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AIR QUALITY MAINTENANCE PLAN AND PM-10 REDESIGNATION REQUEST For the Town of Mammoth Lakes

November 6, 2013

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Prepared for the

PM-10 State Implementation Plan

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

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Table of Contents

List of Figures

List of Tables

Appendices

EXECUTIVE SUMMARY

Introduction

This document is a revision to the 1990 Air Quality Management Plan (AQMP) for the Town of Mammoth Lakes. It includes 1) a request to redesignate the area from nonattainment for the National Ambient Air Quality Standard for PM10 (NAAQS) to attainment based on monitoring data and a modeling analysis, and 2) a maintenance plan that contains requirements to ensure the federal PM10 standard will not be violated in the future.

Background

From 1985 to 1990, monitoring in Mammoth Lakes by the Great Basin Unified Air Pollution Control District (GBUAPCD) recorded 10 violations of the federal 24-hour PM10 standard. Since monitoring was on a once every six day cycle, extrapolation of the data predicted 11.2 expected violations of the NAAQS per year.

In response to the violations of the NAAQS, and determination by the EPA that the Town of Mammoth Lakes was non-attainment for the federal PM-10 standard, the Town of Mammoth Lakes (Town) and the GBUAPCD formed an ad hoc air quality committee. The committee investigated potential control strategies to be included in new particulate emissions regulations for the Town. Multiple potential control strategies were evaluated resulting in a recommendation to the Town of Mammoth Lakes Town Council. On November 30, 1990, the Town Council adopted the recommended measures. Implementation of the adopted measures resulted in an immediate decline in PM-10 levels in the planning area, and since 1994, despite continued community growth, there have been no further exceedences of the NAAQS.

This Air Quality Maintenance Plan and PM-10 Redesignation Request is an update to the 1990 Air Quality Management Plan for the Town of Mammoth Lakes. This plan reviews the background of the 1990 plan, the measures implemented as a result of that plan and their effectiveness, and changes to clean air regulations since the adoption of the 1990 plan. This plan then recommends maintenance measures and requests that the Town of Mammoth Lakes be redesignated as attainment for the federal PM-10 standard.

PM Standards

PM-10 stands for particulate matter less than 10 microns in diameter. The National Ambient Air Quality Standard (NAAQS, or federal standard) for PM-10 was set July 1, 1987 at 150 micrograms per cubic meter (µg/m³) for the 24 hour standard. Levels for the PM-10 standard were selected to protect the health of people who may be sensitive to exposure to airborne particulate matter (OAQPS 2005).

The state 24-hour average PM-10 standard is set at 50 $\mu g/m^3$. Violations of the state standard have also declined significantly since the adoption of the AQMP. The number

of monitored state standard violations was as high as 56 days in 1993. Over the last four years (2009-12) the number of state standard violations has ranged from four to 31 per year.

Area Description and Population

The Town of Mammoth Lakes is located on the eastern slopes of the Sierra Nevada mountains at an elevation of 7,861 feet (2,396 m). The Town was incorporated in 1984 and has grown from a permanent population of 4,785 in 1990 to 8,234 in 2010. Included in the Town boundaries is Mammoth Mountain ski area which attracts about 1.2 to 1.5 million skiers each winter. During major winter weekends there are about 35,000 people in Mammoth Lakes. It is anticipated this figure will grow to about 45,000 to 52,000 people by 2025 (Town of Mammoth Lakes(a) 2007).

Need for a Plan Update

In the 23 years since the adoption of the 1990 AQMP, the conditions affecting PM-10 in Mammoth Lakes have changed significantly. This AQMP update addresses improved air quality in Mammoth Lakes; a revised General Plan for the Town of Mammoth Lakes; updated traffic modeling for the Town; an updated chemical mass balance study; revisions to the GBUAPCD Rules; and a request to have Mammoth Lakes redesignated as attainment for the federal PM-10 standard.

1990 AQMP Summary

In 1987, the Town and the Great Basin Unified Air Pollution Control District (APCD) began developing a plan to reduce air pollution from fireplaces, woodstoves and dust caused by vehicles traveling on roads treated with volcanic cinders.

The AQMP relied on controlling wood smoke by replacing old wood stoves and fireplaces with cleaner wood burning appliances and curtailing wood burning on days that could violate the air quality standard. The Town reduced road dust emissions by using vacuum street sweepers to remove volcanic cinders soon after the roads dried and through promotion of increased transit usage. After adoption of the AQMP, monitored air pollution levels dropped significantly in Mammoth Lakes.

PM-10 and Data Summary

Based on airborne pollutant and meteorological monitoring conducted at the Gateway Center (also known as the Rite Aid/Do-It Yourself shopping center) in Mammoth Lakes, the Mammoth Lakes Planning Area has not exceeded the federal 24-hour NAAQS since 1994. In 1990 when the AQMP was adopted, three exceedences were recorded. Since then, only two exceedences of the 24-hour NAAQS were recorded – one in 1991 and one in 1994.

Emissions Inventory

The emissions inventory section describes the PM-10 emission estimates for residential wood combustion (RWC), resuspended road dust, cinders, mobile source tailpipe emissions and point sources. The methodology and data used to determine emissions is discussed for each source type. Because Mammoth Lakes exceeds the state 24-hour PM-10 standard, the emissions inventory is estimated for a peak 24-hour period.

Woodburning and resuspended road dust comprise almost all the PM-10 emissions during the winter. Motor vehicle exhaust, tire wear industrial sources contribute only approximately 1.4% of the area wide inventory. Estimates for the annual and 24-hour PM-10 emissions are calculated for wood burning and road dust. The annual residential wood combustion emissions estimates, which are based on survey data, provide good information to improve the estimates for the peak 24-hour period. The PM-10 emission estimate for resuspended road dust is based on the AP-42 methodology for estimating reentrained road dust emissions from paved roads (US EPA, Compilation of Air Pollution Emissions Factors, AP-42, 1995, updated).

The current total PM-10 emissions on a peak winter day in Mammoth Lakes are 3,420 kg/day and are summarized in Table ES-1.

Table ES-1. Summary of Peak 24 hour PM-10 Emissions (kg/day) 2012

Source		
Residential Wood Combustion	850	
Resuspended Road Dirt/Cinders	2,522	
Motor Vehicles	9	
Industrial Sources	39	
Total	3,420	kg/day

Chemical Mass Balance Results

The Desert Research Institute of Reno, Nevada (DRI) conducted a chemical mass balance (CMB) study for Mammoth Lakes in 2013. Chemical source profiles, or fingerprints, were taken from the 1990 AQMP. The sources profiled were:

- 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

CMB model version 8 (USEPA) was used to estimate source contributions to PM-10 and PM-2.5 for days with chemically speciated data. For the winter 1987-1988 study (Ono et al, 1990), on average, fireplaces contributed 75% of the PM-10 and road dust

25%. Table 6-4 compares the results of the 1987-88 study to this study. Three of the days in the 1987-88 study showed wood smoke contributing >95% of the PM-10; the current study shows no high PM-10 days with greater than 75% of the PM-10 contributed from wood smoke (DRI, 2013). The CMB study found that since the adoption of the 1990 AQMP, peak PM-10 impacts from wood smoke and road dust have both dropped by about 33%. (DRI, 2013).

Control Measures

In December of 1990, the Town of Mammoth Lakes adopted the Air Quality Management Plan (AQMP) for the Town of Mammoth Lakes. The 1990 AQMP relied on controlling wood smoke by replacing old wood stoves and fireplaces with cleaner wood burning appliances and curtailing wood burning on days that could violate the air quality standard. The Town reduced road dust emissions by using vacuum street sweepers to remove volcanic cinders applied for traction control during icy conditions soon after the roads dried and by limiting future VMT growth. Control measures were adopted by the Town of Mammoth Lakes as Municipal Code Chapter 8.30, Particulate Emissions Regulations. Major controls in the Chapter 8.30 regulations were:

- Replacement or removal of existing uncertified residential wood combustion appliances at the time of sale of a property;
- Limit the maximum number of residential wood combustion appliances in new construction to one certified appliance plus one pellet fueled appliance;
- Institute voluntary and mandatory wood burning curtailment days;
- Implement a public education program;
- Implement a vacuum street sweeping program; and
- Limit peak VMTs to 106,600.

With the implementation of the control measures from the 1990 AQMP, PM-10 levels in Mammoth Lakes declined significantly. The 1990 AQMP estimated 4,259 kg/day of PM-10 for the peak 24-hour period and forecast 8,036 kg/day for the peak 24 hour total PM-10 emissions by 2005 absent any controls (Ono et al. 1990). The updated emissions estimate shows 3,420 kg/day PM-10 in 2012, which is a 20% reduction in emissions since 1990 when the AQMP was adopted. This reduction was achieved despite a 72% population increase from 4,785 in 1990 to 8,234 in 2010. Table ES-2 shows the peak 24-hour PM-10 emissions inventory for Mammoth Lakes in 1990 when the AQMP was adopted, the current inventory in 2012, and the projected emissions inventory in 2030 after the town has reached its buildout population and visitor numbers. The emissions inventory projections for 2030 are based on current control measures for residential wood combustion and on a change to the peak daily traffic volume limit derived from the modeling analysis that was performed for this plan update.

Table ES-2 Peak 24-hour PM-10 Emissions (kg/day)			
Source Category	1990	2012	2030
Residential Wood Combustion	1,839	850	802
Road Dust and Cinders	2,390	2,522	3,143
Tail Pipe and Brake Wear	23	9	4
Industrial Sources	7	39	39
Total	4,259	3,420	3,988

Amendments to Control Measures

Most of the changes to the implementing regulations of the Town of Mammoth Lakes MC 8.30 revise outdated sections or make non-substantive technical edits. The three meaningful amendments are:

- Section 8.30.040 B. This section is modified to clarify that no new wood burning appliances may be installed in multi-family developments. Prohibition of new wood burning appliances in multi-family projects has been the policy of the Town. The proposed revision formalizes that practice and implements General Plan Policy R.10.3.

- Section 8.30.080, Mandatory Curtailment. This section has been modified to include all wood burning appliances, except pellet stoves, in the no-burn day program. Currently, EPA certified stoves are exempted under Town regulations, but are required to participate under the District regulations.

- Section 8.30.100 B. This section sets a limit for vehicle miles traveled (VMT) within the town. The current limit is one hundred six thousand six hundred (106,600) VMT on any given day. Proposed development projects and other Town approved activities which affect vehicle trips are evaluated against this limit. A revised traffic model for the community incorporates additional roadway segments and revises VMT projections based on updated traffic counts and current modeling technologies. It shows an estimated VMT at General Plan buildout of one hundred seventy nine thousand seven hundred eight (179,708) for the revised model roadway segments. The air quality modeling shows that this overall level of traffic will not cause an exceedence of the NAAQS and is suggested as the VMT limit for the AQMP.

Maintenance Demonstration

The AQMP evaluates the effects of increased population and visitors on PM-10 emissions and forecasts the resulting change in the ambient PM-10 design concentration. Receptor modeling results were used with the revised emissions inventory (Table ES-2) that reflected changes in permanent and visitor populations and the adopted control measures to forecast changes in ambient PM-10 concentrations.

The 2007 Town of Mammoth Lakes General Plan evaluated population in terms of People at One Time (PAOT). PAOT is the number of people in town on a peak winter Saturday and includes both residents and visitors. PAOT is expected to grow from 34,265 in 2007 to 52,000 in 2025. 2025 was considered the build out year by the General Plan. The buildout number from the General Plan has been used as the year 2030 projected population in both the RWC and VMT analyses. This provides supporting information for an analysis to demonstrate that the PM-10 standard can be maintained in Mammoth Lakes for at least a 10-year period. This 10-year maintenance demonstration is required under the Clean Air Act to allow the area to be redesignated from nonattainment to attainment for PM-10.

Proportional Rollback Analysis for Control Measure Evaluation

The effect of PM-10 emissions increases or decreases on the ambient PM-10 concentration can be determined by using a linear rollback 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. The effect on the design day PM-10 concentration was used to evaluate the overall effect on future ambient PM-10 levels. The design day concentration, which is the statistical fourth highest daily PM-10 concentration over a three-year period, was used for PM-10 forecasts because it is the value used by the EPA to determine compliance with the federal PM-10 standard. Based on PM-10 data collected over the last three years (2010-12), the fourth high PM-10 concentration, and therefore the PM-10 design day concentration, is 99 $\mu g/m^3$.

As was described in the 1990 AQMP, Mammoth Lakes' air pollution episodes are characterized by two different scenarios. One with high wood smoke contributions and one with high road dust contributions. The proportional roll-back analysis tested both cases. Using the peak wood smoke and peak road dust and cinders days, Tables ES-3 and ES-4 show the expected PM-10 emissions and concentrations due to growth with continued implementation of existing controls. These results show that with current control measures, growth could result in a 1% to 6% increase in the design day ambient PM-10 concentrations over the next 15 years. Since buildout conditions under the General Plan are expected to be sustained beyond 2030, PM-10 projections for 2050 are the same as for 2030. These PM-10 forecasts are also shown graphically in Figures ES-1 and ES-2.

Table ES-3. Forecasted PM-10 Design Day Concentrations for High Residential Wood Combustion Day

Source Category	1990	2012	2030	2050
Background	5 µg/m^3	5 µg/m^3	5 µg/m^3	5 µg/m^3
Road Dust	5 µg/m^3	23 µg/m^3	29 µg/m^3	29 µg/m^3
Residential Wood Combustion	195 µg/m^3	71 µg/m^3	66 µg/m^3	66 µg/m^3
Vehicles*	5 µg/m^3	negligible	negligible	negligible
Industrial Sources	negligible	negligible	negligible	negligible
Total	210 µg/m^3	99 µg/m^3	100 µg/m^3	100 µg/m^3

Figure ES-1 Design Day Projection for High Residential Wood Combustion Day

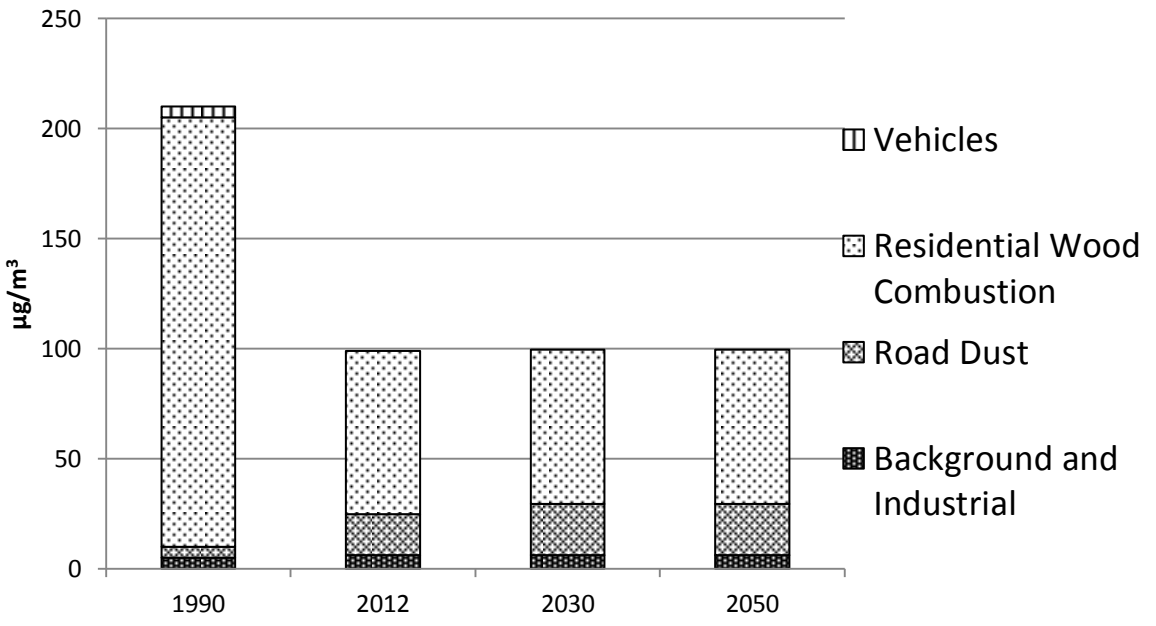
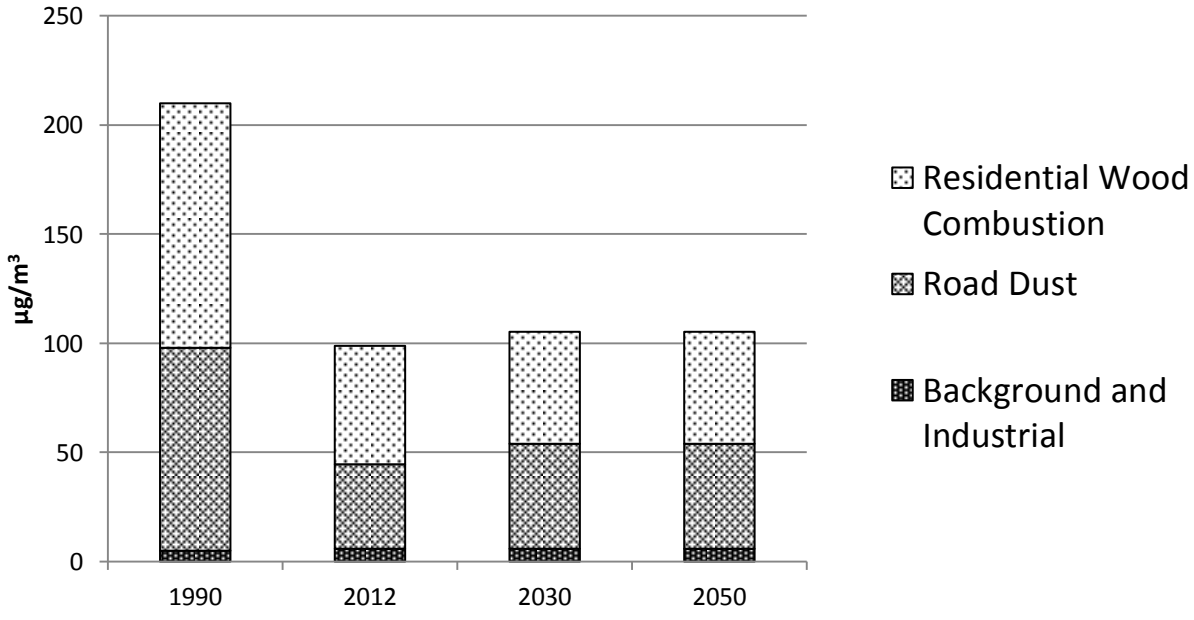


Table ES-4. Forecasted PM-10 Design Day Concentrations for High Road Dust Day

Source Category	1990	2012	2030	2050
Background	5 µg/m^3	5 µg/m^3	5 µg/m^3	5 µg/m^3
Road Dust	93 µg/m^3	37 µg/m^3	46 µg/m^3	46 µg/m^3
Residential Wood Combustion	112 µg/m^3	57µg/m^3	54 µg/m^3	54 µg/m^3
Vehicles*	negligible	negligible	negligible	negligible
Industrial Sources	negligible	negligible	negligible	negligible
Total	210 µg/m^3	99 µg/m^3	105 µg/m^3	105 µg/m^3

Vehicle tailpipe and brake wear emission amount to less than 0.3 µg/m^3 except for the 1990 RWC case.

Figure ES-2 Design Day Projection for High Road Dust Day



Contingency Plan and Maintenance Measures

The analysis in this Plan shows that the adopted control measures for the Town of Mammoth Lakes are sufficient to maintain compliance with the NAAQS for PM-10 with a substantial buffer in the event that the measures do not fully achieve the same level of PM-10 reduction going forward that has been achieved to date. The Plan indicates a future PM-10 level of 105 $\mu g/m^3$ on a high road dust day (Table ES-4). This is 45 $\mu g/m^3$ (30%) lower than the NAAQS of 150 $\mu g/m^3$.

The success of the existing control measures demonstrates that PM-10 levels have been reduced and will be reduced to a sufficient degree that contingency measures are not required. Nonetheless, additional measures have been incorporated into the AQMP to assist in further reductions of PM-10 levels with the goal of improved compliance with the California Ambient Air Quality Standard for PM-10. These measures include amending the Town of Mammoth Lakes Particulate Emissions Regulations to match GBUAPCD Rule 431, requiring all wood burning fireplaces and stoves, whether certified or not, to comply with no-burn days.

Redesignation Request

States may ask U.S. EPA to redesignate an area “attainment” if:

- the area has monitored attainment of the air quality standard;
- the area has a fully approved State Implementation Plan;
- U.S. EPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions;
- the state has submitted, and U.S. EPA has approved, a maintenance plan for the area; and,
- the area has met all other applicable federal CAA requirements.

As described in Chapter 8, the Town of Mammoth Lakes last exceeded the federal PM-10 24-hour standard in 1994. Attainment of the PM-10 standard is a direct result of the implementation of control measures by the Town as described in the 1990 Air Quality Management Plan.

The daily ambient PM-10 monitoring data collected by the Great Basin Unified Air Pollution Control District in Mammoth Lakes demonstrates that no more than 1.0 statistical exceedences of the NAAQS have occurred over the last three years as is required to demonstrate attainment of the federal standard. In fact, the data show that there have been no exceedences of the federal PM-10 standard during the last 19 years.

Applying a proportional roll back analysis to the PM-10 present and future emissions this document demonstrates that no more than 1.0 exceedences per year would be expected through the next 20 year planning period and beyond. With continued implementation of the control measures, attainment will be maintained.

The District finds that the Mammoth Lakes PM-10 Planning Area has attained the federal PM-10 standard and requests the California Air Resources Board recommend to the US Environmental Protection Agency that the area be redesignated from nonattainment to attainment with the federal PM-10 standard.

1. Introduction

1.1 BACKGROUND

Twenty five years ago, the normally clean air in Mammoth Lakes was often polluted during the winter by wood smoke and dust. Smoke from wood stoves and fireplaces and dust from volcanic cinders used on roadways for traction control contributed to high particulate matter levels that caused violations of air quality standards. Air pollution obscured visibility in what should be an idyllic mountain setting, and it posed a health hazard to the public, especially to those that might be sensitive to particulate matter air pollution, such as children, the elderly, and people with existing heart or lung problems. Poor air quality was usually associated with calm winter days when there was little wind to blow the pollution away. Due to these conditions, federal air quality standards for particulate matter were violated on about 11 days each year, and the US Environmental Protection Agency (EPA) required an air pollution control plan for the Town of Mammoth Lakes.

In 1987, the EPA identified the Mammoth Lakes area as having a high probability of violating the federal PM-10 standard (52 FR 29384). This designation was based on measurements of PM-10 that exceeded the standard. As a result of this Group I classification, a PM-10 State Implementation Plan (SIP) for the Mammoth Lakes area was required under the Federal Clean Air Act. The 1990 Air Quality Management Plan (AQMP) for the Town of Mammoth Lakes was developed to satisfy this requirement for a PM-10 SIP.

Implementation of the measures included in the 1990 AQMP, resulted in the PM-10 levels in Mammoth Lakes dropping significantly. The result has been no exceedences of the federal standard since 1994.

This Air Quality Maintenance Plan is an update to the 1990 Air Quality Management Plan for the Town of Mammoth Lakes. This plan reviews the background of the 1990 plan, the measures implemented as a result of that plan and their effectiveness, and changes to clean air regulations since the adoption of the Plan. This plan then recommends maintenance measures and requests that the Town of Mammoth Lakes be redesignated as attainment for the federal PM-10 standard.

1.2 PM STANDARDS AND HEALTH EFFECTS

PM-10 stands for particulate matter less than 10 microns in diameter. For comparison a human hair is about 70 microns in diameter. The National Ambient Air Quality Standard (NAAQS, or federal standard) for PM-10 was set July 1, 1987 at 150 micrograms per cubic meter ($\mu g/m^3$) for the 24 hour standard. Levels for the PM-10 standard were selected to help the people who may be sensitive to exposure to airborne particulate matter. (OAQPS 2005)

Particles less than 10 microns are usually inhaled and retained in the deepest part 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 of Mammoth Lakes, includes several air pollutants aside from PM-10 that contribute to the health effects problems. These are carbon monoxide, hydrocarbons and polycyclic aromatic hydrocarbons (PAH's). Woodburning is a major source of PAH's which has been identified as a class of compounds containing carcinogens (Davis and Read 1989). Particulate matter from woodsmoke is largely composed of particles less than 2.5 microns or PM-2.5. Due to the smaller size of smoke particles, exposure to PM-2.5 poses additional health risks to sensitive populations at lower concentrations than PM-10.

1.3 AREA DESCRIPTION AND POPULATION

The Town of Mammoth Lakes is located on the eastern slopes of the Sierra Nevada mountains at an elevation of 7,861 feet (2,396 m). Figure 1-1 shows the relative location of Mammoth Lakes. The Town was incorporated in 1984 and has grown from a permanent population of 4,785 in 1990 to 8,234 in 2010. Included in the Town boundaries is Mammoth Mountain ski area which attracts about 1.2 to 1.5 million skiers each winter. During major winter weekends there are about 35,000 people in Mammoth Lakes. It is anticipated this figure will grow to about 45,000 to 52,000 people by 2025 (Town of Mammoth Lakes(a) 2007).

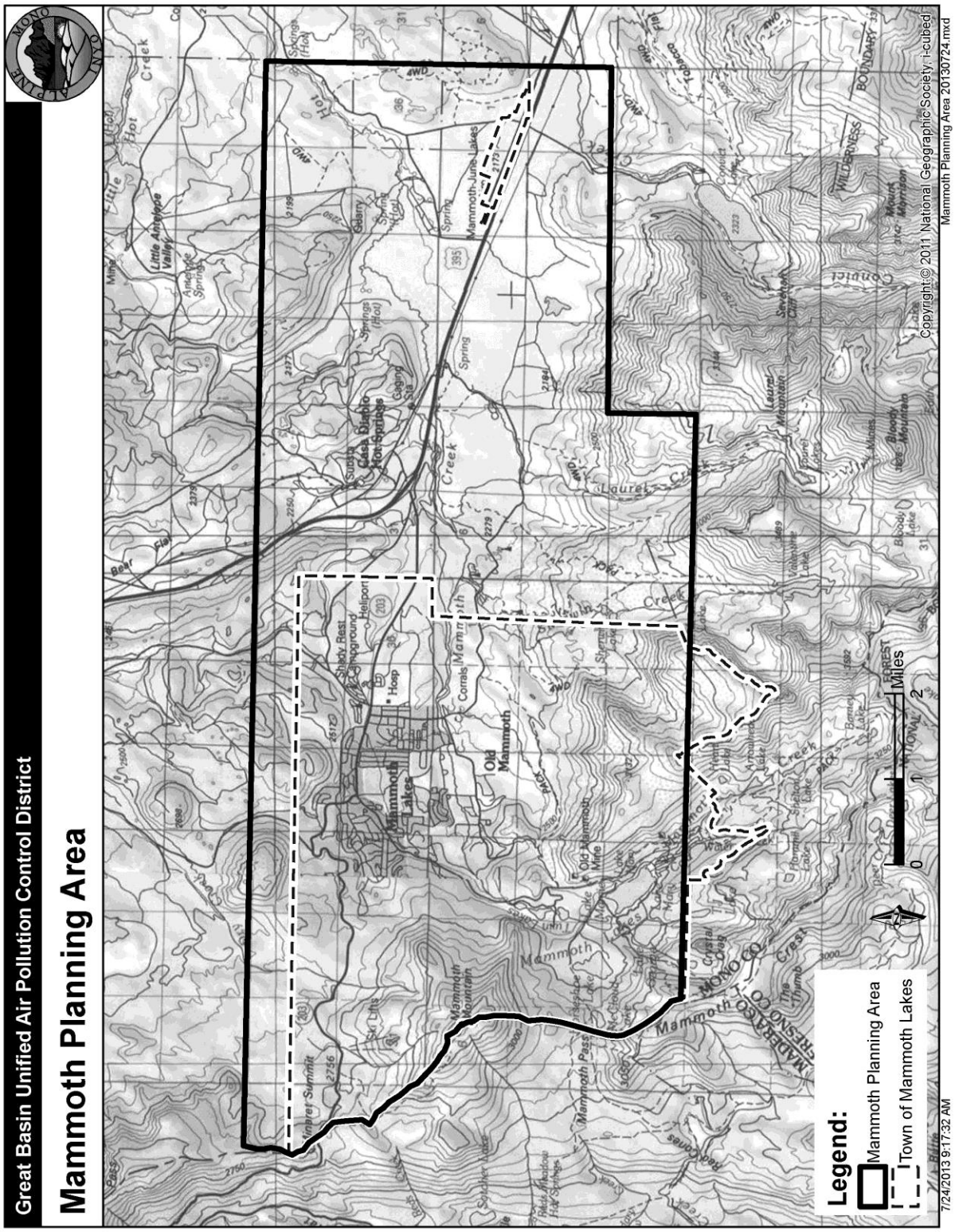
Most homes and rental units in Mammoth Lakes contain woodstoves or fireplaces. Temperature inversions during the winter season cause a buildup of wood smoke in the lower elevations of the town. In addition to wood smoke, particulates generated from re-suspended road dust and cinders that are applied to roadways during snowstorms can add significantly to PM-10 levels after these roads dry. The combination of road dust, woodsmoke and meteorological stagnations, especially during peak periods of the ski season, has been associated with elevated PM-10 in Mammoth Lakes.

1.4 BOUNDARIES OF THE PM-10 PLANNING AREA

The U.S. Environmental Protection Agency identified the boundaries in Figure 1-2 as the initial 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 Town boundaries. 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.

Figure 1-1 Mono County, CA boundary and Mammoth Lakes vicinity.

Figure 1-2 Mammoth Lakes Planning Area



1.5 NEED FOR PLAN UPDATE

In the 23 years since the adoption of the 1990 AQMP, the conditions pertaining to PM-10 in Mammoth Lakes have changed significantly. This AQMP update addresses improved air quality in Mammoth Lakes; a revised General Plan for the Town of Mammoth Lakes; updated traffic modeling for the Town; an updated chemical mass balance study; revisions to the GBUAPCD Rules; and a request to have Mammoth Lakes redesignated as attainment for the federal PM-10 standard.

1.5.1 *Redesignation Requirements*

As a result of the significant air quality improvements following the implementation of the 1990 AQMP, Mammoth Lakes has not exceeded the federal standard for PM-10 since 1994. With that success and the projected maintenance of air quality through adopted implementation measures, the Great Basin Unified Air Pollution Control District recommends that the CARB request that the EPA redesignate the Mammoth Lakes Planning Area to attainment. To be formally redesignated to attainment, the AQMP must demonstrate that:

- The area has monitored attainment of the air quality standard;
- The area has a fully approved State Implementation Plan;
- The U.S. EPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions; and
- The state has submitted, and U.S. EPA has approved, a maintenance plan for the area.

This update to the AQMP fulfills the requirements for redesignation. It incorporates the latest monitoring data from Mammoth Lakes showing that the Planning Area has attained the federal standard for PM-10. The Plan includes existing and proposed measures to maintain PM-10 levels below the federal NAAQS for the next 10 years and beyond. It incorporates an updated vehicle miles traveled (VMT) analysis, residential wood combustion device inventory, and revised community growth estimates from the 2007 Town of Mammoth Lakes General Plan.

2. 1990 AQMP Summary

2.1 DEVELOPMENT OF THE PLAN

In 1987, the Town of Mammoth Lakes (Town) and the Great Basin Unified Air Pollution Control District (APCD) began developing a plan to reduce air pollution from fireplaces, woodstoves and dust caused by vehicles traveling on roads treated with volcanic cinders. The cinders were applied as an anti-skid material on roads during the winter and became airborne when the roads dried. The Town and the APCD worked with an *ad hoc* advisory committee representing local businesses, government agencies, health professionals and the general public to develop an air pollution control strategy. In 1990, this strategy was adopted as the Air Quality Management Plan (AQMP) for the Town of Mammoth Lakes. (Ono, *et al.*, 1990)

2.2 PLAN SUMMARY

The AQMP relied on controlling wood smoke by replacing old wood stoves and fireplaces with cleaner wood burning appliances and curtailing wood burning on days that could violate the air quality standard. The Town reduced road dust emissions by using vacuum street sweepers to remove volcanic cinders soon after the roads dried and through promotion of increased transit usage. After adoption of the AQMP, monitored air pollution levels dropped significantly in Mammoth Lakes.

The federal air quality standard for particulate matter is measured as PM-10 and PM-2.5, which stands for particulate matter less than 10 microns and 2.5 microns in diameter. The AQMP was based on reducing PM-10 emissions to meet the federal 24-hour average standard of 150 $\mu g/m^3$. After the adoption of the AQMP in 1990, three exceedences of the federal PM-10 standard were monitored in the first year. Following that only one exceedence of the federal PM-10 standard was measured in 1991 and none were measured in 1992 and 1993. The last measured exceedence of the federal PM-10 standard was monitored in 1994 (Table 2-1).

Although the federal standard for PM-10 is currently being met, the more stringent California Ambient Air Quality Standard for PM-10 is still violated in the Town. The state 24-hour average PM-10 standard is set at 50 $\mu g/m^3$. Violations of the state standard have declined significantly since the adoption of the AQMP. As seen in Table 2-1, the number of monitored state standard violations was as high as 56 days in 1993. Over the last four years (2009-12) the number of state standard violations has ranged from four to 31 per year.

At the time of adoption, the Town's wood smoke and street sweeping control measures were the most stringent in the state. Since then, other areas have recognized the success of these measures and adopted similar control requirements for their areas.

PM-10 emission projections and air quality monitoring show that the adopted wood smoke and road dust control measures succeeded in bringing the area into attainment

with the federal PM-10 standard. Additional measures; however, will be needed to meet the state PM-10 standard.

2.3 1990 CONTROL MEASURES

2.3.1 *Wood Smoke*

The 1990 Air Quality Management Plan relied on regulations for reducing PM-10 emissions from wood smoke by limiting the number of wood burning appliances to one EPA certified woodstove per dwelling, requiring change-outs of non-EPA certified woodstoves and fireplaces upon resale of a home or dwelling and by instituting no-burn days on days that could violate the standard. The plan also included a public awareness program to encourage compliance with no-burn days.

2.3.2 *Wood Stove & Fireplace Change-outs*

In 1990, it was estimated that there were 5,946 woodstoves and fireplaces with less than 1% of those being EPA-certified. To reduce wood smoke emissions, it was required that upon resale of a property any fireplace or non-EPA certified woodstove must be replaced with an EPA Phase II certified wood stove or a pellet stove. As an alternative to replacement, non-EPA certified wood burning appliances can also be removed or otherwise rendered inoperable. .

2.3.3 *Public Awareness Program.*

The Town has a public awareness program to educate residents and visitors about the air pollution problem in Mammoth Lakes. During the winter, daily weather reports include a “red-yellow-green” burn day call to alert people to the no-burn day status for residential wood burning. Because about 80% of the people in town during the winter are visitors, they must be educated on a daily basis about the air pollution problem and the no-burn day program. The Town's public awareness program includes:

- Daily radio and TV announcements of red, yellow or green burn days, including a no-burn day ticker on the local public access TV channel,
- Newspaper advertisements with the (760) 934-1010 burn day status phone number,
- Newspaper articles about local air pollution and no-burn days,
- Tent cards and pamphlets for visitor rooms providing burning information, and
- Woodburning handbooks published by the California Air Resources Board.

2.3.4 *No-burn Days.*

No-burn days are called when a meteorological inversion and calm wind conditions could persist for a given day. The calm air prevents the dilution and transport of air pollutants and allows PM-10 concentrations to build up in the evening from about 4:00 PM to midnight and then again in the morning from 6:00 to 10:00 AM. When calm weather is predicted, the Town's meteorologist may call a mandatory or a voluntary no-

burn day based on the strength of the forecasted inversion and the population in town. The meteorologist indicates if it is a red, yellow or green burn day to let the public know if it is mandatory or voluntary no-burn day, or if it is okay to burn. Under the 1990 AQMP, appliances meeting the emissions requirements of the EPA were exempted from the no-burn days. Because 85% to 90% of the woodstoves and fireplaces are now EPA certified appliances, pellet stoves, or gas appliances, only a small percentage of the wood burning appliances are now subject to the no burn days. To continue to achieve emission reductions, this updated AQMP removes the no burn day exemption for EPA certified appliances.

2.3.5 *Traffic Related Control Measures*

After winter storms, volcanic cinders are spread on the roadways in town to provide additional traction and prevent vehicles from sliding on the icy roads. These cinders are crushed into ever smaller pieces by passing vehicles. When the roads dry, vehicles kick up fine dust from the roadway. In the 1990 AQMP, road dust was found to contribute up to 44% of the PM-10 on days that violated the federal air quality standard. The AQMP relies on vacuum street sweeping to remove the cinders after the roads dry and a limit on traffic volume to prevent the problem from growing with the population. The traffic volume limit was set at 106,600 vehicle miles traveled on any day and is regulated through the approval of new developments by the Town.

2.3.5.1 *Vacuum Street Sweeping.*

The Public Works Director is directed by the regulations to undertake a vacuum street sweeping program to reduce PM-10 emissions resulting from excessive accumulations of cinders and dirt. This program has been running continuously since the adoption of the 1990 AQMP.

2.3.5.2 *Traffic Volume.*

The traffic volume limit in the 1990 AQMP was based on the PM-10 impact in 1990 when daily peak traffic volume was estimated at 66,275 vehicle miles traveled (VMT). The Final Program Environmental Impact Report (FPEIR) to support the 2007 Town of Mammoth Lakes General Plan Update estimates the 2004 peak traffic volume at 74,051 VMT for 2004. The FPEIR indicated that unconstrained vehicle traffic could reach 128,270 VMT on peak visitor days by 2024. However, it concluded that through transportation mitigation measures included in the General Plan FPEIR, VMT will not exceed the 106,600 VMT limit (Town of Mammoth Lakes (b), 2007).

Since adoption of the General Plan, the Town has developed a revised traffic model. This model includes additional roadway segments and as a result, shows a higher current and future VMT. This AQMP relies on the updated model and the revised VMT numbers. Currently, District rule 431 and Town Ordinance (8.30.110) prohibits the approval of any new development or project that would cause projected vehicle traffic to exceed 106,600 VMT. The Town's revised traffic model combined with the updated Chemical Mass Balance study will lead to amendments to these regulations. If and

when it can be reliably determined that a higher VMT level may be sustained without exceeding the NAAQS, due to restrictions from other emission sources or to refined analytic inputs and/or other methodologies, then the appropriate amendments to the Town's Municipal Code and AQMP may be considered (Town of Mammoth Lakes (b), 2007).

2.4 AIR QUALITY IMPACTS

The 1990 AQMP is based on reducing PM-10 emissions to meet the federal standard of 150 $\mu g/m^3$ for a 24-hour period. After its adoption, three exceedences of the federal PM-10 standard were monitored in the first year. Following that one exceedence of the federal PM-10 standard was measured in 1991 and none were measured in 1992 and 1993. The last measured exceedence of the federal PM-10 standard was monitored in 1994. Table 2-1 shows the actual number of monitored exceedences and the expected number of exceedences based on the proportion of sample days each year. Note that an expected number of exceedences is not calculated for years when the data capture rate is less than 75% for any quarter. (GBUAPCD, 2013)

Although the federal standard for PM-10 is currently being met, the more stringent California Ambient Air Quality Standard for PM-10 (50 $\mu g/m^3$) is still violated in Mammoth Lakes. The number of monitored state standard violations was as high as 56 in 1993, but has declined significantly since the adoption of the AQMP. Over the last four years of daily monitoring in the Mammoth Lakes (2009-12) the number of state PM-10 standard violations has ranged from four to 31 per year. (GBUAPCD, 2013)

2.4.1 *Projected PM-10 Impacts*

The PM-10 analysis in the 1990 AQMP showed that two scenarios existed that could cause violations of the federal standard. One violation day was dominated by PM-10 from wood smoke (95%), with 5% from road dust, while another violation day was 66% wood smoke and 44% road dust. The control strategy in the plan was designed to bring concentrations on both "design days" down to levels that would meet the standard. Chapter 6 has an updated analysis of PM-10 and PM-2.5 filter samples collected from 2003 through 2011 that shows high PM days are still associated with woodsmoke and road dust dominated days, but at concentrations that are below the federal standards.

2.5 1990 AQMP Succeeds in Achieving Federal Attainment

PM-10 emission projections and air quality monitoring show that wood smoke and road dust control measures have succeeded in bringing the Town into attainment with the federal PM-10 standard. Furthermore, as discussed in Chapter 8, the currently adopted control measures are expected to be sufficient to maintain compliance with the federal standard into the future. The Town has been successful in meeting the federal PM-10 standard; however, additional control measures will be needed to meet the more stringent state PM-10 standard.

Table 2-1. Summary of PM-10 air quality standard violations for the Town of Mammoth Lakes (1990 – 2012)

Year	Max PM-10 ($\mu g/m^3$)	Number of Federal Exceedences (>150 $\mu g/m^3$)	Number of State Exceedences (>50 $\mu g/m^3$)	Number of Samples	Data Capture OK?	Expected No. of Federal Exceedences (>150 $\mu g/m^3$)	Expected No. of State Exceedences (>50 $\mu g/m^3$)	Primary Monitor Type
1990	162	3	14	58	Y	18.9	88.1	Hi-Vol
1991	164	1	32	195	N	NA	NA	TEOM
1992	141	0	30	230	N	NA	NA	TEOM
1993	138	0	56	365	Y	0.0	56.0	TEOM
1994	152	1	37	362	Y	1.0	37.3	TEOM
1995	127	0	40	286	N	NA	NA	TEOM
1996	104	0	11	345	Y	0.0	11.6	TEOM
1997	88	0	17	352	Y	0.0	17.6	TEOM
1998	68	0	9	315	Y	0.0	10.4	TEOM
1999	*PM-10 monitor site closed for building renovation.*							
2000								
2001	85	0	18	331	Y	0.0	19.8	TEOM
2002	136	0	18	129	N	NA	NA	TEOM
2003	69	0	9	314	Y	0.0	10.5	TEOM
2004	71	0	16	364	Y	0.0	16.0	TEOM
2005	66	0	6	351	Y	0.0	6.2	TEOM
2006	124	0	9	288	N	NA	NA	FDMS TEOM
2007	67	0	4	273	Y	0.0	6.0	TEOM/Partisol
2008	138	0	6	70	N	0	31.3	FDMS TEOM
2009	116	0	18	365	Y	0	18.0	FDMS TEOM
2010	101	0	31	345	Y	0	32.8	FDMS TEOM
2011	102	0	27	362	Y	0	27.2	FDMS TEOM
2012	56	0	4	366	Y	0	4	FDMS TEOM

GBUAPCD, 2013

3. Federal and State Air Quality Standards for Particulate Matter

3.1 FEDERAL PM-10 AND PM-2.5 STANDARDS

On July 1, 1987, EPA revised the NAAQS for particulate matter with a new PM-10 indicator as the basis for the standards (52 FR 24634). The level of the federal PM-10 standard was set at 150 $\mu g/m^3$ for a 24-hour average concentration and 50 $\mu g/m^3$ for an annual average concentration. The new PM-10 standard replaced the previous standard for total suspended particulates (TSP less than 30 microns in diameter). The change from the TSP standard to PM-10 was in response to updated information from health officials indicating adverse human health effects from the smaller PM-10 penetrating deep into the lower respiratory tract and lung tissue.

In 1997, EPA retained the existing 24-hour and annual PM-10 standard after reviewing the PM NAAQS. However, EPA expanded the PM NAAQS by adding a new PM-2.5 standard based on updated human health research impacts from fine-sized particles 2.5 microns or less in diameter. The PM-2.5 standard was set at 65 $\mu g/m^3$ for a 24-hour average concentration and 15 $\mu g/m^3$ for an annual average concentration (62 FR 38652).

In 2006, EPA reaffirmed the 24-hour PM-10 standard after reviewing the air quality criteria and PM NAAQS again. EPA concluded that the research "evidence continues to support a 24-hour averaging time for a coarse particulate standard, based primarily on evidence suggestive of associations between short-term (24-hour) exposure and morbidity effects and, to a lesser degree, mortality" (71 FR 61144-64233). However, effective December 18, 2006, EPA revoked the annual average PM-10 standard based on the more recent studies indicating long-term health impacts were mainly related to PM-2.5 exposure. EPA also tightened the 24-hour average PM-2.5 standard by lowering the concentration level from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ (71 FR 61144-64233).

Table 3-1. National Ambient Air Quality Standard for Particulates*

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Particle Pollution Dec 14, 2012	PM-2.5	primary	Annual	12 $\mu g/m^3$	annual mean, averaged over 3 years
		secondary	Annual	15 $\mu g/m^3$	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM-10	primary and secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years

*U.S. EPA 2013

3.2 CALIFORNIA CLEAN AIR ACT REQUIREMENTS

The California Air Resources Board adopted new state PM standards in June of 2002, responding to requirements of the Children's Environmental Health Protection Act. This Act requires the evaluation of all health-based ambient air quality standards to determine if the standards adequately protect human health, particularly that of infants and children. The subsequent review of the PM standards resulted in the recommendation of more health-protective ambient air quality standards for PM-10 and a new standard for PM-2.5. The new California PM standards became effective in 2003.

Table 3-2. California Ambient Air Quality Standard for Particulates*

Pollutant	Annual Average	24-Hour Average
PM-10	20 $\mu g/m^3$	50 $\mu g/m^3$
PM-2.5	12 $\mu g/m^3$	-

*California Air Resources Board, 2013

3.3 MAMMOTH LAKES PM COMPLIANCE

As discussed in the following section, air monitoring data for Mammoth Lakes shows that the area has been in compliance with the federal PM-10 standard since 1993, when the number of standard exceedences was less than 1.0 per year averaged over three years This compliance status has been maintained continuously since 1993. However, the area continues to violate the more stringent State PM-10 standard.

The Town of Mammoth Lakes is designated as attainment/unclassified for the federal PM-2.5 standard and attainment for the state PM-2.5 standard. These designations also apply to the larger Great Basin Valleys Air Basin, which includes all of Mono, Inyo and Alpine Counties in California. (CARB, 2013)

4. 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 analysis along with emissions inventory data that is covered in subsequent chapters of this Plan.

4.1 PM-10 AND METEOROLOGICAL MONITORING SITE

Airborne pollutant and meteorological monitoring are conducted at the Gateway (also known as the Rite Aid/Do-It Yourself) shopping center in Mammoth Lakes. Four types of PM-10 monitors have been used at the monitoring site; a Size Selective Inlet (SSI) and a dichotomous sampler (dichot), which both measure once every six days, PM-10 Partisol, which measures once every 3 days, and a TEOM (Tapered Element Oscillating Microbalance) which provides daily and hourly PM-10 concentrations. The TEOM was often operated with a co-located PM-10 Partisol. Although each monitor is a U.S. EPA approved reference or equivalent method sampler, PM-10 concentration measurements can vary. Due to the 50ºC inlet temperature of the TEOM, particulate matter from wood smoke can volatize and cause the mass measurement to be low as compared to the other PM-10 monitors. TEOM values during periods of heavy wood smoke can be estimated by multiplying the TEOM measured value by 1.8. In 2006, the TEOM was modified to an FDMS (Filter Dynamics Measurement System) TEOM. The FDMS TEOM can account for particulate matter volatilization and provide the correct mass. However, due to operational problems with the FDMS it was replaced with a regular TEOM in 2007. A new FDMS TEOM was installed in November 2008. PM-10 monitor data is not available for 1999 and 2000 because the building that housed the monitor was being renovated. The type of PM-10 monitor used in each year is identified in Table 2-1.

4.2 PM-10 AND DATA SUMMARY

Table 2-1 shows that the Mammoth Lakes Planning Area has not exceeded the federal 24-hour NAAQS since 1994. From 1990 through 1994, five exceedences were recorded. Because of the sampling interval, this equates to an expected total of 21 exceedences with 19 occurring in 1990, prior to the adoption and implementation of the 1990 AQMP. Since 1990, only two exceedences of the 24-hour NAAQS were recorded – one in 1991 and one in 1994.

Although the federal standard for PM-10 is currently being met, the more stringent California Ambient Air Quality Standard for PM-10 is still violated in Mammoth Lakes. The state 24-hour average PM-10 standard is set at 50 $\mu g/m^3$. As seen in Table 2-1, the number of monitored state standard violations was as high as 56 days in 1993. Violations of the state standard have declined since the adoption of the AQMP. Over the last three years (2010-12), the average number of state PM-10 violations was around 20 per year.

4.3 PRE AQMP PM-10 VIOLATIONS

Prior to the adoption of the 1990 AQMP, violations of the 150 µg/m^3 24-hour National Ambient Air Quality Standard (NAAQS) for PM-10 were measured on seven occasions the Gateway Center monitoring site. Because the samples were being measured on a one every six day cycle, the actual number of violations was estimated to be higher. These violations occurred during the winter season 1985-86 through 1988-89. The highest measured PM-10 concentration was 210 µg/m^3. Since 1995, there have been no violations of the 24-hour NAAQS and the highest recorded value was 136 µg/m^3. Monitoring since 1991 has been daily.

The measured exceedences evaluated in the 1990 AQMP occurred during periods of low average wind speed, less than 3.5 mph. Violations primarily occurred on weekends (Friday, Saturday, or Sunday) or during the holiday period around Christmas and New Year's. Data analyzed for this Plan follow that same trend.

4.4 PARTICULATE MATTER TREND

The particulate matter trend has generally shown air quality improvement since the adoption of the 1990 AQMP. Figure 4-1 shows that the trend of quarterly average PM-10 concentrations decreased following the adoption of the AQMP with a leveling over the last 10 years. Figure 4-2, shows that for the winter months (November-March) the average winter and peak winter concentrations were generally downward after control measures were implemented, but have started to increase since 2008.

4.5 PM-2.5 Data

PM-2.5 monitoring at the Gateway Center shows that since 2000, Mammoth Lakes has met the 24-hour and Annual NAAQS for PM-2.5 (35 and 12 µg/m^3, respectively). The 98th percentile and annual average PM-2.5 levels are shown in Table 4-1.

Table 4-1 PM-2.5 Monitoring Results

	98th Percentile Concentration (µg/m^3)	Annual Average
2000	30.8	N/A
2001	36.2	N/A
2002	N/A	N/A
2003	30.5	7.48
2004	24.7	N/A
2005	26.9	N/A

Figure 4-1, Mammoth Lakes PM-10
Quarterly Peaks & Averages (1990-2013)

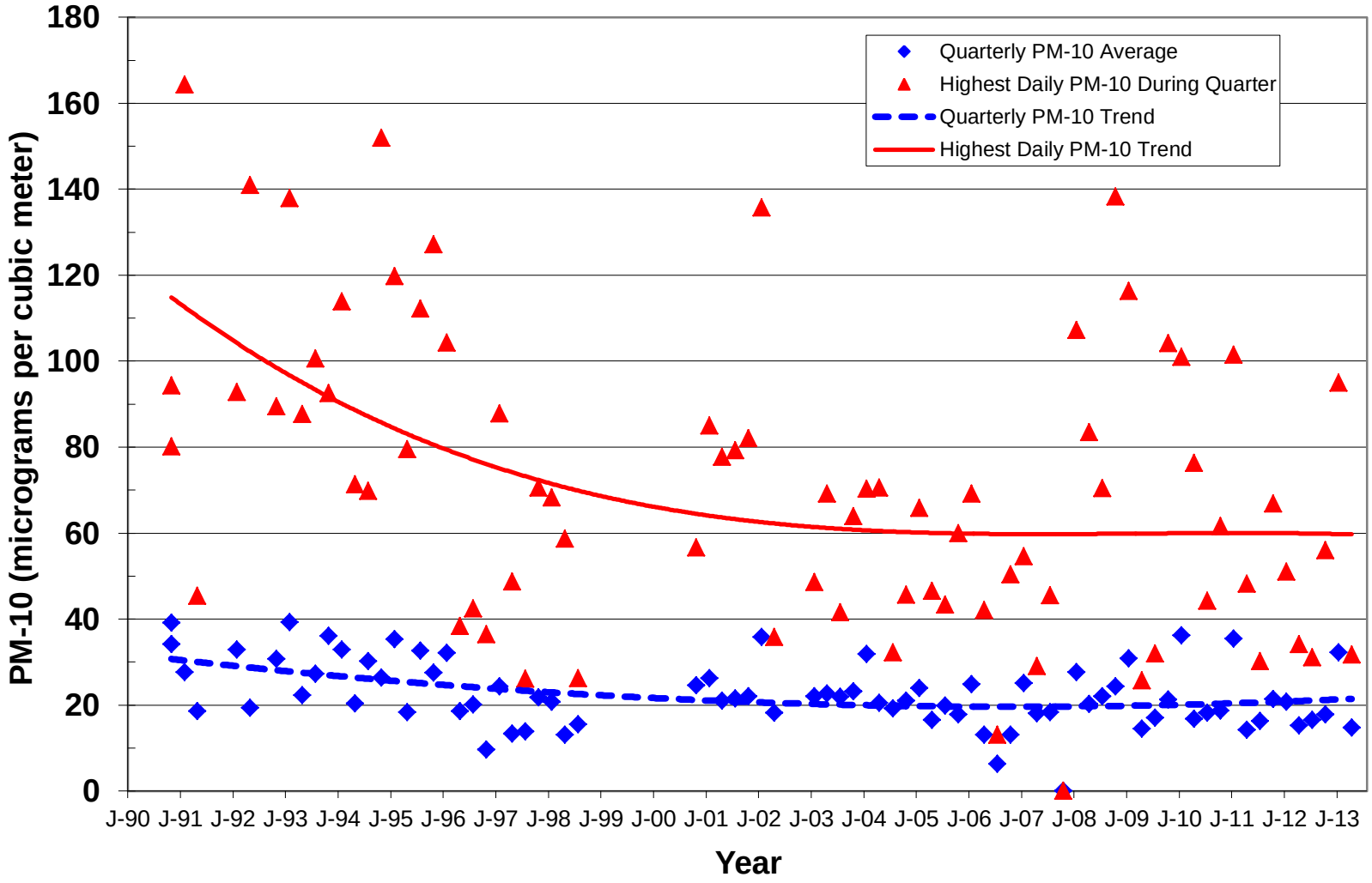
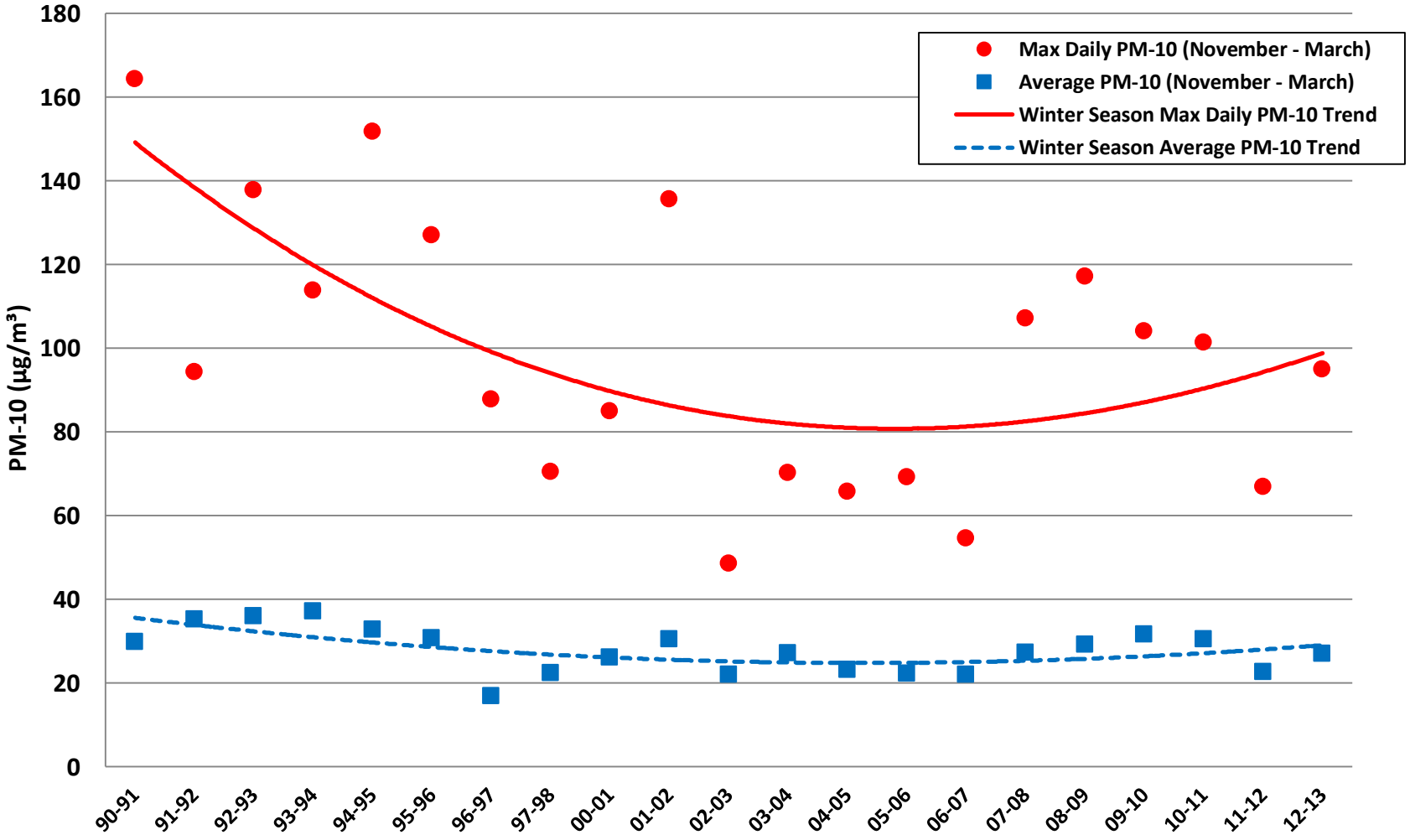


Figure 4-2, Mammoth Lakes PM-10
Winter Season Peaks & Averages (1990-2013)



5. Emissions Inventory

The emissions inventory section covers the PM-10 emission estimates for residential wood combustion (RWC), resuspended road dust, cinders, mobile source tailpipe emissions and point sources. The methodology and data used to determine emissions is discussed for each source type. Because Mammoth Lakes exceeds the state 24-hour PM-10 standard, the emissions inventory is estimated for a peak 24-hour period. These emission estimates consider the large influx of visitors to Mammoth Lakes during the winter ski season.

5.1 WOODSTOVES AND FIREPLACES

Emission rates for woodstoves 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) residents in single-family homes and 3) residents in apartments and mobile homes. Estimates for the annual and 24-hour PM-10 emissions are calculated for wood burning. The annual emissions estimates, which are based on survey data, provide good information to improve the estimates for the peak 24-hour period.

5.2 NUMBER OF WOODSTOVES AND FIREPLACES

The numbers of woodstoves and fireplaces are based on the numbers of condominiums, single-family homes, apartments and mobile homes, and the estimated number of woodstoves and fireplaces in each type of housing. Table 5-1 shows the estimated number of wood burning units from surveys for each housing type in the Planning Area.

Table 5-1, Residential Wood Burning Device Count

	Condominium	Single Family	Mobile home/ apartment	Total
Fireplaces	264	29	0	293
Woodstoves (EPA)	3,289	1,290	193	4,772
Pellet Stoves	297	87	16	400
Woodstoves (uncert)	116	106	9	231
	3,966	1,512	2,18	5,696

Town of Mammoth Lakes 2013

A partial survey being conducted by the Mammoth Lakes Fire Protection District indicates a higher number of unregulated fireplaces (437 versus 293). The AQMP uses the lower number to maintain a conservative estimate of control measure effectiveness. Replacement of a larger number of fireplaces would create a greater reduction in PM-10 than forecast by this AQMP.

5.3 WOODSTOVE AND FIREPLACE USAGE

The estimate of the amount of wood burned is based on a survey conducted during the winter of 2012 – 2013. The survey was sent to over 6,000 property owners and 4,500 Post Office Box holders in Mammoth Lakes. 574 of the surveys were returned. Table 5.2 summarizes the average amount of wood burned during the winter heating season in homes that have a wood burning device.

Table 5-2, Amount of Wood Burned Annually in Homes With Wood Combustion Devices*

Condominium		Single-Family		Mobile Home & Apartment	
Wood Burning	Pellet	Wood Burning	Pellet	Wood Burning	Pellet
1.4 cords	2000 lbs	2.4 cords	2400 lbs	2.3 cords	3000 lbs

* Town of Mammoth Lakes 2013

5.4 ANNUAL PM-10 EMISSIONS ESTIMATE FOR RWC DEVICES

The emission estimates for RWC devices are based on the Environmental Protection Agency's emission factors (US EPA AP 42). These emission factors are based on in situ tests of wood burning devices. Emission factors are given as grams of PM-10 per kilogram of dry wood burned. The emission factors are shown in Table 5-3. 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:

PM-10 emissions/device = $mass_{wood}$ x EF where:

EF = 16.3 g/kg for uncertified woodstoves and fireplaces
7.3 g/kg for EPA certified woodstoves
2.1 g/kg for pellet stoves

The cord density (800 kg per cord) is assumed for ponderosa pine which has a weight density of 10 kg/ft.^{3} A cord is approximately 80 ft.^{3} wood per cord (Davis and Read, 1989). Based on available data this is the best approximation for the Jeffrey and lodgepole pine that is primarily burned in Mammoth Lakes. The total number of fireplaces and wood stoves is taken from Table 5-1, but this category is further broken down into uncertified, and EPA-certified based upon the Town of Mammoth Lakes building permit records for change outs and new construction.

The annual emission estimate for PM-10 of 58,663 kg provides a good basis for comparison with a peak 24-hour emission estimate. The 24-hour emission estimate is critical since woodburning is a significant contributor to 24-hour PM-10 standard exceedences.

Table 5-3 Annual PM-10 Emission Estimates for Residential Wood Combustion											
		Condominiums			Single Family			Mobile Homes and Apartments			
RWC Device	Emission Factor	Wood/ Pellets	Units	PM-10 kg	Wood/ Pellets	Units	PM-10 kg	Wood/ Pellets	Units	PM-10 kg	Emissions Total (kg)
Fireplace/ uncertified stove[1]	16.3	1.17 cords	380	5,798	2.4 cords	135	4,225	2.3 cords	9	270	10,292
Woodstove (EPA)	7.3	1.4 cords	3,289	26,891	2.4 cords	1,290	18,081	2.3 cords	193	2,592	47,564
Pellet	2.1	900 kg	297	561	1,090 kg	87	199	1,360 kg	16	46	806
				33,250			22,505			2,908	58,663

5.5 24-HOUR PM-10 EMISSIONS ESTIMATE FOR RWC DEVICES

To estimate the peak 24-hour emissions inventory for wood burning, it is assumed that all RWC devices are operating and burn an average of 2.4 ft.^{3} (or 24 kg) of wood per day. The amount of wood burned is based on the information provided through the Town's 2013 wood burning survey. Table 5-4 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 approximately 850 kg of PM-10 during a peak wood-burning day.

Table 5-4 Peak 24-Hour Emission Estimates for Residential Wood Combustion											
		Condominiums			Single Family			Mobile Homes and Apartments			
RWC Device	Emission Factor g/kg	Fuel kg/day	Units	PM-10 kg/day	Fuel kg/day	Units	PM-10 kg/day	Fuel kg/day	Units	PM-10 kg	Emissions Total (kg)
Fireplace/ uncertified stove	16.3	19	380	118	27	135	59	19	9	3	180
Woodstove (EPA)	7.3	19	3,289	456	19	1,290	179	19	193	27	662
Pellet	2.1	9	297	6	11	87	2	14	16	0	8
				579			240			30	850

5.6 24-HOUR PM-10 EMISSIONS ESTIMATE FOR 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 (US EPA, Compilation of Air Pollution Emissions Factors, AP-42, 1995, updated). The formula for the emissions factor is:

$E = k(sL)^{0.91} \times (W)^{1.02}$ where:

E = Emissions Factor
k = Particle size multiplier
sL = Road surface silt loading (g/m^2)
W = Average weight (tons) of the vehicles traveling the road

The silt loading factor is taken from the calculations in the 1990 SIP and is estimated to be 8.7 g/m^2, Statewide average vehicle weight is 2.4 tons (CARB, 1997), and the particle size multiplier from AP-42 is 1. (US EPA AP-42) This produces an emissions factor of 17.49 grams of PM-10 per VMT. When multiplied by VMT per day, the result is the estimated mass of PM-10 per day from road dust (Table 5-5). Total peak day PM-10 emissions from road dust is estimated at 2,522 kg/day based on peak traffic volume in 2009.

An annual emissions estimate for road dust was not calculated since it is not needed to evaluate compliance with the 24-hour PM-10 standard.

Table 5-5. 24-Hour Road Dust Emissions

Particle Size Multiplier	Silt Loading	Average Vehicle Weight	Emissions Factor g/VMT	2009 VMT*	Total 24-Hr PM-10 (kg)
1	8.7	2.4	17.49	144,192	2,522

*LSC, 2012a

5.7 VEHICLE TAILPIPE AND TIRE WEAR EMISSIONS

PM-10 emissions from motor vehicle exhaust and tire wear were determined by the California Air Resources Board (CARB, 2010) and the (EPA, 2008). Tailpipe emissions were calculated to be 0.044 g/VMT. Tire and brake wear were calculated to be 0.02 g/VMT for a total of 0.064 g/VMT. These estimates were adjusted using traffic counts in Mammoth Lakes to determine the peak 24-hour emissions from gas and diesel powered vehicles. Estimated current tailpipe and brake/tire wear emissions total 9 kg/day.

An annual emissions estimate for tailpipe emissions was not calculated since it is not needed to evaluate compliance with the 24-hour PM-10 standard,

5.8 INDUSTRIAL POINT SOURCES

The Great Basin Unified Air Pollution Control District permits industrial sources within the Town of Mammoth Lakes. Those sources produce a total of 38.7 kg/day during the winter (Table 5-6).

Table 5-6 Permitted Particulate Matter Sources Within the Mammoth Lakes AQMP

Facility: equipment	PM-2.5		PM-10	
	Peak Winter Day (kg/day)	Annual (kg/yr)	Peak Winter Day (kg/day)	Annual (kg/yr)
7/11 Materials: concrete batch plant	NA	1,998	NA	4,147
CA Dept. Fish & Game - Hot Creek: 1 backup engine	0.04	1.6	0.04	1.6
Mammoth Hospital: 7 boilers, 1 fire & 2 backup engines	3.18	1,130	3.18	1,130
Mammoth Mountain: 4 boilers, 19 backup engines	4.18	130	4.18	130
Mammoth Pacific: 2 engines	0.05	2.4	0.05	2.4
Marzano & Sons: concrete batch plant	NA	1,801	NA	3,740
Monache Condominium: 1 backup engine	0.05	2.6	0.05	2.6
Southern Inyo Hospital District: 1 boiler	0.19	67.6	0.19	67.6
Verizon (Mammoth H.S.): 1 backup engine	0.036	1.9	0.036	1.9
Verizon California - Mammoth Lakes: 1 backup engine	0.03	1.4	0.03	1.4
Total	8	3,139	8	5,077

GBUAPCD, 2013(b)

5.9 SUMMARY OF PM-10 EMISSIONS

Woodburning and resuspended road cinders comprise almost all the PM-10 emissions during the winter. Motor vehicle exhaust, tire wear industrial sources contribute approximately 1.4% of the area wide inventory.

The current total PM-10 emissions on a peak winter day in Mammoth Lakes are 3,420 kg/day and are summarized in Table 5-7.

Table 5-7. Summary of Peak 24 hour PM-10 Emissions (kg/day) 2012

Source		
Residential Wood Combustion	850	
Resuspended Road Dirt/Cinders	2,522	
Motor Vehicles	9	
Industrial Sources	39	
	3,420	kg/day

6. Receptor Modeling

Receptor modeling is based on the idea that the total mass of the receptor (ambient sample) is a sum of the contributions from individual sources. Each source has a unique "fingerprint" of 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 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 concentrations at downwind receptor locations. Dispersion models are especially useful in predicting the effects of point source emissions, such as from industrial smokestacks. 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, the precise conditions that characterize the air pollution problem in Mammoth Lakes.

The receptor model does not 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.

6.1 AMBIENT PROFILES

The Desert Research Institute of Reno, Nevada (DRI) conducted a chemical mass balance (CMB) study for Mammoth Lakes in 2013. DRI analyzed twelve PM-10 and four PM-2.5 filters (dates and concentrations shown in Tables 6-1 and 6-2) for elements and ions. The twelve PM-10 filters included the nine highest and 11th highest PM-10 filter concentration days since 2001, eight of which were since the start of 2008. The other four PM-10 filters are days for which high PM-10 and/or PM-2.5 concentrations were measured and both PM-10 and PM-2.5 filters are available for each day. Three of these four days had the highest PM-10 for days with PM-2.5 filters also. The other day had high PM-2.5 and high PM-2.5 to PM-10 ratios (indicative of large relative wood smoke impact). Because road dust is expected to be mostly in the larger particle sizes and wood smoke mostly in the smaller sizes (PM-2.5) analyzing both PM-10 and PM-2.5 for a few days provided supporting evidence for the estimates based on the PM-10 data. The full report is included as Appendix G.

The chemical analysis included X-ray fluorescence (XRF), which quantified most of the chemical elements, ion chromatography for anions and cations, and light absorption. The XRF analysis provided the contributions from road dust elements, ion chromatography the contributions from sulfate and nitrate, and ammonium. The light

absorption measurement is a good indicator of elemental carbon (EC) (diesel exhaust and wood smoke primarily). What the analysis could not identify that is important is organic carbon (OC), because the carbon-based Teflon filters interfere with measurements of carbon associated with the collected particulates. Because of this, organic carbon was estimated from the residual mass in the CMB analysis.

Table 6-1. Dates with only PM-10 filters:	
Date	PM-10 concentration
1/1/2008	85.9
2/9/2008	96.7
2/27/2008	95.5
2/21/2009	117.6
1/2/2010	101.3
1/29/2010	104.0
2/13/2010	92.0
1/12/2011	127.6

Table 6-2. Dates with PM-10 and PM-2.5 filters:		
Date	PM-10	PM-2.5
12/17/2003	74.6	33.5
1/13/2005	39.3	27.0
1/19/2005	85.1	25.2
1/22/2005	77.8	27.4

6.2 SOURCE PROFILES

6.2.1 *PM-10 analysis*

The chemical source profiles, or fingerprints, were taken from the 1990 AQMP. The sources profiled were:

- 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

Profiles for Mammoth Lakes woodstoves and fireplaces were used plus road dust and cinders. When running CMB it was found that due to their similar chemical fingerprints, significant collinearity occurred between the wood stove and fireplace sources, giving high uncertainty to wood stove contributions (sometimes significantly negative). CMB was run again not using the wood stove source, just fireplaces, cinders, and road dust.

This gave better results. It was attempted to improve results by averaging the wood stove and fireplace profiles, but the quality of the results deteriorated. A weighted average of three parts fireplace to one part wood stove profile was also tried and results were not as good as simply using the fireplace profile.

6.2.2 *PM-2.5 analysis*

The PM-2.5 analysis had collinearity problems between woodstove and fireplace and between road dust and cinders. The analysis with the best results used fireplaces and road dust source profiles only.

6.2.3 *Fitting species*

CMB results can vary significantly based on the choice of fitting species selected. In the initial run, all species measured with available source analysis were used. This gave poor results. Species that were noted from the ambient data to represent the mix of sources were added and subtracted in a trial and error method until the best results were obtained. Attention was paid to squared correlation coefficient, the Chi square statistic and percent of mass explained performance measures (Watson, 2004). The fitting species included: soluble Cl, ammonium, soluble K, total K, Na, Al, Si, S, Ca, Ti, Fe, EC, OC, Ba, Sr, and Zn.

6.3 CHEMICAL MASS BALANCE RESULTS

CMB model version 8 (USEPA) was used to estimate source contributions to PM-10 and PM-2.5 for days with chemically speciated data. CMB analysis done in support of the 1990 Air Quality Management Plan (AQMP, Ono et al, 1990) for Mammoth Lakes showed most of the PM-10 was due to road dust and residential wood combustion (RWC). One of the goals of the 2013 study was to try to determine if the relative contribution of RWC and road dust has changed since the1990 report (DRI, 2013).

Results for the best fitting CMB analysis are shown in Table 6-3. Recommended performance measures (Watson, 2004) are % mass accounted for 100±20%, R-squared>0.80, and Chi-squared < 4.0. For the PM-10 results (discounting the 1/12/2010 sample), 10/11 cases have % mass 100±20%, all cases have R-squared>0.80, and 5/11 meet the Chi-squared <4.0 criteria. For the PM-2.5 results, three out of four met the mass criteria and all four met the R-squared and chi-squared criteria.

The percent of each sample attributed to each source is shown in Table 6-4. On average, residential wood combustion contributed about 64% of the PM-10, road dust plus cinders contributed about 33%, according to the CMB results (DRI, 2013).

Table 6-3. CMB attribution results and performance statistics.

DATE	SIZE	Conc.	FP	RD	CIND	SUM	% mass	R^2	Chi^2
12/17/03	10	74.6	53.0	9.6	10.2	72.8	97.5	0.94	3.70
01/13/05	10	39.3	31.1	3.6	1.7	36.5	92.7	0.92	3.76
01/19/05	10	85.1	51.8	18.1	11.5	81.3	95.5	0.93	4.39
01/22/05	10	77.8	47.5	16.9	8.7	73.0	93.8	0.94	3.70
01/01/08	10	85.9	53.4	24.6	14.8	92.9	108.1	0.93	4.73
02/09/08	10	96.7	68.0	10.2	13.8	92.0	95.1	0.94	3.35
02/27/08	10	95.5	52.6	26.1	12.7	91.3	95.6	0.90	6.40
02/21/09	10	117.6	91.7	26.6	21.0	139.3	118.5	0.94	3.89
01/02/10	10	101.3	100.4	23.2	19.0	142.6	140.8	0.90	6.88
01/29/10	10	104.0	65.8	24.5	16.8	107.1	103.0	0.93	4.52
02/13/10	10	92.0	68.9	25.9	13.9	108.7	118.2	0.91	6.09
01/12/11	10	127.6	43.9	2.2	1.8	47.9	37.5	0.82	8.77
12/17/03	2.5	40.6	28.6	1.5		30.0	74.0	0.96	0.90
01/13/05	2.5	32.7	27.5	0.6		28.1	86.0	0.81	3.90
01/19/05	2.5	30.5	28.1	2.2		30.3	99.3	0.89	2.73
01/22/05	2.5	33.2	27.6	1.9		29.5	89.0	0.92	2.00

DRI, 2013

Table 6-4. CMB Percent Contributions by Road Dust (RD), and Residential Wood Combustion (RWC) 1987-88 and 2003-2011 Data Sets

1990 AQMP PM-10 Source Percentages					2013 AQMP PM-10 Source Percentages			
Date	Conc.	RD%	RWC%		Date	Conc.	RD%	RWC%
12/26/1987	125.9	2.3	97.7		12/17/2003	74.6	25.3	74.7
12/30/1987	132.8	1.3	98.7		1/19/2005	85.1	33.7	66.3
12/31/1987	142.8	2.5	97.5		1/22/2005	77.8	32.5	67.5
1/1/1988	117.4	10.3	89.7		1/1/2008	85.9	39.5	60.5
1/22/1988	143.8	33.7	66.3		2/9/2008	96.7	24.3	75.7
1/23/1988	157.8	41.2	58.8		2/27/2008	95.5	39.4	60.6
2/3/1988	104.3	31.5	68.5		2/21/2009	117.6	32	68
2/5/1988	148.2	33.8	66.2		1/2/2010	101.3	27.7	72.3
2/6/1988	160	31.2	68.8		1/29/2010	104	36	64
2/13/1988	137.6	38.8	61.2		2/13/2010	92	33.8	66.2
2/14/1988	144	45.2	54.8					
2/19/1988	148.5	28.7	71.3					
1987-88 study average		25	75		This study average		32.4	67.6

DRI, 2013

For the winter 1987-1988 study (Ono et al, 1990), on average, fireplaces contributed 75% of the PM-10 and road dust 25%. Table 6-4 compares the results of the 1987-88 study to this study. Three of the days in the 1987-88 study showed wood smoke contributing >95% of the PM-10; the current study shows no high PM-10 days with greater than 75% of the PM-10 contributed from wood smoke (DRI, 2013).

Furthermore, the peak contributions of road dust and residential wood combustion to PM-10 appear to have diminished. A comparison of the results from the 1987-88 study to the 2008-2010 study period showed that the average PM-10 contributions for the top three days in each study dropped from 107 to 72 $\mu g/m^3$ for wood smoke and from 72 to 56 $\mu g/m^3$ for road dust. This represents about a 33% reduction in the ambient PM-10 concentrations for both source categories that can be attributed to the implementation of the 1990 AQMP. (DRI, 2013).

6.4 CHEMICAL MASS BALANCE SUMMARY AND CONCLUSIONS

The question of the relative contributions of wood smoke and road dust to PM-10 in Mammoth Lakes was considered. Teflon filters from high PM-10 days between 2003 and 2011 were subjected to chemical analysis with XRF, ion chromatography, and filter light absorption. Four days analyzed also had PM-2.5 filters that underwent chemical analysis. A major limitation was the inability to measure carbon on the filters. The filter light absorption provided a reasonable estimate of elemental carbon and the unexplained mass (on average 58% of PM-10 and 68% of PM-2.5) was assumed to be organic mass (OC*1.8). Estimates of the contribution of wood smoke and road dust were made using Chemical mass balance and a simple method based on abundance of crustal elements in the samples. For PM-10, CMB showed an average of 32% due to road dust and 68% due to residential wood combustion. This compares to 25% from road dust and 75% from residential wood combustion for the winter 1987-88 study. The CMB maximum contributions (average of three highest days) to PM-10 from road dust and residential wood combustion dropped by about 33% for each source category between 1987-1988 and 2008-2010 (DRI, 2013).

7. Control Measures

In December of 1990, the Town of Mammoth Lakes adopted the Air Quality Management Plan (AQMP) for the Town of Mammoth Lakes. The AQMP relied on controlling wood smoke by replacing old wood stoves and fireplaces with cleaner wood burning appliances and curtailing wood burning on days that could violate the air quality standard. The Town reduced road dust emissions by using vacuum street sweepers to remove volcanic cinders soon after the roads dried. The 1990 control measures are described in Section 2 and are summarized below. An assessment of their effectiveness follows:

7.1 PARTICULATE EMISSIONS REGULATIONS

As a part of the implementation program, the Town of Mammoth Lakes adopted Municipal Code Chapter 8.30, Particulate Emissions Regulations. Major controls in the Chapter 8.30 regulations were:

- Replacement or removal of existing uncertified residential wood combustion appliances at the time of sale of a property;
- Limit the maximum number of residential wood combustion appliances in new construction to one certified appliance plus one pellet fueled appliance;
- Institute voluntary and mandatory wood burning curtailment days;
- Implement a public education Program;
- Implement a vacuum street sweeping program; and
- Limit peak VMTs to 106,600.

7.2 CONTROL MEASURES OVERVIEW AND EFFECTIVENESS

7.2.1 *Wood Stove & Fireplace Change-outs*

In 1990, there were 5,946 woodstoves and fireplaces with less than 1% of those being EPA-certified. In 2013, the number of wood burning appliances is estimated at 5,696 with approximately 91% of the appliances being EPA certified woodstoves (Town of Mammoth Lakes, 2013)).

Although the number of wood burning appliances decreased by roughly 4% from 1990 to 2013, wood smoke emissions went down by about 50% as a result of replacing old wood stoves and fireplaces with EPA-certified wood stoves, pellet stoves and gas fueled appliances. This reduced wood burning PM-10 emissions on permissive burn days from 2,087 kg/day to 850 kg/day during this same time period.

There are indicators that wood heating has decreased since the adoption of the regulations in the AQMP. Town of Mammoth records through June of 2013 show that of the total of 5,414 change outs between December of 1990 and March of 2013, 577 were replaced with propane fueled appliances. It is expected that this trend will continue as older residences are torn down and replaced or renovated. Many of the

older buildings in town have poor insulation and rely on electric heat as their primary heat source. Occupants of these older residences tend to use more wood as a cost-effective alternative to electricity or propane and the amount of wood needed is higher. As these properties are upgraded, their residential wood combustion use should decline.

Anecdotally, there appeared to be an initial decline in personal fuelwood gathering based on data maintained by the Mammoth Ranger District. (Kusumoto 2007 and 2013) Those records showed a decline of approximately 30% in the volume of wood collected from 1999 through 2007. However, since that time, personal fuelwood gathering has increased. The increase follows the spike in fuel prices in 2007 and the recession beginning in 2008. It also appears to coincide with the slight rebound in peak winter PM-10 levels shown in Figure 4-2.

Since 1990, most new condominiums were approved for construction without woodstoves. Since the adoption of the 2007 General Plan, the Town has prohibited wood burning appliances in new multi-unit developments (Town of Mammoth Lakes, 2007). This prohibition is incorporated in the updated Chapter 8.30 of the Mammoth Lakes Municipal Code.

To enforce the change out requirements, the Town of Mammoth Lakes worked with local real estate agents to assure that the seller requirements were disclosed. It also instituted a program that permitted purchasers to assume responsibility for completing the change out provided that the assumption was in writing and filed with the Town. The Town obtained copies of all recorded real estate transactions from the County Recorder and cross-checked those transactions with building permit records to assure that property sales and transfers complied with the Particulate Emissions Regulations. As a result of staffing reductions in the Town, these follow-up programs lapsed in the last five to ten years. The GBUAPCD and the Town have agreed to conduct an inventory of real estate sales for comparison with change out records and to pursue compliance for noncompliant properties.

Although the rule adopted in 1990 limited the installation of solid fuel burning appliances to EPA-certified Phase II woodstoves, EPA has recently created another certification program for EPA Phase II qualified fireplaces and fireplace retrofit devices. Due the Phase II test requirements, fireplaces were not allowed to be tested under the original EPA certification program. They can now be tested under this new program and if the fireplaces or fireplace retrofit devices are listed by the US EPA as Phase II qualified, they will be allowed to be installed in the Town of Mammoth Lakes. This change is codified in the Town of Mammoth Lakes regulations with the adoption of this AQMP (http://www.epa.gov/burnwise/fireplacelist.html#retrofits).

7.2.2 *Public Awareness Program.*

As described in Section 2, the Town implemented a public awareness program beginning in 1990. All components of the program except for the rental unit tent cards

continue to be fully implemented. The tent card program has not been maintained in recent years and the Town is now investigating having additional cards printed for visitor accommodations. Restoring the tent card program will aid in getting no-burn day compliance (see below).

7.2.3 *No-burn Days.*

No-burn days are called when a meteorological inversion and calm wind conditions could persist for a given day. The calm air prevents the dilution and transport of air pollutants and allows PM-10 concentrations to build up from about 4:00 PM to midnight and then again from 6:00 to 10:00 AM. When calm weather is predicted, the Town's meteorologist may call a mandatory or a voluntary no-burn day based on the strength of the forecasted inversion and the Town's population. The meteorologist indicates if it is a red, yellow or green burn day to let the public know if it is mandatory, voluntary or if it is okay to burn.

At the beginning of the program, 10 to 14 mandatory no-burn days were called each winter. Over the past six winters, the Town has averaged one mandatory and one voluntary no-burn day per winter (Daugherty, 2013). A survey of a residential neighborhood and a condominium complex, which was primarily occupied by visitors, showed that full-time residents did not comply with the no-burn day calls, while visitors were more responsive, but not fully compliant (Satterfield, 1994a). The survey showed a negative 36% compliance rate for residents (more wood burned on no burn days) and a positive 35% compliance rate for visitors. The negative compliance rate for the residents was due to having more residents burn on the no-burn survey days than were burning on the survey days when burning was allowed. Since the resident population in the survey was small, the negative value is likely within the statistical uncertainty of the survey and the compliance rate for full-time residents should be considered around zero. Because visitors make up 80% of the population, they had a significant influence on the overall town average. The combined town average with visitors and residents is about 21% compliance on no-burn days (Satterfield, 1994a). This is short of the expected 50% compliance rate that was expected in the plan. There have been no compliance checks for no-burn days since the 1994 study. The effect of the no-burn day compliance shortfall on air quality trends is evaluated in the Maintenance Demonstration section of this report.

In December 2006, a significant change was made to GBUAPCD Rule 431 to make all wood burning appliances, except pellet stoves, subject to no-burn day requirements. Previous to the rule change, only non-EPA certified wood burning appliances were prohibited from being used on no-burn days. EPA certified wood stoves were exempted from the no-burn days and could still be operated. Since 85% to 90% of the non-EPA certified wood burning appliances had been replaced since the adoption of the AQMP in 1990, the large majority of wood stoves were exempt from the no-burn days. Therefore, the removal of the exemption for EPA certified wood stoves is expected to significantly reduce PM-10 on no-burn days. This change in the exemption will also simplify enforcement of the no-burn days as it eliminates the difficulty of pinpointing non-

compliant appliance locations, especially in multi-unit buildings. This rule was adopted by the GBUAPCD and is codified in the Town of Mammoth Lakes regulations with the adoption of this AQMP.

7.2.4 *Traffic Related Control Measures*

After winter storms, volcanic cinders are spread on the Town's roadways to provide additional traction and prevent vehicles from sliding on the icy roads. These cinders are crushed into ever smaller pieces by passing vehicles. When the roads dry, vehicles kick up fine dust from the roadway. In the 1990 AQMP, road dust was found to contribute up to 44% of the PM-10 on days that violated the federal air quality standard. The 1990 AQMP relied on vacuum street sweeping to remove the cinders after the roads dry and a limit on traffic volume to prevent the problem from growing with the population. The traffic volume limit was set at 106,600 vehicle miles traveled on any day and is regulated through the approval of new developments by the Town.

In conjunction with the 2007 update of the Town of Mammoth Lakes General Plan, an updated traffic model was prepared. This new model incorporated additional roadway segments increasing the baseline VMT calculations.

7.2.5 *Vacuum Street Sweeping.*

A test of the effectiveness of the street sweeper showed that PM-10 emissions could be reduced by 68% after use of the Town's Johnson vacuum street sweepers (Satterfield, 1994b). Assuming that it takes two days to clean the heavily trafficked streets, this equates to an overall control efficiency of about 34% for street sweeping. This is consistent with the control efficiency assumption used in the 1990 AQMP. The 34% reduction is also consistent with the CMB analysis that found that ambient PM-10 contributions from road dust have been reduced by 32% from the levels prior to adoption of the AQMP.

7.2.6 *Traffic Volume.*

To provide the most current data for this plan update, the Town of Mammoth Lakes contracted with LSC Transportation Consultants, Inc. for an updated Vehicle Miles Traveled Analysis using a revised traffic model and growth projections from the 2007 Town General Plan.

In 1990 a similar VMT study was completed in combination with the 1990 AQMP. The methodology used in the 1990 study and this VMT study are similar. Both studies are based on a travel demand model that assumes full buildout of the Town’s General Plan in the future. Both studies include all of the Town’s major roadways. The main difference is the extent of the roadways analyzed in each study. The 1990 study had a total of 10.9 miles of roadways on 8 different roads (with 17 segments) for the existing year 1990 VMT, while the future year 2005 had a total of 15.8 miles of roadways on 10 different roads (with 31 segments). In contrast, the updated study’s VMT analysis

included 93.1 miles of roadways on 420 different roads (with 1,037 segments) for both the existing and future analysis years (LSC, 2012a)..

To reconcile the VMT estimates, the VMT in the current TransCAD model was estimated for only those roadway segments included in the 1990 study. As shown in the right columns in Table 7-2, a total of approximately 80,586 existing VMT and 110,641 future VMT are estimated on those roadways included in the 1990 study. Of the total existing VMT in the current TransCAD model network (144,192), about 56 percent are reflected on the roadways included in the 1990 study. Similarly, of the total future VMT in the current model (179,708), about 62 percent occur on roadways included on the 1990 study. The remaining VMT occurs on the smaller roads that were not included in the 1990 study. Note that these figures are based on peak-day conditions, consistent with the 1990 study (LSC, 2012b).

The following findings are made regarding the VMT on the roadways included in the 1990 Study:

- Overall, the VMT in Mammoth Lakes has increased from approximately 66,275 in 1990 to approximately 80,856 in 2009 based on the roadway segments evaluated in 1990. This equates to a total increase of approximately 22 percent over 19 years.
- In 1990, the forecast indicated that the existing VMT would increase by more than double (approximately 222 percent) by 2005. Given that the VMT in 2009 was only slightly higher than the VMT in 1990, this high rate of growth has not occurred.
- The 2005 VMT forecasts made in 1990 are much higher than the 2030 forecasts in the current TransCAD model for the same roadway segments, reflecting that the growth rate has decreased since 1990 and future development is expected to occur at a slower rate. Based on the current TransCAD model, VMT on the roadways included in the 1990 study is expected to increase by a total of 37 percent from 2009 to 2030.
- The roadway segments evaluated in 1990 account for 56% of the total traffic on all roadways in the current TransCAD model for 2009 and 62% of the 2030 VMT. The Emissions Inventory in this AQMP uses all the roadway segments identified in the current TransCAD model.

It should be noted that the increase in VMT from 1990 to 2009 was spread over a larger roadway network, with the addition of roads away from the town center. Although the additional roads contributed to an increase in VMT, they also dispersed the road dust emissions over a larger area. This meant that the increase in VMT did not affect monitored PM-10 concentrations at the Gateway Center in proportion to the increase in overall roadway emissions within the town. To account for the VMT change over the current road network, the maintenance demonstration in Chapter 8 re-examines the relationship of VMT using the current traffic model to the ambient impact at the PM-10 monitoring site.

7.3 SUMMARY OF THE EFFECT OF CONTROL MEASURES ON AMBIENT PM-10 CONCENTRATIONS

With the implementation of the control measures from the 1990 AQMP, PM-10 levels in Mammoth Lakes have declined significantly. The 1990 AQMP estimated 4,259 kg/day of PM-10 for the peak 24-hour period and forecast 8,036 kg/day for the peak 24 hour total PM-10 emissions by 2005 absent any controls. (Ono et al. 1990) The updated emissions estimate shows 3,420 kg/day PM-10 in 2012, which is a 20% reduction in emissions since 1990 when the AQMP was adopted. This reduction was achieved despite a 72% population increase from 4,785 in 1990 to 8,234 in 2010. The reduction in emissions is divided as follows:

Table 7-1. Change in Peak 24-Hour Emissions 1990-2012

	1990	2012	Difference
RWC devices	1,839	850	-989
Road dust/cinders	2,390	2,522	132
Tail pipe and brake wear	23	9	-14
Industrial	7	39	32
	4,259	3,420	-839

7.4 AMENDMENTS TO 1990 CONTROL MEASURES

Most of the changes to the implementing regulations of the Town of Mammoth Lakes MC 8.30 revise outdated sections or make non-substantive technical edits. The three meaningful amendments are:

- Section 8.30.040 B. This section is modified to clarify that no new wood burning appliances may be installed in multi-family developments. Prohibition of new wood burning appliances in multi-family projects has been the policy of the Town. The proposed revision formalizes that practice and implements General Plan Policy R.10.3.

- Section 8.30.080, Mandatory Curtailment. This section has been modified to include all wood burning appliances, except pellet stoves, in the no-burn day program. Currently, EPA certified stoves are exempted under Town regulations, but are required to participate under the District regulations. This revision eliminates ambiguity between the Town and District regulations and better protects the community's air quality on those days forecast to exceed 130 micrograms per cubic meter.

- Section 8.30.100 B. This section sets a limit for vehicle miles traveled (VMT) within the town. The current limit is one hundred six thousand six hundred (106,600) VMT on any given day. Proposed development projects and other Town approved activities which affect vehicle trips are evaluated against this limit. Projects, programs, or policies which would cause an exceedence of this limit would have to incorporate higher levels of traffic mitigation or potentially be

denied. The revised traffic model for the community incorporates additional roadway segments and revises VMT projections based on updated traffic counts and current modeling technologies. It shows and estimated VMT at General Plan buildout of one hundred seventy nine thousand seven hundred eight (179,708) for the revised model roadway segments. The air quality modeling shows that this overall level of traffic will not cause an exceedence of the NAAQS and is suggested as the VMT limit for the AQMP.

The full text of the amended regulations is found in Appendix C.

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Figure 7-2. Vehicle Miles Traveled (VMT) Comparison

			Estimated VMT in 1990 Air Quality Management Plan Study		2011 TransCAD Model VMT	
Roadway	**From**	**To**	**Existing (1990)**	**Future (2005)**	**Existing (2009)**	**Future (2030)**
SR203/Main Street	Meridian Blvd	Minaret Road	23,625	27,790	25,331	28,373
Lake Mary Road	Minaret Road	Twin Lakes Parking Lot	5,700	11,215	4,526	4,952
Meridian Blvd	Majestic Pines Road	Highway 203	6,650	25,150	13,115	17,967
Old Mammoth Road	Main Street	Ranch Road	11,900	20,635	13,448	16,839
Old Mammoth Road[1]	Ranch Road	Red Fir Rd	-			
Sherwin Creek (Old Mammoth Road Extension)[2]	Old Mammoth Road	South 0.1 miles	-	350	-	-
Forest Trail	Main Street	Minaret Road	1,500	1,500	1,422	3,220
Canyon Blvd	Lake Mary Road[3]	Canyon Lodge Parking	2,400	4,980	1,175	5,982
Lakeview Blvd	Canyon Lodge Parking	Canyon Blvd (East)	5,000	7,100	3,421	3,378
Kelley/Majestic Pines[4]	Lake Mary Road	Meridian Blvd	750	2,800	1,175	1,489
Majestic Pines Extension	Meridian Blvd	Old Mammoth Road	-	3,000	-	-
SR203/Minaret Road	Main Street	Scenic Loop Road	8,750	16,160	9,608	10,878
Minaret Road	Main Street	Old Mammoth Road	-	26,235	7,364	17,564
		Total	**66,275**	**146,915**	**80,586**	**110,641**
		Total VMT of all roadways included in the 2011 TransCAD Model			144,192	179,708
		Portion of VMT included on the 1990 Study roadways			56%	62%

Note 1: The segment of Old Mammoth Road from Ranch Road to Red Fir Road did not exist in 1990.

Note 2: The Old Mammoth Road Extension is not included in the TransCAD model.

Note 3: In the 1990 VMT Study, Canyon Blvd is assumed to start at Minaret Road, consistent with its previous alignment.

Note 4: The Majestic Pines Extension is not included in the TransCAD model.

Source: LSC Transportation Consultants, Inc. LSC 2012b

8. Maintenance Demonstration

This section will cover the effects of increased population and visitors on PM-10 emissions on ambient PM-10 concentrations. Receptor modeling results from Chapter 6 will be used with design day concentrations and the projected emissions inventory to determine the future ambient PM-10 concentrations that will result from population and visitation growth.

8.1 EMISSIONS AND POPULATION GROWTH PROJECTIONS

The 2007 Town of Mammoth Lakes General Plan evaluated population in terms of People at One Time (PAOT). PAOT is the number of people in town on a peak winter Saturday. PAOT is expected to grow from 34,265 in 2007 to 52,000 in 2025. 2025 was considered the build out year by the General Plan. With the slowdown in development as a result of the recent recession, actual growth has been substantially less than forecasted. Nonetheless, the buildout number from the General Plan has been used as the year 2030 projected population in both the RWC and VMT analyses. This provides the required 10-year maintenance period with sufficient lead time to allow for redesignation.

Tables 8-1 and 8-2 show the expected PM-10 emissions to growth with continued implementation of existing controls. Table 8-3 summarizes the peak daily PM-10 emissions for each source category for 1990, 2012, and projections to 2030.

Table 8-1. Peak Roadway Emissions Per Day 2012-2030

		2012		2030	
EF in g/VMT		**VMT**	**Emissions**	**VMT**	**Emissions**
EF Road Dust	17.49	144,192	2,522 kg	179,708	3,143 kg
EF Tailpipe	0.044	144,192	6 kg	179,708	8 kg
EF Tire and Brake Wear	0.02	144,192	3 kg	179,708	4 kg
Total	17.55	144,192	2,531 kg	179,708	3,154 kg

Table 8-2. Peak Residential Wood Combustion Emissions Per Day 2012-2030

	2012		2030	
	Devices	**Emissions**	**Devices**	**Emissions**
Non certified stoves & fireplaces	524	180 kg	64	21 kg
Certified stoves	4,772	662 kg	5,569	779 kg
Pellet stoves	400	8 kg	430	8 kg
Total	5,696	850	6,063	802

Table 8-3 Peak 24-hour PM-10 Emissions (kg/day)			
	1990	**2012**	**2030**
Residential Wood Combustion	1,839	850	802
Road Dust and Cinders	2,390	2,522	3,143
Tail Pipe and Brake Wear	23	9	4
Industrial	7	39	39
Total	4,259	3,420	3,988

PM-10 emissions generated in the Planning Area are primarily from wood smoke from residential wood combustion and resuspended road dust. The attainment emissions inventory for Mammoth Lakes is based on estimated daily PM-10 emissions for 2012. Emission estimates for 2012 are typical of emissions in the Planning Area over the 3-year period (2010-2012) when PM-10 compliance was determined from monitoring evaluations. Table 8-3 shows that total peak daily emissions decreased from 1990 to 2012 and are currently estimated at 3,420 pounds per day.

8.2 DESIGN DAY SELECTION FOR AMBIENT PM-10 FORECAST

For air quality planning purposes the design day concentration is the monitored PM-10 concentration that is used to determine if an area is attainment with the federal standard. For PM-10 it is statistically the fourth highest daily monitored concentration measured over the last three calendar years. Since PM-10 was monitored daily at the Gateway Center during 2010-2012, the fourth highest concentration taken from the last three years is the used as the design concentrations. This design concentration can then be used to forecast ambient PM-10 concentrations and future compliance with the federal PM-10 standard (see Chapter 8.3).

Table 8-4 Four Highest Monitored PM-10 Concentrations At Gateway Center, Mammoth Lakes, CA (2010-2012)					
Year	Number of Samples	1st Hi ($\mu g/m^3$)	2nd Hi ($\mu g/m^3$)	3rd Hi ($\mu g/m^3$)	4th Hi ($\mu g/m^3$)
2010	339	101	100	**99**	89
2011	355	102	81	81	79
2012	330	56	53	51	48

Table 8-4 shows the four highest monitored PM-10 concentrations for the three year period from 2010 through 2012. The fourth highest PM-10 concentration from this period, and therefore the design concentration is 99 $\mu g/m^3$ measured on January 2, 2010. It should be noted that all of the monitor values shown in this table were measured during the winter months from December through March, which is consistent with the highest PM-10 days that the AQMP is intended to mitigate.

8.3 PROPORTIONAL ROLL-BACK METHOD FOR CONTROL STRATEGY ANALYSIS

The effect of PM-10 emissions increases or decreases on the ambient PM-10 concentration can be determined by using a linear rollback 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 rollback equation includes background PM-10 concentration. The background concentration for Mammoth Lakes is about 5 $\mu g/m^3$ based on the winter time PM-10 data from Simis Ranch a sparsely populated location near Mono Lake, CA.

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

C_T = Total PM-10 concentration
C_b = Background concentration, 5 $\mu g/m^3$
C_i = PM-10 concentration due to source i
C_{di} = Design day source contribution from source i
E_i = PM-10 emissions from source i
E_{di} = Peak PM-10 emissions from source i

As was described in the 1990 AQMP, Mammoth Lakes' air pollution episodes are characterized by two different scenarios. When temperatures are lower, road dust and cinders are bound up in ice and snow and wood heating demands are higher, wood smoke is the dominant contributor to PM-10. When temperatures are warmer, melting snow and drying pavement releases road dust and wood burning demands are lower, road dust comprises a much higher fraction of PM-10. This leads to air pollution episodes that may be dominated by either wood smoke or road dust. The proportional roll-back analysis tested both cases. The results in Table 6-4 were used to estimate the contributions for the two design day PM10 forecasts. The high wood smoke day is based on the sample collected on 2/9/2008, which had 75% of the PM-10 attributed to residential wood combustion with the remainder coming from road dust. The high road dust day is based on the sample collected on 2/27/2008, which had 39% of the PM-10 attributed to road dust and cinders with the remainder coming from residential wood combustion. Due to the lack of evidence in the CMB analysis and their relatively low emissions as compared to road dust and wood smoke, some emission categories were considered negligible for the purpose of the PM-10 forecast. This included emissions from industrial sources, tail pipes, and brake wear.

To determine the ambient source contributions for the two design day scenarios, use the following peak day 2012 emissions for E_{di}:

E_{di} = 850 kg/day for fireplaces and wood stoves
= 2522 kg/day for road dust and cinders
= negligible for all other sources

For the wood burning dominated design day assume 75% of the design day concentration minus background (example, C_{di} = 0.75 x (99 – 5) = 70.5) is due to fireplaces and woodstoves and the remainder is attributed to road dust and cinders.:

C_{di} = 70.5 µg/m^3 for fireplaces and wood stoves
= 18.8 µg/m^3 for road dust and tailpipe

Likewise, for the high road dust and cinders design day, assume 39% is attributable to road dust and cinders and the remainder is due to fireplaces and woodstoves:

C_{di} = 57.3 µg/m^3 for fireplaces and wood stoves
= 36.7 µg/m^3 for road dust and tailpipe
=negligible for all other sources

Effective future emission changes on the ambient contributions can be estimated by using emissions data for 2030 as shown in table 8-3 for the variable E_i.

E_i = 802 kg/day for fireplaces and wood stoves
= 3,143 kg/day for road dust and cinders
= negligible for other sources

8.4 EFFECT OF GROWTH ON PM-10 CONCENTRATIONS

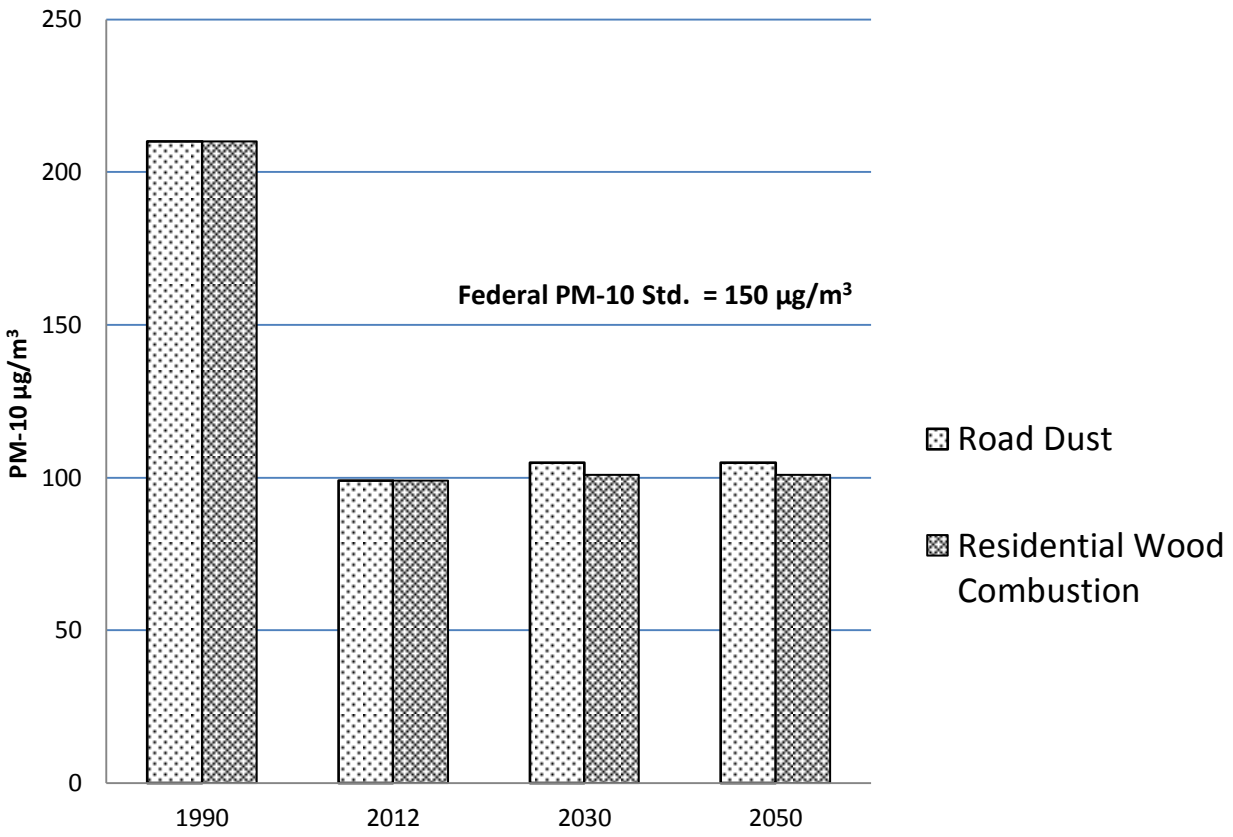
These results show that, with current control measures, growth could result in a 0.4% to a 6.5% increase in worst-case ambient PM-10 concentrations over the next 15 years. Table 8-5 demonstrates that no exceedences of the NAAQS for PM-10 are expected through 2050 with existing control measures. This is also shown in Figure 8.1.

Table 8-5. Future PM-10 Concentrations for Residential Wood Combustion and Road Dust Design Days

	2012	2030	2050*
High RWC Design Day	99.0 µg/m^3	100.8 µg/m^3	100.8 µg/m^3
High Road Dust Design Day	99.0 µg/m^3	104.8 µg/m^3	104.8/m^3

*Assumes no growth after buildout in 2030

Figure 8-1 Design Day Projection for High Residential Wood Combustion and Road Dust Days



Tables 8-6 and 8-7 and Figures 8-2 and 8-3 Show the contributions by source for high residential combustion days and for high road dust contribution days.

Table 8-6 Forecasted PM-10 Design Day Concentrations by Source for High Residential Wood Combustion Day

Source Category	1990	2012	2030	2050
Background	5 µg/m^3	5 µg/m^3	5 µg/m^3	5 µg/m^3
Road Dust	5 µg/m^3	23 µg/m^3	29 µg/m^3	29 µg/m^3
Residential Wood Combustion	195 µg/m^3	71 µg/m^3	66 µg/m^3	66 µg/m^3
Vehicles*	5 µg/m^3	negligible	negligible	negligible
Industrial Sources	negligible	negligible	negligible	negligible
Total	210 µg/m^3	99 µg/m^3	100 µg/m^3	100 µg/m^3

Figure 8-2 Design Day Projection for High Residential Wood Combustion Day

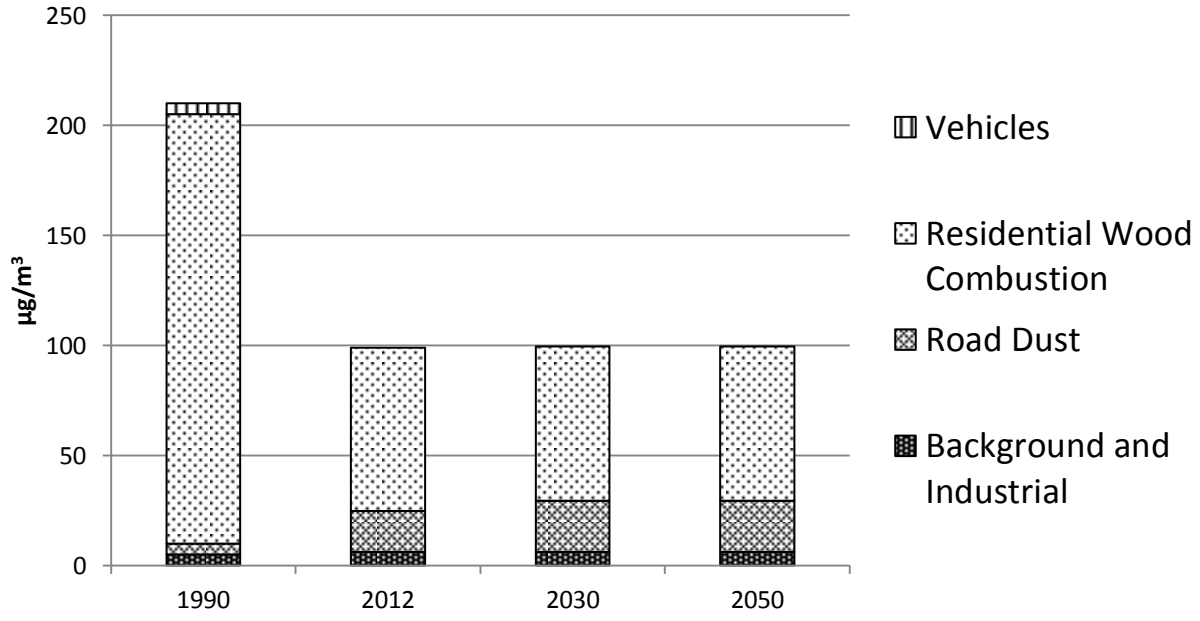
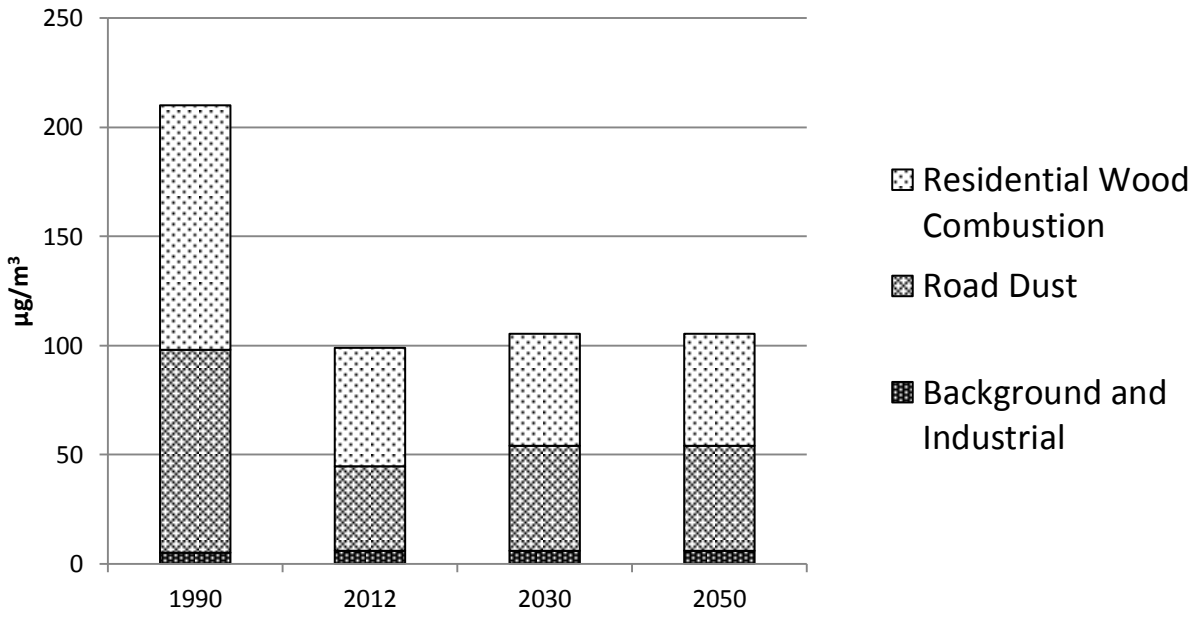


Table 8-7 Forecasted PM-10 Design Day Concentrations by Source for High Road Dust Day

Source Category	1990	2012	2030	2050
Background	5 µg/m^3	5 µg/m^3	5 µg/m^3	5 µg/m^3
Road Dust	93 µg/m^3	37 µg/m^3	46 µg/m^3	46 µg/m^3
Residential Wood Combustion	112 µg/m^3	57µg/m^3	54 µg/m^3	54 µg/m^3
Vehicles*	negligible	negligible	negligible	negligible
Industrial Sources	negligible	negligible	negligible	negligible
Total	210 µg/m^3	99 µg/m^3	105 µg/m^3	105 µg/m^3

Vehicle tailpipe and brake wear emission amount to less than 0.3 µg/m^3 except for the 1990 RWC case.

Figure 8-3 Design Day Projection for High Road Dust Day



9. Contingency Plan and Maintenance Measures

9.1 CONTINGENCY PLAN REQUIREMENTS

Section 172(c)(9) of the CAA requires that SIPs include contingency measures.

> *Such plan shall provide for the implementation of specific measures to be undertaken if the area fails to make reasonable further progress, or to attain the national primary ambient air quality standard by the attainment date applicable under this part. Such measures shall be included in the plan revision as contingency measures to take effect in any such case without further action by the State or the Administrator.*

In subsequent NAAQS implementation regulations and SIP approvals/disapprovals published in the Federal Register, the EPA has issued guidance that the contingency measure requirement could be satisfied with already adopted control measures, provided that the controls are above and beyond what is needed to demonstrate attainment with the NAAQS (76 FR 57891). Thus, an already adopted control measure with an implementation date prior to the milestone year or attainment year would obviate the need for an automatic trigger mechanism.

The analysis in this Plan shows that the adopted control measures for the Town of Mammoth Lakes are sufficient to maintain compliance with the NAAQS for PM-10 with a substantial buffer in the event that the measures do not fully achieve the same level of PM-10 reduction going forward that has been achieved to date. The Plan indicates a future design day PM-10 level of 100.8 µg/m^3 on high residential wood combustion days and 104.8 µg/m^3 (Table 8-5) on high road dust days. This is 45 µg/m^3 (30%) lower than the NAAQS of 150 µg/m^3.

Despite the attainment of the Federal NAAQS, the Town of Mammoth Lakes still exceeds the California 24-hour standard for PM-10. Therefore, this Plan incorporates additional measures to continue to improve the community's air quality.

These measures include amending the Town of Mammoth Lakes Particulate Emissions Regulations to match GBUAPCD Rule 431, requiring all wood burning fireplaces and stoves, whether certified or not, to comply with no-burn days. Any new facilities in the Planning Area that may emit air pollution will be subject to the District's new source review rules (209-A, 216 and 216-A). Facilities that qualify as a major source under the US EPA federal permitting guidelines will also be subject to federal PSD (Prevention of Significant Deterioration) permitting requirements (40 CFR 51.166 and 52.21).

9.2 CONTINGENCY PLAN CONCLUSIONS

The success of the existing control measures demonstrates that PM-10 concentrations have been significantly reduced to a level that contingency measures are not required to

maintain compliance with the federal standard. Nonetheless, additional measures have been incorporated into the AQMP to assist in further reductions of PM-10 levels with the goal of improved compliance with the California Ambient Air Quality Standard for PM-10.

10. Transportation Conformity

10.1 BACKGROUND

Transportation conformity is a way to ensure that Federal funding and approval are given to those transportation activities that are consistent with air quality goals. It ensures that these transportation activities do not worsen air quality or interfere with the "purpose" of the SIP, which is to meet the NAAQS. Meeting the NAAQS often requires emissions reductions from mobile sources.

According to the Clean Air Act, transportation plans, programs, and projects cannot:

- Create new NAAQS violations;
- Increase the frequency or severity of existing NAAQS violations; or
- Delay attainment of the NAAQS.

Transportation conformity requirements contained in Great Basin Unified Air Pollution Control District Regulation XII require that federal actions and federally funded transportation projects conform to SIP rules and that they do not interfere with efforts to attain federal air quality stands. Transportation sources were found to contribute to the nonattainment problem in Mammoth Lakes and PM-10 from paved roads. Estimated at 2,531 kilograms per day, paved road emissions comprise 34.5% of the daily PM-10 emissions in the Mammoth Lakes Planning Area (see Table 8-1).

In terms of transportation plans and transportation improvement programs (TIPs), FHWA/Federal Transit Administration's joint conformity determination is based on a quantitative demonstration that projected motor vehicle emissions from the planned transportation system do not exceed the motor vehicle emissions budget established in the SIP. If the transportation plan or TIP cannot meet the motor vehicle emissions budget, then changes may be needed to the transportation plan or TIP, or the SIP. If conformity is not determined according to the timeframes established in the regulations, a conformity "lapse" will occur. When conformity lapses, Federal projects may proceed only if they are exempt from transportation conformity (e.g., safety projects), TCMs in an approved SIP, or project phases that have already received funding commitments by FHWA or FTA.

10.2 PLANNING ASSUMPTIONS

Forecasts in this plan are based on the projections in the Town of Mammoth Lakes General Plan. Both growth in VMT and changes in the numbers of residential wood burning appliances assume full build-out of the community at the maximum densities identified in the General Plan.

Proposed Motor Vehicle Emission Budget

The proposed motor vehicle emission budget is based on the build-out assumptions contained in the Town of Mammoth Lakes General Plan. As set forth in the Mammoth Lakes Vehicle Miles Traveled Analysis (LSC, August, 2012) for the year 2030, traffic volume in Mammoth Lakes will reach 179,708 VMT per day, producing 3,154 kg of PM-10. The 2030 VMT in the General Plan is the limit for VMT in this AQMP. Projects that may result in VMT in excess of 179,708 per day shall incorporate measures to reduce VMT or revise the AQMP to demonstrate through additional controls or other methods that the increase in VMT will not result in a violation of the NAAQS for PM-10.

11. General Conformity

General conformity is the federal regulatory process for preventing major federal actions or projects from interfering with air quality planning goals. Conformity provisions ensure that federal funding and approval are given only to those activities and projects that are consistent with state air quality implementation plans (SIPs). Conformity with the SIP means that major federal actions will not cause new air quality violations, worsen existing violations, or delay timely attainment of the national ambient air quality standards (NAAQS). Current federal rules require that federal agencies use the emissions inventory from an approved SIP's attainment or maintenance demonstration to support a conformity determination.

General conformity requirements contained in District Regulation XIII require that federal actions and federally funded projects conform to SIP rules and that they do not interfere with efforts to attain federal air quality standards. A conformity determination is currently required for any federally funded (non-transportation) project or action that takes place in a moderate PM-10 nonattainment and maintenance areas that have the potential to exceed a *de minimis* PM-10 emissions threshold of 100 tons per year. In order to maintain the stringency of control requirements in the Mammoth Lakes Planning Area under a maintenance plan, the District will retain the 100 tons of PM-10 per year *de minimis* emissions threshold for triggering a conformity determination as currently required under District Regulation XIII.

12. Redesignation Request

States may ask U.S. EPA to redesignate an area "attainment" if:

- the area has monitored attainment of the air quality standard;
- the area has a fully approved State Implementation Plan;
- U.S. EPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions;
- the state has submitted, and U.S. EPA has approved, a maintenance plan for the area; and,
- the area has met all other applicable federal CAA requirements.

As described in Chapter 8, the Town of Mammoth Lakes last exceeded the federal PM-10 24-hour standard in 1994. Attainment of the PM-10 standard is a direct result of the implementation of control measures by the Town of Mammoth Lakes as described in the 1990 Air Quality Management Plan for the Town of Mammoth Lakes.

The daily data collected by the Great Basin Unified Air Pollution Control District in Mammoth Lakes demonstrates that no more than 1.0 exceedences of the NAAQS have occurred over the last three years as is required to demonstrate attainment of the federal standard. In fact, the data show that there have been no exceedences during the last 19 years.

Applying a proportional roll back analysis to the PM-10 present and future emissions this document demonstrates that no more than 1.0 exceedences per year would be expected through the next 20 year planning period and beyond. With continued implementation of the control measures, attainment will be maintained.

The District finds that the Mammoth Lakes PM-10 Planning Area has attained the federal PM-10 standard and requests the California Air Resources Board recommend to the US Environmental Protection Agency that the area be redesignated from nonattainment to attainment with the federal PM-10 standard.

13. References

52 FR 24634. Federal Register, *Revisions to the National Ambient Air Quality Standards for Particulate Matter*, July 1, 1987.

52 FR 29384. Federal Register, August 7, 1987.

62 FR 38652. Federal Register, *National Ambient Air Quality Standards for Particulate Matter*, July 18, 1997.

71 FR 61144-64233. *National Ambient Air Quality Standards for Particulate Matter* 10/17/06.

CARB, 1997. *Entrained Road Dust from Paved Road Travel,* California Air Resources Board, July 2, 1997.

CARB, 2010. *Methods to Find the Cost-Effectiveness of Funding Air Quality Projects*, California Air Resources Board, March, 2010.

CARB, 2013a. *Area Designations Maps / State and National,* 4/22/13*,* website accessed May 2, 2013, www.arb.ca.gov, 4/22/13.

CARB 2013b. *Ambient Air Quality Standards,* California Air Resources Board, web site accessed June 4, 2013, http://www.arb.ca.gov/research/aaqs/caaqs/pm/pm.htm.

EPA, 2008. *Average In-Use From Heavy-Duty Trucks*. U.S. EPA Office of Transportation and Air Quality, October 2008.

EPA 2013. *National Ambient Air Quality Standard for Particulates*, US EPA, website accessed May 2, 2013, www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html.

EPA, AP-42. *Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors,* Last Updated December 28, 2011, Us EPA, website accessed June 15, 2013, www.epa.gov/ttn/chief/ap42/index.html.

Daugherty, 2013. Jennifer Daugherty, Associate Planner, Town of Mammoth Lakes, personal communication.

Davis and Read. *Guidance Document for Residential Wood Combustion Emission Control Measures*, 1989.

DRI, 2013. *Chemical Analysis of PM10 and PM2.5 Filters from Mammoth Lakes*, Desert Research Institute Division of Atmospheric Sciences, Reno, Nevada, May 21, 2013.

GBUAPCD. 2013a, *Summary of PM-10 air quality standard violations for the Town of Mammoth Lakes (1990 – 2012),* Great Basin Unified Air Pollution Control District, Bishop, California, August 7, 2013.

GBUAPCD, 2013b. Great Basin Unified Air Pollution Control District, *Permitted Particulate Matter Sources Within the Mammoth Lakes AQMP*, August 7, 2013.

Kusumoto, 2007 and 2013. Scott Kusumoto, Inyo National Forest, personal communication.

LSC, 2012a, *Mammoth Lakes Vehicle Miles Traveled Analysis*, Sara Hawley and Leslie Suen, LSC Transportation Consultants, Inc., Tahoe City, California, August 3, 2012.

LSC, 2012b, *Mammoth Lakes Vehicle Miles Traveled Analysis – Comparison with 1990 Study*, Sara Hawley and Leslie Suen, LSC Transportation Consultants, Inc., Tahoe City, California, September 10, 2012.

OAQPS 2005. *Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information*. U.S. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, December, 2005

Ono, 1990. Ono, Duane, William Taylor and Debra Lawhon, (1990)*, Air Quality Management Plan for the Town of Mammoth Lakes,* Great Basin Unified Air Pollution Control District and the Town of Mammoth Lakes, Bishop, CA, November 30, 1990.

Satterfield, 1994a, *No Burn Day Compliance Study for the Town of Mammoth Lakes, California*, Charles G. Satterfield, Satterfield & Associates, June Lake, California, June 16, 1994.

Satterfield, 1994b, *Street Sweeper Efficiency Study for the Town of Mammoth Lakes*, Charles G. Satterfield, Satterfield & Associates, June Lake, California, June 13, 1994.

Town of Mammoth Lakes (a), *Town of Mammoth Lakes General Plan,* 2007.

Town of Mammoth Lakes (b), *Final Environmental Impact Report for the Town of Mammoth Lakes 2005 General Plan Update,* 2007.

Town of Mammoth Lakes, 2013, Building Permit Records as of 6/30/13.