.00031	.00069+-	.00064	-.4	RB
38	SR			<	.00040	<	.00091	.00068+-	.00043	.3	SR
39	Y			<	.00000	<	.00101	.00003+-	.00050	.0	Y
40	ZR			<	.00020	<	.00132	.00016+-	.00075	.0	ZR
42	MO			<	.00000	<	.00213	.00019+-	.00114	.0	MO
46	PD			<	.00000	<	.00477	.00001+-	.00198	.0	PD
47	AG			<	.00000	<	.00527	.00006+-	.00234	.0	AG
48	CD			<	.00200	<	.00588	.00027+-	.00256	-.3	CD
56	BA			<	.02320	<	.03845	.00862+-	.01605	-.4	BA
82	PB	*		.02230+-	.00150	.02261+-	.00189	.02351+-	.00306	.4	PB
91	OC	*		38.47440+-	2.78550	39.01598+-	3.42901	42.68422+-	15.20016	.3	OC
92	EC	*		19.23740+-	2.00130	19.50819+-	2.25023	19.23154+-	4.28002	.0	EC
94	NO3			.81950+-	.05080	.83104+-	.06609	.12459+-	.02860	-11.9	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 98.6+- 4.9 COARSE: 45.2+- 7.5 TOTAL: 143.8+- 5.6

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0123 VERSION: 6.0
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 14
R-SQUARE: .89
CHI SQUARE: 5.48
DF: 7

#	TYPE	UG/M3	%
1	CINDR	.884+- .072	.908+- .087
3	MAMFP	69.629+- 21.103	71.460+-21.953
4	MAMWS	7.198+- 36.802	7.388+-37.771
6	SCCAR	1.114+- .152	1.143+- .166
	TOTAL:	78.825+- 21.401	80.898+-22.336

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	76.827+- 21.406
29 30	76.827+- 21.406

	SPECIES	INCL	MISS FLG	FINE MEAS. UG/M3		SUSPENDED PARTICULATE PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			97.43740+-	4.89130	100.00000+-	7.09927	78.82487+-	21.40119	-.8	TOTAL
13	AL	*		.01990+-	.00620	.02042+-	.00645	.08803+-	.01154	5.2	AL
14	SI	*		.27990+-	.01470	.28726+-	.02087	.20522+-	.02335	-2.7	SI
15	P			<	.00000	<	.00821	.00443+-	.00519	.0	P
16	S	*		.15720+-	.00830	.16133+-	.01175	.13872+-	.03777	-.5	S
17	CL	*		.23030+-	.01270	.23636+-	.01763	.25389+-	.09450	.2	CL
19	K	*		.43480+-	.02230	.44624+-	.03202	.57652+-	.39129	.4	K
20	CA	*		.08320+-	.00520	.08539+-	.00685	.07238+-	.01072	-.9	CA
22	TI			<	.00000	<	.01498	.00882+-	.00527	.0	TI
23	V			<	.00000	<	.00626	.00031+-	.00218	.0	V
24	CR			<	.00000	<	.00164	.00025+-	.00056	.0	CR
25	MN			.00500+-	.00060	.00513+-	.00067	.00383+-	.00114	-.9	MN
26	FE	*		.09980+-	.00510	.10242+-	.00734	.08734+-	.00775	-1.3	FE
27	CO			<	.00040	<	.00185	.00026+-	.00091	-.1	CO
28	NI			<	.00020	<	.00082	.00017+-	.00021	.0	NI
29	CU			.00150+-	.00040	.00154+-	.00042	.00129+-	.00026	-.4	CU
30	ZN	*		.02680+-	.00150	.02750+-	.00207	.04698+-	.02612	.8	ZN
33	AS			<	.00070	<	.00472	.00059+-	.00115	.0	AS
34	SE			<	.00000	<	.00103	.00000+-	.00035	.0	SE
35	BR			.00810+-	.00050	.00831+-	.00066	.01704+-	.00184	4.7	BR
37	RB			<	.00030	<	.00103	.00069+-	.00064	.3	RB
38	SR			<	.00050	<	.00113	.00079+-	.00043	.2	SR
39	Y			<	.00000	<	.00133	.00003+-	.00050	.0	Y
40	ZR			<	.00040	<	.00164	.00018+-	.00076	-.1	ZR
42	MO			<	.00000	<	.00277	.00022+-	.00114	.0	MO
46	PD			<	.00000	<	.00564	.00001+-	.00197	.0	PD
47	AG			<	.00200	<	.00647	.00006+-	.00232	-.3	AG
48	CD			<	.00000	<	.00688	.00028+-	.00254	.0	CD
56	BA			<	.03360	<	.04437	.00907+-	.01589	-.5	BA
82	PB	*		.02570+-	.00170	.02638+-	.00219	.02715+-	.00347	.4	PB
91	OC	*		36.16360+-	2.62310	37.11470+-	3.27393	41.57072+-	15.05482	.4	OC
92	EC	*		20.32420+-	2.11290	20.85872+-	2.40804	18.97990+-	4.23985	-.3	EC
94	NO3			.71080+-	.04670	.72949+-	.06032	.12309+-	.02838	-10.8	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 97.4+- 4.9 COARSE: 60.4+- 7.8 TOTAL: 157.9+- 6.0

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0203 VERSION: 6.0
FINE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 0
R-SQUARE: .89
CHI SQUARE: 4.89
DF: 7

#	TYPE	UG/M3	%
1	CINDR	.624+- .051	.895+- .086
3	MAMFP	61.233+- 18.296	87.729+-26.577
4	MAMWS	.412+- 32.093	.591+-45.980
6	SCCAR	.526+- .083	.753+- .124
	TOTAL:	62.796+- 18.690	89.968+-27.152

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	61.645+- 18.694
29 30	61.645+- 18.694

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			69.79760+-	3.48690	100.00000+-	7.06503	62.79559+-	18.69032	-.4	TOTAL
13	AL	*		.01880+-	.00480	.02694+-	.00701	.06153+-	.00879	4.3	AL
14	SI	*		.19360+-	.01030	.27737+-	.02024	.14388+-	.01653	-2.6	SI
15	P			<	.00000	<	.01289	.00236+-	.00454	.0	P
16	S	*		.20280+-	.01040	.29055+-	.02080	.11393+-	.03310	-2.6	S
17	CL	*		.17020+-	.00950	.24385+-	.01827	.21599+-	.08305	.5	CL
19	K	*		.34160+-	.01750	.48942+-	.03502	.49209+-	.34407	.4	K
20	CA	*		.05120+-	.00350	.07335+-	.00621	.05321+-	.00885	.2	CA
22	TI			<	.00580	<	.01634	.00622+-	.00459	.0	TI
23	V			<	.00050	<	.00688	.00022+-	.00190	-.1	V
24	CR			<	.00080	<	.00201	.00016+-	.00049	-.4	CR
25	MN			.00370+-	.00050	.00530+-	.00076	.00253+-	.00099	-1.1	MN
26	FE	*		.06190+-	.00320	.08868+-	.00638	.05581+-	.00523	-1.0	FE
27	CO			<	.00000	<	.00172	.00019+-	.00065	.0	CO
28	NI			<	.00050	<	.00100	.00009+-	.00018	-.6	NI
29	CU			.00160+-	.00030	.00229+-	.00044	.00062+-	.00020	-2.7	CU
30	ZN	*		.02050+-	.00110	.02937+-	.00215	.03898+-	.02296	.8	ZN
33	AS			<	.00020	<	.00358	.00034+-	.00075	.1	AS
34	SE			<	.00000	<	.00100	.00000+-	.00031	.0	SE
35	BR			.00400+-	.00030	.00573+-	.00052	.00879+-	.00088	5.1	BR
37	RB			.00090+-	.00020	.00129+-	.00029	.00057+-	.00055	-.6	RB
38	SR			<	.00050	<	.00115	.00056+-	.00037	.1	SR
39	Y			<	.00000	<	.00129	.00002+-	.00043	.0	Y
40	ZR			<	.00040	<	.00158	.00012+-	.00063	-.2	ZR
42	MO			<	.00050	<	.00272	.00010+-	.00098	-.2	MO
46	PD			<	.00080	<	.00630	.00001+-	.00172	-.2	PD
47	AG			<	.00080	<	.00702	.00001+-	.00203	-.1	AG
48	CD			<	.00000	<	.00745	.00023+-	.00221	.0	CD
56	BA			<	.00770	<	.04929	.00611+-	.01391	.0	BA
82	PB	*		.01230+-	.00100	.01762+-	.00168	.01282+-	.00181	.3	PB
91	OC	*		25.53570+-	1.87430	36.58535+-	3.24831	32.61897+-	13.23092	.5	OC
92	EC	*		13.25250+-	1.38380	18.98704+-	2.19782	15.87582+-	3.72759	.7	EC
94	NO3			.83380+-	.05150	1.19460+-	.09490	.10660+-	.02490	-12.7	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 69.8+- 3.5 COARSE: 34.5+- 5.4 TOTAL: 104.3+- 4.1

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0205 VERSION: 6.0

FINE PARTICULATE FRACTION

SAMPLING DURATION: 24 HRS. WITH START HOUR: 12

R-SQUARE: .92

CHI SQUARE: 3.79

DF: 7

#	TYPE	UG/M3	%
1	CINDR	1.078+- .080	1.098+- .099
3	MAMFP	68.542+- 20.979	69.867+-21.669
4	MAMWS	13.907+- 36.525	14.176+-37.238
6	SCCAR	.526+- .088	.536+- .094
	TOTAL:	84.052+- 21.231	85.677+-22.063

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	82.449+- 21.234
29 30	82.449+- 21.234

	SPECIES	INCL	MISS FLG	FINE MEAS. UG/M3		SUSPENDED PARTICULATE PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			98.10340+-	4.91360	100.00000+-	7.08322	84.05212+-	21.23078	-.6	TOTAL
13	AL	*		.04420+-	.00660	.04505+-	.00710	.10409+-	.01319	4.1	AL
14	SI	*		.32430+-	.01690	.33057+-	.02389	.24686+-	.02819	-2.4	SI
15	P			<	.00000	<	.00703	.00296+-	.00510	.0	P
16	S	*		.13100+-	.00690	.13353+-	.00971	.13786+-	.03711	.2	S
17	CL	*		.30670+-	.01650	.31263+-	.02298	.25439+-	.09302	-.6	CL
19	K	*		.45140+-	.02310	.46013+-	.03295	.58484+-	.38533	.3	K
20	CA	*		.07990+-	.00510	.08144+-	.00661	.08376+-	.01144	.3	CA
22	TI			<	.01250	<	.01286	.01072+-	.00528	-.1	TI
23	V			<	.00000	<	.00540	.00038+-	.00217	.0	V
24	CR			<	.00050	<	.00153	.00026+-	.00056	-.1	CR
25	MN			.00550+-	.00060	.00561+-	.00067	.00331+-	.00111	-1.7	MN
26	FE	*		.10470+-	.00540	.10672+-	.00767	.08806+-	.00879	-1.6	FE
27	CO			<	.00000	<	.00183	.00030+-	.00110	.0	CO
28	NI			<	.00040	<	.00071	.00013+-	.00021	-.4	NI
29	CU			.00170+-	.00040	.00173+-	.00042	.00064+-	.00023	-2.3	CU
30	ZN	*		.02300+-	.00130	.02344+-	.00177	.04624+-	.02573	.9	ZN
33	AS			<	.00050	<	.00265	.00037+-	.00082	.0	AS
34	SE			<	.00000	<	.00082	.00000+-	.00035	.0	SE
35	BR			.00460+-	.00040	.00469+-	.00047	.00911+-	.00089	4.6	BR
37	RB			.00130+-	.00030	.00133+-	.00031	.00071+-	.00062	-.9	RB
38	SR			.00240+-	.00030	.00245+-	.00033	.00097+-	.00042	-2.8	SR
39	Y			<	.00000	<	.00102	.00004+-	.00049	.0	Y
40	ZR			.00140+-	.00040	.00143+-	.00041	.00022+-	.00071	-1.4	ZR
42	MO			<	.00000	<	.00214	.00011+-	.00111	.0	MO
46	PD			<	.00000	<	.00499	.00001+-	.00195	.0	PD
47	AG			<	.00120	<	.00561	.00010+-	.00230	-.2	AG
48	CD			<	.00150	<	.00612	.00029+-	.00251	-.2	CD
56	BA			<	.00000	<	.03853	.00751+-	.01579	.0	BA
82	PB	*		.01230+-	.00110	.01254+-	.00129	.01283+-	.00188	.2	PB
91	OC	*		42.22400+-	3.04970	43.04030+-	3.78297	45.04058+-	14.84713	.2	OC
92	EC	*		22.33910+-	2.32050	22.77097+-	2.62596	19.20696+-	4.17601	-.7	EC
94	NO3			.92330+-	.05560	.94115+-	.07372	.12306+-	.02803	-12.9	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 98.1+- 4.9 COARSE: 50.1+- 7.6 TOTAL: 148.2+- 5.8

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0206 VERSION: 6.0

FINE PARTICULATE FRACTION

SAMPLING DURATION: 24 HRS. WITH START HOUR: 13

R-SQUARE: .92

CHI SQUARE: 3.70

DF: 7

#	TYPE	UG/M3	%
1	CINDR	1.089+- .081	.945+- .085
3	MAMFP	71.883+- 22.063	62.383+-19.400
4	MAMWS	19.124+- 38.452	16.596+-33.380
6	SCCAR	.529+- .090	.459+- .081
	TOTAL:	92.625+- 22.364	80.383+-19.821

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	91.007+- 22.366
29 30	91.007+- 22.366

	SPECIES	INCL	MISS FLG	FINE MEAS. UG/M3		SUSPENDED PARTICULATE PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			115.22990+-	5.76870	100.00000+-	7.07991	92.62491+-	22.36356	-1.0	TOTAL
13	AL	*		.04380+-	.00650	.03801+-	.00595	.10525+-	.01347	4.1	AL
14	SI	*		.31200+-	.01630	.27076+-	.01959	.24948+-	.02851	-1.9	SI
15	P			<	.00000	<	.00599	.00298+-	.00537	.0	P
16	S	*		.12880+-	.00680	.11178+-	.00813	.14800+-	.03896	.5	S
17	CL	*		.33540+-	.01790	.29107+-	.02130	.27088+-	.09761	-.7	CL
19	K	*		.46540+-	.02380	.40389+-	.02890	.62298+-	.40425	.4	K
20	CA	*		.08720+-	.00540	.07567+-	.00603	.08570+-	.01182	-.1	CA
22	TI			<	.00900	<	.01094	.01083+-	.00558	.1	TI
23	V			<	.00000	<	.00460	.00039+-	.00229	.0	V
24	CR			<	.00080	<	.00130	.00027+-	.00059	-.3	CR
25	MN			.00640+-	.00060	.00555+-	.00059	.00342+-	.00117	-2.3	MN
26	FE	*		.10760+-	.00550	.09338+-	.00668	.08902+-	.00889	-1.8	FE
27	CO			<	.00020	<	.00156	.00030+-	.00112	.0	CO
28	NI			<	.00030	<	.00061	.00013+-	.00022	-.2	NI
29	CU			.00170+-	.00040	.00148+-	.00035	.00064+-	.00024	-2.3	CU
30	ZN	*		.02510+-	.00140	.02178+-	.00163	.04935+-	.02700	.9	ZN
33	AS			<	.00100	<	.00226	.00037+-	.00085	-.2	AS
34	SE			<	.00000	<	.00069	.00000+-	.00037	.0	SE
35	BR			.00490+-	.00040	.00425+-	.00041	.00929+-	.00090	4.5	BR
37	RB			.00110+-	.00030	.00095+-	.00026	.00076+-	.00065	-.5	RB
38	SR			.00130+-	.00030	.00113+-	.00027	.00098+-	.00045	-.6	SR
39	Y			<	.00000	<	.00095	.00004+-	.00052	.0	Y
40	ZR			<	.00000	<	.00113	.00023+-	.00075	.0	ZR
42	MO			<	.00000	<	.00191	.00011+-	.00118	.0	MO
46	PD			<	.00000	<	.00417	.00001+-	.00206	.0	PD
47	AG			<	.00130	<	.00477	.00013+-	.00243	-.2	AG
48	CD			<	.00080	<	.00512	.00031+-	.00265	-.1	CD
56	BA			<	.00000	<	.03306	.00800+-	.01670	.0	BA
82	PB	*		.01230+-	.00110	.01067+-	.00109	.01290+-	.00192	.3	PB
91	OC	*		47.53200+-	3.41590	41.24971+-	3.61280	50.11444+-	15.59888	.2	OC
92	EC	*		24.26750+-	2.51600	21.06007+-	2.42468	20.62761+-	4.38227	-.7	EC
94	NO3			1.32110+-	.07250	1.14649+-	.08516	.13032+-	.02938	-15.2	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 115.2+- 5.8 COARSE: 47.8+- 8.7 TOTAL: 163.0+- 6.5

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0213 VERSION: 6.0
FINE PARTICULATE FRACTION
SAMPLING DURATION: 20 HRS. WITH START HOUR: 15
R-SQUARE: .96
CHI SQUARE: 1.73
DF: 7

#	TYPE	UG/M3	%
1	CINDR	1.215+- .088	1.381+- .121
3	MAMFP	68.184+- 20.706	77.497+-23.850
4	MAMWS	4.225+- 36.067	4.802+-40.994
6	SCCAR	.632+- .100	.719+- .119
	TOTAL:	74.256+- 20.941	84.398+-24.171

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	72.409+- 20.944
29 30	72.409+- 20.944

SPECIES		INCL	MISS FLG	FINE MEAS. UG/M3	SUSPENDED PARTICULATE PERCENT	CALC. UG/M3	RATIO R/U	
1	TOTAL			87.98260+- 4.39370	100.00000+- 7.06234	74.25587+- 20.94070	-.6	TOTAL
13	AL	*		.07340+- .00750	.08343+- .00949	.11731+- .01445	2.7	AL
14	SI	*		.32920+- .01710	.37416+- .02696	.27852+- .03174	-1.4	SI
15	P			< .00000	< .00909	.00345+- .00506	.0	P
16	S	*		.16280+- .00850	.18504+- .01337	.13037+- .03688	-.9	S
17	CL	*		.23640+- .01300	.26869+- .01996	.24468+- .09249	.1	CL
19	K	*		.40470+- .02070	.45998+- .03288	.56203+- .38315	.4	K
20	CA	*		.09170+- .00550	.10423+- .00813	.09137+- .01204	.0	CA
22	TI			< .01030	< .01558	.01209+- .00524	.1	TI
23	V			< .00010	< .00648	.00043+- .00214	.1	V
24	CR			< .00020	< .00182	.00030+- .00055	.1	CR
25	MN			.00660+- .00060	.00750+- .00078	.00355+- .00111	-2.4	MN
26	FE	*		.11210+- .00570	.12741+- .00908	.10000+- .00992	-1.1	FE
27	CO			< .00050	< .00216	.00032+- .00124	-.1	CO
28	NI			< .00040	< .00091	.00015+- .00021	-.3	NI
29	CU			.00160+- .00040	.00182+- .00046	.00077+- .00022	-1.8	CU
30	ZN	*		.02210+- .00120	.02512+- .00185	.04434+- .02557	.9	ZN
33	AS			< .00260	< .00353	.00041+- .00086	-.7	AS
34	SE			< .00000	< .00091	.00000+- .00034	.0	SE
35	BR			.00550+- .00040	.00625+- .00055	.01046+- .00106	4.4	BR
37	RB			.00140+- .00030	.00159+- .00035	.00067+- .00062	-1.1	RB
38	SR			.00090+- .00090	.00102+- .00102	.00109+- .00042	.2	SR
39	Y			< .00030	< .00125	.00004+- .00048	-.2	Y
40	ZR			< .00010	< .00159	.00024+- .00070	.1	ZR
42	MO			< .00000	< .00261	.00013+- .00110	.0	MO
46	PD			< .00000	< .00591	.00001+- .00192	.0	PD
47	AG			< .00240	< .00682	.00005+- .00226	-.4	AG
48	CD			< .00270	< .00739	.00029+- .00247	-.3	CD
56	BA			< .00520	< .04683	.00742+- .01553	.1	BA
82	PB	*		.01500+- .00120	.01705+- .00161	.01543+- .00214	.2	PB
91	OC	*		34.69550+- 2.52510	39.43450+- 3.48066	38.73555+- 14.73628	.3	OC
92	EC	*		18.49350+- 1.92440	21.01950+- 2.42608	18.10472+- 4.15108	-.1	EC
94	NO3			1.35840+- .07660	1.54394+- .11630	.11975+- .02795	-15.2	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 88.0+- 4.4 COARSE: 49.6+- 6.9 TOTAL: 137.6+- 5.3

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0214 VERSION: 6.0
FINE PARTICULATE FRACTION
SAMPLING DURATION: 22 HRS. WITH START HOUR: 14
R-SQUARE: .97
CHI SQUARE: 1.57
DF: 7

#	TYPE	UG/M3	%
1	CINDR	2.963+- .195	3.624+- .300
3	MAMFP	84.908+- 25.769	103.867+-31.953
4	MAMWS	-15.443+- 44.829	-18.892+-54.848
6	SCCAR	.641+- .106	.784+- .136
	TOTAL:	73.068+- 25.946	89.384+-32.055

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	69.464+- 25.948
29 30	69.464+- 25.948

SPECIES		INCL	MISS FLG	FINE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			81.74650+-	4.10850	100.00000+-	7.10770	73.06817+-	25.94560	-.3	TOTAL
13	AL	*		.21610+-	.01380	.26435+-	.02148	.28122+-	.03260	1.8	AL
14	SI	*		.69000+-	.03520	.84407+-	.06045	.67571+-	.07698	-.2	SI
15	P			<	.00000	<	.01162	.00578+-	.00633	.0	P
16	S	*		.20390+-	.01050	.24943+-	.01795	.14536+-	.04595	-1.2	S
17	CL	*		.25670+-	.01400	.31402+-	.02329	.28636+-	.11522	.3	CL
19	K	*		.43640+-	.02240	.53385+-	.03835	.66973+-	.47730	.5	K
20	CA	*		.25720+-	.01350	.31463+-	.02286	.20035+-	.02318	-2.1	CA
22	TI			.01770+-	.00440	.02165+-	.00549	.02944+-	.00718	1.4	TI
23	V			<	.00000	<	.00661	.00105+-	.00275	.0	V
24	CR			<	.00140	<	.00196	.00069+-	.00069	-.4	CR
25	MN			.00850+-	.00070	.01040+-	.00100	.00589+-	.00143	-1.6	MN
26	FE	*		.21940+-	.01110	.26839+-	.01914	.22344+-	.02387	.2	FE
27	CO			<	.00000	<	.00416	.00071+-	.00299	.0	CO
28	NI			.00080+-	.00030	.00098+-	.00037	.00027+-	.00026	-1.3	NI
29	CU			.00290+-	.00040	.00355+-	.00052	.00086+-	.00028	-4.2	CU
30	ZN	*		.02090+-	.00120	.02557+-	.00195	.05083+-	.03186	.9	ZN
33	AS			<	.00090	<	.00379	.00048+-	.00101	-.1	AS
34	SE			<	.00000	<	.00098	.00000+-	.00043	.0	SE
35	BR			.00630+-	.00040	.00771+-	.00062	.01087+-	.00109	4.0	BR
37	RB			.00160+-	.00030	.00196+-	.00038	.00080+-	.00077	-1.0	RB
38	SR			.00330+-	.00040	.00404+-	.00053	.00266+-	.00055	-.9	SR
39	Y			<	.00030	<	.00122	.00010+-	.00061	-.2	Y
40	ZR			<	.00090	<	.00159	.00056+-	.00088	-.2	ZR
42	MO			<	.00010	<	.00257	.00013+-	.00138	.0	MO
46	PD			<	.00240	<	.00600	.00003+-	.00243	-.4	PD
47	AG			<	.00150	<	.00661	-.00004+-	.00286	-.3	AG
48	CD			<	.00000	<	.00697	.00044+-	.00312	.0	CD
56	BA			<	.01980	<	.04626	.00848+-	.01961	-.3	BA
82	PB	*		.01570+-	.00120	.01921+-	.00176	.01566+-	.00230	.0	PB
91	OC	*		31.47910+-	2.30340	38.50819+-	3.41838	35.01363+-	18.38326	.2	OC
92	EC	*		17.27630+-	1.80180	21.13400+-	2.44671	20.24098+-	5.17228	.5	EC
94	NO3			.88630+-	.05540	1.08421+-	.08696	.14336+-	.03597	-11.2	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 81.7+- 4.1 COARSE: 62.3+- 6.8 TOTAL: 144.1+- 5.4

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0219 VERSION: 6.0

FINE PARTICULATE FRACTION

SAMPLING DURATION: 7 HRS. WITH START HOUR: 15

R-SQUARE: .94

CHI SQUARE: 2.94

DF: 7

#	TYPE	UG/M3	%
1	CINDR	.893+- .073	.847+- .081
3	MAMFP	84.275+- 25.431	79.992+-24.466
4	MAMWS	9.855+- 44.571	9.354+-42.308
6	SCCAR	.761+- .116	.722+- .116
	TOTAL:	95.784+- 25.943	90.915+-25.039

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	94.130+- 25.948
29 30	94.130+- 25.948

	SPECIES	INCL	MISS FLG	FINE MEAS. UG/M3		SUSPENDED PARTICULATE PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			105.35490+-	5.25730	100.00000+-	7.05705	95.78381+-	25.94348	-.4	TOTAL
13	AL	*		.03370+-	.00680	.03199+-	.00665	.08795+-	.01239	3.8	AL
14	SI	*		.25510+-	.01350	.24213+-	.01761	.20580+-	.02362	-1.8	SI
15	P			<	.00000	<	.00797	.00341+-	.00626	.0	P
16	S	*		.16450+-	.00860	.15614+-	.01128	.16446+-	.04559	.0	S
17	CL	*		.38440+-	.02040	.36486+-	.02658	.30606+-	.11433	-.7	CL
19	K	*		.58830+-	.02990	.55840+-	.03977	.69828+-	.47362	.2	K
20	CA	*		.07670+-	.00540	.07280+-	.00628	.07613+-	.01230	.0	CA
22	TI			<	.00000	<	.01376	.00889+-	.00635	.0	TI
23	V			<	.00000	<	.00579	.00032+-	.00263	.0	V
24	CR			<	.00000	<	.00161	.00023+-	.00068	.0	CR
25	MN			.00580+-	.00060	.00551+-	.00063	.00363+-	.00136	-1.5	MN
26	FE	*		.09130+-	.00470	.08666+-	.00621	.08016+-	.00749	-1.3	FE
27	CO			<	.00030	<	.00161	.00027+-	.00093	.0	CO
28	NI			<	.00050	<	.00076	.00014+-	.00025	-.4	NI
29	CU			.00220+-	.00040	.00209+-	.00039	.00089+-	.00028	-2.7	CU
30	ZN	*		.03660+-	.00190	.03474+-	.00250	.05563+-	.03161	.6	ZN
33	AS			<	.00070	<	.00332	.00048+-	.00105	-.1	AS
34	SE			<	.00000	<	.00085	.00000+-	.00042	.0	SE
35	BR			.00630+-	.00050	.00598+-	.00056	.01269+-	.00128	4.7	BR
37	RB			.00180+-	.00030	.00171+-	.00030	.00083+-	.00076	-1.2	RB
38	SR			<	.00080	<	.00095	.00080+-	.00051	.0	SR
39	Y			<	.00000	<	.00114	.00003+-	.00060	.0	Y
40	ZR			<	.00030	<	.00142	.00018+-	.00087	-.1	ZR
42	MO			<	.00000	<	.00228	.00015+-	.00136	.0	MO
46	PD			<	.00040	<	.00522	.00001+-	.00237	-.1	PD
47	AG			<	.00020	<	.00579	.00007+-	.00280	.0	AG
48	CD			<	.00030	<	.00626	.00032+-	.00306	.0	CD
56	BA			<	.03080	<	.04065	.00902+-	.01923	-.5	BA
82	PB	*		.01770+-	.00130	.01680+-	.00149	.01856+-	.00260	.3	PB
91	OC	*		48.10380+-	3.46230	45.65882+-	3.99888	50.81504+-	18.22486	.1	OC
92	EC	*		23.45560+-	2.43370	22.26342+-	2.56327	22.87276+-	5.13175	-.1	EC
94	NO3			1.08490+-	.06490	1.02976+-	.08022	.14929+-	.03428	-12.7	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 105.4+- 5.3 COARSE: 43.1+- 7.9 TOTAL: 148.4+- 5.9

RESULTS FOR CMB SITE: 26785 YEAR: 87 DATE: 1226 VERSION: 6.0
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 12
R-SQUARE: .82
CHI SQUARE: 1.53
DF: 9

#	TYPE	UG/M3	%
2	PAVRD	1.933+- .360	15.279+- 3.207
3	MAMFP	5.853+- 1.372	46.264+-11.728
6	SCCAR	.339+- .420	2.679+- 3.328
	TOTAL:	8.125+- 1.347	64.223+-12.319

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
27 50	2.272+- .449
27 50	2.272+- .449

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3	PERCENT	CALC. UG/M3	RATIO R/U	
1	TOTAL			12.65120+- 1.22090	100.00000+- 13.64782	8.12494+- 1.34690	-2.5	TOTAL
13	AL	*		.10290+- .03240	.81336+- .26786	.15440+- .02176	1.3	AL
14	SI	*		.42550+- .13480	3.36332+- 1.11385	.48879+- .07842	.4	SI
15	P			< .00170	< .04981	.00533+- .00193	.6	P
16	S	*		.04130+- .01470	.32645+- .12039	.01766+- .00664	-1.5	S
17	CL	*		.12310+- .03670	.97303+- .30491	.02576+- .07083	-1.2	CL
19	K	*		.08210+- .01750	.64895+- .15184	.08854+- .03348	.2	K
20	CA	*		.12710+- .02150	1.00465+- .19566	.06667+- .01257	-2.4	CA
22	TI	*		< .01100	< .10152	.00840+- .00129	-.2	TI
23	V			< .00080	< .04269	.00058+- .00034	.0	V
24	CR			< .00100	< .01267	.00050+- .00018	-.3	CR
25	MN			.00540+- .00060	.04268+- .00628	.00275+- .00147	-1.7	MN
26	FE	*		.10810+- .00560	.85446+- .09359	.11562+- .07895	.1	FE
27	CO			< .00000	< .01423	.00018+- .00135	.0	CO
28	NI			< .00000	< .00553	.00033+- .00038	.0	NI
29	CU			.01150+- .00070	.09090+- .01037	.00195+- .00208	-4.4	CU
30	ZN	*		.00420+- .00050	.03320+- .00509	.00725+- .00447	.7	ZN
33	AS			< .00000	< .01897	.00004+- .00046	.0	AS
34	SE			< .00000	< .00632	.00001+- .00006	.0	SE
35	BR			.00190+- .00030	.01502+- .00278	.00113+- .00215	-.4	BR
37	RB			< .00000	< .00632	.00037+- .00018	.0	RB
38	SR			< .00040	< .00712	.00068+- .00163	.1	SR
39	Y			< .00000	< .00869	.00004+- .00009	.0	Y
40	ZR			< .00110	< .01110	.00032+- .00023	-.6	ZR
42	MO			< .00000	< .01818	.00018+- .00027	.0	MO
46	PD			< .00020	< .04110	.00003+- .00036	.0	PD
47	AG			< .00000	< .04506	.00007+- .00043	.0	AG
48	CD			< .00000	< .04822	.00018+- .00048	.0	CD
56	BA			< .00000	< .30590	.00669+- .00664	.0	BA
82	PB	*		.00880+- .00100	.06956+- .01037	.00817+- .01339	.0	PB
91	OC	*		4.88160+- .59820	38.58606+- 6.01864	3.38896+- 1.28290	-1.1	OC
92	EC	*		1.19620+- .22780	9.45523+- 2.01862	1.56203+- .36672	.8	EC
94	NO3			.04180+- .02830	.33040+- .22596	.01018+- .01177	-1.0	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 113.2+- 5.7 COARSE: 12.7+- 1.2 TOTAL: 125.8+- 5.8

RESULTS FOR CMB SITE: 26785 YEAR: 87 DATE: 1230 VERSION: 6.0
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 12
R-SQUARE: .92
CHI SQUARE: .25
DF: 9

#	TYPE	UG/M3	%
2	PAVRD	1.326+- .774	9.390+- 5.551
3	MAMFP	9.473+- 2.979	67.075+-22.005
6	SCCAR	2.562+- 2.610	18.142+-18.556
	TOTAL:	13.362+- 2.907	94.607+-22.399

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 50	12.036+- 3.049
29 50	12.036+- 3.049

	SPECIES	INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			14.12370+-	1.31990	100.00000+-	13.21623	13.36202+-	2.90671	-.2	TOTAL
13	AL	*		.10230+-	.03270	.72431+-	.24122	.12506+-	.05697	.3	AL
14	SI	*		.66620+-	.21100	4.71689+-	1.55762	.47638+-	.36344	-.5	SI
15	P			<	.00210	<	.04817	.00926+-	.01339	.5	P
16	S	*		.04040+-	.01500	.28604+-	.10952	.02403+-	.04243	-.4	S
17	CL	*		.02850+-	.01010	.20179+-	.07396	.03666+-	.53178	.0	CL
19	K	*		.10090+-	.02120	.71440+-	.16428	.10391+-	.05703	.0	K
20	CA	*		.11880+-	.02020	.84114+-	.16320	.07795+-	.06991	-.6	CA
22	TI	*		<	.00260	<	.08994	.00595+-	.00354	.3	TI
23	V			<	.00000	<	.03753	.00040+-	.00179	.0	V
24	CR			<	.00070	<	.01063	.00077+-	.00122	.0	CR
25	MN			.00680+-	.00060	.04815+-	.00619	.00666+-	.01092	.0	MN
26	FE	*		.08960+-	.00470	.63439+-	.06799	.34347+-	.59144	.4	FE
27	CO			<	.00020	<	.01133	.00013+-	.00093	.0	CO
28	NI			<	.00010	<	.00496	.00153+-	.00283	.5	NI
29	CU			.02380+-	.00130	.16851+-	.01824	.00812+-	.01566	-1.0	CU
30	ZN	*		.00580+-	.00060	.04107+-	.00572	.02244+-	.02967	.6	ZN
33	AS			<	.00000	<	.07930	.00004+-	.00278	.0	AS
34	SE			<	.00000	<	.00566	.00006+-	.00019	.0	SE
35	BR			.00150+-	.00030	.01062+-	.00234	.00719+-	.01623	.4	BR
37	RB			<	.00000	<	.00566	.00071+-	.00128	.0	RB
38	SR			.00100+-	.00090	.00708+-	.00641	.00046+-	.01231	.0	SR
39	Y			<	.00000	<	.00920	.00003+-	.00038	.0	Y
40	ZR			<	.00040	<	.00992	.00022+-	.00168	-.1	ZR
42	MO			<	.00000	<	.01628	.00103+-	.00159	.0	MO
46	PD			<	.00000	<	.03399	.00002+-	.00099	.0	PD
47	AG			<	.00000	<	.03894	.00005+-	.00129	.0	AG
48	CD			<	.00070	<	.04248	.00014+-	.00169	-.1	CD
56	BA			<	.01270	<	.27131	.03004+-	.04886	.3	BA
82	PB	*		.06810+-	.00380	.48217+-	.05248	.05333+-	.10125	-.1	PB
91	OC	*		8.35720+-	1.00300	59.17146+-	9.00055	6.10338+-	2.58669	-.8	OC
92	EC	*		2.29440+-	.26340	16.24504+-	2.40475	2.75973+-	.84841	.5	EC
94	NO3			.10650+-	.02990	.75405+-	.22312	.01647+-	.00879	-2.9	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 118.7+- 5.9 COARSE: 14.1+- 1.3 TOTAL: 132.9+- 6.1

RESULTS FOR CMB SITE: 26785 YEAR: 87 DATE: 1231 VERSION: 6.0
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 12
R-SQUARE: .91
CHI SQUARE: .51
DF: 9

#	TYPE	UG/M3	%
2	PAVRD	3.248+- .789	14.978+- 3.822
3	MAMFP	11.454+- 3.319	52.816+-15.855
6	SCCAR	2.489+- 2.581	11.476+-11.937
	TOTAL:	17.190+- 3.210	79.270+-16.057

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 50	13.942+- 3.300
29 50	13.942+- 3.300

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3	PERCENT	CALC. UG/M3	RATIO R/U	
1	TOTAL			21.68560+- 1.70300	100.00000+- 11.10601	17.19013+- 3.20975	-1.2	TOTAL
13	AL	*		.17210+- .05350	.79361+- .25446	.27513+- .06373	1.2	AL
14	SI	*		1.08980+- .34500	5.02545+- 1.63914	.93746+- .36580	-.3	SI
15	P			< .00000	< .03412	.01357+- .01305	.0	P
16	S	*		.03040+- .01260	.14019+- .05914	.03434+- .04146	.1	S
17	CL	*		.08390+- .02560	.38689+- .12190	.04891+- .51659	-.1	CL
19	K	*		.19050+- .03910	.87846+- .19305	.16157+- .06793	-.4	K
20	CA	*		.19860+- .03360	.91582+- .17082	.13788+- .06917	-.8	CA
22	TI	*		.01910+- .00430	.08808+- .02100	.01426+- .00388	-.8	TI
23	V			< .00070	< .02444	.00098+- .00177	.0	V
24	CR			< .00090	< .00692	.00119+- .00119	.1	CR
25	MN			.00800+- .00070	.03689+- .00434	.00850+- .01062	.0	MN
26	FE	*		.15760+- .00800	.72675+- .06796	.41186+- .57467	.4	FE
27	CO			< .00010	< .01153	.00030+- .00227	.1	CO
28	NI			< .00040	< .00323	.00163+- .00275	.4	NI
29	CU			< .00080	< .00462	.00886+- .01521	.5	CU
30	ZN	*		.00890+- .00070	.04104+- .00456	.02480+- .02893	.5	ZN
33	AS			< .00000	< .08347	.00008+- .00273	.0	AS
34	SE			< .00000	< .00415	.00006+- .00020	.0	SE
35	BR			.00180+- .00040	.00830+- .00196	.00711+- .01577	.3	BR
37	RB			< .00010	< .00415	.00098+- .00125	.6	RB
38	SR			.00150+- .00030	.00692+- .00149	.00114+- .01196	.0	SR
39	Y			< .00000	< .00692	.00006+- .00038	.0	Y
40	ZR			< .00100	< .00647	.00053+- .00163	-.2	ZR
42	MO			< .00000	< .01061	.00104+- .00156	.0	MO
46	PD			< .00000	< .02213	.00005+- .00108	.0	PD
47	AG			< .00000	< .02536	.00011+- .00138	.0	AG
48	CD			< .00170	< .02767	.00031+- .00176	-.2	CD
56	BA			< .00040	< .17523	.03201+- .04749	.5	BA
82	PB	*		.11200+- .00590	.51647+- .04884	.05304+- .09834	-.6	PB
91	OC	*		9.34960+- 1.21210	43.11432+- 6.53494	7.29603+- 2.91379	-.7	OC
92	EC	*		2.80060+- .31210	12.91456+- 1.76065	3.28077+- .92371	.5	EC
94	NO3			.11390+- .03080	.52523+- .14790	.01992+- .01992	-2.6	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 121.1+- 6.1 COARSE: 21.7+- 1.7 TOTAL: 142.8+- 6.3

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0101 VERSION: 6.0
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 13
R-SQUARE: .95
CHI SQUARE: .92
DF: 9

#	TYPE	UG/M3		%	
2	PAVRD	9.794+-	.992	67.789+-	9.065
3	MAMFP	3.657+-	1.091	25.310+-	7.870
6	SCCAR	.181+-	.285	1.250+-	1.977
	TOTAL:	13.632+-	1.290	94.349+-	12.148

UNCERTAINTY/SIMILARITY CLUSTERS: SUM OF CLUSTER SOURCES

	SPECIES	INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			14.44840+-	1.26180	100.00000+-	12.35054	13.63190+-	1.28973	-.5	TOTAL
13	AL	*		.72330+-	.21640	5.00609+-	1.56025	.76920+-	.10391	.2	AL
14	SI	*		2.79480+-	.88470	19.34332+-	6.35192	2.38359+-	.31625	-.4	SI
15	P			<	.00460	<	.05060	.02331+-	.00333	2.3	P
16	S	*		.03780+-	.01370	.26162+-	.09753	.04157+-	.00955	.2	S
17	CL	*		.17660+-	.05210	1.22228+-	.37606	.04002+-	.04042	-2.1	CL
19	K	*		.21050+-	.04300	1.45691+-	.32367	.24301+-	.03542	.6	K
20	CA	*		.45210+-	.07620	3.12907+-	.59399	.31131+-	.04343	-1.6	CA
22	TI	*		.03970+-	.00460	.27477+-	.03987	.04242+-	.00573	.4	TI
23	V			<	.00160	<	.03739	.00295+-	.00091	.2	V
24	CR			.00260+-	.00050	.01800+-	.00380	.00223+-	.00033	-.6	CR
25	MN			.01190+-	.00090	.08236+-	.00952	.01040+-	.00159	-.8	MN
26	FE	*		.40180+-	.02040	2.78093+-	.28092	.41161+-	.06821	.1	FE
27	CO			<	.00000	<	.04153	.00088+-	.00685	.0	CO
28	NI			.00080+-	.00020	.00554+-	.00147	.00083+-	.00023	.1	NI
29	CU			.01400+-	.00080	.09690+-	.01011	.00542+-	.00143	-5.2	CU
30	ZN	*		.01000+-	.00080	.06921+-	.00820	.01146+-	.00259	.5	ZN
33	AS			<	.00020	<	.02076	.00017+-	.00140	.0	AS
34	SE			<	.00000	<	.00554	.00002+-	.00024	.0	SE
35	BR			.00110+-	.00030	.00761+-	.00218	.00091+-	.00115	-.2	BR
37	RB			<	.00040	<	.00554	.00138+-	.00018	1.2	RB
38	SR			.00380+-	.00040	.02630+-	.00360	.00343+-	.00092	-.4	SR
39	Y			<	.00000	<	.00692	.00019+-	.00031	.0	Y
40	ZR			.00150+-	.00050	.01038+-	.00358	.00161+-	.00025	.2	ZR
42	MO			<	.00000	<	.01523	.00030+-	.00072	.0	MO
46	PD			<	.00000	<	.03253	.00016+-	.00148	.0	PD
47	AG			<	.00060	<	.03668	.00033+-	.00177	.0	AG
48	CD			<	.00010	<	.03945	.00084+-	.00190	.1	CD
56	BA			<	.01750	<	.25354	.01563+-	.00541	-.1	BA
82	PB	*		.01280+-	.00120	.08859+-	.01135	.00990+-	.00716	-.4	PB
91	OC	*		2.68020+-	.52960	18.55015+-	4.00750	2.91758+-	.84033	.2	OC
92	EC	*		1.19640+-	.21840	8.28050+-	1.67566	1.08342+-	.26700	-.3	EC
94	NO3			.03470+-	.02890	.24016+-	.20112	.00636+-	.05842	-.4	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 103.0+- 5.2 COARSE: 14.4+- 1.3 TOTAL: 117.4+- 5.3

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0122 VERSION: 6.0
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 0
R-SQUARE: .97
CHI SQUARE: .53
DF: 9

#	TYPE	UG/M3		%	
2	PAVRD	40.735+-	3.878	90.112+-	10.205
3	MAMFP	2.886+-	2.418	6.385+-	5.362
6	SCCAR	-1.452+-	1.868	-3.212+-	4.138
	TOTAL:	42.169+-	3.799	93.285+-	10.167

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES	
29 50	1.435+-	2.328
29 50	1.435+-	2.328

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			45.20470+-	2.77250	100.00000+-	8.67367	42.16929+-	3.79915	-.6	TOTAL
13	AL	*		3.30130+-	.98410	7.30300+-	2.22259	3.18084+-	.43300	-.1	AL
14	SI	*		10.67550+-	3.37950	23.61591+-	7.61501	9.77989+-	1.32686	-.2	SI
15	P			.02670+-	.01160	.05906+-	.02592	.09166+-	.01525	3.4	P
16	S	*		.09520+-	.03350	.21060+-	.07522	.14880+-	.04394	1.0	S
17	CL	*		.45050+-	.13130	.99658+-	.29682	.12357+-	.30712	-1.0	CL
19	K	*		.75480+-	.15110	1.66974+-	.34959	.91321+-	.12147	.8	K
20	CA	*		1.58590+-	.26700	3.50826+-	.62862	1.26260+-	.18373	-1.0	CA
22	TI	*		.18140+-	.01050	.40129+-	.03384	.17622+-	.02387	-.2	TI
23	V			.01070+-	.00290	.02367+-	.00658	.01226+-	.00384	.3	V
24	CR			.00770+-	.00080	.01703+-	.00206	.00886+-	.00147	.7	CR
25	MN			.03580+-	.00240	.07920+-	.00720	.03860+-	.00847	.3	MN
26	FE	*		1.59930+-	.08090	3.53791+-	.28127	1.46213+-	.40340	-.3	FE
27	CO			<	.00000	<	.05176	.00363+-	.02847	.0	CO
28	NI			.00230+-	.00040	.00509+-	.00094	.00220+-	.00168	-.1	NI
29	CU			.00350+-	.00040	.00774+-	.00100	.01614+-	.00965	1.3	CU
30	ZN	*		.01530+-	.00100	.03385+-	.00303	.02673+-	.01700	.7	ZN
33	AS			<	.00000	<	.00686	.00070+-	.00599	.0	AS
34	SE			<	.00000	<	.00177	.00005+-	.00098	.0	SE
35	BR			.00120+-	.00030	.00265+-	.00068	-.00248+-	.00921	-.4	BR
37	RB			.00360+-	.00040	.00796+-	.00101	.00523+-	.00095	1.6	RB
38	SR			.01710+-	.00100	.03783+-	.00321	.01426+-	.00710	-.4	SR
39	Y			<	.00090	<	.00266	.00077+-	.00128	-.1	Y
40	ZR			.00530+-	.00060	.01172+-	.00151	.00668+-	.00131	1.0	ZR
42	MO			<	.00120	<	.00531	.00037+-	.00307	-.2	MO
46	PD			<	.00000	<	.01150	.00065+-	.00617	.0	PD
47	AG			<	.00250	<	.01328	.00138+-	.00737	-.1	AG
48	CD			<	.00220	<	.01416	.00347+-	.00792	.1	CD
56	BA			.04160+-	.01340	.09203+-	.03018	.04049+-	.03248	.0	BA
82	PB	*		.01360+-	.00120	.03009+-	.00323	-.00396+-	.05743	-.3	PB
91	OC	*		4.23470+-	.55590	9.36783+-	1.35734	4.80103+-	1.54652	.3	OC
92	EC	*		1.48910+-	.23080	3.29413+-	.54909	1.08163+-	.70554	-.5	EC
94	NO3			.08310+-	.02840	.18383+-	.06383	.00502+-	.24290	-.3	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 98.6+- 4.9 COARSE: 45.2+- 2.8 TOTAL: 143.8+- 5.6

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0123 VERSION: 6.0
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 24 HRS. WITH START HOUR: 14
R-SQUARE: .97
CHI SQUARE: .53
DF: 9

#	TYPE	UG/M3	%
2	PAVRD	56.337+- 5.254	93.198+-10.240
3	MAMFP	4.809+- 3.205	7.956+- 5.323
6	SCCAR	-1.757+- 2.311	-2.906+- 3.826
	TOTAL:	59.389+- 5.140	98.247+-10.241

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 50	3.053+- 3.109
29 50	3.053+- 3.109

SPECIES		INCL	MISS FLG	COARSE SUSPENDED PARTICULATE MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			60.44850+-	3.51180	100.00000+-	8.21598	59.38908+-	5.13997	-.2	TOTAL
13	AL	*		4.46910+-	1.33160	7.39324+-	2.24435	4.40121+-	.59848	.0	AL
14	SI	*		14.03960+-	4.44380	23.22572+-	7.47419	13.54091+-	1.82994	-.1	SI
15	P			.02920+-	.01280	.04831+-	.02136	.12738+-	.02048	4.1	P
16	S	*		.14680+-	.05130	.24285+-	.08603	.20749+-	.05865	.8	S
17	CL	*		.55400+-	.16130	.91648+-	.27210	.17375+-	.37377	-.9	CL
19	K	*		1.00320+-	.20040	1.65959+-	.34526	1.26944+-	.16849	1.0	K
20	CA	*		2.16130+-	.36360	3.57544+-	.63636	1.74971+-	.25272	-.9	CA
22	TI	*		.25670+-	.01400	.42466+-	.03384	.24374+-	.03298	-.4	TI
23	V			<	.01040	<	.01756	.01696+-	.00527	.6	V
24	CR			.01130+-	.00100	.01869+-	.00198	.01230+-	.00199	.4	CR
25	MN			.05170+-	.00340	.08553+-	.00751	.05390+-	.01096	.2	MN
26	FE	*		2.25570+-	.11340	3.73161+-	.28669	2.05063+-	.51075	-.4	FE
27	CO			<	.00000	<	.05443	.00502+-	.03938	.0	CO
28	NI			.00310+-	.00050	.00513+-	.00088	.00319+-	.00206	.0	NI
29	CU			.00670+-	.00050	.01108+-	.00105	.02306+-	.01195	1.4	CU
30	ZN	*		.02330+-	.00140	.03855+-	.00322	.03900+-	.02071	.8	ZN
33	AS			<	.00100	<	.00744	.00097+-	.00822	.0	AS
34	SE			<	.00000	<	.00132	.00007+-	.00136	.0	SE
35	BR			.00140+-	.00030	.00232+-	.00051	-.00273+-	.01115	-.4	BR
37	RB			.00450+-	.00040	.00744+-	.00079	.00728+-	.00122	2.2	RB
38	SR			.02460+-	.00130	.04070+-	.00320	.01972+-	.00863	-.6	SR
39	Y			<	.00090	<	.00199	.00107+-	.00177	.1	Y
40	ZR			.00600+-	.00070	.00993+-	.00129	.00924+-	.00169	1.8	ZR
42	MO			<	.00110	<	.00381	.00061+-	.00420	-.1	MO
46	PD			<	.00400	<	.00944	.00090+-	.00853	-.3	PD
47	AG			<	.00000	<	.00993	.00192+-	.01018	.0	AG
48	CD			<	.00100	<	.01075	.00480+-	.01093	.3	CD
56	BA			.05940+-	.01400	.09827+-	.02385	.05875+-	.04093	.0	BA
82	PB	*		.02320+-	.00160	.03838+-	.00346	-.00033+-	.06951	-.3	PB
91	OC	*		6.44910+-	.63280	10.66875+-	1.21657	7.16739+-	2.13315	.3	OC
92	EC	*		2.27360+-	.26590	3.76122+-	.49116	1.73631+-	.96074	-.5	EC
94	NO3			.09300+-	.02860	.15385+-	.04815	.00836+-	.33594	-.3	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 97.4+- 4.9 COARSE: 60.4+- 3.5 TOTAL: 157.9+- 6.0

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0214 VERSION: 6.0

COARSE PARTICULATE FRACTION

SAMPLING DURATION: 22 HRS. WITH START HOUR: 14

R-SQUARE: .96

CHI SQUARE: .64

DF: 9

#	TYPE	UG/M3		%
2	PAVRD	58.473+-	5.741	93.826+-10.629
3	MAMFP	5.024+-	3.633	8.062+- 5.847
6	SCCAR	-2.328+-	2.952	-3.735+- 4.741
	TOTAL:	61.170+-	5.675	98.152+-10.663

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES	
29 50	2.696+-	3.473
29 50	2.696+-	3.473

COARSE SUSPENDED PARTICULATE

SPECIES		INCL	MISS FLG	MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			62.32100+-	3.52260	100.00000+-	7.99363	61.16959+-	5.67483	-.2	TOTAL
13	AL	*		4.72970+-	1.40910	7.58926+-	2.30137	4.56403+-	.62196	-.1	AL
14	SI	*		13.97170+-	4.42260	22.41893+-	7.20874	14.02399+-	1.91027	.0	SI
15	P			<	.01720	<	.03918	.13100+-	.02255	3.4	P
16	S	*		.43440+-	.15120	.69704+-	.24579	.21495+-	.06535	-1.3	S
17	CL	*		.59670+-	.17370	.95746+-	.28392	.18045+-	.49059	-.8	CL
19	K	*		1.15970+-	.23150	1.86085+-	.38607	1.31784+-	.17528	.5	K
20	CA	*		2.59100+-	.43610	4.15751+-	.73817	1.80939+-	.26524	-1.5	CA
22	TI	*		.23160+-	.01260	.37162+-	.02915	.25294+-	.03429	.6	TI
23	V			.01500+-	.00330	.02407+-	.00547	.01760+-	.00556	.4	V
24	CR			.00940+-	.00090	.01508+-	.00168	.01267+-	.00217	1.4	CR
25	MN			.04740+-	.00310	.07606+-	.00657	.05494+-	.01294	.6	MN
26	FE	*		2.05850+-	.10380	3.30306+-	.25020	2.07120+-	.62659	.0	FE
27	CO			<	.00000	<	.04846	.00521+-	.04087	.0	CO
28	NI			.00350+-	.00040	.00562+-	.00072	.00303+-	.00267	-.2	NI
29	CU			.00480+-	.00040	.00770+-	.00078	.02246+-	.01523	1.2	CU
30	ZN	*		.02540+-	.00150	.04076+-	.00333	.03744+-	.02718	.4	ZN
33	AS			<	.00030	<	.00546	.00100+-	.00868	.1	AS
34	SE			<	.00000	<	.00112	.00006+-	.00141	.0	SE
35	BR			.00170+-	.00030	.00273+-	.00051	-.00419+-	.01477	-.4	BR
37	RB			.00660+-	.00050	.01059+-	.00100	.00747+-	.00146	.6	RB
38	SR			.02780+-	.00150	.04461+-	.00349	.02047+-	.01134	-.6	SR
39	Y			.00210+-	.00040	.00337+-	.00067	.00111+-	.00184	-.5	Y
40	ZR			.00810+-	.00070	.01300+-	.00134	.00959+-	.00199	.7	ZR
42	MO			<	.00000	<	.00321	.00044+-	.00445	.0	MO
46	PD			<	.00150	<	.00786	.00094+-	.00887	-.1	PD
47	AG			<	.00000	<	.00850	.00199+-	.01059	.0	AG
48	CD			<	.00270	<	.00947	.00499+-	.01138	.2	CD
56	BA			.04130+-	.01230	.06627+-	.02009	.05555+-	.05065	.3	BA
82	PB	*		.01710+-	.00130	.02744+-	.00260	-.01068+-	.09207	-.3	PB
91	OC	*		6.81850+-	.65060	10.94094+-	1.21337	7.25867+-	2.39056	.2	OC
92	EC	*		1.94310+-	.25040	3.11789+-	.43874	1.74659+-	1.05784	-.2	EC
94	NO3			.32210+-	.03620	.51684+-	.06502	.00874+-	.34868	-.9	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 81.7+- 4.1 COARSE: 62.3+- 3.5 TOTAL: 144.1+- 5.4

RESULTS FOR CMB SITE: 26785 YEAR: 88 DATE: 0219 VERSION: 6.0
COARSE PARTICULATE FRACTION
SAMPLING DURATION: 7 HRS. WITH START HOUR: 15
R-SQUARE: .99
CHI SQUARE: .24
DF: 9

#	TYPE	UG/M3	%
2	PAVRD	39.290+- 3.774	91.261+-10.453
3	MAMFP	5.660+- 2.529	13.146+- 5.931
6	SCCAR	-1.193+- 1.589	-2.771+- 3.695
	TOTAL:	43.757+- 3.850	101.636+-10.965

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 50	4.467+- 2.467
29 50	4.467+- 2.467

COARSE SUSPENDED PARTICULATE

	SPECIES	INCL	MISS FLG	MEAS. UG/M3		PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			43.05270+-	2.68730	100.00000+-	8.82736	43.75719+-	3.85037	.2	TOTAL
13	AL	*		3.36700+-	1.00320	7.82065+-	2.38075	3.06982+-	.41735	-.3	AL
14	SI	*		10.28370+-	3.25490	23.88631+-	7.70588	9.44570+-	1.27564	-.2	SI
15	P			.03400+-	.01480	.07897+-	.03473	.08891+-	.01421	2.7	P
16	S	*		.19450+-	.06790	.45177+-	.16021	.14886+-	.04072	-.6	S
17	CL	*		.20190+-	.05950	.46896+-	.14127	.12920+-	.25424	-.3	CL
19	K	*		.75330+-	.15090	1.74972+-	.36712	.90357+-	.12025	.8	K
20	CA	*		1.48920+-	.25060	3.45902+-	.62083	1.22126+-	.17609	-.9	CA
22	TI	*		.16670+-	.00980	.38720+-	.03320	.16999+-	.02300	.1	TI
23	V			<	.00750	<	.01908	.01183+-	.00367	.5	V
24	CR			.00690+-	.00070	.01603+-	.00191	.00858+-	.00138	1.1	CR
25	MN			.03470+-	.00230	.08060+-	.00734	.03770+-	.00755	.4	MN
26	FE	*		1.44070+-	.07240	3.34636+-	.26816	1.43381+-	.35033	.0	FE
27	CO			<	.00000	<	.04901	.00350+-	.02746	.0	CO
28	NI			.00230+-	.00040	.00534+-	.00099	.00224+-	.00140	.0	NI
29	CU			.00480+-	.00050	.01115+-	.00135	.01617+-	.00816	1.4	CU
30	ZN	*		.02390+-	.00150	.05551+-	.00491	.02881+-	.01419	.3	ZN
33	AS			<	.00100	<	.00627	.00068+-	.00573	-.1	AS
34	SE			<	.00000	<	.00186	.00005+-	.00095	.0	SE
35	BR			.00190+-	.00030	.00441+-	.00075	-.00176+-	.00757	-.5	BR
37	RB			.00400+-	.00040	.00929+-	.00110	.00511+-	.00084	1.2	RB
38	SR			.01740+-	.00100	.04042+-	.00343	.01375+-	.00587	-.6	SR
39	Y			<	.00090	<	.00233	.00075+-	.00123	-.1	Y
40	ZR			.00530+-	.00060	.01231+-	.00159	.00644+-	.00117	.9	ZR
42	MO			<	.00190	<	.00489	.00044+-	.00292	-.4	MO
46	PD			<	.00080	<	.01185	.00063+-	.00595	.0	PD
47	AG			<	.00040	<	.01301	.00134+-	.00710	.1	AG
48	CD			<	.00050	<	.01394	.00336+-	.00762	.3	CD
56	BA			.04350+-	.01320	.10104+-	.03130	.04147+-	.02807	-.1	BA
82	PB	*		.01140+-	.00110	.02648+-	.00304	.00043+-	.04721	-.2	PB
91	OC	*		6.24790+-	.72180	14.51221+-	1.90561	6.22199+-	1.77593	.0	OC
92	EC	*		1.90040+-	.28400	4.41412+-	.71489	1.80357+-	.72207	-.1	EC
94	NO3			.23320+-	.03700	.54166+-	.09235	.00984+-	.23430	-.9	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 105.4+- 5.3 COARSE: 43.1+- 2.7 TOTAL: 148.4+- 5.9

RESULTS FOR CMB SITE: 26785 YEAR: 87 DATE: 1230 VERSION: 6.0

FINE PARTICULATE FRACTION

SAMPLING DURATION: 24 HRS. WITH START HOUR: 12

R-SQUARE: .97

CHI SQUARE: .56

DF: 7

#	TYPE	UG/M3	%
1	CINDR	-.036+- .032	-.030+- .027
3	MAMFP	91.066+- 26.621	76.696+-22.747
4	MAMWS	-3.534+- 47.135	-2.976+-39.698
6	SCCAR	.757+- .102	.638+- .091
	TOTAL:	88.253+- 27.640	74.327+-23.574

UNCERTAINTY/SIMILARITY CLUSTERS:	SUM OF CLUSTER SOURCES
29 30	87.532+- 27.655
29 30	87.532+- 27.655

SPECIES		INCL	MISS FLG	FINE MEAS. UG/M3		SUSPENDED PARTICULATE PERCENT		CALC. UG/M3		RATIO R/U	
1	TOTAL			118.73560+-	5.94370	100.00000+-	7.07931	88.25258+-	27.64046	-1.1	TOTAL
13	AL	*		<	.00000	<	.01145	.00119+-	.00854	.0	AL
14	SI	*		<	.00000	<	.00640	-.00529+-	.00503	.0	SI
15	P			<	.00000	<	.00876	.00217+-	.00675	.0	P
16	S	*		.22560+-	.01160	.19000+-	.01363	.16564+-	.04923	-1.2	S
17	CL	*		.38360+-	.02030	.32307+-	.02353	.31634+-	.12351	-.5	CL
19	K	*		.45610+-	.02330	.38413+-	.02747	.71205+-	.51171	.5	K
20	CA	*		.01390+-	.00290	.01171+-	.00251	.01984+-	.01148	.5	CA
22	TI			<	.00000	<	.01221	-.00033+-	.00674	.0	TI
23	V			<	.00000	<	.00514	-.00001+-	.00282	.0	V
24	CR			<	.00100	<	.00143	.00003+-	.00073	-.5	CR
25	MN			.00380+-	.00050	.00320+-	.00045	.00249+-	.00146	-.8	MN
26	FE	*		.01330+-	.00090	.01120+-	.00094	.01419+-	.00216	.4	FE
27	CO			<	.00060	<	.00067	.00008+-	.00028	-.6	CO
28	NI			<	.00020	<	.00067	.00007+-	.00027	-.2	NI
29	CU			.00310+-	.00040	.00261+-	.00036	.00084+-	.00029	-4.5	CU
30	ZN	*		.02690+-	.00150	.02266+-	.00170	.05697+-	.03415	.9	ZN
33	AS			<	.00020	<	.00320	.00048+-	.00110	.1	AS
34	SE			<	.00000	<	.00084	.00000+-	.00046	.0	SE
35	BR			.01040+-	.00070	.00876+-	.00073	.01268+-	.00127	1.6	BR
37	RB			<	.00020	<	.00093	.00080+-	.00082	.4	RB
38	SR			<	.00000	<	.00093	-.00003+-	.00055	.0	SR
39	Y			<	.00000	<	.00109	.00000+-	.00064	.0	Y
40	ZR			<	.00000	<	.00135	-.00001+-	.00093	.0	ZR
42	MO			<	.00000	<	.00227	.00015+-	.00146	.0	MO
46	PD			<	.00000	<	.00472	.00000+-	.00255	.0	PD
47	AG			<	.00010	<	.00522	-.00002+-	.00301	.0	AG
48	CD			<	.00000	<	.00564	.00027+-	.00329	.0	CD
56	BA			<	.02460	<	.03673	.00830+-	.02069	-.3	BA
82	PB	*		.01970+-	.00150	.01659+-	.00151	.01844+-	.00263	-.4	PB
91	OC	*		46.77670+-	3.36230	39.39568+-	3.45079	45.86184+-	19.67874	.0	OC
92	EC	*		19.79080+-	2.05550	16.66796+-	1.92174	23.15052+-	5.54382	.6	EC
94	NO3			1.60440+-	.08550	1.35124+-	.09880	.15738+-	.03688	-15.5	NO3

MEASURED AMBIENT MASS (UG/M3): FINE: 118.7+- 5.9 COARSE: 14.1+- 8.5 TOTAL: 132.9+- 6.1

APPENDIX E

VEHICLE MILES TRAVELED (VMT) ESTIMATES BASED ON THE MAMMOTH LAKES GENERAL PLAN

ESTIMATE OF VEHICLE MILES TRAVELED IN MAMMOTH LAKES FOR 1990 TO 2005

Reference: The Town of Mammoth Lakes General Plan, 1987; with modifications to projections for 2005 based on correspondence with Bill Taylor, 12/8/89.

EXISTING TRAFFIC VOLUME AND VMT - Estimate for 1990

ROAD	AVG DAILY TRAFFIC	DISTANCE MILES	VEH MILES TRAVELED
MAIN ST 1	11.50	0.75	8625.00
MAIN ST 2	16.00	0.50	8000.00
MAIN ST 3	17.50	0.40	7000.00
MAIN ST 4	8.00	0.50	4000.00
LAKE MARY RD	1.70	1.00	1700.00
MERIDIAN 1	3.00	0.50	1500.00
MERIDIAN 2	5.00	0.75	3750.00
MERIDIAN 3	2.00	0.70	1400.00
OLD MMT RD 1	9.00	0.40	3600.00
OLD MMT RD 2	4.50	0.60	2700.00
OLD MMT RD 3	14.00	0.40	5600.00
FOREST TRAIL	1.50	1.00	1500.00
CANYON	4.00	0.60	2400.00
CANYON/LKVIEW	5.00	1.00	5000.00
KELLY/MJPINE	1.50	0.50	750.00
SR 203 1	5.00	1.00	5000.00
SR 203 2	12.50	0.30	3750.00

TOTAL VMT = 66,275

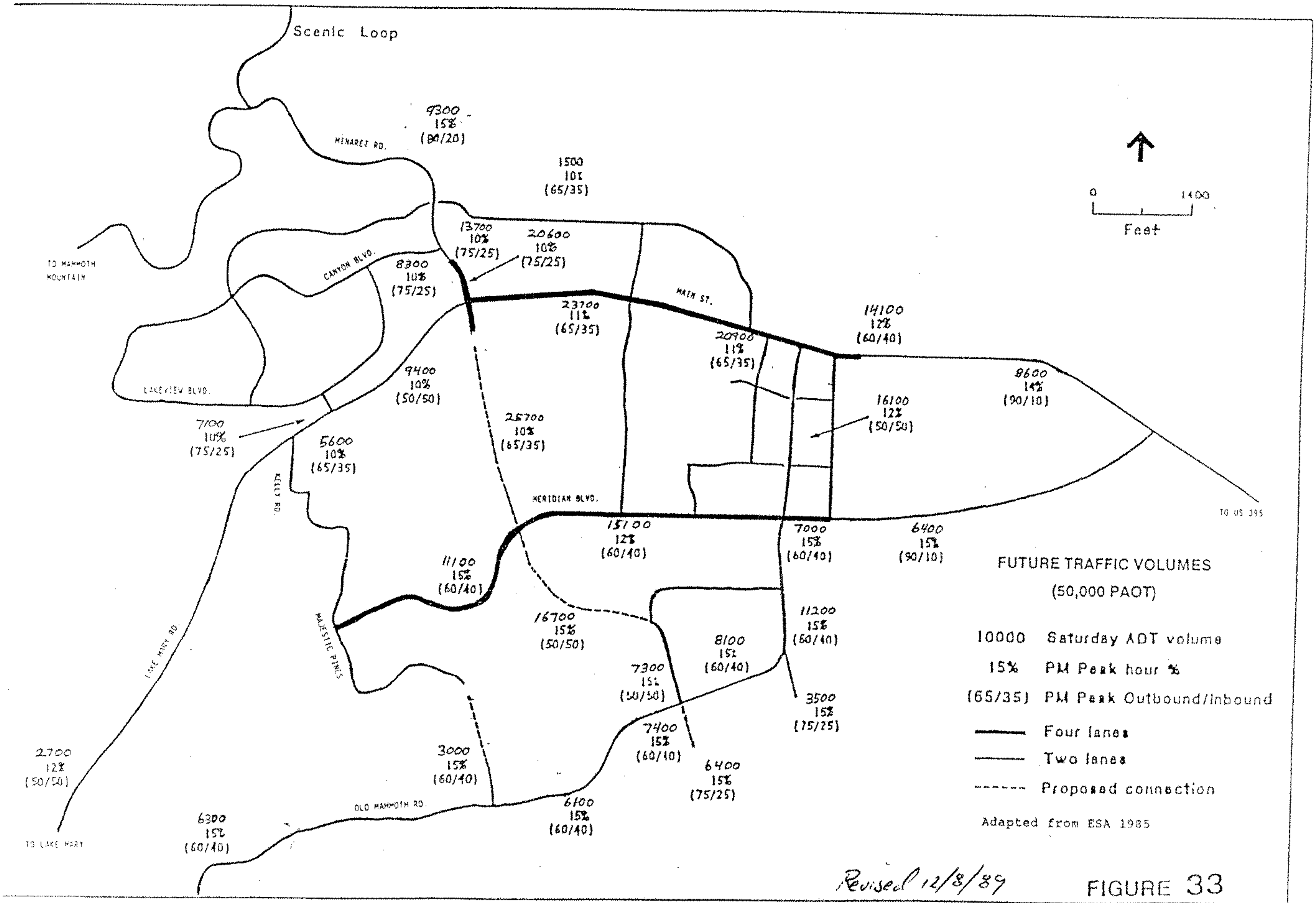
FUTURE TRAFFIC VOLUME AND VMT - Estimate for 2005

ROAD	AVG DAILY TRAFFIC	DISTANCE MILES	VEH MILES TRAVELED
MAIN ST 1	8.60	0.75	6450.00
MAIN ST 2	14.10	0.10	1410.00
MAIN ST 3	20.90	0.50	10450.00
MAIN ST 4	23.70	0.40	9480.00
MAIN ST 5	9.40	0.60	5640.00
LAKE MARY 1	7.10	0.50	3550.00
LAKE MARY 2	2.70	0.75	2025.00
MERIDIAN 1	6.40	0.90	5760.00
MERIDIAN 2	7.00	0.15	1050.00
MERIDIAN 3	15.10	0.70	10570.00
MERIDIAN 4	11.10	0.70	7770.00
MERIDIAN 5	0.00	0.40	0.00
OLD MMT RD 1	16.10	0.40	6440.00
OLD MMT RD 2	11.20	0.30	3360.00
OLD MMT RD 3	8.10	0.30	2430.00
OLD MMT RD 4	7.40	0.25	1850.00
OLD MMT RD 5	6.10	0.30	1830.00
OLD MMT RD 6	6.30	0.75	4725.00
OLD MMT EXT	3.50	0.10	350.00
FOREST TRAIL	1.50	1.00	1500.00
CANYON	8.30	0.60	4980.00
CANYON/LKVIEW	7.10	1.00	7100.00
KELLY/MJPINE	5.60	0.50	2800.00
MAJ PINE EXT	3.00	1.00	3000.00
SR 203 1	9.30	1.00	9300.00
SR 203 2	13.70	0.20	2740.00
SR 203 3	20.60	0.20	4120.00
MINARET 1	25.70	0.60	15420.00
MINARET 2	16.70	0.50	8350.00
MINARET 3	7.30	0.25	1825.00
MINARET 4	6.40	0.10	640.00

TOTAL VMT = 146,915

Interpolation of the data over the 15 year period:

YEAR	TOTAL VMT
1990	66,275
1993	82,403
1995	93,155
2000	120,035
2005	146,915



Scenic Loop
TO MAMMOTH MOUNTAIN
MINARET RD.
CANYON BLVD.
LAKEVIEW BLVD.
MAIN ST.
MERIDIAN BLVD.
KELLY RD.
MAJESTIC PINES
LAKE MARY RD.
OLD MAMMOTH RD.
TO LAKE MARY
TO US 395
9300 15% (80/20)
1500 10% (65/35)
13700 10% (75/25)
20600 10% (75/25)
8300 10% (75/25)
23700 11% (65/35)
14100 12% (60/40)
20900 11% (65/35)
9400 10% (50/50)
8600 14% (90/10)
16100 12% (50/50)
7100 10% (75/25)
25700 10% (65/35)
5600 10% (65/35)
15100 12% (60/40)
7000 15% (60/40)
6400 15% (90/10)
11100 15% (60/40)
11200 15% (60/40)
16700 15% (50/50)
8100 15% (60/40)
7300 15% (50/50)
3500 15% (75/25)
7400 15% (60/40)
3000 15% (60/40)
6400 15% (75/25)
2700 12% (50/50)
6100 15% (60/40)
6300 15% (60/40)
0 1400 Feet
FUTURE TRAFFIC VOLUMES
(50,000 PAOT)
10000 Saturday ADT volume
15% PM Peak hour %
(65/35) PM Peak Outbound/Inbound
Four lanes
Two lanes
Proposed connection
Adapted from ESA 1985
Revised 12/8/89

FIGURE 33

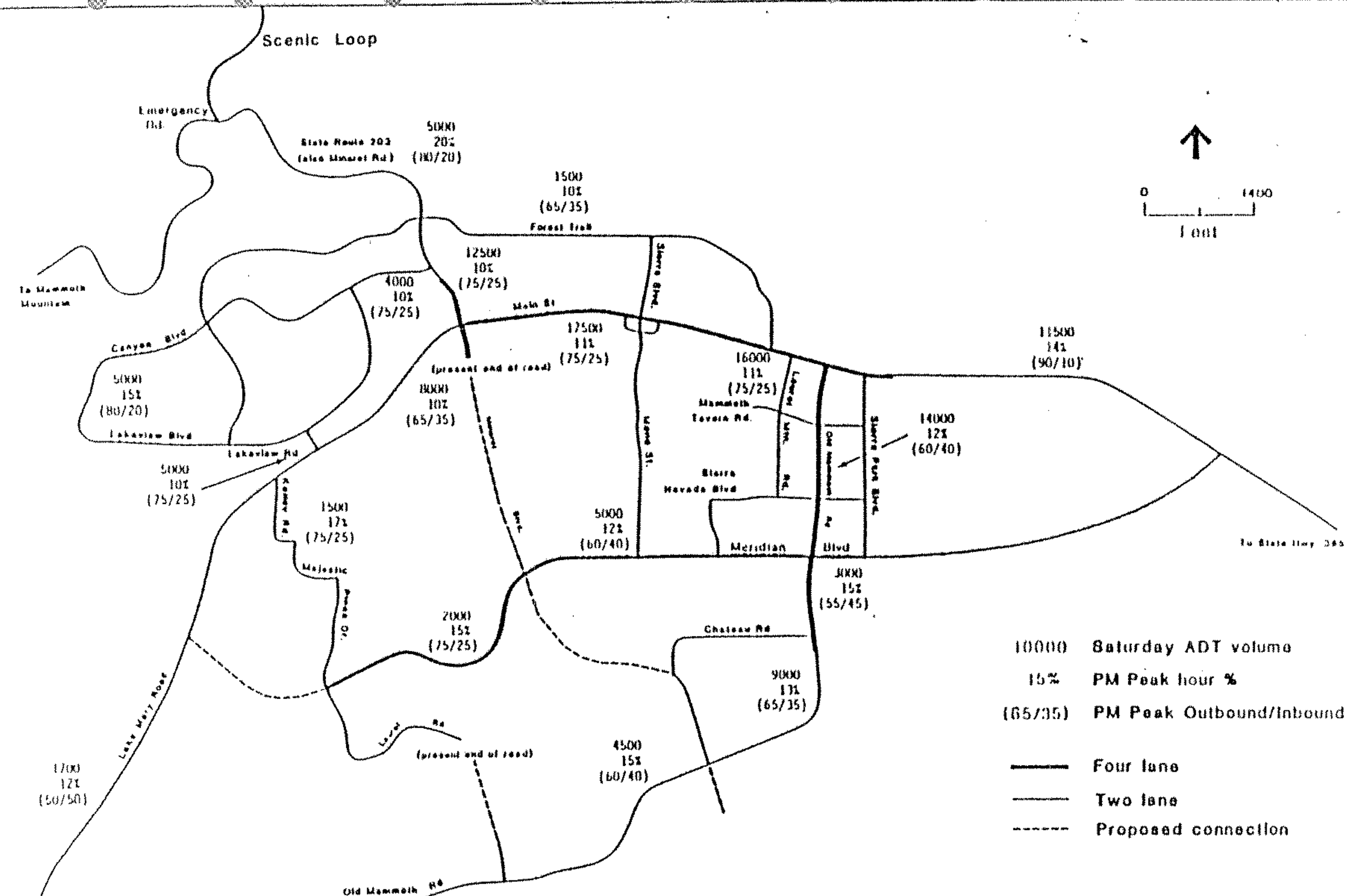


FIGURE 30

Existing Traffic Volumes

SOURCE: Environmental Science Associates, Inc.

APPENDIX F

PROPOSED CONTROL MEASURES AND CONTROL STRATEGY EVALUATION

APPENDIX F

PROPOSED CONTROL MEASURES & CONTROL STRATEGY EVALUATION

The following section was the original Section 6 of the draft SIP. The control measures discussed in this section were used in the decision making process to help decide on the final control strategy. Although some of the calculations have changed based on refinements to the data, the relative control effectiveness calculations for the control measures is still useful. The refined numbers included in the new Section 6 are accurate and indeed are the only numbers of importance in the final SIP. The old section 6 is therefore removed from the body of the final SIP and relegated to the appendices in its original form.

OLD SECTION 6

PROPOSED CONTROL MEASURES & CONTROL STRATEGY EVALUATION

6.0 PROPOSED CONTROL MEASURES & CONTROL STRATEGY EVALUATION

Through the implementation of the control measures discussed in this section, the Town of Mammoth Lakes can attain the Federal PM-10 Standard within the 3 year period required under Section 110 of the Clean Air Act. By forecasting the emissions growth and the proposed controls into the future it can be shown that the standard can be maintained for the next 15 years.

In the following discussions of each of the control measures, the proportional roll-back equation in Section 5.4 is used to determine the effectiveness of each control to reduce the ambient PM-10 concentrations. Table 6.1 lists the proposed control measures.

The controls are evaluated for two cases; Case A, a wood burning dominated day, and Case B, a road dust and cinder dominated day. In section 5 it was shown that Case B, the road dust and cinder dominated day would create the highest uncontrolled ambient concentrations. Since it appears that the road dust and cinder dominated day will require the most stringent controls, the control strategy in this section is evaluated for these conditions. Although this simplifies the control strategy evaluation process, it is still necessary to confirm that the chosen strategy will also work for the wood burning dominated days in Case A. An evaluation of Case A, similar to the Case B evaluation in this section, is included in Appendix H to confirm the adequacy of the strategy.

Many of the proposed control measures are interrelated, so that reduction credits are not simple independent calculations. For the purposes of comparison, estimations are shown with the assumption that all measures will be implemented. Changes to the proposed control strategy can be evaluated on a LOTUS spreadsheet. This spread sheet has been set up to consider the related effects of each control measure and is used to determine the overall effectiveness of the strategy. The methodology to determine the reductions using the LOTUS spreadsheet is included in Appendix F.

6.1 Proposed Control Measures

The following control measures are evaluated for the Case B, road dust and cinders dominated day. See Appendix H for the Case

TABLE 6.1

LIST OF CONSIDERED CONTROL MEASURES

MEASURE NUMBER	CONTROL MEASURE	
1	Use Vacuum Street Sweeper for Cinders & Road Dust	
2	Reduce Vehicle Traffic	
3	Institute a Public Awareness Program for Wood Burning	
4	Wood Stove Replacement	
	4a	Require Replacement or Removal of Non-certified Wood Stoves Upon Resale of Home or Rental Unit
	4b	Limit Installation of Wood Stoves After July 1, 1990 EPA Phase II Certified or Pellet Stoves
5	Fireplace Phase-out	
	5a	Ban Fireplaces in New Dwellings
	5b	Require Transient Occupancy Units to Render Fireplaces Inoperable or to Replace with a Gas Burner or Pellet Stove
	5c	Require Fireplaces to be Rendered Inoperable or Replaced with a Gas Burner or Pellet Stove Upon Resale of Home
6	Wood Burning Performance	
	6a	Require Certification for Wood Stove Installers
	6b	Require a 20% Wood Moisture Limit for Wood Retailers
	6c	Prohibit Trash and Coal Burning in Wood Stoves
	6d	Set 20% Opacity Limit for Wood Burning
7	Curtail Wood Burning During Air Pollution Episodes	
	7a	Institute a Voluntary Wood Burning Ban During Periods of Poor Air Quality
	7b	Institute a Mandatory Wood Burning Ban When Continued Stove Use is Expected to Cause a Federal PM-10 Standard Violation

A evaluation. The uncontrolled and ambient concentrations and the reductions needed to attain the Federal PM-10 Standard (150 $\mu g/m^3$) are shown below for the years 1993 through 2005.

Case B - Peak Road Dust and Cinder Dominated Days

	1993	1995	2000	2005
Uncontrolled Concentration	244	267	324	381
Total Reductions Needed	94	117	174	231

Control Measure 1 - Vacuum Street Sweeping

Reentrained road dust and cinders contribute as much as 44% of the ambient PM-10 concentration during the winter months. Cinders used as an anti-skid material and track out of mud and dirt onto the streets are a major source of PM-10 emissions during the winter months. The U.S. Environmental Protection Agency (EPA) reports that a 34% reduction in reentrained road dust can be accomplished by vacuum sweeping (Control of Open Fugitive Dust Sources, 1988). This would reduce the peak PM-10 emissions by 1,010 kg/day (1.11 tons/day) in 1993. This control measure would require the Town of Mammoth Lakes to vacuum sweep the streets during periods when road conditions allowed the removal of anti-skid materials. The streets must be swept from curb to curb, which includes the driving lanes, to maximize the control effectiveness.

In 1989, the Town of Mammoth Lakes purchased a vacuum street sweeper that will be used to remove the road dust and cinders from the roadways. The present schedule for sweeping allows for cleaning the major roadways from curb to curb at least once a week and most other streets on a less frequent schedule. The cost to operate the sweeper is not expected to increase as a result of this control measure. Because of the present frequency of sweeping, the intensive sweeping program should only result in accelerating the schedule but not the frequency of sweeping in most areas. If an additional sweeper is needed to augment the program, because of breakdowns or a need for better coverage, a new sweeper would cost approximately $120,000 and about $22 per hour for operation and maintenance. It is estimated that it will take about 24 hours of sweeping to clean 40 miles of roadway from curb to curb.

Adoption Date: June 1990
Implementation Date: November 1, 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 1 Reductions	35	38	44	51

Control Measure 2 - Vehicle Traffic Reduction

PM-10 emissions from reentrained road dust and cinders cannot be controlled by vacuum sweeping alone. The expected uncontrolled increase in vehicle traffic over the next 15 years will increase peak roadway emissions by 120% or 2,940 kg/day (3.24 tons/day). A reduction in traffic will result in a proportional reduction in the PM-10 emissions. Under this proposed measure, future development projects will be required to develop and implement a transportaion plan to limit future peak vehicle traffic to 106,600 vehicle miles traveled in the Town of Mammoth Lakes. This is 40,320 vehicle miles more than the present peak traffic estimate. These transportation plans may include shuttle services from transportation hubs to major points of interest. The cost to implement this measure is unknown. Associated benefits would be reduced cost for parking areas at points of interest and reduced road maintenance costs.

Adoption Date: June 1990
Implementation Date: June 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 2 Reductions	11	19	38	57

Control Measure 3 - Public Awareness Program for Wood Burning

The success of control plans for wood burning sources will depend on a good public awareness program. This program will be especially important if voluntary or mandatory wood burning bans are implemented. A public awareness program will also help to promote cleaner and more efficient wood burning techniques. Although this measure cannot be directly credited with emission reductions, the success of the wood burning controls will be dependent upon good cooperation from the public. Elements of this program could include use of the news media, wood burning brochures, and outdoor signs to alert the public during curtailment periods. Cost for implementing this measure is estimated at about $2,000 for brochures, plus the cost for staff time to prepare and to disseminate information to the public.

Adoption Date: June 1990
Implementation Date: November 1990

Control Measure 4 - Wood Stove Replacement

This control measure proposes that the number of new wood stoves that are installed in the Town of Mammoth Lakes be limited to 1,700 new installations. New wood stove that are installed to replace stoves that were installed prior to the adoption of this measure will not be affected by this limit. This measure is intended to put a cap on the future number of wood stoves at 4,300. Currently there are about 2,600 wood stoves in the Town of Mammoth Lakes. This wood stove limit is based upon the 15 year growth estimate for residents and visitors and is not credited with emission reductions. It is only intended to keep the wood stove emissions from increasing beyond the expected number that can be allowed to insure the overall success of the control strategy.

Adoption Date: June 1990
Implementation Date: June 1990

Control Measure 4a - Replace Non-Certified Wood Stove Upon Resale of Dwelling

This measure will require non-certified wood stoves to be replaced with an EPA certified stove before escrow can close on the resale of a home or rental unit. Non-certified wood stoves are those stoves that have not received Phase I or Phase II certification from EPA (see Appendix G). Non-certified wood stoves can also be removed and rendered inoperable in lieu of replacing the wood stove. It is assumed that 90% of the existing homes and rental units will be sold in the next 15 years (Taylor, 1989). This measure may result in a 300 kg/day (0.3 tons/day) reduction in the peak wood stove and fireplace insert emissions from the presently existing appliances over the next 15 years. The cost to switch-out conventional wood stoves with EPA certified stoves ranges from $600 to $2,200 (Martindale, 1989). The fuel savings with the EPA certified stove is estimated at $125 per year. This is based on an annual 3.5 cords burned in a conventional wood stove at $150 per cord (Fernandez, A Proposed Suggested Control Measure for the Control of Emissions from Residential Wood Combustion, 1989).

Adoption Date: June 1990
Implementation Date: July 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 4a Reductions	6	10	19	29

Control Measure 4b - Require EPA Certified Phase II Wood Stoves After July 1, 1990

As required by EPA, only Phase II certified wood stoves can be sold after July 1, 1992. Presently, there are 91 different stoves that have received Phase II certification (Residential Wood Heaters Certified by U.S. EPA, 1989). The list of currently certified Phase I and II wood stoves are shown in Appendix E. The Town of Mammoth Lakes currently requires all new wood stoves to have EPA Phase I certification. This measure proposes that only Phase II certified stoves be installed after July 1, 1990. This proposal will advance the Federal deadline by 2 years and will take advantage of the lower emissions and higher burning efficiencies of the Phase II certified appliances. Phase II certified stoves will result in about a 23% decrease in emissions from the Phase I certified wood stoves that would be installed before July 1, 1992. An exemption should be provided to allow retailers to sell out their available stock of Phase I stoves after July 1, 1990.

Adoption Date: June 1990
Implementation Date: July 1, 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 4b Reductions	0	0	1	1

Control Measure 5a - Ban Fireplaces in New Dwellings

Fireplaces presently contribute to about 45% of the ambient PM-10 concentration on peak wood burning days. It is estimated that 1,000 kg/day (1.1 tons/day) of PM-10 is emitted on these peak days and that it is expected to increase by 680 kg/day (0.75 tons/day) over the next 15 years. A ban on fireplaces would put a cap on the growth of emissions from fireplaces to 10% of the expected growth. Although open fireplaces would be banned, gas-only fireplace units and pellet stove inserts would be allowed.

The cost is unknown, but this measure should result in reducing fire hazards and home heating costs as well as significantly reducing future PM-10 emissions.

Adoption Date: June 1990
Implementation Date: July 1, 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 5a Reductions	8	13	26	39

Control Measure 5b - Render Transient Occupancy Unit Fireplaces Inoperable or Replace With a Gas Burner or Pellet Stove

Presently about 20% of the ambient PM-10 concentration on peak wood burning days is caused by fireplaces from condominiums and rental units that are regulated under Transient Occupancy Permits. This measure would result in a reduction of 351 kg/day (0.39 tons/day) on peak wood burning days. This measure would require that fireplaces in Transient Occupancy Units be rendered inoperable for open wood burning. Although open wood burning fireplaces would be banned in Transient Occupancy Units, gas-only fireplaces and pellet stove inserts would be allowed. The cost is unknown, but in addition to substantial air quality benefits, it is expected to reduce fire hazards and home heating costs.

Adoption Date: June 1990
Implementation Date: June 1990 to November 1, 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 5b Reductions	20	20	20	20

Control Measure 5c - Render Fireplace Inoperable or Replaced With a Gas Burner or Pellet Stove Upon Resale of Dwelling

Fireplaces in homes contribute about 29% of the PM-10 on peak wood burning days. This measure would reduce the present peak PM-10 emissions from this source category by 550 kg/day (0.60 tons/day) over the next 15 years. The measure would require that fireplaces in homes be rendered inoperable to open wood burning before escrow can close on the resale of the home. Although open wood burning fireplaces would be banned at the time of resale, gas-only fireplaces and pellet stove inserts would be allowed. The cost is unknown, but this measure should result in reducing fire hazards and home heating costs as well as significantly reducing future PM-10 emissions.

Adoption Date: June 1990
Implementation Date: July 1, 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 5c Reductions	6	10	21	31

Control Measure 6a - Wood Stove Installer Certification

Proper installation of the EPA certified wood stoves is necessary in order to achieve the emission reductions that are possible with the clean burning technologies. Stove size, flue size and proper venting are important if the new technology stoves are to effectively meet the heating needs of the resident. This measure would require that new installations be inspected by certified installers or inspectors. A certification training program would be offered to retailers, chimney sweeps, and others involved in installing or inspecting wood stoves. It is estimated that a 5% reduction in emissions from the new stoves can be expected as a result of this measure. The cost of the training course is unknown.

Adoption Date: June 1990
Implementation Date: July 1991

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 6a Reductions	1	1	2	3

Control Measure 6b - 20% Moisture Limit for Wood Retailers

Wood that has not been adequately dried will result in higher air pollution emissions, increased creosote build-up in the flue, and as much as 50% lower heating efficiency. Most wood should be dried for six months to a year to ensure that it is dry before it is burned. This measure would affect wood retailers and not wood gathering for personal use. A calibrated moisture measuring device would be used to determine the moisture content of wood. This control measure would prohibit the selling or offering for sale, wood with a moisture content greater than 20% between July 1 and December 31 of each year. This measure could result in a 5% decrease in emissions from wood burning stoves and fireplaces. The cost for the moisture measuring device is about $300 each. The cost for wood sellers to implement the measure is unknown. The program may cause wood sellers to increase their prices, but it will also result in fewer flue fires, lower air pollution emissions, a higher burning efficiency and less wood burned.

Adoption Date: June 1990
Implementation Date: July 1, 1991

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 6b Reductions	1	1	2	3

Control Measure 6c - Prohibited Fuels in Wood Stoves and Fireplaces

Toxic or potentially toxic compounds may be emitted by burning garbage, plastics, petroleum wastes, and rubber products. In addition some materials, such as colored inks in newspaper, will damage the catalyst in catalytic wood stoves. Burning these materials can cause excessive smoke and objectionable odors, which sometimes lead to public complaints. This measure would prohibit individuals from burning: garbage, treated wood, plastic products, rubber products, waste petroleum products, paints and paint solvents, and coal with a sulfur content more than one percent by weight. There are no PM-10 emission reductions credited with this measure, but it is included to heighten public awareness of the possible toxic emissions from trash burning and to be used as a possible enforcement tool for individuals that may cause repeated complaints of smoke or odors. This control measure will increase enforcement costs if the number of complaints increases as a result of the adoption of this measure.

Adoption Date: June 1990
Implementation Date: June 1990

Control Measure 6d - 20% Opacity Limit for Wood Burning

Excessive smoke from wood burning will occur during start-up and when adding fuel. Excessive smoke will also be emitted if green wood or trash is being burned, or if improper burning techniques are being used. Conventional wood stoves, open fireplaces and certified wood stoves can meet a 20% opacity limit during normal operation. But, even the certified wood stoves will cause violations of a 20% opacity limit if excessive smoldering is allowed in a low air venting situation. This measure can be enforced under the Great Basin Unified Air Pollution Control District's current rule for a 20% opacity limit from a source. There are no emission reductions associated with this measure, but it is included as a possible enforcement tool for individuals that may cause repeated complaints of smoke or odors. This control measure will increase enforcement costs if the number of complaints increases as a result of the adoption of this measure.

Adoption Date: June 1990
Implementation Date: November 1, 1990

Control Measure 7a - Voluntary Wood Burning Ban

On days with poor air quality, the public may be requested to voluntarily curtail wood burning. This may occur when it is anticipated that the PM-10 levels may approach or exceed the Federal PM-10 Standard. Based on hourly PM-10 data, the District or Town would decide if a voluntary wood burning ban should be called. If a voluntary ban is called an alert will be sent to the local radio and television stations before 4:00 PM. The success of this measure will depend on good cooperation from the public and a good public awareness program. To implement this program, it will be necessary to install a continuous PM-10 monitor. This monitor will be capable of accurately measuring hourly PM-10 concentrations. In addition, a forecasting program will have to be developed to predict when voluntary wood burning bans should be called. It is anticipated that a 10% reduction in wood burning emissions can be attained by this measure (Guidance Document for Residential Wood Combustion Emission Control Measures, 1989). The cost for this program will include about $20,000 for the monitoring device and cost for staff time to develop the forecasting program and to build public awareness in the community.

Adoption Date: June 1990
Implementation Date: November 1, 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 7a Reductions	8	7	6	4

Control Measure 7b - Mandatory Wood Burning Ban

On days with very poor air quality, the public may be required to curtail wood burning. This may occur when it is anticipated that the PM-10 levels will exceed the Federal PM-10 Standard if wood burning continues. Based on hourly PM-10 data, the District or Town would decide if a mandatory wood burning ban should be called. If a mandatory ban is called an alert will be sent to the local radio and television stations before 4:00 PM. The success of this measure will depend on good cooperation from the public and a good public awareness program. It is anticipated that a 50% reduction in wood burning emissions can be attained by this measure (Guidance Document for Residential Wood Combustion Emission Control Measures, 1989). The cost for this program will be the same as for Measure 7a, but additional staff costs to notify violators is anticipated.

Adoption Date: June 1990
Implementation Date: November 1, 1990

	Case B Ambient Reductions ($\mu g/m^3$)			
	1993	1995	2000	2005
Measure 7b Reductions	32	29	24	18

6.2 Control Strategy Evaluation

Table 6.2 shows a summary of the effectiveness of each of the control measures on the ambient air quality over the next 15 years. The implementation of controls for vehicle related sources will be essential to the long term success of the strategy for road dust and cinder dominated days. The phase-out of non-certified wood stoves and fireplaces has also been shown to be essential for the control of days dominated by wood burning emissions.

A summary of the predicted air quality trend for the peak road dust and cinder days is shown in Figures 6.1. An analysis for the less stringent, peak wood burning days is included in Appendix H. It should be noted that most strategies that would attain the Federal PM-10 Standard for the peak road dust and cinder days will also satisfy days that are dominated by wood burning. The trend lines in Figure 6.1 shows that the suggested control measures can attain the Federal PM-10 Standard within the next 3 to 5 years. It also shows that it is not necessary to adopt all the measures to maintain the Standard for the next 15 years.

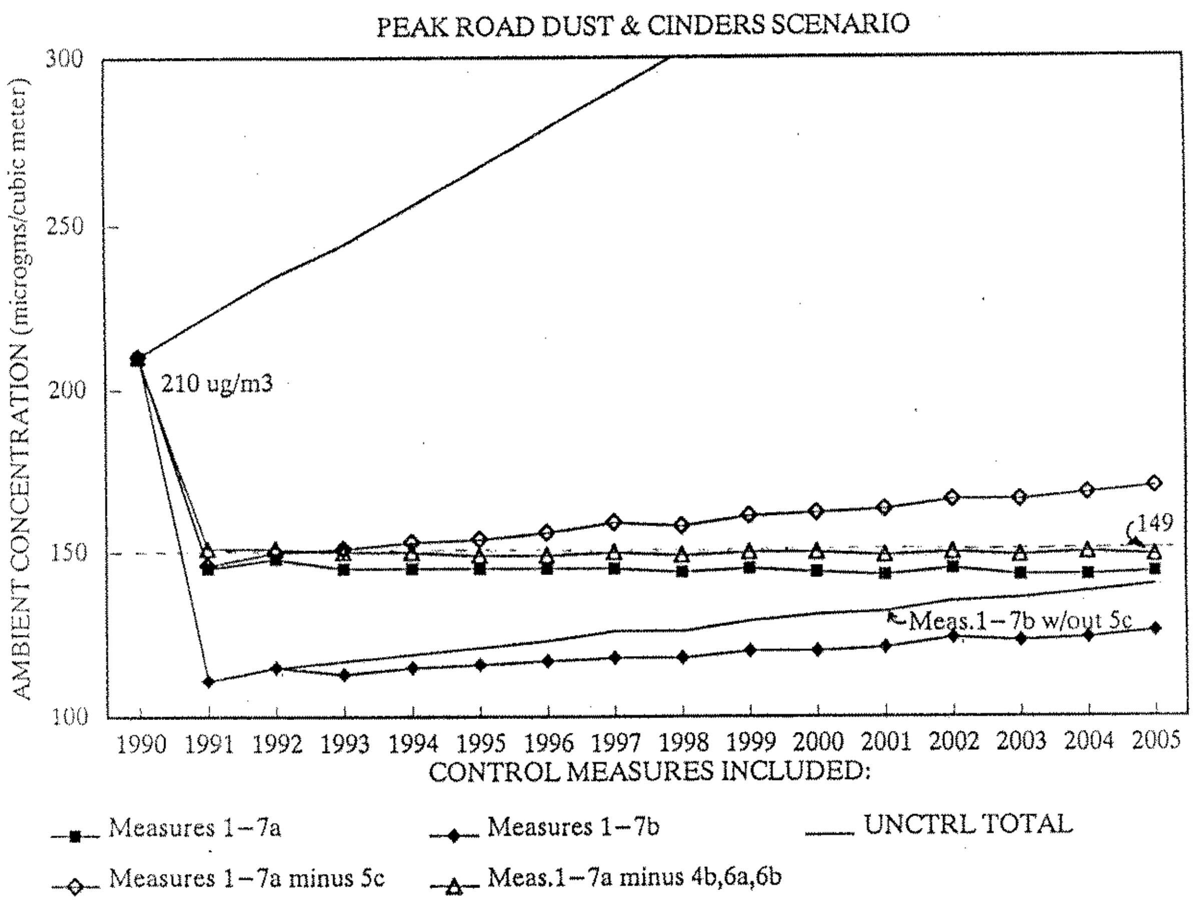
TABLE 6.2

CASE B - PEAK ROAD DUST AND CINDERS DOMINATED DAYS

	1993	1995	2000	2005
UNCONTROLLED CONCENTRATION ($\mu g/m^3$)	244	267	324	381
TOTAL REDUCTIONS NEEDED ($\mu g/m^3$)	94	117	174	231

	Ambient Reductions ($\mu g/m^3$)			
CONTROL MEASURE	1993	1995	2000	2005
1 VACUUM STREETS	35	38	44	51
2A INCREASE MASS TRANSIT (reduce exhaust)	0	0	0	0
2B INCREASE MASS TRANSIT (reduce cinders)	11	19	38	57
4A REMOVE STOVE UPON HOME RESALE	6	10	19	29
4B INSTALL PHASE II CERTIFIED STOVES (1990)	0	0	1	1
5A BAN NEW FIREPLACES	8	13	26	39
5B BAN EXISTING FIREPLACES IN RENTAL UNITS	20	20	20	20
5C BAN EXISTING FIREPLACES UPON HOME RESALE	6	10	21	31
6A CERTIFY STOVE INSTALLERS	1	1	2	3
6B LIMIT WOOD MOISTURE	4	4	3	2
7A VOLUNTARY WOOD BURNING BAN	8	7	6	4
7B MANDATORY WOOD BURNING BAN	32	29	24	18
TOTAL REDUCTIONS WITHOUT 7B	99	122	180	237
TOTAL REDUCTIONS WITH 7B (= all measures)	131	151	203	255
TOTAL CONCENTRATIONS WITHOUT 7B	145	145	144	144
TOTAL CONCENTRATIONS WITH 7B (= all meas.)	113	116	121	126
TOTAL CONCENTRATIONS WITHOUT 5C, 7B	151	154	162	170
TOTAL CONCENTRATIONS WITHOUT 4B,6A-B,7B	150	149	150	149

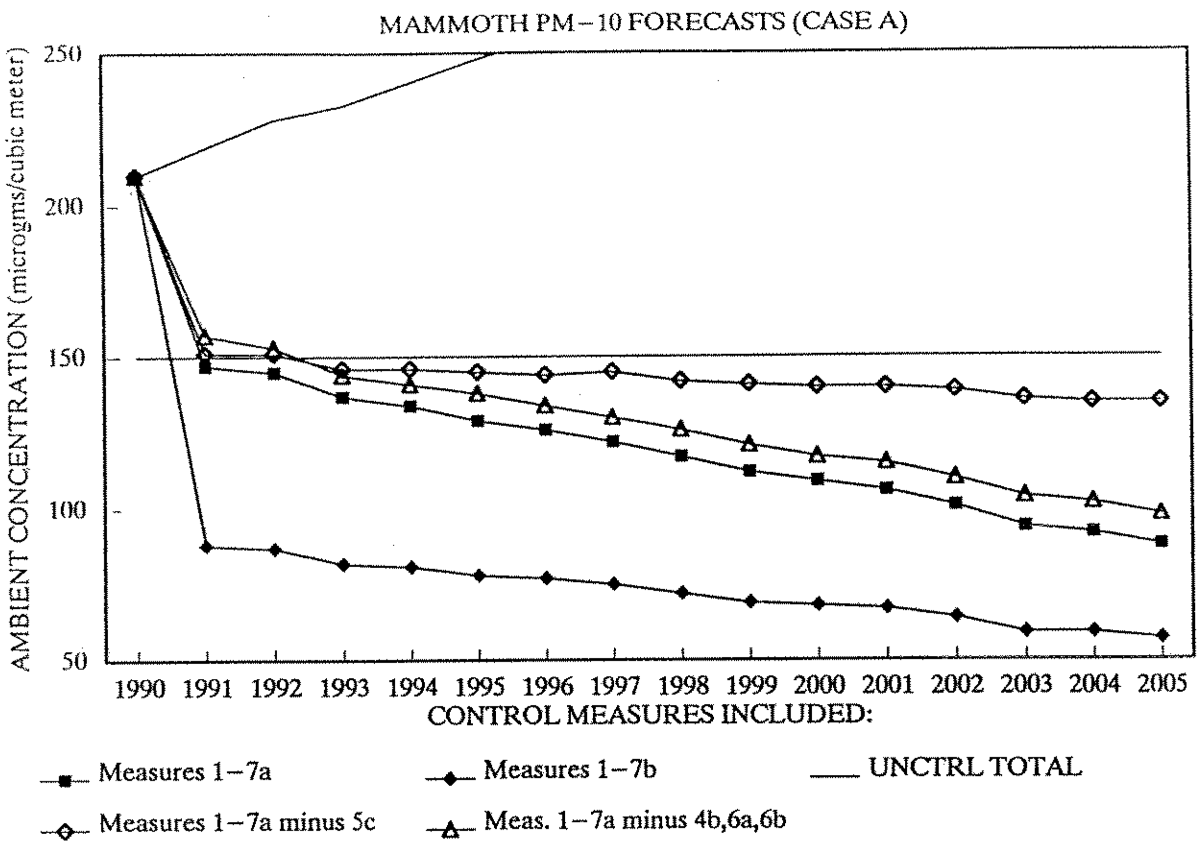
FIGURE 6.1
FORECASTED AIR QUALITY - WITH CONTROL OPTIONS



CASE A - PEAK WOOD BURNING DOMINATED DAYS

	1993	1995	2000	2005
UNCONTROLLED CONCENTRATION ($\mu g/m^3$)	233	248	285	323
TOTAL REDUCTIONS NEEDED ($\mu g/m^3$)	83	98	135	173

	Ambient Reductions ($\mu g/m^3$)			
CONTROL MEASURE	1993	1995	2000	2005
1 VACUUM STREETS	2	2	2	3
2A INCREASE MASS TRANSIT (reduce exhaust)	1	1	2	3
2B INCREASE MASS TRANSIT (reduce cinders)	1	1	2	3
4A REMOVE STOVE UPON HOME RESALE	10	16	33	49
4B INSTALL PHASE II CERTIFIED STOVES (1990)	0	1	1	2
5A BAN NEW FIREPLACES	14	23	46	68
5B BAN EXISTING FIREPLACES IN RENTAL UNITS	35	35	35	35
5C BAN EXISTING FIREPLACES UPON HOME RESALE	11	18	37	55
6A CERTIFY STOVE INSTALLERS	1	2	3	5
6B LIMIT WOOD MOISTURE	7	7	5	4
7A VOLUNTARY WOOD BURNING BAN	14	13	10	8
7B MANDATORY WOOD BURNING BAN	55	51	41	31
TOTAL REDUCTIONS WITHOUT 7B	96	119	176	235
TOTAL REDUCTIONS WITH 7B (= all measures)	151	170	217	266
TOTAL CONCENTRATIONS WITHOUT 7B	137	129	109	88
TOTAL CONCENTRATIONS WITH 7B (= all meas.)	82	78	68	57
TOTAL CONCENTRATIONS WITHOUT 5C, 7B	146	145	140	135
TOTAL CONCENTRATIONS WITHOUT 4B,6A-B,7B	144	138	117	98



MAMMOTH PM-10 FORECASTS (CASE A)
AMBIENT CONCENTRATION (microgms/cubic meter)
250
200
150
100
50
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005
CONTROL MEASURES INCLUDED:
Measures 1-7a
Measures 1-7b
UNCTRL TOTAL
Measures 1-7a minus 5c
Meas. 1-7a minus 4b,6a,6b

APPENDIX G

EPA CERTIFIED RESIDENTIAL WOOD HEATERS

1990

RESIDENTIAL WOOD HEATERS CERTIFIED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (Btu/hr)	Certific Level
Aladdin Steel Products, Inc. 401 N. Wynne Street Colville, Washington 99114 509-684-3745				
Quadra-Fire 2000, 2000-I Catalytic? N	6.1	63**	7400-43700	I
Quadra-Fire 3000, 3000-I Catalytic? N	6.5	63**	9000-44700	I
Quadrafire 4100 Catalytic? N	4.0	63**	11700-50500	II
Quadra-Fire 3100, 3100F-I Catalytic? N	2.1	63**	11900-43200	II
Quadra-Fire 2100, 2100 I Catalytic? N	3.6	63**	9300-39300	II
American Road Equipment Company 4201 North 26th Street Omaha, Nebraska 68111 402-451-2575				
Erik SW II Catalytic Environmentalist SSW-1000 Catalytic? Y	1.2	72**	9800-46900	I
Appalachian Stove & Fabricators, Inc. 329 Emma Road Asheville, NC 28806 (704) 253-0164				
28 CD Catalytic? Y	4.5	72**	9500-16300	I
32-BW-XL-88, Gemini-XLB 1989 Catalytic? Y	4.0	72**	8400-19800	II
Trailmaster 4N1-XL Catalytic? Y	4.7	72**	9600-19600	I
36-BW-1988 Catalytic? Y	3.9	72**	9500-19300	II
Model 52 WXL 1988 Catalytic? Y	4.2	72**	10500-15400	I

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
Brass Flame Stove Company P.O. Box 100 1110 Ort Lane Merlin, Oregon 97532 503-476-5238				
KS-1005, SV-14; KS-2000, FI-15 Catalytic? N	6.0	63**	9500-41100	I
Brass Flame KS-805 Catalytic? N	5.3	63**	9300-49800	I
Brass Flame KS-805 Catalytic? N	6.0	63**	9300-49800	II
Buchanan Welding & Fabrication, Inc. Route 3 Box 288-A Bakersville, NC 28705 919-765-6850				
XTEC 2000 Catalytic? Y	3.3	72**	10800-43100	II
Chippewa Welding, Inc. Route 5, Box 190 Chippewa Falls, WI 54729 715-723-9667				
Energy King Bay 2000C Catalytic? Y	2.5	72**	11400-34600	II
Energy King 2500C Catalytic? Y	3.0	72**	16100-39800	II
Energy King Legacy 1600 Catalytic? N	7.0	63**	11700-23100	II
Energy King Legacy 2100 Catalytic? N	3.2	63**	11000-31100	II
Energy King Legacy 900 Catalytic? N	6.5	63**	10200-30800	II
Country Flame P.O. Box 151 Mt. Vernon, Missouri 65712 417-466-7161				
B-6, B-I Catalytic? Y	4.6	72**	9600-48200	I

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific. Level
El-6, El-I Catalytic? Y	3.7	72**	12400-55300	I
S-6, S-I Catalytic? Y	6.5	72**	13100-48900	I
R-6 Catalytic? Y	3.3	72**	13800-50700	I
O-2 Catalytic? Y	2.5	72**	8000-30000	I
BBF-6, BBF-I Catalytic? Y	3.0	72**	9500-48600	I
NC-6D Catalytic? N	4.7	63**	11700-54900	II
SBF/A Catalytic? Y	3.6	72**	8700-33600	II
BBF Catalytic? Y	3.0	72**	10500-51400	II
B/A Catalytic? Y	2.0	72**	10400-55500	II
E-2 Catalytic? Y	3.3	72**	13000-34400	II

Country Stoves, Inc.
P.O. Box 987
Auburn, Washington 98071-0987
206-872-9663

Starlite C-20, C-21 Catalytic? N	9.6	63**	7700-43500	I
Converter C-30, C-35 Catalytic? Y	4.0	72**	8000-49200	I
Performer C-4, C-5, C-6 Catalytic? N	6.6	63**	11400-38700	II
T-Top C-40, C-45, C-46 Catalytic? N	5.7	63**	10700-40900	II
STRIKER C-50, C-50L, and C-55 Catalytic? N	5.6	63**	9300-43600	II

Derco, Inc./Grizzly Stoves
P.O. Box 9
10005 East U.S. 223
Blissfield, Michigan 49228
517-486-4337

Little Blazer FP-20 Catalytic? Y	4.7	72**	7200-28400	I
Super Achiever FPI-2-LEX Catalytic? Y	2.4	72**	9800-34200	I
Achiever FPI-1-LEX Catalytic? Y	2.0	72**	7900-26700	II

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
FPI2-LEX/90 Catalytic? Y	1.6	72**	10300-36500	II
Dovre, Inc. 401 Hankes Avenue Aurora, Illinois 60505 (312) 844-3353				
Horizon 500 CC Catalytic? Y	2.9	72**	10300-33800	I
Heirloom 300 HC Catalytic? Y	4.5	72**	11600-45100	I
Horizon 500 CC Catalytic? Y	3.6	72**	8300-28000	II
Earth Stove Marketing, Inc. 19700 SW Teton Tualatin, Oregon 97062 503-692-3991				
1002-C Catalytic? Y	5.5	72**	11600-47100	I
Bayview BV400, BV450 Catalytic? Y	5.5	72**	11000-53700	I
Bayview II BV4000 Catalytic? Y	3.1	72**	9200-42300	I
1000HT, 1100HT, 2000HT, 2200HT Catalytic? N	8.3	63**	6600-32200	I
Traditions T-100 Catalytic? Y	3.8	72**	8300-43800	I
1003-C Catalytic? Y	3.7	72**	11700-36800	II
Earth Stove and Ranger 1500HT, 2500HT, 1400HT Catalytic? N	6.6	63**	11700-37000	II
Bayview BV400C/450C Catalytic? Y	3.0	72**	11000-48100	II
Traditions T100SC Catalytic? Y	4.1	72**	6500-35300	II
Bayview BV4000C Catalytic? Y	1.9	72**	6600-40900	II
Elmira Stove Works 145 Northfield Drive Waterloo, Ontario N2L 5J3 Canada 519-747-5443				

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
5000 Combination Range Design #50001				
Catalytic? N	5.5	63**	13600-21600	I
Fireview 2300				
Catalytic? N	7.0	63**	11700-27500	II
Fire View Insert 2700				
Catalytic? N	3.8	63**	9400-27500	II

England's Stove Works
P.O. Box 206
Monroe, Virginia 24574
(804) 929-0120

Englander Econo Radiant 18PC				
Catalytic? Y	3.6	72**	8500-31000	I
Englander Freestanding Radiant 24FC				
Catalytic? Y	2.4	72**	7200-35600	I
Englander Front Loading Space Saver 28CC				
Catalytic? Y	2.7	72**	7900-25500	I
Englander Front Loading Fireplace 28IC				
Catalytic? Y	2.5	72**	8200-24400	I
Englander Fireplace Insert 28JC				
Catalytic? Y	4.4	72**	8400-29100	I
22 PIC				
Catalytic? Y	5.1	72**	9000-30200	I
Model 18 PC				
Catalytic? Y	2.2	72**	8700-26400	II
Model 24 AC/FC				
Catalytic? Y	3.8	72**	9100-25400	II
Model 24				
Catalytic? Y	2.1	72**	7200-28600	II
Model 24IC				
Catalytic? Y	2.6	72**	10200-27100	II

Evergreen Marketing, Inc.
8196 SW Hall Boulevard
Suite 310
Beaverton, Oregon 97229

Mohawk 60A				
Catalytic? Y	3.8	72**	4700-14300	I

Evergreen Metal Products Inc.
Suite 202
910 Sleater-Kinney Road S.E.
Lacey, Washington 98503
206-459-0445

Schrader Pelletmiser 905-P				
Catalytic? N	1.0	78**	11000-32700	II

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific[illegible] Level
Fabco, Inc. 101 Eagle Glen Lane P.O. Box 9 Eagle, Idaho 83616 208-939-0420				
Briarwood II 87 Catalytic? N	7.3	63**	9900-45900	I
Briarwood XE 88 Catalytic? N	6.4	63**	12800-34200	I
Eagle 88, Pioneer ZC Catalytic? N	6.4	63**	12800-22800	I
Briarwood II/90 Catalytic? N	3.5	63**	10600-36000	II
Eagle/Pioneer E90, PZ-90, Briarwood XE-90, XEI-90 Catalytic? N	5.2	63**	13500-38000	II
Fireplace Xtrordinair 12700 N.E. 124th Street Suite 10 Kirkland, Washington 98034 206-821-4800				
Model B-36 Catalytic? Y	4.0	72**	11900-55000	II
Model 44 FR[illegible]. Design #2 Catalyt[illegible] Y	2.3	72**	10700-75700	II
Fonderies du Lion S.A. 6373 Frasnes-lez-Couvin , Belgium 011-32-60-311453				
Efel Harmony 386.75 Catalytic? Y	3.8	72**	7100-51000	II
Efel Symphony 387.74 Catalytic? Y	5.1	72**	10600-49700	I
Glo King Wood Stoves P.O. Box 179 Florence, Oregon 97439-0006 503-997-2666				
GK-500SD Catalytic? N	6.4	63**	10000-22400	II

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
GK-300HT Catalytic? N	7.0	63**	11000-31000	II
400HT Catalytic? N	7.0	63**	10000-40200	II
Godin Imports, Inc. 8 Lahave St. South Portland, ME 04106-4903 207-773-1920				
Nouvelle Epoque 3137 Catalytic? Y	3.9	72**	10500-20700	II
Haugh's Products 10 Atlas Court Brampton, Ontario L6T 5C1 CANADA (416) 792-8000				
Douglas Elite S131E, S132E; Mini Elite S111E,S112E Catalytic? N	7.1	63**	10400-22200	I
Cabot Elite I, S171E, S172E, S173E Catalytic? N	4.5	63**	11300-34400	II
Fraser Elite I, S407E, S408E, S409E Catalytic? N	3.4	63**	10000-37900	II
Campbell Elite S144E Catalytic? N	5.1	63**	11000-31100	II
Heatilator, Inc. 1915 W. Saunders Street Mt. Pleasant, Iowa 52641 319-385-9211				
Arrow 18 Catalytic? N	7.2	63**	14500-34400	I
Heatilator 11, 12 Catalytic? N	5.1	63**	12400-36100	I
Arrow 14, 20 Catalytic? N	4.0	63**	14000-36100	I
Arrow 55 Catalytic? Y	3.0	72**	9900-37500	I
Arrow Fireplace Insert 25 Catalytic? Y	4.7	72**	11300-55000	I
Heatilator 1290/ Arrow 2090 Catalytic? N	6.1	63**	10500-44500	II
Heatilator 1190/Arrow 1490 Catalytic? N	6.1	63**	10500-44500	II

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific. Level
Heating Energy Systems P.O. Box 593 (15525 SE For-Mor Court) Clackamas, Oregon 97015 503-650-0504				
Trailblazer Genesis 1600, Classic 1500 Catalytic? N	8.2	63**	12100-28100	I
Trailblazer Genesis 2000-C Catalytic? Y	3.1	72**	10600-37500	II
Heritage Stoves Inc. 352 South Main Street Clearfield, Utah 84015 801-773-8606				
Bostonian 2500C Catalytic? Y	6.8	72**	9600-37300	I
American 2000C Catalytic? Y	5.5	72**	13600-33800	I
Hitzer, Inc. 269 East Main Street Berne, IN 46711 (219) 589-8536				
Glo King 300HT Catalytic? N	7.0	63**	11000-31000	II
Glo King 400HT Catalytic? N	7.0	63**	10000-40200	II
Glo King 500SD Catalytic? N	6.4	63**	10000-22400	II
Horizon Research Inc. 17905 Bothell Way Southeast Suite #105 Bothell, Washington 98012				
Eclipse Catalytic? N	1.0	78**	7800-33100	II
Hutch Manufacturing Company P.O. Box 350 200 Commerce Avenue Loudon, Tennessee 37774 (800) 251-9232				

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
HRD-18C Catalytic? Y	4.5	72**	9300-39100	I
HRS-18C Small Freestanding Catalytic? Y	2.9	72**	10300-38400	II
HRD-27C Catalytic Freestanding Catalytic? Y	2.5	72**	10300-56200	II
DWI-42C-2 (EPA) Catalytic? Y	1.5	72**	10700-52800	II
DWI-42C Catalytic? Y	1.6	72**	9800-54600	I

Jotul U.S.A., Inc.
400 Riverside Street
Portland, Maine 04104
207-797-5912

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
American Fireplace Stove 3TDC Catalytic? Y	4.0	72**	8800-31700	I
Alpha 350132 Catalytic? Y	3.1	72**	10100-33000	II
Model 8 TDIC Catalytic? Y	3.8	72**	10900-35100	II

Kent Heating Limited
59 Tidal Road Mangere
P.O. Box 23-340 Papatoetoe
Auckland,
New Zealand
Fax 649-275-7558

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
Tile Fire L.E.M. TLE-1 Catalytic? N	5.9	63**	8500-38600	I
Sherwood L.E.M. XLE-1 Catalytic? N	6.5	63**	9600-33400	I
Catalytic Tile Fire Catalytic? Y	2.0	72**	5900-24500	I
Log Fire 2000 Catalytic? N	7.0	63**	11200-23700	II
Tile Fire 2000, Ultima 2000 Catalytic? N	6.3	63**	12500-21700	I
Sherwood 2000 Catalytic? N	8.1	63**	13000-26600	I
Log Fire LPE Catalytic? N	5.9	63**	8900-28200	I
Ultima 2000S Catalytic? N	4.5	63**	11000-23000	II

Long Manufacturing of North Carolina Inc.
P.O. Box 1139
111 Fairview Street
Tarboro, North Carolina 27886
919-823-4151

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certifi Level
Silent Flame 2058 Catalytic? Y	5.3	72**	9000-27100	I
2062 Catalytic freestanding/insert Catalytic? Y	3.3	72**	10600-20700	II
Luap Associates, Inc. 2720 Roosevelt Blvd. Eugene, Oregon 97402 503-461-2141				
Eagle 2001 Catalytic? N	2.6	78**	8400-55200	I
Mark's Custom Stoves 13736 S. Locan Selma, CA 93662 (209) 896-8445				
Kuma K-300/K-400, K-100B Catalytic? Y	2.8	72**	12100-65200	II
Martin Industries, Inc. P.O. Box 128 Florence, Alabama 35631 (205) 767-0330				
Sahara AHS1, ASH1B; King KHS; Atlanta ATHS, BTHS Catalytic? Y	2.4	72**	7200-29500	I
Ashley APS5,APS5B; King KC5,KC5B; Atlanta AC5,AC5B Catalytic? Y	3.8	72**	9400-35400	I
Ashley CAHF,CAHFB; King MCF,MCFB; Atlanta ACF,ACFB Catalytic? Y	4.8	72**	9900-30000	I
Ashley CC60D, King CKWC Catalytic? Y	5.3	72**	5200-33200	I
Ashley APC2,APC2C; King KC2,KC2B; Atlanta AC2,AC2B Catalytic? Y	3.0	72**	9700-27900	I
Ashley CC60,King 8803 & CKW,Atlanta 2402,Aspen CAW Catalytic? Y	3.8	72**	5700-35300	II
Ashley CAHF-2, Atlanta ACF-2, King MCF-2 Catalytic? Y	1.6	72**	12800-38900	II
Ashley AHS2, AHS2B; King KHS2 Catalytic? Y	1.9	72**	13700-34300	II
NHC Inc. Hearthstone Way Morrisville, Vermont 05661 802-888-4586				

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
3-C				
Catalytic? Y	2.0	72**	7900-15000	I
Harvest HII				
Catalytic? Y	3.8	72**	8800-28900	II
NU-TEC/Upland Distributors, Inc. P.O. Box 908 72 College Street East Greenwich, RI 02818 (401) 738-2915				
Upland Amity AM-40				
Catalytic? Y	2.6	72**	10600-23600	II
National Steelcrafters of Oregon P.O. Box 2501 Eugene, Oregon 97402 (503) 683-3210				
Craft Stove CB-4426, CB-26, CAT 44-1				
Catalytic? Y	3.9	72**	12100-35600	I
Craft Stove CB-4830, CB-300				
Catalytic? Y	3.1	72**	11600-41100	I
Chateau NC24				
Catalytic? N	5.4	63**	14500-51000	I
National Steelcrafters, Inc. P.O. Box 56 Gastonia, North Carolina 28053				
Craft Stove CB-4426				
Catalytic? Y	3.9	72**	12100-35600	I
Craft Stove CB-4830				
Catalytic? Y	3.1	72**	11600-41100	I
Craft CB-4830 Insert				
Catalytic? Y	3.4	72**	9100-22400	II
New Buck Corporation/Minpro Supply, Inc. P.O. Box 69 1265 Bakersville Highway Spruce Pine, NC 28777 800-222-7439				
Regular Buck 27000-C				
Catalytic? Y	3.8	72**	14700-25100	I

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certifi Level
Little Buck 26000-C Catalytic? Y	4.0	72**	6800-38700	I
Big Buck 28000-C Catalytic? Y	4.7	72**	8500-39100	I
Regular Buck 27000-CR Catalytic? Y	4.8	72**	14700-30800	I
41BCV, BBay, CD, CS, CV, CBAY, PCV, PCBAY Catalytic? Y	2.6	72**	6900-27800	II
50PCV, 50PBay, 50CV, 50CBay, 50CD, 50BCV, 50BBay Catalytic? Y	2.5	72**	10100-38000	II
Model 70 Catalytic? Y	5.0	72**	9800-31300	I
Model 71 Freestanding/Insert Catalytic Catalytic? Y	3.6	72**	13100-40200	II
OK Doke, Ltd. 1425 Weld County Road 32 Longmont, Colorado 80501-9619 (303) 776-2300				
Sweethearth Presidential 800/800XL Catalytic? Y	3.6	72**	9900-20000	II
Oregon Woodstoves, Inc. P.O. Box 70107 1844 Main St., Springfield OR 97477 Eugene, Oregon 97401 503-747-8868				
#1, Design 01 Catalytic? Y	2.7	72**	9600-49700	I
Orley's Manufacturing Company, Inc. 1718 W. Antelope Rd. White City, Oregon 97503 503-826-3233				
Leopard U245,U246,UO245,UO246; Panther F245,F246 Catalytic? Y	3.5	72**	9100-39000	I
Cougar G-225 Catalytic? Y	2.7	72**	9100-36200	I
Orrville Products, Inc. 375 East Orr Street P.O. Box 902 Orrville, Ohio 44667-0902 800-232-4010				
Country Comfort CC100 Catalytic? N	8.5	63**	8700-33400	I

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
Country Comfort CC150, CC1000, CC150H				
Catalytic? N	7.5	63**	7200-23900	I
Country Comfort CC125				
Catalytic? N	9.5	63**	12300-27600	I
Country Comfort CC350				
Catalytic? Y	4.3	72**	11200-29100	I
Country Comfort CC325				
Catalytic? Y	3.5	72**	18600-60600	II
CC 350				
Catalytic? Y	3.8	72**	13700-68900	II

Osburn Manufacturing, Inc.
555 Ardersier Road
Victoria, Br. Columbia V8Z 1C8
Canada
(604) 383-6000

Imperial 2000				
Catalytic? N	4.6	63**	9000-33000	I
Imperial MKII, MKII Insert, Goldenaire				
Catalytic? N	7.0	63**	10700-51600	I
1050				
Catalytic? N	6.9	63**	10600-42900	II
Osburn 1600				
Catalytic? N	4.4	63**	11800-42400	II

Pacific Energy Woodstoves, Ltd.
P.O. Box 29
1394 Fisher Road
Cobble Hill, Br. Columbia V0R 1L0
Canada
604-743-2543

S-27, Spectrum, Standard, Pacific				
Catalytic? N	6.4	63**	10600-36400	I
Super 27 Design D, Spectrum, Standard, Pacific Ins				
Catalytic? N	3.4	63**	11000-34600	II

Panda Wood Stoves
6261 Crater Lake Highway
Medford, Oregon 97504
(503) 826-7804

UMF-400				
Catalytic? Y	5.0	72**	7600-38300	I

Pellefier Inc.
P.O. Box 487
Morton, WA 98356-0487

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certifi Level
Venturi PVI-87 Catalytic? N	0.5	78**	9000-31800	I
Piazzetta S.p.A. 31010 Casell d'Asolo Treviso, Italy				
904 Catalytic? N	7.5	63**	6700-28300	II
Model 905 Catalytic? N	6.8	63**	11600-30300	II
Pinehill Innovators Inc. 205-20701 No. 10 Highway Langley, Br. Columbia V3A 5E8 Canada				
Sierra 1200 NC Catalytic? N	5.1	63**	11500-59000	II
Challenger 700 NC Catalytic? N	4.8	63**	11600-43700	II
Pyro Industries, Inc. 11625 Airport Road Everett, Washington 98204 206-348-0400				
Whitfield WP-1 Catalytic? N	1.3	78**	9000-24700	I
Whitfield Advantage WP-2 Catalytic? N	1.3	78**	10900-35100	II
Whitfield Fireplace/Hearth Stove Catalytic? N	1.0	78**	11000-35700	I
RSF Energy Ltd. 2965 Tatlow Road Box 3637 Smithers, Br. Columbia V0J 2N0 Canada 604-847-4301				
Ardent HF 40 Catalytic? N	9.9	63**	6400-30600	I
Regency Industries, Ltd. 7830 Vantage Way Delta, Br. Columbia V4G 1A7 Canada				

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
Medium Flush Insert R14 Catalytic? N	4.5	63**	11200-42700	I

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
Small Freestanding R7, RA7, R5 Catalytic? N	8.3	63**	5900-33500	I
Medium Freestanding R3, RA3, R9 Catalytic? N	4.2	63**	11200-35500	I
Large Freestanding Woodstove R6 Catalytic? N	3.9	63**	11500-59000	II
Fireplace Insert R-16 Catalytic? N	6.6	63**	11100-32900	II
Small Freestanding R5-2, R7-2, RA7-2 Catalytic? N	3.8	63**	09400-38700	II
Medium Freestanding Woodstove R3-2, R9-2, RA3-2 Catalytic? N	7.1	63**	11800-34200	II
Regency R14-2 Catalytic? N	5.0	63**	11500-37500	II

Reverso Manufacturing, Ltd.
4480 Chesswood Drive
Downsview, Ontario M3J 2B9
CANADA
(416) 630-3340

Challenger MMX Catalytic? N	2.6	63**	11200-33800	II

Riteway-Dominion Manufacturing Company, Inc.
200 Old River Road
Box 5
Bridgewater, Virginia 22812
(703) 828-3155

Dominion 005 Catalytic? Y	4.5	72**	7000-29100	I

Russo Corporation
87 Warren Street
Randolph, Massachusetts 02368
617-963-1182

W-25C Catalytic? Y	2.4	72**	8400-31300	I
W-18C Catalytic? Y	6.2	72**	7900-40900	I
GV-30C Catalytic? Y	3.1	72**	10300-39400	I

Salvo Machinery, Inc.
220 Shove Street
P.O. Box 6145
Fall River, MA 02724
508-678-7507

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
Model Citation Catalytic? Y	2.4	72**	9600-33500	II
Sarratt Agencies Limited c/o Meridian Heating 1/677 Boronia Road Wantirna, 3152 Australia (0061-3) 887-2687				
Merlin 3 FS-15, IS-15 Catalytic? N	6.1	63**	9800-21100	I
Security Chimneys Ltd. 2125 Monterey Laval, Quebec H7L 3T6 Canada 514-337-3387				
Bis Design No. 1.2 Catalytic? N	5.5	63**	14200-55800	I
BIS II Catalytic? N	5.3	63**	11300-41500	II
Seefire Stoves 3930 Hobbs Street Victoria, Br. Columbia V8N 4C9 CANADA (604) 477-0148				
Seefire 1600 S Catalytic? N	7.0	63**	11700-23100	II
Seefire 2100 S Catalytic? N	3.2	63**	11000-31100	II
Seefire 900 S Catalytic? N	6.5	63**	10200-30800	II
Shenandoah Manufacturing Company, Inc. P.O. Box 839 Harrisonburg, Virginia 22801 (703) 434-3838				
CH-77, CH-84 Catalytic? Y	3.1	72**	8000-33800	II
Sherwood Industries, Ltd. 6820 Kirkpatrick Crescent Victoria, Br. Columbia V8X 3X1 CANADA (604) 652-6080				

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
Seefire 1600 S Catalytic? N	7.0	63**	11700-23100	II
Seefire 2100 S Catalytic? N	3.2	63**	11000-31100	II
Sierra Manufacturing Company of Virginia Inc. 1680 Country Club Road Harrisonburg, Virginia 22801 (703) 434-3800				
Evolution 8000TE Catalytic? Y	2.2	72**	7900-40500	I
Cricket MHCR 5200 Catalytic? Y	3.5	72**	6800-27600	I
Evolution 7000TE,7000C Catalytic? Y	4.0	72**	11200-43000	I
Diplomat 4300 TE Catalytic? Y	5.1	72**	10400-53400	I
Sweet Home AFX-HT, AFI-HT Catalytic? N	6.4	63**	11300-28200	II
Ambassador 4700TE Catalytic? Y	2.5	72**	10100-37600	I
Sweet Home Catalytic Fir AK-18 Catalytic? Y	3.1	72**	8800-29500	I
Sweet Home Solitaire PFA 2000 Catalytic? N	4.0	78**	9700-28200	I
Sweet Home NFX-HT Catalytic? N	7.8	63**	145[illegible]0-33200	I
Cricket 5300 Catalytic? N	6.6	63**	11000-36400	II
Suburban Manufacturing Company P.O. Box 399 North Broadway Dayton, Tennessee 37321 (615) 775-2131				
Woodchief W6-88C, Woodmaster W6-88WC Catalytic? Y	3.4	72**	9500-42500	II
TEC Enterprises Box 23 Lewiston, Idaho 83501 (208) 843-7297				
2000 pellet stove Catalytic? N	4.7	78**	11600-22500	II

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
Thermic, Inc. N. 9510 Newport Highway P.O. Box 11986 Spokane, Washington 99211 509-467-4328				
Crossfire FS-1 Catalytic? N	0.5	78**	6900-39900	I
Tolotti Manufacturing, Inc, 670 Dunn Circle Sparks, Nevada 89431 702-359-5661				
Benchmark, 1800; P,I,ZC Catalytic? N	7.8	63**	10000-32000	I
Travis Industries, Inc. 10850 117th Pl. N.E. Kirkland, Washington 98033 206-827-9505				
Lopi Flawless Performance 380, 440 Catalytic? N	7.0	63**	6900-48700	I
Lopi Premiere Answer Series PA1, PA2, PA3, PA4,PA5 Catalytic? N	7.0	63**	8000 .1500	I
Lopi Elan E1, E2 Catalytic? N	4.3	63**	11700-26300	I
Avalon 700 Catalytic? N	5.9	63**	9200-39100	I
Avalon 901 Catalytic? N	5.2	63**	7500-45500	I
Avalon 1000C2 Catalytic? Y	3.5	72**	7300-47100	I
Lopi X Fireplace Insert Catalytic? N	6.0	63**	13600-29100	I
Lopi Flex FS, FL, LX Catalytic? Y	2.9	72**	10900-31000	II
Lopi The Answer Catalytic? N	6.7	63**	10500-63100	II
Avalon 796 Catalytic? N	3.0	63**	8700-44400	II
Flex-95 FL, LX, and FS Catalytic? Y	4.1	72**	10900-55300	II
Avalon 1196, Lopi 520/96 Catalytic? N	7.4	63**	11300-43600	II

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific Level
Avalon 996 Catalytic? N	5.5	63**	9500-45600	II
LOPI 380-96 Catalytic? N	5.[illegible]	63**	9400-52800	II
Lopi X/96 Catalytic? N	7.2	63**	11600-53900	II
Tri-Fab, Inc. 62880 Peerless Court Bend, Oregon 97701 503-389-0304				
SunRise P56 Catalytic? N	6.2	63**	10700-39700	I
SunRise P-48-H, P-48-L Catalytic? N	5.5	63**	11700-25800	II
U. S. Stove Company P.O. Box 5349 Chattanooga, Tennessee 37406 (615) 698-3435				
Wonder Wood 6000, 2821, Sears 143.8404 Catalytic? Y	3.7	72**	9100-18700	II
Bay Insert 4500 Catalytic? Y	3.7	72**	9600-30700	II
Wonder Wood (Glass Front) 2921, Sears 143.8417 Catalytic? Y	3.3	72**	12500-54600	II
Vansco Industries 1625 Lenoir Drive P.O. Box 2497 Winchester, Virginia 22601 703-662-8600				
Treemont TAC-260C Catalytic? Y	3.9	72**	8400-40700	II
Treemont TAC-520C Catalytic? Y	5.2	72**	12000-37300	I
Treemont TAC-340C Catalytic? Y	3.7	72**	8200-37200	II
Vermont Castings, Inc. Prince Street Randolph, Vermont 05060 (802) 728-3181				
Intrepid II Catalytic? Y	1.0	72**	5700-18300	I

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific. Level
Defiant Encore				
Catalytic? Y	0.6	72**	6200-32900	I
C.D. Extra-Lg. Federal Convection Heater FA288CCL				
Catalytic? Y	2.6	72**	8400-38700	I
C.D. Small Federal Convection Heater FA224CCL				
Catalytic? Y	2.8	72**	7000-30600	I
C.D. Federal "A Plus" FA224ACL				
Catalytic? Y	3.5	72**	7200-30000	I
C.D. Rocky Mountain Heater FA211CL				
Catalytic? Y	2.9	72**	6800-27800	I
C.D. Small Federal Box Heater FA207CL				
Catalytic? Y	4.3	72**	6200-28000	I
C.D. Adirondack Wood Heater FA267CL				
Catalytic? Y	3.7	72**	8400-40000	I
C.D. Large Federal Box Heater FA209CL				
Catalytic? Y	4.3	72**	9000-25600	I
C.D. Lg. Fed. Convection Heater FA264CCL, FA264CCR				
Catalytic? Y	1.6	72**	6600-26700	I
C.D. Sequoia FA455				
Catalytic? Y	3.6	72**	8700-60300	I
WinterWarm 1280				
Catalytic? Y	2.1	72**	10300-30000	II
Resolute Acclaim 0041				
Catalytic? N	5.1	63**	8700-30900	II
Intrepid II 1308				
Catalytic? Y	3.1	72**	10200-22500	II
FA224				
Catalytic? Y	3.1	72**	9100-34800	II
FA264				
Catalytic? Y	2.2	72**	9500-31700	II
FA288				
Catalytic? Y	3.1	72**	7800-29300	II
FA455				
Catalytic? Y	1.3	72**	10400-26500	II
Defiant Encore 2140				
Catalytic? Y	1.8	72**	9000-41300	II

Vestal Manufacturing
P.O. Box 420
Sweetwater, Tennessee 37874
615-337-6125

Vestal Fireplace Insert V 200 - I				
Catalytic? Y	2.0	72**	11700-26500	II
Vestal Radiant Heater V-100				
Catalytic? Y	2.2	72**	9400-27700	II

W.E.T. Industries
14601 Arminta Street
Van Nuys, California 91402
(818) 785-8806

Heat Pro C210				
Catalytic? Y	3.9	72**	10700-43300	II

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
Heat Pro C110 Catalytic? Y	2.8	72**	9600-32400	II
Wamsler Herd und Ofen GmbH Landsberger Strasse 372 D-8000 Munchen 21, West Germany 89-589-6243				
HOK 10 Catalytic? N	4.6	63**	9200-16900	I
Waterford Foundry Export Ltd. Bilberry, Waterford Ireland 011-353-051-75911				
100B Design 29 Catalytic? N	7.5	63**	7200-27500	I
Erin Catalytic? N	7.6	63**	11800-41500	I
104 MK II 31 Catalytic? N	2.9	63**	8800-25900	II
Waterford 100B 90 32 Catalytic? N	3.1	63**	10800-32400	II
Webco Industries 105 East Street Woodland, California 95695 (916) 666-6107				
Marquis 800, 800 XL Catalytic? Y	3.6	72**	9900-20000	II
Welenco Manufacturing, Inc. 119 New 6th Street Lewiston, Idaho 83501 (208) 743-5525				
P-1000W Catalytic? N	0.7	78**	9600-23900	I
Weso-Aurorahautte GmbH Ceramic Radiant Heat Pleasant Drive Lochmere, New Hampshire 03252 603-524-9663				
Prestige 125, 225, 325, 425 Catalytic? N	7.3	63**	8900-31200	I

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certific. Level
Renaissance 326 Catalytic? N	8.0	63**	9200-32900	I
Winnebago Manufacturing Company 3201 Third Avenue Mankato, Minnesota 56013 507-625-4436				
Clayton Zero Clearance Fireplace Catalytic? Y	4.2	72**	13400-59500	I
Winston Stove Company 13643 Fifth Street Chino, California 91710 714-591-7405				
Model WP-24 Catalytic? N	1.5	78**	9700-29400	II
Model WP-18 Catalytic? N	0.6	78**	10000-21300	II
Wolf Steel Ltd. R.R. 1 (Highways 11 & 23) Barrie, Ontario L4M 4Y8 Canada 705-721-1212				
Napoleon 1000 Catalytic? N	6.5	63**	10200-30800	II
Napoleon 1500 Catalytic? N	7.0	63**	11700-23100	II
Napoleon 2000 Catalytic? N	3.2	63**	11000-31100	II
Woodcutters Manufacturing, Inc. 3301 East Isaacs Walla Walla, Washington 99362 509-529-9820				
Blaze King, Royal Guardian RGT-3001 Catalytic? N	5.8	63**	9400-39800	II
Blaze King, Princess Catalytic PEJ-1002 Catalytic? Y	3.7	72**	8400-35400	I
Blaze King, Royal Heir RHT-2200, 2250 Catalytic? Y	2.5	72**	7700-31100	I

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
Blaze King, King Catalytic KEJ-1101 Catalytic? Y	1.9	72**	9000-35300	I
Blaze King, King Catalytic Insert KEI-1300 Catalytic? Y	2.2	72**	10100-34500	I
Blaze King, Royal Heir RHT-2100 Catalytic? Y	3.0	72**	6800-57100	I
Blaze King, Auto Light PAL-4000 Catalytic? N	2.5	78**	12200-33700	II
Blaze King PEJ 1003 Catalytic? Y	3.5	72**	10300-41600	II
Blaze King KEJ-1102 Catalytic? Y	3.9	72**	7900-42600	II

Woodkiln Inc.
24 Jamestown Street
Sinclairville, New York 14782
(716) 962-8178

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
Woodkiln WK-23 Catalytic? N	3.8	63**	10700-27200	II

Woodstock Soapstone Company, Inc.
RR 1, Box 37H
Air Park Road
West Lebanon, NH 03784
603-298-5955

Manufacturer/Model	Emissions (g/hr)	Efficiency (%)	Heat Output (BTU/hr)	Certification Level
Catalytic Fireview Soapstone Stove #201 Catalytic? Y	3.5	72**	13200-40000	II

Total number of models certified = 281

* = Level of Certificate:

Phase I (1988) -
Applies to units: Manufactured after June 30, 1988
or
Sold at retail after June 30, 1990

Units may not be: Manufactured after June 30, 1990
or
Sold at retail after June 30, 1992

Phase II (1990) -
Meets more stringent emission limits

Applies to units: Manufactured after June 30, 1990
or
Sold at retail after June 30, 1992

Certificates valid for five years from issue date and may be renewed

No restrictions on sales

** = Default efficiency value shown (stove not tested for efficiency for EPA)

Noncatalytic Wood Heaters:	63%
Catalytic Wood Heaters:	72%
Pellet Wood Heaters:	78%

APPENDIX H

EFFECTIVENESS OF CONTROLS FOR DAYS DOMINATED BY WOOD BURNING

- ADOPTED ORDINANCE -

TABLE H-1

CASE A - WOOD SMOKE DOMINATED DAY

SUMMARY OF AMBIENT PM-10 CONTRIBUTIONS
Assume NAAQS Not Attained by January 1, 1993

PRIMARY CONTROL STRATEGY

Mandatory Burning Curtailment Program (With an Exemption for Certified Wood Stoves)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Wood Burning	97.8	102.5	103.9	105.9	110.9	115.8
Traffic	3.3	3.4	3.7	4.0	4.6	5.3
Background	5.0	5.0	5.0	5.0	5.0	5.0
	106.1	110.9	112.6	114.9	120.5	126.1

Mandatory Burning Curtailment Program (No Exemption for Certified Wood Stoves)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Wood Burning	97.5	101.0	94.2	89.1	77.0	64.4
Traffic	3.3	3.4	3.7	4.0	4.6	5.3
Background	5.0	5.0	5.0	5.0	5.0	5.0
	105.8	109.4	102.9	98.1	86.6	74.7

Without the Mandatory Burning Curtailment Program

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
All Wood Burning	195.0	202.0	188.4	178.3	153.9	128.8
Traffic	3.3	3.4	3.7	4.0	4.6	5.3
Background	5.0	5.0	5.0	5.0	5.0	5.0
	203.3	210.4	197.1	187.3	163.5	139.1

TABLE H-2

CASE A - WOOD SMOKE DOMINATED DAY

SUMMARY OF AMBIENT PM-10 CONTRIBUTIONS
Assume NAAQS attained by January 1, 1993

SECONDARY CONTROL STRATEGY

Mandatory Burning Curtailment Program
(With an Exemption for Certified Wood Stoves)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Wood Burning	98.0	102.5	103.9	97.0	105.9	114.6
Traffic	3.3	3.4	3.7	4.0	4.6	5.3
Background	5.0	5.0	5.0	5.0	5.0	5.0
	106.3	110.9	112.6	106.0	115.5	124.9

Mandatory Burning Curtailment Program
(No Exemption for Certified Wood stoves)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
All Wood Burning	97.5	101.0	94.2	48.6	52.9	57.3
Traffic	3.3	3.4	3.7	4.0	4.6	5.3
Background	5.0	5.0	5.0	5.0	5.0	5.0
	105.8	109.4	102.9	57.6	62.5	67.6

Without the Mandatory Burning Curtailment Program

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
All Wood Burning	195.0	202.0	188.4	97.0	105.9	114.6
Traffic	3.3	3.4	3.7	4.0	4.6	5.3
Background	5.0	5.0	5.0	5.0	5.0	5.0
	203.3	210.4	197.1	106.0	115.5	124.9

APPENDIX I

EFFECTIVENESS CALCULATIONS
FOR THE TOWN OF MAMMOTH LAKES
PARTICULATE EMISSIONS REGULATIONS

- ADOPTED ORDINANCE -

Road Dust & Cinders Emission Growth
VMT Growth Limited by Control
Measure 2 - Vehicle Traffic Reduction

Year	VMT	Emissions (kg/day)
1990	66,275	2,390
1993	74,339	2,681
1995	79,715	2,875
2000	93,155	3,360
2005	106,600	3,844

Step 2 - Controlled Emissions

Vacuum sweeping is credited with a 34% reduction in emissions from roadways. Using the emissions from Step 1 for the uncontrolled growth emissions and for the case with vehicle traffic reductions resulting from the adoption of control measure 2, the effect of street sweeping is shown below.

Example Calculation

$$\text{Controlled Emissions} = \text{emissions (kg/day)} \times (1 - 0.34) = 2{,}972 \times (1 - 0.34) = 1{,}961.5 \text{ kg/day}$$

	Street Sweeping Only		Street Sweeping & Vehicle Traffic Reductions	
Year	Emissions (kg/day)	Controlled (kg/day)	Emissions (kg/day)	Controlled (kg/day)
1990	2,390	1,577	2,390	1,577
1993	2,972	1,962	2,681	1,769
1995	3,360	2,218	2,875	1,898
2000	4,329	2,857	3,360	2,218
2005	5,298	3,497	3,844	2,537

Step 3 - Ambient PM-10 Contribution

The ambient contribution from road dust can be estimated from the roll-back equation for road dust dominated days,

$$\text{Ambient Contribution} = (93\ \mu g/m^3) \times (\text{Ctrl Emissions}/2{,}390 \text{ kg/day})$$

For convenience the summary table for the ambient contributions is shown as a function of the VMT's. To perform the calculations the controlled emissions from the previous table must be used. A summary of the VMT's and the ambient PM-10 contributions from roadway emissions are shown below for the uncontrolled contributions and the contributions with street sweeping alone and with vehicle traffic reductions.

Example Calculation
For street sweeping in 1993

Ambient Concentration = 93 x (1,962/2,390) = 76.3 $\mu g/m^3$

Year	Uncontrolled		Controlled by Street Sweeping		Controlled by SS & VMT Reduction	
	VMT	($\mu g/^3$)	VMT	($\mu g/m^3$)	VMT	($\mu g/m^3$)
1990	66,275	93	66,275	61.4	66,275	61.4
1993	82,403	115.6	82,403	76.3	74,339	68.8
1995	93,155	130.7	93,155	86.3	79,715	73.9
2000	120,035	168.5	120,035	111.2	93,155	86.3
2005	146,915	206.2	146,915	136.1	106,600	98.7

Section 8.30.100, POLLUTION REDUCTION EDUCATION PROGRAMS

There are no emission reductions associated with this measure. Although it is an essential part of the wood burning program there is no practical method to calculate the affect of the program on emission reductions.

Section 8.30.030, STANDARDS FOR REGULATION OF SOLID FUEL APPLIANCES

Section 8.30.050, REPLACEMENT OF NON-CERTIFIED APPLIANCES UPON SALE OF PROPERTY

IMPACT ON WOOD STOVES

Note: Fireplaces are also regulated under these sections, but will be treated separately to simplify calculations.

Step 1 - Emissions Growth

The uncontrolled emissions growth for emissions from wood stoves is based upon the present number of wood stoves, including fireplace inserts, and the growth rate of the number of residents

**EFFECTIVENESS CALCULATIONS FOR THE
TOWN OF MAMMOTH LAKES
PARTICULATE EMISSIONS REGULATIONS**

Adopted November 7, 1990

The effect of the Particulate Emissions Regulations on the future ambient PM-10 concentrations for each section of the regulation was determined by following 3 steps;

Step 1 - Estimate the uncontrolled emissions from the affected sources for each year.

Step 2 - Estimate the controlled emissions from the affected sources for each year, and

Step 3 - Estimate the ambient PM-10 contribution resulting from the controlled emissions using the proportional roll-back method in Section 5.4. For all ambient contribution estimates in this appendix, the road dust and cinders dominated day is used for the C_{di} values.

$$C_T = \Sigma C_i + C_b = \Sigma[C_{di}\ (E_i/E_{di})] + C_b$$

C_T = Total PM-10 Concentration
C_b = Background PM-10 Concentration, 5 $\mu g/m^3$
C_i = PM-10 Concentration Due to the Source i
C_{di} = Design Day Source Contribution for Source i
E_i = PM-10 Emissions from Source i
E_{di} = Peak PM-10 Emissions from Source i

To determine the ambient source contributions for either design day scenario, use the following emissions for E_{di}:

E_{di} = 882 kg/day for fireplaces
= 957 kg/day for wood stoves
= 2,390 kg/day for road dust & cinders
= 23 kg/day for vehicle tailpipes

For the Wood Burning Dominate Design Day use the source contributions estimated using the Chemical Mass Balance model in Section 4:

C_{di} = 94 $\mu g/m^3$ for fireplaces
= 101 $\mu g/m^3$ for wood stoves
= 5 $\mu g/m^3$ for road dust and cinders
= 5 $\mu g/m^3$ for vehicle tailpipes

For the Road Dust and Cinders Dominated Design Day:

C_{di} = 54 $\mu g/m^3$ for fireplaces
= 58 $\mu g/m^3$ for wood stoves
= 93 $\mu g/m^3$ for road dust and cinders
= negligible for vehicle tailpipes

Section 8.30.110, Road Dust Reduction Measures

Step 1 - Emissions Growth

Two emissions growth calculations will be determined; 1) for no controls, and 2) for VMT growth limited through the adoption of Control Measure number 2.

No Controls - Uncontrolled Growth

This growth estimate was calculated for Section 5.1 and displayed in Table 5.2. A summary of the VMT and emission estimates is shown below for an emission rate of 36.064 grams/VMT (22.4 grams/VKT) for road dust and cinders. The VMT projections can be found in Appendix E.

Example Calculation
Emissions = VMT/day x 36.064 grams/VMT x kg/1000 grams
= 82,403 x 36.064 = 2,972 kg/day

Road Dust & Cinders Emission Growth
No Controls - Uncontrolled Growth

Year	VMT	Emissions (kg/day)
1990	66,275	2,390
1993	82,403	2,972
1995	93,155	3,360
2000	120,035	4,329
2005	146,915	5,298

Future VMT is limited to 106,600 VMT. It is assumed that the peak VMT will be reached in 15 years. From section 3.2, the emissions factor for road dust and cinders is 36 grams/VMT and the 1990 peak VMT is 66,300. A straight line interpolation of the VMT from 1990 to 2005 will yield the following VMT's and emission estimates:

and visitors. This emission estimate must also consider that all new stoves that are installed in Mammoth Lakes must meet EPA's Phase I certification, and will meet Phase II certification after January 1, 1991.

The 1990 emission estimates for wood stoves which were discussed in Section 3 and summarized in Table 3.4 are shown below.

Example Calculation

Emissions = emission factor (g/kg) x wood usage (kg/day) x # units x kg/1000 g
= 15.0 x 19 x 490/1000 = 139.65 kg

Wood Stove	Emission Factor g/kg	Condos Wood kg/d	Condos Units	Condos PM-10 kg	Sgl. Family Res. Wood kg/d	Sgl. Family Res. Units	Sgl. Family Res. PM-10 kg	Mobile Homes & Apts Wood kg/d	Mobile Homes & Apts Units	Mobile Homes & Apts PM-10 kg	Total Emissions kg
Conventional	15.0	19	490	140	33	861	426	19	240	68	635
Certified	9.0	--	--	--	19	55	9	--	--	--	9
FP Insert	15.0	19	980	279	41	55	34	--	--	--	313

The population projections in Table 5.1 for permanent residents and visitors are used to estimate the effect of growth on the number of wood stoves.

Year	Permanent Residents	Skiers & Visitors
1990	5,000	24,000
1993	5,680	27,280
1995	6,130	29,470
2000	7,270	34,930
2005	8,400	40,400

To project the number of wood stoves from 1990 to 2005, the wood stoves for 1990 must be re-categorized to fit the permanent resident and visitor population groups. To do this, it is assumed that the single family residence and the mobile home and apartments categories can be projected using the permanent resident growth rate and the condominium emissions can be projected using the visitor growth rate. It is also assumed that fireplace inserts and wood stoves can be re-grouped into the wood stove category. Since they have the same emission factor, the emission calculations will not be affected. Because the Town requires that all new stoves be EPA certified, the number of conventional stoves is held constant in the projections and the additional number of stoves due to growth are added to the number of certified stoves. The certified wood stoves can also be broken down into Phase I and Phase II certified stoves by assuming that all new stoves before 1991 are

Phase I certified. The result of the re-categorization and the projection results in the following:

Example Calculation
Projected Total # of Stoves
= (Stoves # in 1990) x (Pop. in given year)/(1990 Pop.)
Projected # of Certified stoves
= (Total #) - (1990 # of conventional) + (1990 # of certified)
For Visitors, total number of stoves in 2005
= 1,470 x 40,400/24,000 = 2,474.5 stoves
Number of conventional stoves is held constant at 1,470.
Projected number of certified stoves = 2,474.5 - 1,470 = 1004.5

Projected Number of Wood Stoves

Wood Stoves	1990	1991	1993	1995	2000	2005
Visitors						
Conventional	1,470	1,470	1,470	1,470	1,470	1,470
Certified Ph I	0	67	67	67	67	67
Certified Ph II	0	0	134	268	602	938
Residents						
Conventional	1,156	1,156	1,156	1,156	1,156	1,156
Certified Ph I	55	110	110	110	110	110
Certified Ph II	0	0	110	218	495	768
	2,681	2,803	3,047	3,289	3,900	4,509

The emissions from these stoves can be estimated by using the following PM-10 emission factors:

15 grams/kg wood for conventional wood stoves & fireplace inserts
9.0 grams/kg wood for Phase I stoves (1990), and
7.5 grams/kg wood for Phase II stoves installed after 1990.

Based on the wood use survey, a weighted average of 30.5 kg wood/day for conventional wood stoves is used for the residents and 19 kg/day is used for visitors. From the survey, the wood usage rate for certified wood stoves is 19 kg wood/day for residents and visitors. The number of wood stoves in the previous table is used to project the emissions.

Example Calculation
Emissions = wood use x emission factor x # stoves x kg/1000 g
For Residents with Phase I stoves in 1990
Emissions = 19 x 9.0 x 55/1000
= 9.4 kg/day

Projected Wood Stove Emissions Considering Phase II Stoves are Required after January 1, 1991.

	PM-10 Emissions (kg)					
Wood Stoves	1990	1991	1993	1995	2000	2005
Visitors						
Conventional	419	419	419	419	419	419
Certified Ph I	0	11	11	11	11	11
Certified Ph II	0	0	19	38	86	134
Residents						
Conventional	529	529	529	529	529	529
Certified Ph I	9	19	19	19	19	19
Certified Ph II	0	0	16	31	78	109
	957	978	1,013	1,047	1,135	1,221

Step 2- Controlled Emissions

Replace Non-certified Wood Stoves Upon Resale of Dwelling, it is assumed that 90% of the dwellings in Mammoth Lakes will be sold over the next 15 years. This will result in 90% of the wood stoves to be switched from conventional stoves to Phase II certified wood stoves after 1990. This change-over, which is proportioned over the next 15 years, will result in the following breakdown for the stoves.

Projected Number of Wood Stoves Considering Replacement of Non-Certified Wood Stoves Upon Resale of Dwelling and Require Phase II Stoves after January 1, 1991.

	Projected Number of Wood Stoves					
Wood Stoves	1990	1991	1993	1995	2000	2005
Visitors						
Conventional	1,470	1,470	1,205	1,029	588	147
Change - Ph II	0	0	265	441	882	1,323
New Cert. Ph I	0	67	67	67	67	67
New Cert. Ph II	0	0	134	268	602	938
Residents						
Conventional	1,156	1,156	948	809	462	116
Change - Ph II	0	0	208	347	694	1,040
New Cert. Ph I	55	110	110	110	110	110
New Cert. Ph II	0	0	110	218	495	768
	2,681	2,803	3,047	3,298	3,900	4,509

Using the same method that was used in step 1 to calculate the PM-10 emissions, the following table summarizes the effect of replacing conventional wood stoves with certified wood stoves.

Projected Wood Stove Emissions Considering Replacement of Non-Certified Wood Stove Upon Resale of Dwelling and Require Phase II Certified Stoves After January 1, 1991

	Controlled PM-10 Emissions (kg)					
Wood Stoves	1990	1991	1993	1995	2000	2005
Visitors						
Conventional	419	419	343	293	168	42
Change - Ph II	0	0	38	63	126	189
Certified Ph I	0	11	11	11	11	11
Certified Ph II	0	0	19	38	86	134
Residents						
Conventional	529	529	434	370	211	53
Change - Ph II	0	0	30	49	99	148
Certified Ph I	9	19	19	19	19	19
Certified Ph II	0	0	16	31	71	109
	957	978	910	874	791	705

Step 3 - Ambient PM-10 Contribution

The ambient PM-10 contribution from wood stoves can be estimated from the roll-back equation for road dust dominated days,

Ambient conc. = (58 $\mu g/m^3$) x (controlled emissions/957 kg/day)

The ambient contribution for each of the stove types from residents and visitors is shown below.

Projected Ambient Contributions for Wood Stove Emissions Considering Replacement of Non-certified Wood Stoves Upon Resale of Dwelling and Requirement for EPA Phase II Certified Wood Stoves After January 1, 1991.

Wood Stoves	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Visitors						
Conventional	25.3	25.3	20.8	17.7	10.2	2.5
Change - Ph II	0	0	2.3	3.8	7.6	11.9
New Cert. Ph I	0	0	0.6	0.6	0.6	0.6
New Cert. Ph II	0	0	1.2	2.3	5.2	8.1
Residents						
Conventional	32.1	32.1	26.3	22.4	12.8	3.2
Change - Ph II	0	0	1.8	3.0	6.0	9.0
New Cert. Ph I	0.5	1.2	1.2	1.2	1.2	1.2
New Cert. Ph II	0	0	0.9	1.9	4.3	6.6
	57.9	58.6	55.1	52.9	47.9	43.1

IMPACT ON FIREPLACES

Step 1 - Emissions Growth

The uncontrolled emissions growth from fireplaces is based upon the present number of fireplaces, not including fireplace inserts, and the growth rate of the number of residents and visitors. The 1990 emission estimates for fireplaces which were discussed in Section 3 are summarized in Table 3.4 and shown below.

Example Calculation
Emissions = emissions factor (g/kg wood) x wood usage (kg wood/day) x # of fireplaces x kg/1000 g

For Fireplaces the emissions factor is 14 g/kg wood
For residents,
Emissions = 14 x 22 x 324/1000 = 99.8 kg

1990 Fireplace Emissions

	Wood Use	Number	Emissions
Condos	19 kg/d	2,941	782 kg/d
Residents	22 kg/d	324	100 kg/d

Using the same population projection figures and method that was used for the wood stove measures, the effect of growth on the number of fireplaces and the emissions is shown below.

Projected Number of Fireplaces and Emissions

Year	Condominiums Number	Condominiums Emissions (kg/day)	Residents Number	Residents Emissions (kg/day)	Total Emissions
1990	2,941	782	324	100	882
1991	3,075	818	353	109	927
1993	3,343	889	412	127	1,016
1995	3,611	961	434	134	1,095
2000	4,280	1,138	471	145	1,283
2005	4,951	1,317	544	168	1,485

Step 2 - Controlled Emissions

Regulations that affect fireplaces will institute a ban on new fireplaces except in common areas of lodges and condominiums. In addition, fireplaces must be replaced with Phase II certified wood stoves or cleaner burning appliances before sale of a dwelling.

Note: New fireplaces in common areas of lodges and condominiums is assumed to be negligible as compared to the total wood burning emissions. These fireplaces are not included in the calculations. It is also assumed that fireplaces that would have been installed in new dwellings will be gas logs.

The strategy assumes that 90% of the dwellings will be sold over the next 15 years. This will result in 90% of the open wood burning fireplaces to be rendered inoperable or to be replaced with a cleaner burning device. The control efficiency for the affected dwellings is conservatively assumed to be 46%, based on the replacement of the fireplace with a Phase II certified wood stove. Although it is likely that many fireplaces will be rendered inoperable, or be replaced with gas logs or pellet stoves, there is no data to support consideration of these variables.

The projected number of fireplaces that are replaced for the next 15 years is shown below.

Projected Number of Fireplaces and Those That Are Replaced	1990	1991	1993	1995	2000	2005
Visitors						
Fireplaces	2,941	3,075	2,706	2,337	1,415	492
FP to Phase II	0	0	369	738	1,661	2,583
Residents						
Fireplaces	324	353	311	268	162	56
FP to Phase II	0	0	42	85	191	297

From the number of fireplaces and Phase II wood stoves an estimate of the controlled emissions can be made using the emissions equation in Step 1 for the fireplaces emissions and step 1 from the Phase II wood stove emissions. The fireplace wood usage rate for visitors is 19 kg/day and for residents it is 22 kg/day. The wood usage rate in Phase II stoves is 19 kg/day for both visitors and residents. The emissions factor for fireplaces is 14 g/kg of wood and the emission factor for phase II wood stoves is 7.5 g/kg of wood.

	Projected Emissions (kg/day)					
	1990	1991	1993	1995	2000	2005
Visitors						
Fireplaces	782	818	720	622	376	131
FP to Phase II	0	0	53	105	237	368
Residents						
Fireplaces	100	109	96	83	50	17
FP to Phase II	0	0	6	12	27	42
Total	882	927	875	822	690	558

Step 3 - Ambient PM-10 Contribution

The ambient PM-10 contribution can be estimated from the roll-back equation for road dust dominated days,

Ambient Contribution = 54 $\mu g/m^3$ x (Ctrl Emissions/882 kg/day)

A summary of the ambient contributions is shown in the table below.

Projected Ambient Contributions With Sections 8.30.030 and 8.30.050 Ban New Fireplaces and Remove Fireplaces Upon Sale of Dwelling

	Ambient Contributions ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Visitors						
Fireplaces	47.9	50.1	44.1	38.1	23.0	8.0
FP to Phase II	0	0	3.2	6.4	14.5	22.5
Residents						
Fireplaces	6.1	6.7	5.9	5.1	3.1	1.0
FP to Phase II	0	0	0.4	0.7	1.7	2.6
Total	54.0	56.8	53.6	50.30	42.3	34.1

Section 8.30.040, DENSITY LIMITATIONS

This section of the ordinance limits the number of wood burning appliances to one certified wood stove in new units, or two appliances if one is a pellet stove. The previous calculations assume one appliance per dwelling unit. It is anticipated that the emissions from the additional pellet stoves will be insignificant. This section also requires an inspection of new installations by a certified inspector. This is credited with a 5% reduction from new units.

Step 1 - Emissions Growth

The emissions growth calculation for new wood stoves can be taken from the new wood stove estimates that have been completed in previous sections.

Projected Wood Stove Emissions with Replacement of Non-certified appliance Upon Resale, Change-over of Fireplaces, Require Phase II Wood Stoves

	PM-10 Emissions (kg)					
New Wood Stoves	1990	1991	1993	1995	2000	2005
Visitors						
Conv WS to Ph II	0	0	38	63	126	189
New Ph II	0	0	19	38	86	134
FP to Phase II	0	0	53	105	237	368
Residents						
Conv WS to Ph II	0	0	30	49	99	148
New Ph II	0	0	16	31	71	109
FP to Phase II	0	0	6	12	27	42
	0	0	162	298	646	990

Step 2 - Controlled Emissions

Wood Stove Installer Certification is credited with a 5% reduction in emissions from new stoves that are installed.

Example Calculation
For 1993,
Controlled emissions = 162 kg/day x (1 - 0.05)
= 154 kg/day

Controlled PM-10 Emissions (kg)						
New Wood Stoves	1990	1991	1993	1995	2000	2005
	0	0	154	283	614	941

Step 3 - Ambient PM-10 Contribution

The ambient PM-10 contribution from the previous wood stove ordinances can be estimated from the roll-back equation for road dust dominated days,

Ambient Concentration = (58 $\mu g/m^3$) x (ctrl emissions/957 kg/day)

Using the controlled emissions estimates from the previous table, the ambient contributions are shown below.

Ambient Contributions from the Wood Stove Certification and All Previous Wood Stove Ordinances for New Wood Stoves

	Ambient PM-10 Contribution ($\mu g/m^3$)					
New Wood Stoves	1990	1992	1993	1995	2000	2005
	0	0	9.3	17.2	37.2	57.0

Section 8.30.080, PROHIBITED FUELS

There are no emission reductions associated with this measure. It is intended to give the regulating agencies a tool to prevent the general public from burning materials that may cause odors or excessive smoke.

Section 8.30.070, OPACITY LIMITS

There are no emission reductions associated with this measure. It is included as a possible enforcement tool for individuals that may cause repeated complaints of smoke or odor.

Section 8.30.090, MANDATORY CURTAILMENT

Initially the mandatory wood burning curtailment will exempt certified wood burning appliances. If more reductions are needed this exemption may be dropped and the curtailment will affect all wood burning. The following calculations will consider the affect of the curtailment with and without exemptions for certified wood stoves.

Step 1 - Emissions Growth

The total emissions growth estimate for mandatory wood burning bans can be estimated from the previous estimates for emissions from new and existing wood stoves and fireplaces. These emission estimates assume that the previous controls were implemented.

	Projected Emissions (kg/day)					
	1990	1991	1993	1995	2000	2005
Fireplaces						
Visitors	782	818	720	622	376	131
Residents	100	109	96	83	50	17
Sub-total	882	927	816	705	426	148
Non-Certified Wood Stoves						
Vis Conv WS	419	419	343	293	168	42
Res Conv WS	529	529	434	370	211	53
Sub-total	948	948	777	663	379	95
Non-Certified Total	1,830	1,875	1,593	1,368	805	243
Certified Wood Stoves						
Visitor Ph I	0	11	11	11	11	11
Resident Ph I	9	19	19	19	19	19
Vis/Res Phase II	0	0	154	283	614	941
Certified Total	9	30	184	313	644	971
All Wood Burning Total	1,839	1,905	1,777	1,681	1,449	1,214

Step 2 - Controlled Emissions

A mandatory wood burning ban is credited with a 50% reduction from the uncontrolled emissions. The summary of the controlled emissions is shown below.

Example Calculation
Controlled Emissions = Emissions (kg/day) x (1 - 0.5)
For all wood burning in 1993,
Controlled emissions = 1,777 x (0.5) = 889 kg/day

	Controlled Emissions (kg/day)					
	1990	1991	1993	1995	2000	2005
Non-certified	915	938	797	684	403	122
Certified (exempt)	9	30	184	313	644	971
All Wood Burning	920	953	889	841	725	607

Step 3 - Ambient PM-10 Contribution

The ambient PM-10 contribution from wood burning can be estimated from the roll-back equation for road dust dominated days. Although the ambient contribution estimates for wood stoves and fireplaces can be calculated separately, it can also be calculated for wood burning in general by using the following equation:

For all wood burning,
Ambient Conc. = (58 + 54 $\mu g/m^3$) x
(wood burning emissions)/(957 + 882 kg/day)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Non-certified	55.7	57.1	48.5	41.7	24.5	7.4
Certified (exempt)	0.5	1.8	11.2	19.1	39.2	59.1
Total w/exemption	56.2	58.9	59.7	60.8	63.7	66.5
All Wood Burning (no exemptions)	56.0	58.0	54.1	51.2	44.2	37.0

Section 8.30.060, SOLID FUEL BURNING APPLIANCE REPLACEMENT SCHEDULE

If the National Ambient Air Quality Standard for PM-10 is not attained by January 1, 1993, all non-certified solid fuel appliances must be replaced by November 1, 1994. The following section will include an analysis of the impact of this schedule.

Step 1 - Emissions Growth

The emissions growth for wood burning can be calculated from the number of wood stoves and fireplaces. This has been determined in previous calculations. It is important to assume the wood burning regulations that affect the number of devices is in effect.

Projected Number of Wood Stoves & Fireplaces Considering Replacement of Non-Certified Wood Stoves and Fireplaces Upon Resale of Dwelling and Require Phase II Stoves after January 1, 1991.

	Projected Number of Wood Stoves					
Wood Stoves	1990	1991	1993	1995	2000	2005
Visitors						
Conventional	1,470	1,470	1,205	1,029	588	147
Change - Ph II	0	0	265	441	882	1,323
New Cert. Ph I	0	67	67	67	67	67
New Cert. Ph II	0	0	134	268	602	938
Residents						
Conventional	1,156	1,156	948	809	462	116
Change - Ph II	0	0	208	347	694	1,040
New Cert. Ph I	55	110	110	110	110	110
New Cert. Ph II	0	0	110	218	495	768
	2,681	2,803	3,047	3,298	3,900	4,509

Projected Number of Fireplaces and Those That Are Replaced						
	1990	1991	1993	1995	2000	2005
Visitors						
Fireplaces	2,941	3,075	2,706	2,337	1,415	492
FP to Phase II	0	0	369	738	1,661	2,583
Residents						
Fireplaces	324	353	311	268	162	56
FP to Phase II	0	0	42	85	191	297

Step 2 - Controlled Emissions

If all wood burning appliances are required to be changed to certified wood stoves by November 1994, then after 1995 there should be zero non-certified appliances. An accelerated change over of appliance should begin in 1993. It is assumed that it will be a straight line linear reduction from the expected number of non-certified devices, to zero devices in 1995. The reduction of non-certified devices is assumed to match the increase of certified devices over that 2 year period.

Projected Number of Wood Stoves & Fireplaces Considering Replacement of Non-Certified Wood Stoves and Fireplaces Upon Resale of Dwelling and Require Phase II Stoves after January 1, 1991 and Accelerated Change-over from 1993 to 1995.

	Projected Number of Wood Stoves					
Wood Stoves	1990	1991	1993	1995	2000	2005
Visitors						
Conventional	1,470	1,470	1,205	0	0	0
Change - Ph II	0	0	265	1,470	1,470	1,470
New Cert. Ph I	0	67	67	67	67	67
New Cert. Ph II	0	0	134	268	602	938
Residents						
Conventional	1,156	1,156	948	0	0	0
Change - Ph II	0	0	208	1,156	1,156	1,156
New Cert. Ph I	55	110	110	110	110	110
New Cert. Ph II	0	0	110	218	495	768
	2,681	2,803	3,047	3,298	3,900	4,509

Projected Number of Fireplaces and Those That Are Replaced						
	1990	1991	1993	1995	2000	2005
Visitors						
Fireplaces	2,941	3,075	2,706	0	0	0
FP to Phase II	0	0	369	3,075	3,075	3,075
Residents						
Fireplaces	324	353	311	0	0	0
FP to Phase II	0	0	42	353	353	353

Projected Wood Stove and Fireplace Emissions Considering Replacement of Non-Certified Wood Stove Upon Resale of Dwelling, Require Phase II Certified Stoves After January 1, 1991, 5% Reduction for Certified Installer of Phase II Stoves and Accelerated Change-over from 1993 to 1995.

	Controlled PM-10 Emissions (kg)					
Wood Stoves	1990	1991	1993	1995	2000	2005
Visitors						
Conventional	419	419	343	0	0	0
Certified Stoves						
Change - Ph II	0	0	36	199	199	199
Certified Ph I	0	11	11	11	11	11
Certified Ph II	0	0	18	36	82	127
Residents						
Conventional	529	529	434	0	0	0
Certified Stoves						
Change - Ph II	0	0	29	157	157	157
Certified Ph I	9	19	19	19	19	19
Certified Ph II	0	0	15	29	67	104
Sub-total	957	978	905	451	535	617

	Projected Emissions (kg/day)					
	1990	1991	1993	1995	2000	2005
Visitors						
Fireplaces	782	818	720	0	0	0
Certified Stoves						
FP to Phase II	0	0	50	416	416	416
Residents						
Fireplaces	100	109	96	0	0	0
Certified Stoves						
FP to Phase II	0	0	6	48	48	48
Sub-total	882	927	872	464	464	464

	Projected Emissions (kg/day)					
	1990	1991	1993	1995	2000	2005
Certified Stoves						
Visitors						
Change - Ph II	0	0	36	199	199	199
Certified Ph I	0	11	11	11	11	11
Certified Ph II	0	0	18	36	82	127
FP to Phase II	0	0	50	416	416	416
Residents						
Change - Ph II	0	0	29	157	157	157
Certified Ph I	9	19	19	19	19	19
Certified Ph II	0	0	15	29	67	104
FP to Phase II	0	0	6	48	48	48
Certified Sub-total	9	30	184	915	999	1,081
Non-Certified						
Visitors						
Conventional	419	419	343	0	0	0
Fireplaces	782	818	720	0	0	0
Residents						
Conventional	529	529	434	0	0	0
Fireplaces	100	109	96	0	0	0
Non-Certified Sub-total	1,830	1,875	1,593	0	0	0
All Wood Burning Total	1,839	1,905	1,777	915	999	1,081

Step 3 - Ambient PM-10 Contribution

The ambient PM-10 contribution from wood burning can be estimated from the roll-back equation for road dust dominated days. Although the ambient contribution estimates for wood stoves and fireplaces can be calculated separately, it can also be calculated for wood burning in general by using the following equation:

For all wood burning,
Ambient Conc. = (58 + 54 $\mu g/m^3$) x
(wood burning emissions)/(957 + 882 kg/day)

Without the Mandatory Curtailment

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
All Wood Burning	112.0	116.0	108.2	55.7	60.8	65.8

For the mandatory curtailment program a 50% reduction in the ambient contribution from wood burning is expected. The mandatory wood burning curtailment will initially exempt certified wood stoves. If more reductions are needed the mandatory curtailment may instituted without the exemptions. The impact of both cases is estimated.

With the Mandatory Curtailment

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Certified (exempt)	0.5	1.8	11.2	55.7	60.8	65.8
Non-Certified (not exempt)	55.8	57.1	48.5	0	0	0
Total w/exemption	56.3	58.9	59.7	55.7	60.8	65.8
All Wood Burning	56.0	58.0	54.1	27.9	30.4	32.9

SUMMARY OF AMBIENT PM-10 CONTRIBUTIONS
Assume NAAQS Attained by January 1, 1993

Mandatory Burning Curtailment Program (With an Exemption for Certified Wood Stoves)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Wood Burning	56.2	58.9	59.7	60.8	63.7	66.5
Traffic	61.4	63.9	68.8	73.9	86.3	98.7
Background	5.0	5.0	5.0	5.0	5.0	5.0
	122.6	127.8	133.5	139.7	155.0	170.2

Mandatory Burning Curtailment Program (No Exemption for Certified Wood Stoves)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Wood Burning	56.0	58.0	54.1	51.2	44.2	37.0
Traffic	61.4	63.9	68.8	73.9	86.3	98.7
Background	5.0	5.0	5.0	5.0	5.0	5.0
	122.4	126.9	127.9	130.1	135.5	140.7

Without the Mandatory Burning Curtailment Program

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
All Wood Burning	112.0	116.0	108.2	102.4	88.4	74.0
Traffic	61.4	63.9	68.8	73.9	86.3	98.7
Background	5.0	5.0	5.0	5.0	5.0	5.0
	178.4	184.9	182.0	181.3	179.7	177.7

SUMMARY OF AMBIENT PM-10 CONTRIBUTIONS
Assume NAAQS Not Attained by January 1, 1993

Mandatory Burning Curtailment Program
(With an Exemption for Certified Wood Stoves)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
Wood Burning	56.3	58.9	59.7	55.7	60.8	65.8
Traffic	61.4	63.9	68.8	73.9	86.3	98.7
Background	5.0	5.0	5.0	5.0	5.0	5.0
	122.7	127.8	133.5	134.6	152.1	169.5

Mandatory Burning Curtailment Program
(No Exemption for Certified Wood stoves)

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
All Wood Burning	56.0	58.0	54.1	27.9	30.4	32.9
Traffic	61.4	63.9	68.8	73.9	86.3	98.7
Background	5.0	5.0	5.0	5.0	5.0	5.0
	122.4	126.9	127.9	106.8	121.7	136.6

Without the Mandatory Burning Curtailment Program

	Ambient PM-10 Contribution ($\mu g/m^3$)					
	1990	1991	1993	1995	2000	2005
All Wood Burning	112.0	116.0	108.2	55.7	60.8	65.8
Traffic	61.4	63.9	68.8	73.9	86.3	98.7
Background	5.0	5.0	5.0	5.0	5.0	5.0
	178.4	184.9	182.0	134.6	152.1	169.5