

**PARTICULATE MATTER ATTAINMENT PLAN**

**MENDOCINO COUNTY**

**AIR QUALITY MANAGEMENT DISTRICT**

**of the**

**CALIFORNIA**

**NORTH COAST AIR BASIN**

**January, 2005**

**MENDOCINO COUNTY AIR QUALITY MANAGEMENT DISTRICT**  
**PARTICULATE MATTER ATTAINMENT PLAN**

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## I. INTRODUCTION

The Mendocino County Air Quality Management District is the agency responsible for enforcement of all State and Federal Air Quality Laws and Local Air Quality Regulations in Mendocino County. The District's legal boundaries are coterminous with the County boundaries, however the District is part of the larger North Coast Air Basin, which includes Del Norte, Trinity, Humboldt, Mendocino and part of Sonoma County.

The District is in attainment for all Federal criteria air pollutants and is also in attainment for all State standards except Particulate Matter less than 10 microns in size (PM<sup>10</sup>). Districts designated non-attainment for all pollutants except PM<sup>10</sup> are required to prepare an attainment plan<sup>1</sup>. While the District is not required to prepare a PM<sup>10</sup> attainment plan the District is required to prevent significant deterioration of local air quality and make reasonable efforts toward achieving attainment status for all pollutants. In general, 'reasonable progress' is defined as a 5% reduction in emissions per year, until the standard is attained.

This document is designed to meet the requirements of Senate Bill 656 (2003). SB 656 requires the District to list particulate matter control measures it considers cost-effective and develop a schedule for their implementation by July 31, 2005<sup>2</sup>. This document is designed to serve as a summary of the District's current status, a long range planning tool and a roadmap for future District policy.

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<sup>1</sup> California Health and Safety Code, [HSC] Section 40911

<sup>2</sup> For more information on SB 656 visit <http://www.arb.ca.gov/pm/pmmeasures/pmmeasures.htm>

## **II. EXECUTIVE SUMMARY**

The Mendocino County Air Quality Management District is designated as non-attainment for the State Standard for Airborne Particulate Matter less than 10 microns in size (PM<sup>10</sup>). The California Clean Air Act of 1988 requires that any District that does not meet the PM<sup>10</sup> standard make continuing progress to attain the standard at the earliest practicable date.

Since the early 1980s levels of airborne particulate matter in the District, as monitored by the District, have gradually declined. This decline is the result of a changing industrial base, enhanced regulations and increased enforcement by the District.

Particulate Matter (PM) has significant documented health effects and new research has shown that children are especially susceptible to elevated PM levels.

While PM levels have dropped over the last 20 years, the District still exceeds the state standard several times a year. The majority of these exceedances result from wildfires, residential wood burning, unpaved roads and construction activities, the largest sources of PM in the District. As the population within the District continues to grow, emissions from many of these sources are likely to increase.

Growth in population, vehicle use and wood combustion will surpass the reductions in levels of airborne particulate matter that have occurred in the last 15 years. In order to continue to improve local air quality, as required by the California Clean Air Act of 1988, the District must implement control measures on the largest sources of Particulate Matter in the County. If implemented properly these measures do not need to be burdensome or complex.

The goal of this document is to provide information on PM levels and its effects on the public and to provide direction from the Mendocino County Air Quality Management District Board to District Staff regarding policy options to reduce future PM levels.

### **III. GLOSSARY OF TERMS**

#### Attainment:

Meeting (or attaining) an Air Quality Standard set by either the Federal or State Government. Mendocino County meets all Air Quality Standards except the State Standard for PM<sup>10</sup>.

#### Ambient Air Quality Standards (AAQS):

Health- and welfare-based standards for outdoor air that identify the maximum acceptable average concentrations of air pollutants during a specified period of time.

#### ARB (or CARB):

The California Air Resources Board. The Agency responsible for overseeing District Programs and controlling vehicular sources of air pollution in California.

#### Area Sources:

Sources of pollution where the emissions are spread over a wide area and are individually small, such as consumer products, fireplaces, road dust and farming operations. Area sources do not include mobile sources or stationary sources.

#### EPA:

The United States Environmental Protection Agency. EPA enforces the Federal Clean Air Act and oversees the ARB and some District programs.

#### Maintenance Plan:

A plan to maintain compliance with an existing air quality standard.  
For example: Mendocino County is in compliance with the PM<sup>2.5</sup> Standard therefore, the District must maintain that compliance.

#### Monitoring:

The periodic or continuous sampling and analysis of air pollutants in ambient air.

#### Non-attainment Area:

A geographic area identified by the U.S. EPA and/or CARB as not meeting the Air Quality standards for a given pollutant. Mendocino County is “non-attainment” for the State (ARB) PM<sup>10</sup> Standard.

Particulate Matter (PM):

Any material, except pure water, that exists in the solid or liquid state in the atmosphere. The size of particulate matter can vary from coarse, wind-blown dust particles to fine particle combustion products.

PM<sup>2.5</sup>:

Includes tiny particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.

PM<sup>10</sup>:

A criteria air pollutant consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows the particles to make their way to the air sacs deep within the lungs where they may be deposited and result in adverse health effects. PM<sup>10</sup> also causes reduction in visibility.

Regional Haze (and Class 1 areas):

The haze produced by a multitude of sources and activities that emit fine particles and their precursors across a broad geographic area. National regulations require states to develop plans to reduce the regional haze that impairs visibility in national parks and wilderness areas (or Class 1 areas).

Total Suspended Particulate (TSP):

Particles of solid or liquid matter -- such as soot, dust, aerosols, fumes, and mist that are suspended in the air.

Woodstove:

When used in this document woodstove refers to any wood-fired devices used for residential heating. That would include fireplaces and wood-fired boilers or mass heaters. The phrase 'EPA certified woodstoves' refers only to devices meeting the EPA certification for Phase II wood fueled residential heaters. No fireplaces currently meet the Phase II standard.

#### **IV. DISTRICT ATTAINMENT STATUS**

Both the United States Environmental Protection Agency (EPA) and the California Air Resources Board (ARB) have set Ambient Air Quality Standards (AAQS). Ambient air quality refers to the relative concentration of ‘criteria pollutants’ typically found in a defined area. The EPA has set thresholds for each of the criteria pollutants - ozone (O<sub>3</sub>), carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>), lead (Lb), sulfur dioxide (SO<sub>2</sub>), particulate matter less than 10 microns in size (PM<sup>10</sup>) and particulate matter less than 2.5 microns in size (PM<sup>2.5</sup>). Each criteria pollutant can have two thresholds or standards – one that is protective of human health and one that is protective of public welfare. The California Air Resources Board standards for the seven criteria pollutants are generally more stringent than the EPA Standards. The State also has additional standards for visibility reducing particles (of any size), sulfates and hydrogen sulfide (H<sub>2</sub>S). These standards are based on observable short-term (acute) health effects. (See Appendix A for details on the various AAQS).

Once the EPA and ARB set an Ambient Air Quality Standard, the various Air Districts (and Air Basins) of California are monitored to determine if they meet (attain) or do not meet (exceed) the AAQS. After auditing and reviewing the monitoring data, EPA and ARB then determine the attainment status of the air district. The Mendocino County Air Quality Management District (MCAQMD) has been determined to be in attainment for all federal air quality standards and in attainment of all state air quality standards except for PM<sup>10</sup>.

Attainment status can have a wide variety of implications for the local community. Under both the Federal and State Clean Air Acts areas designated as non-attainment must make progress towards coming into attainment or risk losing access to some State or Federal funds. Attainment status can impact eligibility and the requirements imposed on HUD and CDBG funding. Federal Ozone non-attainment areas must have “transportation conformity” between transportation plans and the EPA approved State Implementation Plan (SIP) for air quality. Both the Bay Area and the San Joaquin Valley are currently at risk of losing federal transportation dollars because of failure to meet the goals in the SIP.

In general, the penalties for failing to attain the state PM<sup>10</sup> standard are the lowest of all non-attainment penalties. The California Clean Air Act does not require attainment plans or transportation conformity for Districts that exceed the PM<sup>10</sup> standard, but only requires the District make reasonable efforts toward coming into attainment. Every District in California is non-attainment for the state PM<sup>10</sup> standard at the present time with the exception of Lake County, which meets all state and federal standards.

The Mendocino County Air Quality Management District is currently listed by the Air Resources Board as “non-attainment” for the Annual Average PM<sup>10</sup> standard and the 24-hour PM<sup>10</sup> standard.

## **V. SONOMA TECHNOLOGIES REPORT**

In 1998, Sonoma Technologies, Inc. completed a report on the air quality in the District<sup>3</sup>. This report (referred to as the STI Report) contained a number of recommendations for further District research, improvements in the monitoring program and evaluation of various mitigation measures.

The STI Report made the following recommendations in relation to Particulate Matter –

- (1) Chemically speciate PM samples of current and historical exceedances to assist in establishing the sources of PM in the District.
- (2) Add a PM monitor in a more rural location (near unpaved roads) to better assess exposures in more rural areas
- (3) Co-locate metrological stations with PM monitors to pinpoint source locations.

To address the first recommendation, the District had a number of ambient air PM<sup>10</sup> monitoring samples that showed PM exceedances chemically speciated. The results showed that the filters contained primarily wood smoke and chlorides (salt), with dust representing a significant fraction as well. These results reaffirmed the findings of the STI report.

To address the second recommendation, the District temporarily moved its PM<sup>10</sup> Tapered Element Oscillating Monitor (TEOM)<sup>4</sup> to the Boonville DOT yard (leaving a high volume PM<sup>10</sup> and a high volume PM<sup>2.5</sup> monitor in Ukiah<sup>5</sup>). The initial results from that monitor show that PM<sup>10</sup> levels in Boonville are slightly lower than the PM<sup>10</sup> levels in Ukiah. The seasonal variations are the same however, indicating that the sources are similar, but the volume emitted is less.

To address the third recommendation, the District is considering the purchase of a portable metrological station. Currently the District has permanent metrological stations for gaseous pollutant at the Ukiah and Willits monitoring sites, which are each within a mile of the respective PM monitoring sites. The Fort Bragg monitoring site does not currently have a weather station, however wind patterns in Fort Bragg are well known.

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<sup>3</sup> “A Study of Air Quality Conditions Including Emissions Inventory, Ozone Formation, PM-10 Generation, and Mitigation Measures for Mendocino County, California.” Chinkin et al. STI Report, number 998080-1816-FR. This report is available online from the District’s website.

<sup>4</sup> The TEOM is a continuous monitor which can operated 24 hours a day 7 days a week, as opposed to the “High Volume” samplers which operate one day out of every six. TEOM data is ‘unofficial’ and is not submitted to ARB or EPA for use in determining attainment status.

<sup>5</sup> See the next section for a description of the various monitor types and a description of the local monitoring network.

The STI Report also contains several general statements about the sources and possible controls for PM in Mendocino County. These are -

- “The main goal of the District’s control strategy should be to reduce PM<sup>10</sup> concentrations in order to meet state air quality standards and consider mitigation measures to prevent any future problems with Ozone or PM<sup>2.5</sup>.”
- Elevated PM levels in the District are the result of local emissions, not transport from other areas.
- PM control strategies should focus on man-made sources that are significant during the winter months (when PM levels are typically highest), including residential wood combustion and sources of man-made dust.”

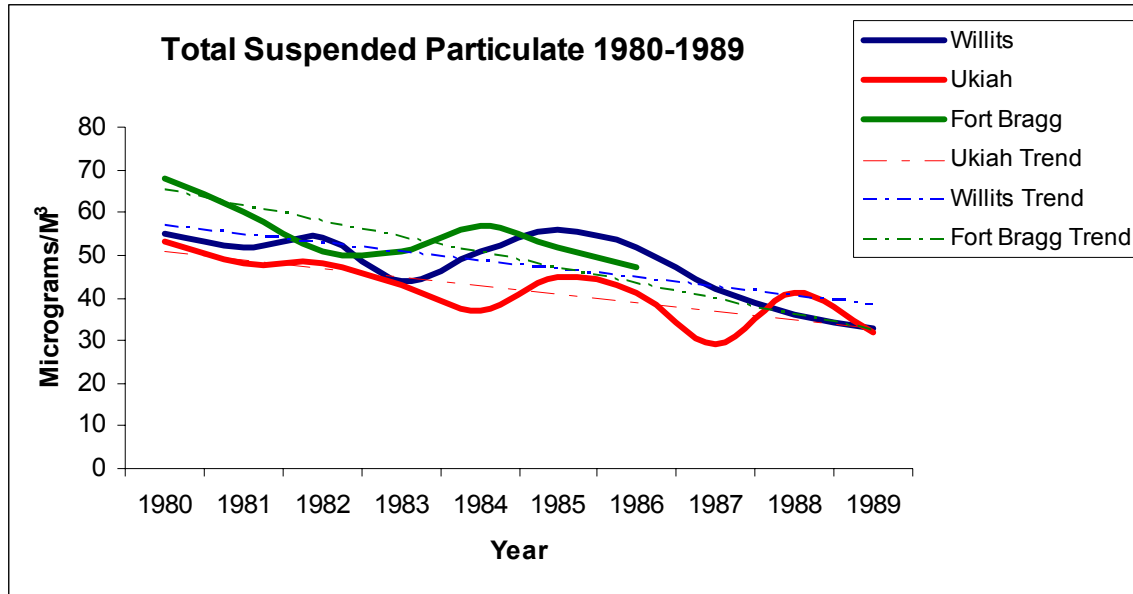
The Particulate Matter Attainment Plan is the policy document that will build on the work done in the STI Report and assist in the development of future policies and regulations in the District.

## VI. PAST AND PRESENT PARTICULATE MATTER LEVELS IN THE DISTRICT

The District has operated PM monitors in Mendocino County since the early 1970s. High volume samplers are typically used to monitor for PM. A high volume sampler usually runs for 24 hours every six days drawing a high volume of air across filter media. The filter is then weighed and the average particulate level for that 24-hour period is recorded. In the 1970s and early 1980s the District monitored for Total Suspended Particulate (TSP) using high volume samplers. TSP is the total amount of solids in the air regardless of size. In the mid-1980s, the District gradually converted to PM<sup>10</sup> high volume samplers. PM<sup>10</sup> monitors only sample the particulates that are less than 10 microns in size. Since the late 1990s, the District has also operated high volume PM<sup>2.5</sup> samplers in Ukiah. PM<sup>2.5</sup> monitors sample only the particulates that are less than 2.5 microns in size.

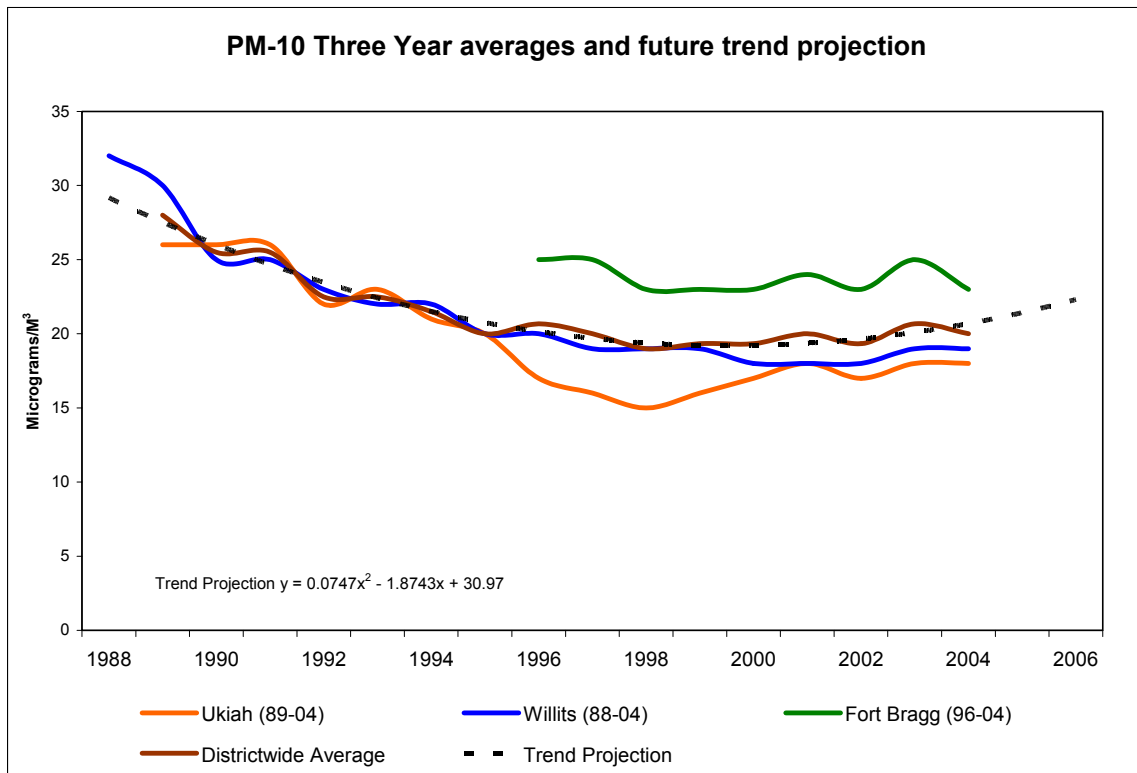
The District also operates a continuous particulate sampler (TEOM) that has been previously located in Ukiah and Point Arena and is currently in Boonville. While data from the TEOM is not reported to ARB and U.S.EPA, it is useful in recording sudden events (fires) and PM levels at different times of day. With a change of external hardware, TEOMs can record either PM<sup>10</sup> or PM<sup>2.5</sup>; however, the District has only the PM<sup>10</sup> sampling hardware at this time. Maps of the District's monitoring locations are available in Appendix C of this report.

Before 1989, the only consistently available PM data in the District is TSP data. TSP data is shown in the chart below –



Through the 1980s, TSP levels declined at an average rate of around 2 micrograms per cubic meter per year inland. The coastal levels declined even more significantly (7 mg per cubic meter per year), however the monitoring data is less complete on the coast and equipment was moved several times, leaving some question as to the validity of the data set.

Mendocino County has been designated non-attainment for the State of California Suspended Particulate Matter standard since November 5<sup>th</sup>, 1989 (California Code of Regulations, Title 17, Section 60205). The standard is 50 mg/cubic meter which cannot be exceeded in any single 24 hour period. Records from 1988 to 2002 (see figure 1) show that PM<sup>10</sup> levels dropped significantly over this time-period<sup>6</sup>. The numbers for the monitoring sites in Ukiah and Willits follow the same general trend. No PM<sup>10</sup> monitoring took place in Fort Bragg until 1993 therefore a three (3) year average was not available until 1996 and those records show less of a downward trend than the Willits and Ukiah data<sup>7</sup>. For comparison; records from other districts in the North Coast Air Basin<sup>8</sup> average indicate a similar drop in the early 1990s but relatively steady levels since the mid-1990s.



TSP and PM<sup>10</sup> data cannot easily be compared, but both show a general decline in the level of particulates. However, the trend line for all three Mendocino County sites shows increasing PM<sup>10</sup> levels, with the lowest point being around the year 2000.

PM<sup>10</sup> levels in Fort Bragg generally show a higher average than the inland locations. The most likely cause of this is a higher background caused by airborne sea salt. The fact that some of the PM in Fort Bragg may be natural in origin has no effect on the need for the

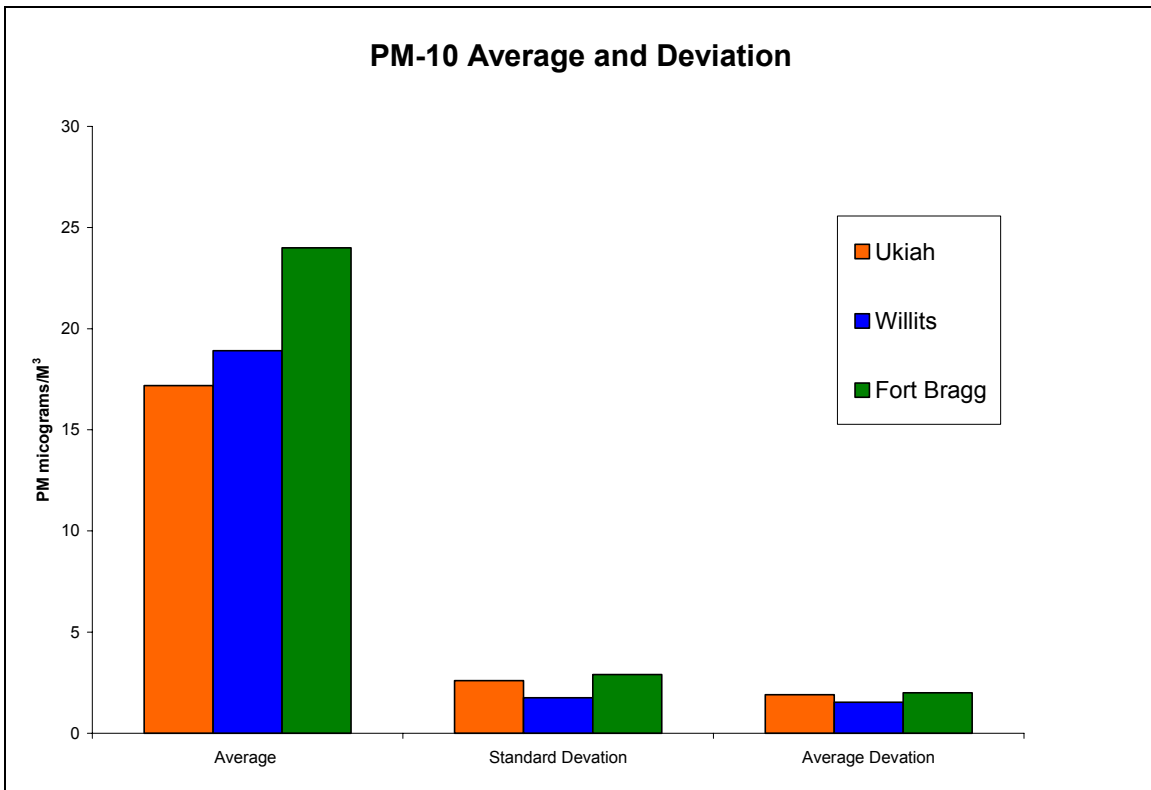
<sup>6</sup> The data in Figure 1 is based on information collected by District monitors and verified by the State Air Resources Board. The three-year average is used to reduce the impact of exceptional events (wildfires) to show background trends.

<sup>7</sup> The Fort Bragg site and the Basinwide average have been at the same level since 1996. That makes the table a little hard to read.

<sup>8</sup> Northern Sonoma APCD, Mendocino AQMD and North Coast Unified AQMD

District to attain the state standard. Very detailed, and expensive, source analysis of PM<sup>10</sup> samples from Crescent City and Eureka<sup>9</sup> (in the North Coast Unified Air Quality Management District) show that the amount of sea salt on the filter actually drops during a PM<sup>10</sup> exceedance<sup>10</sup>. This is likely because exceedances occur most often when wind speeds are very low and ocean spray is not carried as far inland.

Averages and deviation data are shown in the following table.



Generally, Fort Bragg has the highest readings, averaging just under half the state 24-hour standard (50), while Willits and Ukiah are slightly lower. Both Ukiah and Fort Bragg show slightly more variability than Willits, probably reflecting the more sheltered conditions in Little Lake Valley (less wind dispersion). The higher annual average in Fort Bragg exceeds the State PM<sup>10</sup> Annual Average Standard, while the 24-hour PM<sup>10</sup> Standard is exceeded at all three monitoring locations.

While the District is not yet in attainment for all particulate pollution standards the record does show that the District, and the community at large, is making progress toward air quality goals.

<sup>9</sup> North Coast Unified Air Quality Management District Particulate Matter (PM<sup>10</sup>) Attainment Plan dated May 11<sup>th</sup>, 1995.

<sup>10</sup> Both as a percentage and in total weight

The drop in PM<sup>10</sup> levels from the late 1980s is the result of two factors –

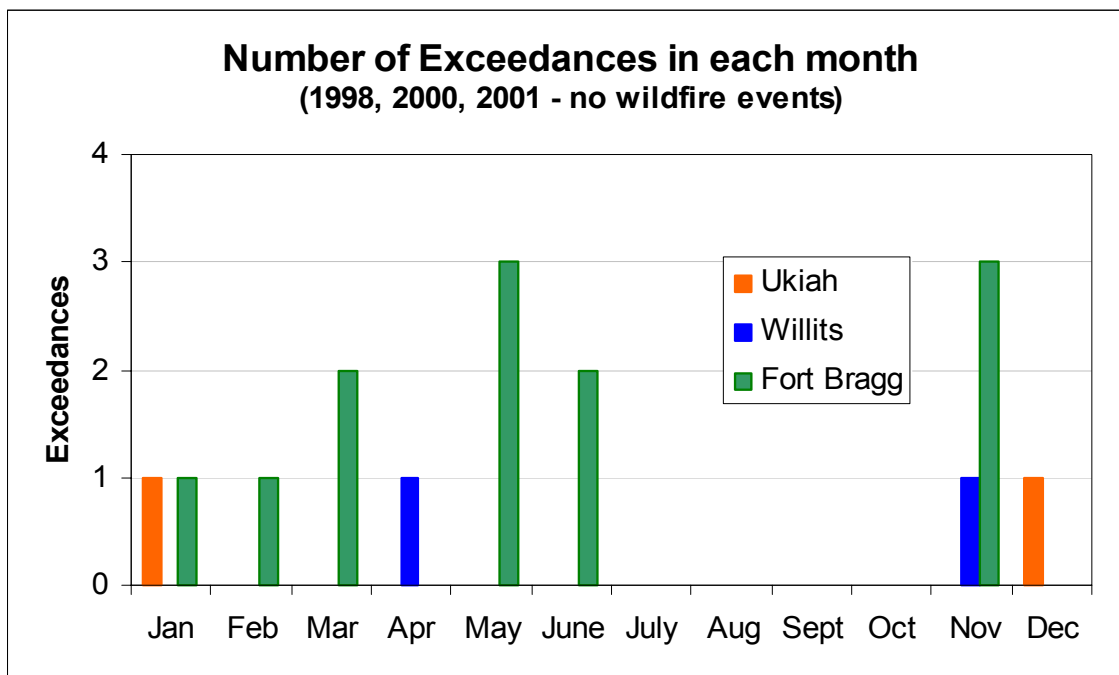
- Closures or decreases in operations of forest products industries and
- Increased enforcement of District open outdoor burning regulations.

It is also likely that several other factors may have contributed to decreases in PM<sup>10</sup> levels.

- Rainfall was higher in the mid to late 1990s than it was in the late 1980s (increased soil moisture decreases both natural and manmade dust emissions).
- Improvements in diesel and gasoline engine emissions control technology.
- Implementation of EPA emissions standards for new woodstoves.

In the past the District had several PM<sup>10</sup> samples from days recording an exceedance speciated<sup>11</sup>. The three primary components of the speciated samples were identified as dust, woodsmoke and natural sources (salts, pollens etc.). The ratio of these pollutants varies significantly based on the time of year and the location where the sample was taken. In general woodsmoke is much more prevalent during the winter months when outdoor burning is allowed and woodstoves are in use, and dust levels are higher in the summer and early fall. Tailpipe emissions from trucks and automobiles represented a very small proportion of the speciated samples. However, trucks and automobiles driven on unpaved roads are a significant source of fugitive dust emissions<sup>12</sup>.

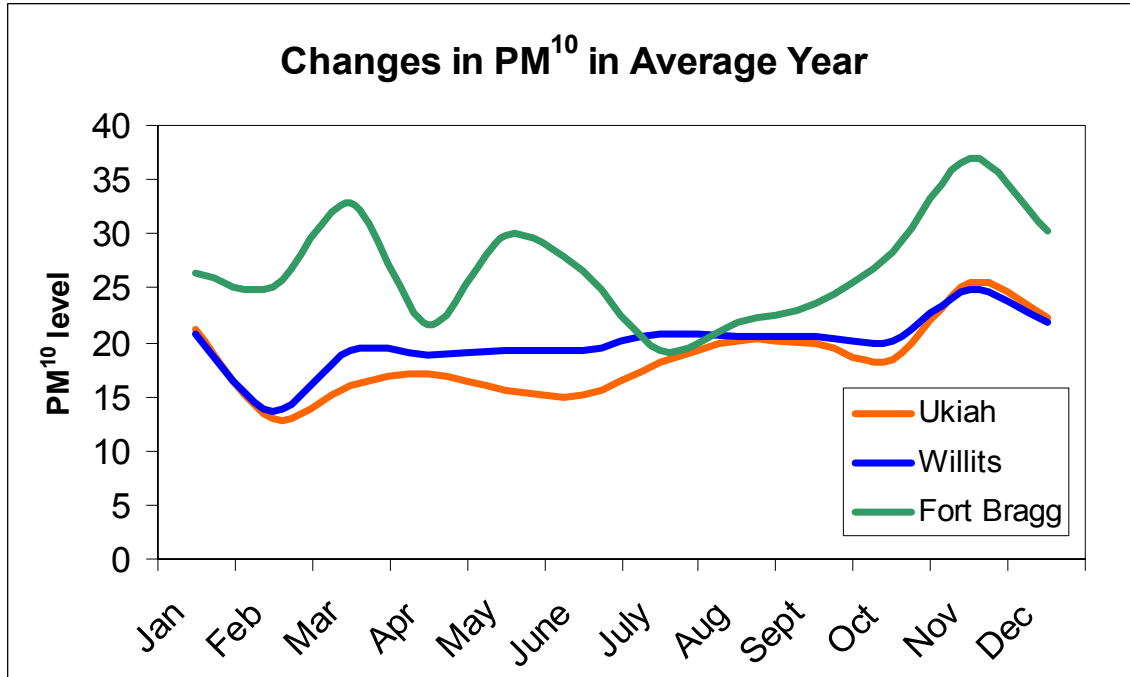
District exceedances also show a clear seasonal bias. In a typical year, most exceedances occur during the colder months, and no exceedances occur during the hotter months.



<sup>11</sup> Speciation is the determination by a laboratory as to the source of the particles that make up the sample.

<sup>12</sup> Diesel vehicle emissions are a small part of total PM emissions, but they are of serious concern because they are an identified air toxic.

These results support the theory that residential wood heating is a significant contributor to local exceedances of the state PM<sup>10</sup> standard. Additionally, the average monitored levels of PM<sup>10</sup> are higher during the winter months as shown below.



Based on PM<sup>10</sup> readings from 1998, 2000 and 2001 (years without wildfire events)

The annual changes in the PM<sup>10</sup> chart (above) indicate that the highest PM<sup>10</sup> readings occur in the late fall, when temperatures are cold and significant rainfall has not reduced dust levels. Readings then typically decrease though January and February (as a result of higher rainfall lowering dust levels). Both of these findings clearly point to residential wood combustion as a significant source of the District's PM<sup>10</sup> problem.

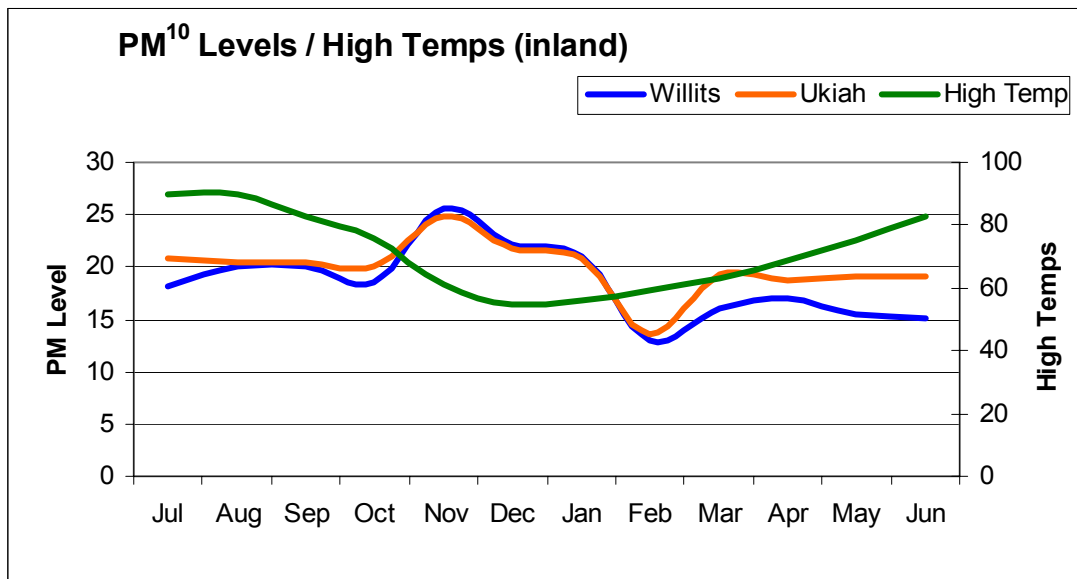
According to the California Air Resources Board 1.5 cords of wood are burned per household per year in the North Coast Air Basin<sup>13</sup>. The cumulative impact of the emissions resulting from this wood burning activity is significantly impacting local and regional air quality.

<sup>13</sup> This figure is for all households including those with woodstoves and those without. When the non-woodburning households are subtracted the figure rises to 2.4 cords per woodburning household.



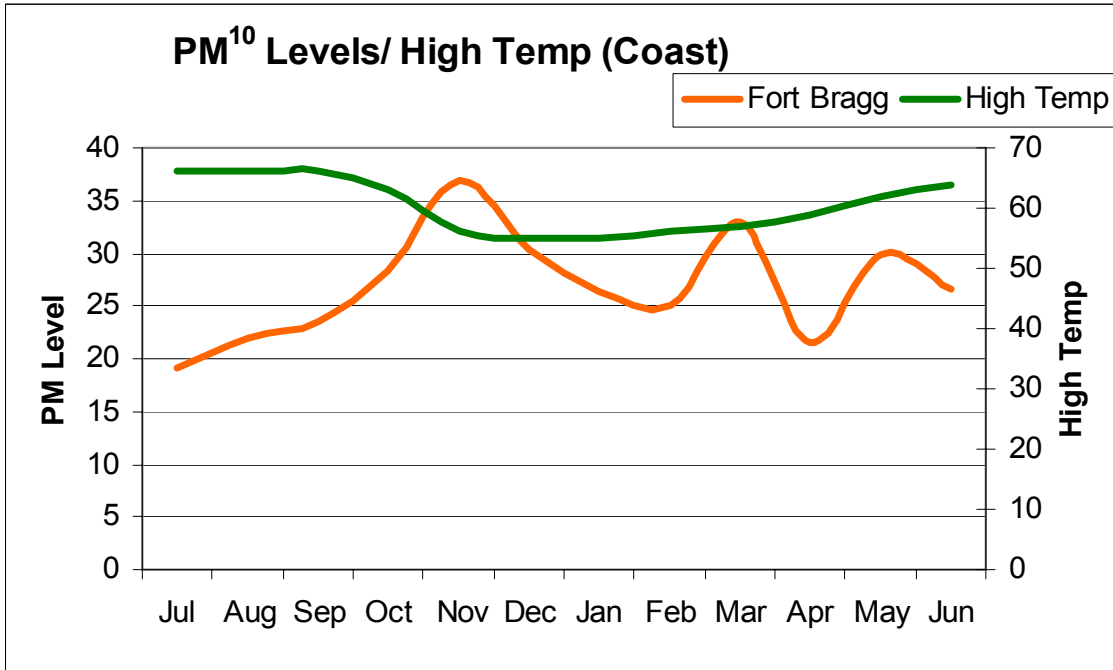
The view of woodsmoke sitting over Ukiah. Taken from Watson Road towards Ukiah.

Further evidence is provided when PM<sup>10</sup> levels are compared to local temperatures.

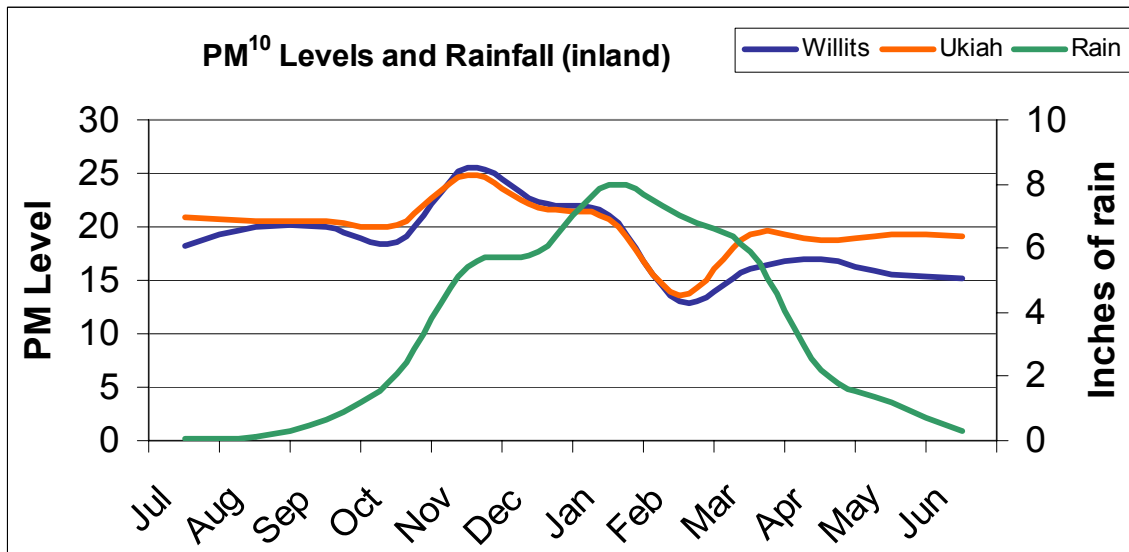


The above table and the following 3 tables are shown as July through June to better show the winter PM<sup>10</sup> patterns.

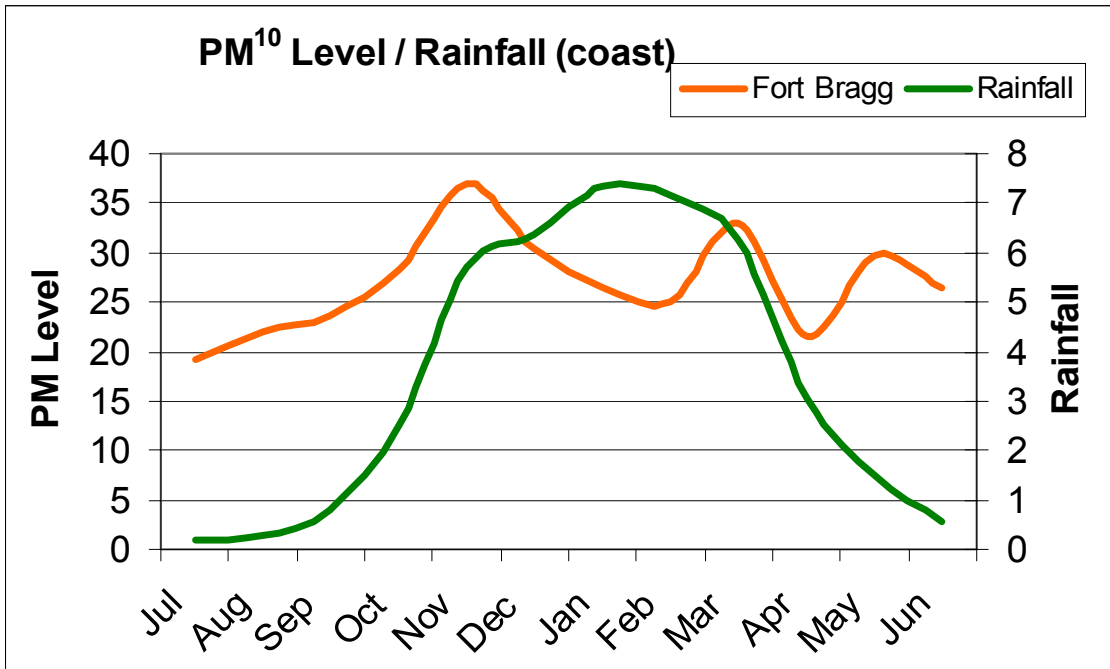
As the temperature begins to drop in late fall woodstove use increases and more particulate matter is released into the atmosphere. Because of the lack of significant rainfall until late November dust levels tend to remain high, adding to the PM generated by woodstoves - resulting in the 'November' spike seen in both inland (above) and coastal (below) charts. Additionally, the lifting of the "Burn Ban" by the California Department of Forestry typically in the October-November timeframe (determined by fire risk conditions) results in higher levels of particulate resulting from outdoor burning.



Higher levels of rainfall are also linked to lower PM levels.



As rainfall increases, (highest in January and February) the PM<sup>10</sup> drops. Once the rainfall begins to decrease PM<sup>10</sup> levels rebound to the ‘normal’ summer levels (~20 micrograms/M<sup>3</sup>). This same pattern is seen on the coast.



The levels rebound once rainfall decreases in April, however because of the colder temperatures in Fort Bragg<sup>14</sup> ‘normal summer’ levels do not occur until July.

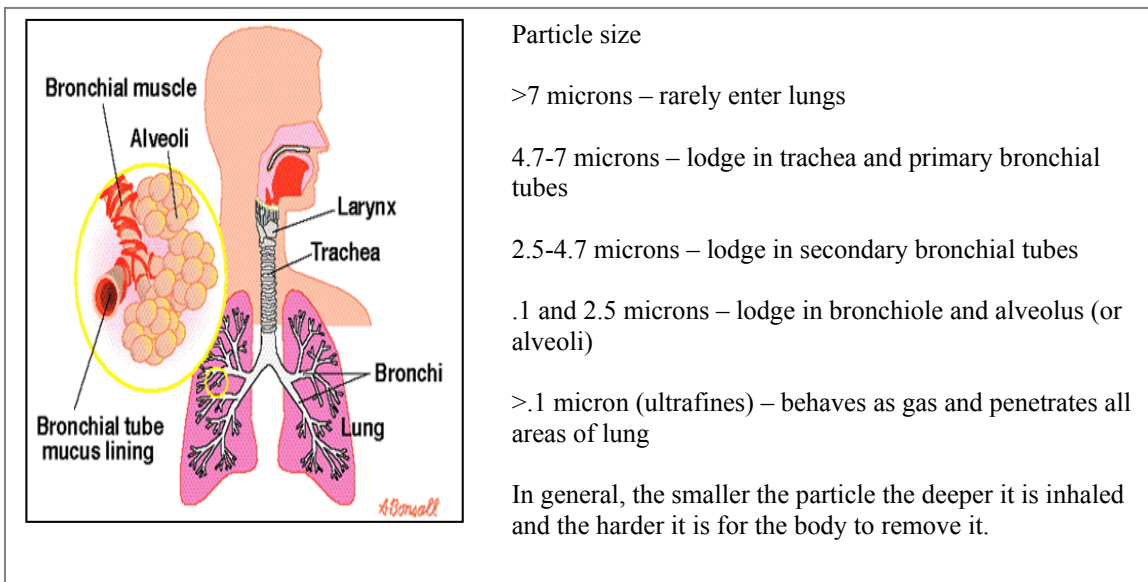
Overall, the District’s monitoring data indicates that PM<sup>10</sup> levels have decreased since the late 1980s. However, levels are beginning to increase. Additionally there is significant data that shows PM<sup>10</sup> levels are linked to wood stove usage and lack of rainfall.

<sup>14</sup> Resulting in more woodstove use in late spring than in inland Mendocino County.

## VII PUBLIC HEALTH IMPACTS OF AIRBORNE PARTICULATE MATTER

Particulate Matter (PM) is a term used to describe a wide range of air pollutants consisting of solids or liquids (aerosols) suspended in the air. Particulate matter becomes a public health concern when the particles are small enough to become inhaled and remain in the lungs. Both the U.S. EPA and the California Air Resources Board have set health-based standards for PM<sup>10</sup>, or particulate matter less than 10 microns in diameter. These particles are smaller than one-seventh the diameter of a human hair. PM<sup>10</sup> is small enough to be inhaled and can be especially harmful to people with existing vascular or respiratory illness, the aged, and the very young. The findings of recently published literature<sup>15,16,17,18</sup> have focused on the health consequences of PM<sup>10</sup> and PM<sup>2.5</sup>, smaller size particles that can become lodged deeply in the lungs. These studies indicate that when particle levels increase, adverse health effects increase as well.

### The Human Respiratory System



Particulate matter has several health effects, not all of which are fully understood at the present. The direct, medically observed, effects of PM exposure include –

- Increases in blood pressure
- Decreases in heart function

<sup>15</sup> Levy, J. I., Hammitt, J.K., and J.D. Spengler, 2000. Estimating the Mortality Impacts of Particulate Matter: What Can be Learned from Between-Study Variability? *Env.Health.Pers.* 108:109-117.

<sup>16</sup> Dockery, D.W., Pope, C.A. III, Xu, X., Spengler, J.D., Ware, J.H., Fay, M.E., Ferris, B.G. Jr., and F.E. Speizer, 1993. An Association Between Air Pollution and Mortality in Six U.S. Cities. *N.Engl.Med.* 329:1753-1759.

<sup>17</sup> Pope III, C.A. and D.W. Dockery, 1999. "Epidemiology of Particle Effects", in *Air Pollution and Health*, Academic Press, pp.675-705.

<sup>18</sup> Pope III, C.A., 2000. Review: Epidemiological Basis for Particulate Air Pollution Health Standards. *Aer.Sci.Tech.* 108:125-133.

Health studies have shown that higher ambient PM levels –

- Are known to increase the occurrence rate of asthma
- Are known to result in more frequent asthma attacks
- Are known to decrease the rate of lung growth
- Are known to aggravate bronchitis
- Are strongly believed to reduce childhood lung function
- Are strongly believed to cause long term elevated blood pressure
- Are strongly believed to decrease the age of onset for asthma in those susceptible
- Are very likely to contribute to premature death and hospital visits for those with existing heart and lung ailments

Some of the areas of uncertainty at present include –

- Are individual components of PM more harmful than others?
- What is a safe threshold of exposure to PM?
- What is the biological cause of the observed health effects above?

A 2000 report by the Health Effects Institute<sup>19</sup> concluded that there is an adverse relationship between increases in PM<sup>10</sup> and total mortality and hospitalization. This study, an analysis of mortality, hospital admissions, and air quality data from urban areas across the United States, concluded that an approximate average of 0.5 percent increase in total mortality was associated with each 10 microgram per cubic meter<sup>20</sup> ( $\mu\text{g}/\text{m}^3$ ) increase in PM<sup>10</sup>. Cardiovascular-related hospitalization admissions for the elderly (ages 65 and above) increased by one percent. A two percent increase was noted for pneumonia and chronic obstructive pulmonary disease for every PM<sup>10</sup> increase of 10  $\mu\text{g}/\text{m}^3$ . It should be noted that this report, and most other studies on air quality and health, was limited to monitoring in urban areas. The specific effects of exposure to short-term agricultural and rural exposures is still being investigated but the data support the benefits of an air quality program which limits public exposure to particulate matter.

In addition to general PM exposure there is increasing research emphasis on the toxic (generally carcinogenic) effects of some components of PM. In 1998, ARB determined that PM from diesel exhaust was an air toxic and likely to cause cancer. The potential cancer causing effects of some types of PM are not included in the studies above or in the regulatory discussion at the end of this document. Because there is frequently no known safe exposure, air toxics are regulated through a different regulatory process than ambient air pollutants.

The Air Resources Board has identified that it “is important to move forward with additional research efforts focused on:

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<sup>19</sup> Samet, J.M., Dominici, F., Zeger, S.L., Schwartz, J. and D.W. Dockery, 2000. National Morbidity, Mortality, and Air Pollution Study. HEI Research Report No. 94, May 2000, Health Effects Institute, Cambridge, MA.

<sup>20</sup> The State standard is 50 micrograms per cubic meter based on a 24-hour average. The District exceeds this level several times a year. The HEI report does not comment on whether the State Standard is adequate to protect public health.

- Improving our knowledge of the levels of smoke to which people are exposed; and
- Better characterizing and, if possible, quantifying how people of varying health status (healthy or diseased) respond to smoke.”

### **The Children’s Longitudinal Health Study**

As a part of its ongoing research mission the California Air Resources Board began a long-term children’s health study in 1992. The study was to look at the impacts of air pollution on children in typical California communities. The study, called the Children’s Longitudinal Health Study<sup>21,22</sup> is still ongoing but ARB has released a number of important findings to date. These findings include –

- Children exposed to the current lower levels of air pollution have significantly reduced lung growth and development when exposed to higher levels of acid vapor, ozone, nitrogen dioxide, and PM 2.5.<sup>23</sup>
- Children in high ozone communities, who actively participate in several sports, are more likely to develop asthma than children in the same communities not participating in sports.
- Children in communities with higher concentrations of nitrogen dioxide, PM, and acid vapor have lungs that develop and grow more slowly and are less able to move air through them.
- Children who moved away from study communities had increased lung development if the new communities had lower particulate pollution, and had decreased lung development if the new communities had higher particulate pollution.
- Days with higher ozone concentrations resulted in significantly higher school absences due to respiratory illness.
- Children with asthma who are exposed to higher concentrations of PM are much more likely to develop bronchitis.

These findings highlight the importance of ambient PM reduction.

### **Local Asthma Rates**

In Mendocino and Lake Counties<sup>24</sup> the asthma prevalence rate is shown in the table below-

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<sup>21</sup> Some data is online at <http://www.arb.ca.gov/research/chs/over.htm>

<sup>22</sup> Data collection ended in early 2003, but the results are still being analyzed.

<sup>23</sup> Published in the American Journal of Respiratory and Critical Care Medicine July 1, 2002 (Volume 166 Pages 76- 84).

| Location            | Childhood Rate | Adult Rate | Overall Rate |
|---------------------|----------------|------------|--------------|
| Mendocino & Lake    | 8.5            | 11.4       | 10.7         |
| Sonoma              | 11.6           | 8.7        | 9.4          |
| Humboldt, Del Norte | 9.4            | 13.0       | 12.2         |
| Statewide           | 9.6            | 8.5        | 8.8          |

As the table shows Mendocino and Lake Counties exceed the statewide and Sonoma County asthma prevalence rate for adults and overall<sup>25</sup>. For childhood asthma Mendocino and Lake Counties are below the statewide, Sonoma County and Humboldt/Del Norte rates. Without more in depth research as to why the childhood rate is below average and the adult rate is above average no firm conclusions can be drawn from this data.

According to the California Department of Health Services, a total of 294 hospital admissions occurred in the year 2000 for asthma in Mendocino County. Statewide each hospital admission to treat asthma is for an average of 2 to 3 days. This figure does not include hospital emergency room admissions, for which data is not current available.

Actually relating local asthma rates to air pollution is becoming very difficult to accomplish. Over the last 30 years Americans, especially Californians, have become much more mobile. Families move more frequently, they drive longer distances to work or school on a daily basis. Additionally the impact of individual voluntary behaviors, such as smoking<sup>26</sup> or using a poorly ventilated wood stove has a much greater impact on human health than background air pollution. Also impacting Mendocino County asthma rates is number of people who moved to Mendocino County for the ‘clean air’ after a lifetime of exposure in other more urban environments.

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<sup>24</sup> From the “2001 California Health Interview Study” UCLA Center for Health Policy Research. Lake and Mendocino Counties were grouped together by the researchers for statistical purposes.

<sup>25</sup> This data is from telephone survey interviews and relies on self-reporting of illness that has not been verified by a medical practitioner or from medical records.

<sup>26</sup> Of tobacco and any other substance.

## **VIII. AIRBORNE PARTICULATE MATTER GENERATION AND CREATION**

PM is created in one of two ways. It is either released directly into the air (primary emissions) or is generated in the air by chemical reactions in the atmosphere (secondary emissions). Pollutants that generate PM by reacting in the atmosphere are called PM precursors.

Generally the larger particles in PM<sup>10</sup> are created by both natural actions and manmade actions. For example, fugitive dust can result from grading activity or the simple action of wind on exposed soil. The District records higher PM<sup>10</sup> readings in Fort Bragg than in Ukiah and Willits as a result of geogenic (caused by geologic forces) release of salt into the air from the ocean. Geogenic, biogenic (caused by plants) and anthropogenic (human caused) PM-10 can all effect human health.

PM<sup>10</sup> can also be formed as a result of chemical reactions of gases in the atmosphere between sulfur oxides (SOx), nitrogen oxides (NOx), ammonia<sup>27</sup> and volatile organic compounds (VOCs). The monitored levels of SOx, NOx, ammonia (NH<sub>3</sub>) in the District are low enough that PM-10 generation from these compounds is minor to non-existent. Volatile organic compounds are a different story however. The District has a very high background level of VOCs, mainly generated by biogenic sources (vegetation)<sup>28</sup>. Research has shown that VOCs react with ozone (O<sub>3</sub>) and form particulates as part of very complex chemical reactions.

PM<sup>2.5</sup>, the finer fraction of particulate matter, is generated almost exclusively from anthropogenic sources, primarily combustion sources including vehicles. A portion of wood smoke from wildfires is PM<sup>2.5</sup>, however those smaller particles tend to coalesce into larger particles (PM<sup>10</sup> and above) over time.

The so called ‘ultrafines’ or particles that are less than .1 microns in size are exclusively man-made<sup>29</sup> and represent a small portion of the particulate matter in the atmosphere, but represent one of the more significant health concerns. Ultrafines are small enough to behave nearly like a gas and can remain airborne for significant periods of time. They are also the most likely particles to be inhaled deepest in the lung.

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<sup>27</sup> Some facilities are required to use Ammonia to reduce emissions of NOx in order to meet emissions standards. NOx is one of the major contributors to ground level Ozone. Ammonia reacts with the NOx released from the stack - as part of the reaction, PM is generated from the reaction. At this time there are no facilities subject to this requirement in the District.

<sup>28</sup> See Study of Air Quality Conditions Including Emissions Inventory, Ozone Formation, PM10 Generation and Mitigation Measures for Mendocino County California by Sonoma Technologies available from the District and on the web.

<sup>29</sup> From internal combustion engines primarily.

## **IX. WILDFIRE EVENTS**

During a normal year, particulate matter is released into the air by woodstoves and dust generating activities, but occasionally large wildland fires can become a major source of PM.

At least twice in the last five years, Mendocino County has been significantly impacted by wildfires in other parts of the Northwest. In 1999, a series of fires in the north-central part of the state (referred to as ‘the Shasta fire’) severely impacted Mendocino County and large parts of the rest of Northern California.



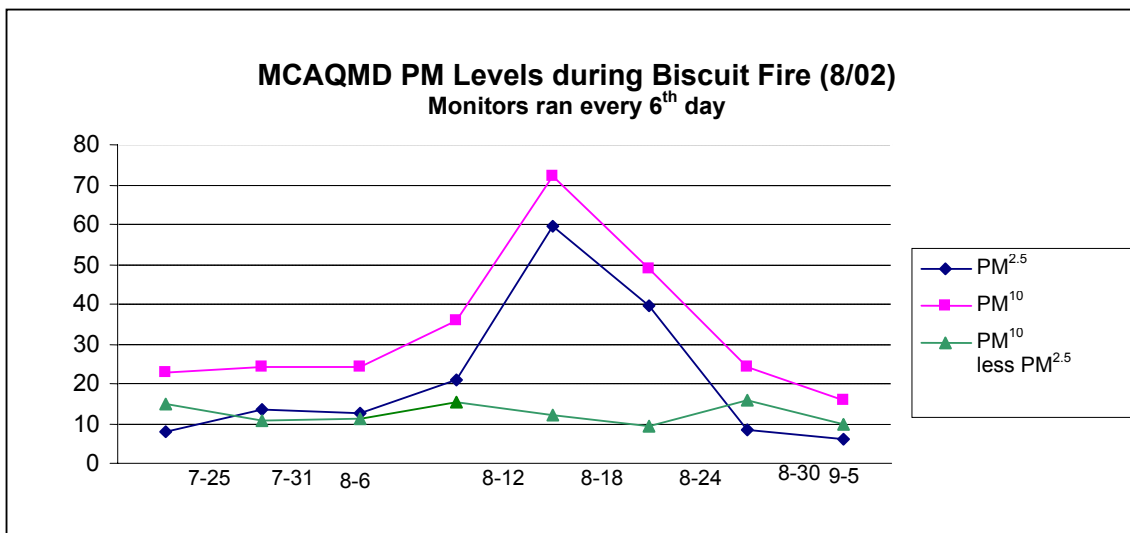
**The Biscuit Fire**

More recently in July and August of 2002, a large wildfire in southern Oregon, ‘the Biscuit Fire,’ resulted in some of the worst air quality ever recorded in the District. The Biscuit fire was the largest fire in Oregon’s history and burned just under 500,000 acres (for comparison Mendocino County is just under 2.2 Million acres). The Biscuit Fire began on July 13<sup>th</sup> as the result of a series of thunderstorms. Initially the fire was a series of small separate fires that slowly merged into one large wildfire over the course of several weeks. By July 30<sup>th</sup> the fire had merged and was threatening as many as 3,400 homes and roughly 45,000 acres had burned. After a week of high temperatures and high winds the fire covered 380,000 acres by August 8<sup>th</sup>. On August 17<sup>th</sup> 435,000 acres had been consumed and fire behavior was rated as ‘extreme’. By August 22<sup>nd</sup> 490,000 acres were involved, but full containment was expected by the end of the month. The fire was

officially extinguished on November 9<sup>th</sup>, 2002 for a total burn duration of 120 days.

Any fire of this size and severity would have a significant impact on local and regional air quality. The District began to notice the impacts of the fire in early August with decreasing visibility and increasing PM levels. By the middle of the month visibility in the Ukiah Valley dropped below 3 miles on a regular basis and instantaneous PM<sup>10</sup> readings exceeded 120 mg/cubic meter<sup>30</sup>. The state standard for PM<sup>10</sup> is 50 mg/cubic meter. At the same time, the District was recording ozone readings slightly above the state standard. As a result, the District issued the first air quality alerts ever issued for Mendocino County.

The rise in the PM levels during August of 2002 is shown in the table below –



Looking at the table above you can see that the vast majority of the PM in the atmosphere was in the PM<sup>2.5</sup> range while particles in the PM<sup>2.5</sup> to PM<sup>10</sup> range (green) actually stayed level during the event. Because of the distance the smoke had traveled from Southern Oregon most of the heavier particles likely dropped out while the lighter PM<sup>2.5</sup> fraction stayed airborne.

PM<sup>2.5</sup> is the greatest health concern to the District because it is much finer than PM<sup>10</sup> and is inhaled more deeply into the lungs. Wildfires represent a significant short-term public health concern, especially to those who are sensitive to air pollution.

The regional impact of wildfires is a continuing threat to local air quality and public health.

<sup>30</sup> These readings were recorded on the District's TEOM monitor, which is not used to establish attainment status. Under ARB and EPA regulations attainment status is established using high volume samplers, which run for a 24 hour period every six days.

## **X. LOCAL SOURCES OF PARTICULATE MATTER**

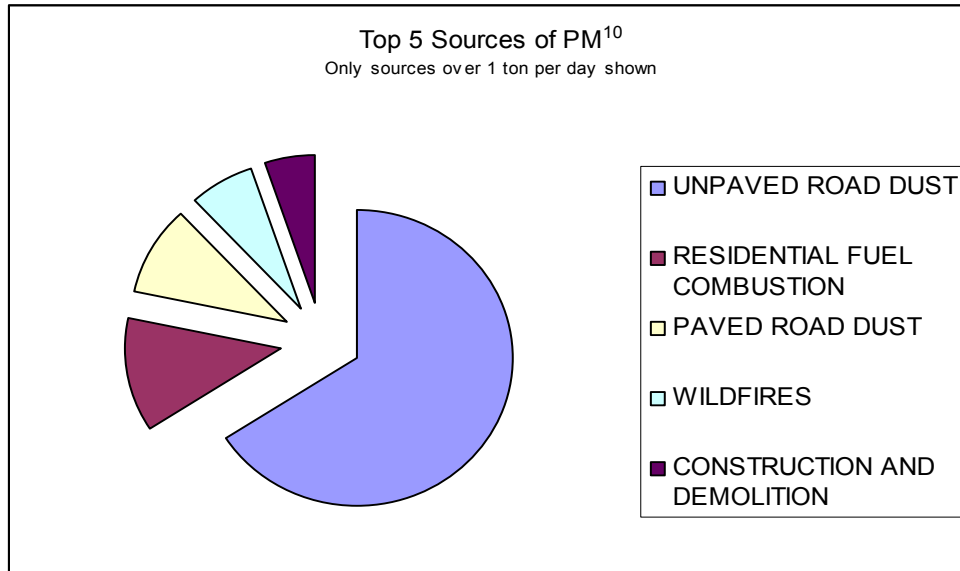
Statewide PM<sup>10</sup> has been documented to consist of heavy metals, nitrates, aerosols, smoke, organic soil, dust, salts, sulfates and carbon. PM<sup>10</sup> in Mendocino County is generated from a wide variety of sources. While few of these sources are individually significant generators of PM<sup>10</sup>, as a group they have a significant impact.

Each year the California Air Resources Board (ARB) prepares an emissions inventory for each Air District based on data provided by the District and on modeling done at ARB. The emissions inventory is required to be prepared annually by the U.S. EPA under the Federal Clean Air Act and is used to demonstrate progress towards air quality goals. The emissions inventory contains both precise data of actual emissions provided by industrial sources under permit through annual reporting, and estimated emissions based on complex models. For vehicle emissions and area source emissions nearly all of the data is based on models. These models are designed, reviewed, modified and run by U.S. EPA and ARB. The models are designed based on highly detailed emissions studies done on the various sources. The Residential Fuel Combustion Methodology for LPG (Propane) and Distillate oil (fuel oil), for example is a rather simple one at seven (7) pages. Comparatively the much more complex methodology for mobile sources is hundreds of pages long and can contain thousands of variables. It is important to note however that these figures are only models based on actual emissions; they are not the real world itself<sup>31</sup>. In layman's terms, the emission inventory models get us in the 'ballpark.' Real world emissions could be significantly higher or significantly lower than the modeled emissions. Some emissions sources are not reflected in the models at the present time or may not be reflected accurately, for this reason the models are in a constant state of revision and improvement.

The Mendocino County Emissions Inventory for the year 2002 has 81 distinct sources of air emissions. Of these 81 sources, only 25 have identified PM<sup>10</sup> emissions. The top five (5) sources of PM<sup>10</sup> are shown in the chart below.

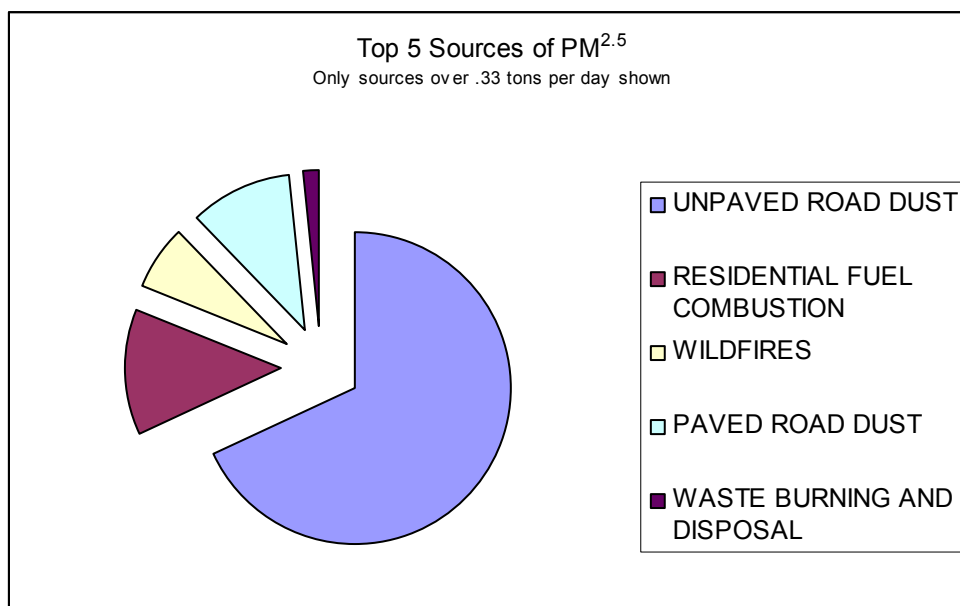
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<sup>31</sup> A fact often lost on graduate students and others who spend too much time 'playing with models'



The largest sources of PM<sup>10</sup> in the County are what are typically referred to as ‘area sources’ as opposed to ‘point sources’. An ‘area source’ is one that generates emissions from a large number of small individual sources that, in the aggregate have a significant effect. A ‘point source’ is a single identifiable source of pollution such as a smokestack. The top 3 sources of PM<sup>10</sup> are in fact, directly related to population growth and land development – unpaved roads, residential heating and paved roads.

PM<sup>2.5</sup>, the smaller size fraction that is of greater health concern comes largely from the same sources (although in smaller amounts) as PM<sup>10</sup>. The top five (5) sources of PM<sup>2.5</sup> are shown in the chart below.



The top five (5) sources of PM<sup>2.5</sup> are very much the same as the sources of PM<sup>10</sup>, although waste burning and disposal does replace construction and demolition. In both

‘top 5s’ none of the listed sources is related to industry or any other traditional point source. The only activities in the ‘top 5’ that is subject to permitting is waste burning and disposal and some construction and demolition activities.

The only category in the ‘top 5’ that is not directly the result of human activities is Wildfires<sup>32</sup>. The remaining sources are all so-called anthropogenic sources, and are generated by man’s activities and are therefore controllable (in theory) by man.

Many of the area sources identified as the ‘top 5’ are also areas in which significant growth is occurring, or is expected to occur. The amount of land subdivision and development in remote parts of the County that are served by unpaved or poorly maintained roads is likely to increase emissions in nearly all of the above categories.

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<sup>32</sup> Clearly some wildfires are set intentionally by man (arson) or started accidentally by man, however man also suppresses wildfires as well.

## **XI. CONCLUSION**

As presented in this report, without preemptive action the growth in population, vehicle use and wood combustion will surpass the reductions in levels of airborne particulate matter that has occurred in the last 15 years. In order to continue to improve local air quality, as required by the California Clean Air Act of 1988, the District must implement control measures on the largest sources of airborne particulate matter in the County. If implemented properly these measures do not need to be burdensome or complex.

## **XII. RECOMMENDED CONTROL MEASURES FOR PARTICULATE MATTER**

***IMPORTANT NOTE! Each proposed control measure in this section would still be subject to the District's usual rule adoption proceedings of public notice, workshops, Board Action and Air Resources Board approval. The adoption of this plan will not establish any one of these control measures without a separate regulatory proceeding and public hearings. The items below currently represent long-range policy guidance from the Air Quality Management District Board.***

Because most major point sources (typically industrial facilities) of particulate matter are already subject to District regulation and permitting, there is little possibility for significant reductions in point source emissions. Additional regulation of industrial sources will not produce the particulate matter reductions that will allow Mendocino County to become an attainment area without imposing undue economic hardship.

Most area sources are currently unregulated by the District and significant reductions in emissions may be possible with little economic impact. Area sources include the impacts of open outdoor burning, residential wood burning (home heating), unpaved roads and land use decisions. Reductions in particulate matter will come from these area sources and from changes in individual behavior.

Several recommended control measures are discussed below. More stringent control measures<sup>33</sup> may become necessary if the recommended control measures below are not effective in reducing particulate matter levels.

### **1. Woodstoves**

Burning of wood for heat is a classic example of the theory of economic externalities. In terms of economic theory an externality is the cost of an activity that is not borne by the individual conducting the activity. Because externalities are most often borne by society-at-large their cost does not enter into the economic decision making process of individuals. Lower emission heating options (mainly natural gas and propane in the District) are more expensive for the individual than wood burning (provided the wood grows on their own property). However wood burning generates significantly more pollution. Since the owner of the wood-burning device does not have to pay any price for the additional pollution they are generating (compared to propane or natural gas) it is cheaper for them to burn wood.

Burning of wood might be cheaper for the individual, but it is not cheaper for society-at-large because we all pay the price for higher levels of pollution. The idea of an impact fee and/or woodstove replacement funding is to create an economic cost for the externality and an economic incentive to upgrade to cleaner devices.

In 1988, the EPA required that all new woodstoves be certified to new lower emissions standards<sup>33</sup>. A primary benefit of an EPA certified wood-burning device is the reduction

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<sup>33</sup> After July 1, 1998 only 'Phase I' stoves could be sold and after July 1, 1992 only 'Phase II' stoves could be sold.

of smoke emitted from the chimney. A significant secondary benefit is the reduction of smoke byproducts that enter the home. An additional benefit is the enhanced heating efficiency of EPA certified devices resulting in long term cost savings for the consumer. EPA certified wood burning devices have between 75% and 90% lower emissions than comparable non-certified devices. Put another way, the replacement of ONE uncertified woodstove with a certified model allows up to nine (9) new wood-burning devices without reducing air quality. All new woodstoves and many fireplace inserts meet these new EPA standards.

### **A. New Woodstoves**

**A.1.** The Uniform Building code, as adopted by all jurisdictions in the County requires that a woodstove cannot be the sole source of heat for a new residence. The District will be working with all local Planning agencies to educate the public about this provision.

#### **A. 1.1** Timeline – Ongoing

**A.2.** The District should develop and adopt a woodstove/fireplace rule. (Similar rules have been adopted in Glenn County [1994], Shasta County [1994], Tehama County [1995], Feather River AQMD [1996], Great Basin APCD [1990], Butte County [2001] San Luis Obispo APCD [1993] Placer County [1986], Northern Sierra AQMD [1998], Feather River AQMD [1996])

#### **A.2.1.** Timeline – Board adoption by December 31<sup>st</sup>, 2005<sup>34</sup>.

### **B. Multiple Woodstoves**

As home sizes have increased over the last few decades, it has become increasingly common to see more than one woodstove per residence. Additionally woodstove equipped outbuildings are not uncommon in Mendocino County. Each woodstove is a separate source of air pollution and the cumulative impact of multiple woodstoves is significant.

**B.1.** Develop a regulation to limit emissions from the installation and use of second woodstoves in new construction. (Similar rules have been adopted in Northern Sierra AQMD, Placer County AQMD and other air Districts)

#### **B.1.1.** Timeline - Board adoption by December 31<sup>st</sup>, 2006.

### **C. Existing Woodstoves**

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<sup>34</sup> The terms “Board Adoption” and “Implementation Date” or “Implementation Schedule” (required by SB 656) are interchangeable for purposes of this document.

Woodstove replacement programs are a time proven and cost-effective method for improving air quality.

- C.1.** Develop and secure funding for a woodstove replacement program. (Similar programs have been established in Feather River AQMD, San Joaquin Valley AQMD and many communities in Bay Area AQMD)

- C.1.1.** Timeline – Ongoing

## **2. Campgrounds**

While not directly recorded in the emissions inventory; campgrounds, especially the larger campgrounds operated by State Parks represent a significant and growing source of Particulate Matter. Smoke from a large number of campfires can significantly impact local communities, such as Manchester, Cleone, and Mendocino, when campgrounds are in use. In addition, the increased vehicle traffic and congestion generated by these campgrounds is a source of additional air pollution.

- A.1.** Develop regulations establishing an impact fee for larger campground operators. The funds generated by this fee would be used to fund woodstove replacement or educational programs.

- A.1.1.** Timeline - Board adoption by December 31<sup>st</sup>, 2005.

## **3. Unpaved Roads**

Unpaved roads are a significant and growing source of particulate matter air pollution. Emissions are generated both from ‘in use’ activities (vehicle traffic) and from ‘non-use’ actions (wind generated dust). As residential development continues to occur off unpaved roads, fugitive dust emissions will increase. In addition to any control measures discussed in this plan the Naturally Occurring Asbestos regulations (CCR 93105 and 13106) have road surfacing requirements that the District must enforce.

- A.1.** Encourage and support DOT in making paving of existing roads a priority over development of new roads.

- A.1.1.** Timeline – Ongoing

- A.2.** Develop and adopt regulations that will reduce emissions from unpaved roads in Mendocino County (i.e. impact fee to fund dust suppression or dust control requirements).

- A.2.1.** Timeline – Board adoption by December 31<sup>st</sup>, 2007.

#### **4. Construction and Grading Activities**

Construction and grading activities can result in localized air quality impacts. Grading activities frequently result in complaints to the District. The District issues a number of citations for fugitive dust from construction activities each year.

**A.1.** Increase enforcement of existing Air Quality regulations.

**A.1.1.** Timeline – Ongoing

**A.2.** Develop a regulation that would require permits for projects with over 1 acre of disturbance. This is similar to the requirements under the Naturally Occurring Asbestos regulations and could simplify the current permit requirements by making them consistent countywide.

**A.2.1.** Timeline – Board Adoption by December 31<sup>st</sup>, 2005.

#### **5. New Residential Development**

**A.1.** Develop an Air Quality impact fee for new development to be assessed when building permits are issued (similar to the fees assessed in Colusa County APCD, Placer County AQMD and other Districts in California). The impact fees may be used to fund mitigation programs, such as wood stove change-outs, low emissions vehicles and possibly dust suppression programs<sup>35</sup>.

**A.1.2.** Timeline – Board Adoption by December 31<sup>st</sup>, 2006.

#### **6. Open Burning Emissions Reduction Control Measures**

**A.1.** Develop regulations prohibiting residential outdoor burning on parcels less than one acre in size in all areas where greenwaste pickup is available (Similar to Lake County AQMD Rules).

**A.1.2.** Timeline – Board Adoption by September 31<sup>st</sup>, 2006.

#### **Control Measure Priorities**

The proposed control measures above are prioritized based on the implementation (adoption) date. A number of factors, including reasonableness of compliance, cost-effectiveness and other relevant local factors (i.e. the County General Plan Update scheduled for completion in 2005 or 2006) will impact the implementation date. Information on cost-effectiveness is provided in Appendix D. However, cost effectiveness will be greatly affected by the details of the measures adopted by the Air Quality Management District Board for implementation.

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<sup>35</sup> Any impact fee could include a number of exemptions, including one exempting very-low and low income housing.

### **XIII. IMPLEMENTATION, REVIEW AND RE-EVALUATION SCHEDULE**

In order to continue to make progress toward the goal of attaining all state and federal air quality standards District Staff recommends that the Air Quality Management District Board adopt the selected control measures by the dates listed (or as brought forward by District staff).

Following adoption the District will review control measures annually for the first three (3) years and report to the Board. The District will also prepare a report at the end of the first three (3) years for evaluation of any adopted control measures and hold a public hearing to determine whether the measures are functioning properly and being fairly enforced.

Any Board action to implement the suggested control measures should include written review and re-evaluation direction.

## **XIV. APPENDICES**

**Appendix A**

**Table I-1 – Ambient Air Quality Standards**

| Pollutant   | Averaging Time         | California Standards              |   | Federal Standards                              |                          |  |
|---|------------------------|-----------------------------------|---|--|--------------------------|--|
|   |                        | Concentration <sup>3</sup>        | Method <sup>4</sup>                       | Primary <sup>3,5</sup>                         | Secondary <sup>3,6</sup> | Method <sup>7</sup>                                  |
| <b>Ozone (O<sub>2</sub>)</b>                            | 1 Hour                 | 0.09 ppm (180 µg/m <sup>3</sup> ) | Ultraviolet Photometry                    | 0.12 ppm (235 µg/m <sup>3</sup> ) <sup>8</sup> | Same as Primary Standard | Ethylene Chemiluminescence<br>Ultraviolet Photometry |
|   | 8 Hour                 | ---                               |   | 0.08 ppm (157 µg/m <sup>3</sup> ) <sup>8</sup> |                          |  |
| <b>Respirable Particulate Matter (PM<sub>10</sub>)*</b> | Annual Geometric Mean  | 30 µg/m <sup>3</sup>              | Size Selective Inlet Sampler              | -----  | Same as Primary Standard | Inertial Separation and Gravimetric Analysis         |
|   |                        | 50 µg/m <sup>3</sup>              |   | 150 µg/m <sup>3</sup>                          |                          |  |
|   | 24 hour                | 20 µg/m <sup>3</sup>              | 50 µg/m <sup>3</sup>                      |  |                          |  |
| <b>Fine Particulate Matter (PM<sub>2.5</sub>)</b>       | Annual Arithmetic Mean | No Separate State Standard        | Gravimetric or Beta Attenuation*          | 65 µg/m <sup>3</sup>                           | Same as Primary Standard | Inertial Separation and Gravimetric Analysis         |
|   | 24 Hour                | 12 µg/m <sup>3</sup>              |   | 15 µg/m <sup>3</sup>                           |                          |  |
| <b>Carbon Monoxide (CO)</b>                             | 8 Hour                 | 9.0 ppm (10 mg/m <sup>3</sup> )   | Non-Dispersive Infrared Photometry (NDIR) | 9 ppm (10 mg/m <sup>3</sup> )                  | None                     | Non-Dispersive Infrared Photometry (NDIR)            |
|   | 1 Hour                 | 20 ppm (23 mg/m <sup>3</sup> )    |   | 35 ppm (40 mg/m <sup>3</sup> )                 |                          |  |
|   | 8 Hour (Lake Tahoe)    | 6 ppm (7 mg/m <sup>3</sup> )      |   | ---  |                          |  |
| <b>Nitrogen Dioxide (NO<sub>2</sub>)</b>                | Annual Arithmetic Mean | ---                               | Gas Phase Chemiluminescence               | 0.053 ppm (100 µg/m <sup>3</sup> )             | Same as Primary Standard | Gas Phase Chemiluminescence                          |
|   | 1 Hour                 | 0.25 ppm (470 µg/m <sup>3</sup> ) |   | ---  |                          |  |
| <b>Sulfur Dioxide (SO<sub>2</sub>)</b>                  | Annual Arithmetic Mean | ---                               | Ultraviolet Fluorescence                  | 0.03 ppm (80 µg/m <sup>3</sup> )               | ---                      | Spectrophotometry (Parosanine Method)                |
|   | 24 Hour                | 0.04 ppm (105 µg/m <sup>3</sup> ) |   | 0.14 ppm (365 µg/m <sup>3</sup> )              |                          |  |

|   |                            |  |                            |                              |   |   |
|---|----------------------------|--|----------------------------|------------------------------|---|---|
|   | 3 Hour                     | ---  |                            | ---                          | 0.5 ppm (1300 $\mu\text{g}/\text{m}^3$ ) <sup>8</sup> |   |
|   | 1 Hour                     | 0.025 ppm (655 $\mu\text{g}/\text{m}^3$ )  |                            | ---                          | ---   |   |
| <b>Lead<sup>9</sup></b>   | 30 Day Average             | 1.5 $\mu\text{g}/\text{m}^3$   | AIHL Method 54 (12/74)     | ---                          | ---   | High Volume Sampler and Atomic Absorption |
|   | Calendar Quarter           | ---  | Atomic Absorption          | 1.5 $\mu\text{g}/\text{m}^3$ | Same as Primary Standard                              |   |
| <b>Visibility Reducing Particles</b>  | 8 Hour (10 am to 6 pm PST) | In sufficient amount to produce an extinction coefficient of 0.23 per kilometer - visibility of ten miles or more due to particles when relative humidity is less than 70 percent. |                            |                              | <b>No</b>   |   |
| <b>Sulfates</b>   | 24 Hour                    | 25 $\mu\text{g}/\text{m}^3$  | Ion Chromatography*        |                              | <b>Federal Standards</b>                              |   |
|   | 24 Hour                    | 0.03 ppm (42 $\mu\text{g}/\text{m}^3$ )  | Cadmium Hydroxide STRactan |                              |   |   |
| <b>Hydrogen Sulfide</b>   | 24 Hour                    |  | Ultraviolet Fluorescence   |                              |   |   |
| <b>Vinyl Chloride<sup>9</sup></b>   | 24 Hour                    | 0.01 ppm (26 $\mu\text{g}/\text{m}^3$ )  | Gas Chromatography         |                              |   |   |
| * On June 20, 2002, the Air Resources Board approved staff's recommendation to revise the PM10 annual average standard to 20 $\mu\text{g}/\text{m}^3$ and to establish an annual standard for PM2.5 of 12 $\mu\text{g}/\text{m}^3$ . These standards will take effect upon final approval by the Office of Administrative Law, which is expected in September 2003. Information regarding these revisions can be found at <a href="http://www.arb.ca.gov/research/aaqs/std-rs/std-rs/htm">http://www.arb.ca.gov/research/aaqs/std-rs/std-rs/htm</a> |                            |  |                            |                              |   |   |
| <b>See also footnotes below</b>   |                            |  |                            |                              |   |   |

Footnotes:

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter – PM<sub>10</sub>, PM<sub>2.5</sub> and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM<sub>10</sub>, the 24-hour standard is attained when 99 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. For

- PM<sub>2.5</sub>, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.
3. Concentration is expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury (1,0132 millibars); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
  4. Any equivalent procedure that can be shown to the satisfaction of ARB to give equivalent results at or near the level of the air quality standard may be used.
  5. National Primary Standards: The level of air quality necessary, with an adequate margin of safety, to protect the public health.
  6. National Secondary Standards: The level of air quality necessary to protect the public welfare from any known or anticipated effects of a pollutant.
  7. Reference method as described by the U.S. EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the U.S. EPA.
  8. New (federal) national 8-hour ozone and fine particulate matter standards were promulgated by U.S. EPA on July 18, 1997. The national 1-hour ozone standard continues to apply in areas that violate the standard. Contact U.S. EPA for further clarification and current federal policies.
  9. The ARB has identified lead and vinyl chloride as ‘toxic air contaminants’ with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

## Appendix B –

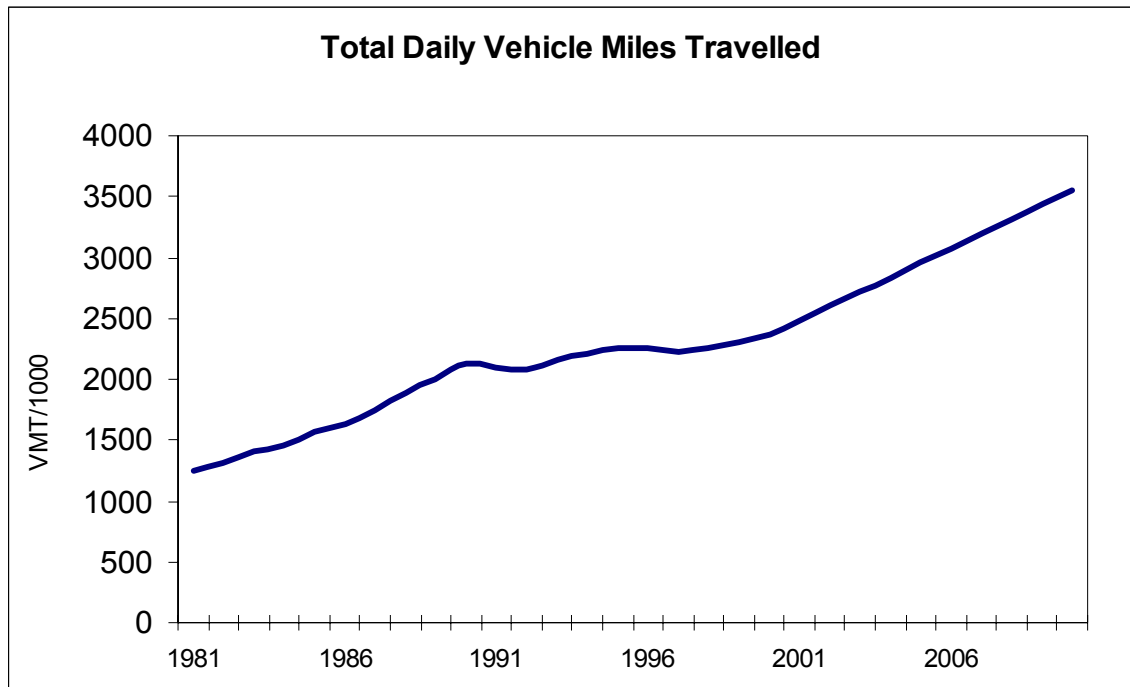
### Increasing Vehicle Use

Establishing stricter emissions levels for motor vehicles is under the authority of the California Air Resources Board and the District can only recommend more stringent standards. Reducing the region wide emissions from motor vehicles through Transportation Control Measures (TCM's) (bikeways, pedestrian and public transit improvements) is a time-tested method to reduce vehicle trips (and emissions). However many of these programs are not appropriate in a region wide document. The District will continue to recommend TCMs on a project-by-project basis when the potential for real world emissions benefits exists, but has no plans to include those measures in this plan. In addition, TCMs are more effective at reducing ozone precursors than reducing particulate matter. Should the District become designated non-attainment for Ozone then the issue of TCMs would be revisited in an Ozone Attainment Plan.

Between 2000 and 2010 Mendocino County's population is projected to increase by 15,000 people for a 16% increase<sup>36</sup>. Compared to a projected continuing decline in industrial emissions over the next 10 years housing and population growth are of significant concern to the District. Vehicles can be significant sources of PM emissions, both direct emissions from tailpipes and in-use emissions from wearing tires and brake pads and area source dust emissions from both paved and unpaved roads.

Additionally, the District has concerns over increasing vehicle use per capita in the County. Since 1981, Vehicle Miles Traveled (VMT) per capita has increased significantly county-wide from 17 miles per person per day to 28 miles per person per day. VMT includes miles traveled by local residents and vehicles passing through the county for other destinations.

Combining the increasing VMT per person with the increasing population based on the Department of Finance projections leads to the data shown below.



<sup>36</sup> Based on State Department of Finance Population Projections – base population 2000; 90,442 final population 2010 105,225.

The above table shows that Overall VMT (not per person) will increase from 1,246,000 vehicle miles per day in 1981 to 3,553,000 vehicle miles per day in 2010. To put this in individual perspective the VMT in 1981 was 17 miles per day per person. Today it is 28 miles per day per person and in 2010 it is projected to be 34 miles per day per person.

While individual vehicle emissions per mile have been greatly reduced in the last 20 years, overall vehicle emissions have increased because of an increasing average daily VMT.

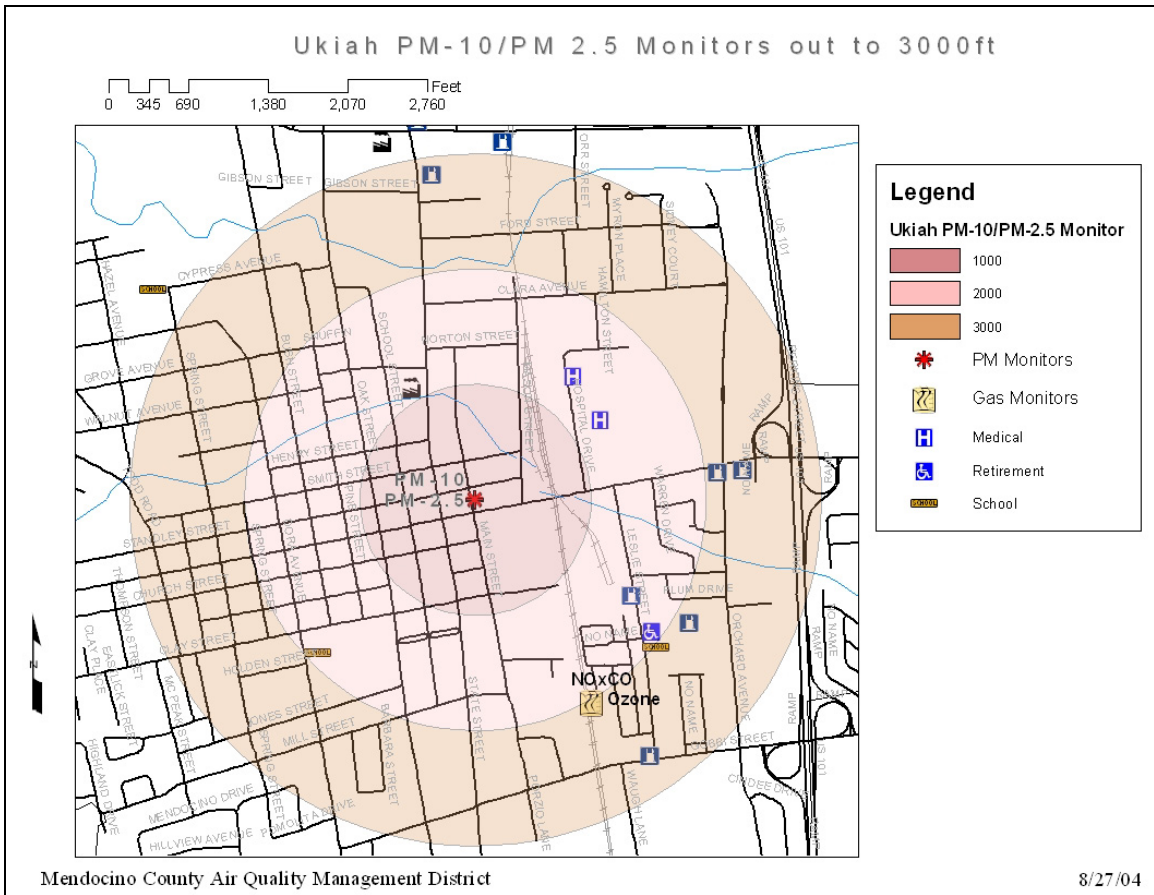
It is important to note that these VMT projections do not include any calculation for the time it takes to travel the miles projected. It is likely that as both population and per capita VMT rise, increased congestion will occur and average speeds will decrease, as has already happened in other parts of California. Increased congestion leads to increased emissions as vehicles idle longer and consume more fuel per mile traveled.

## Appendix C

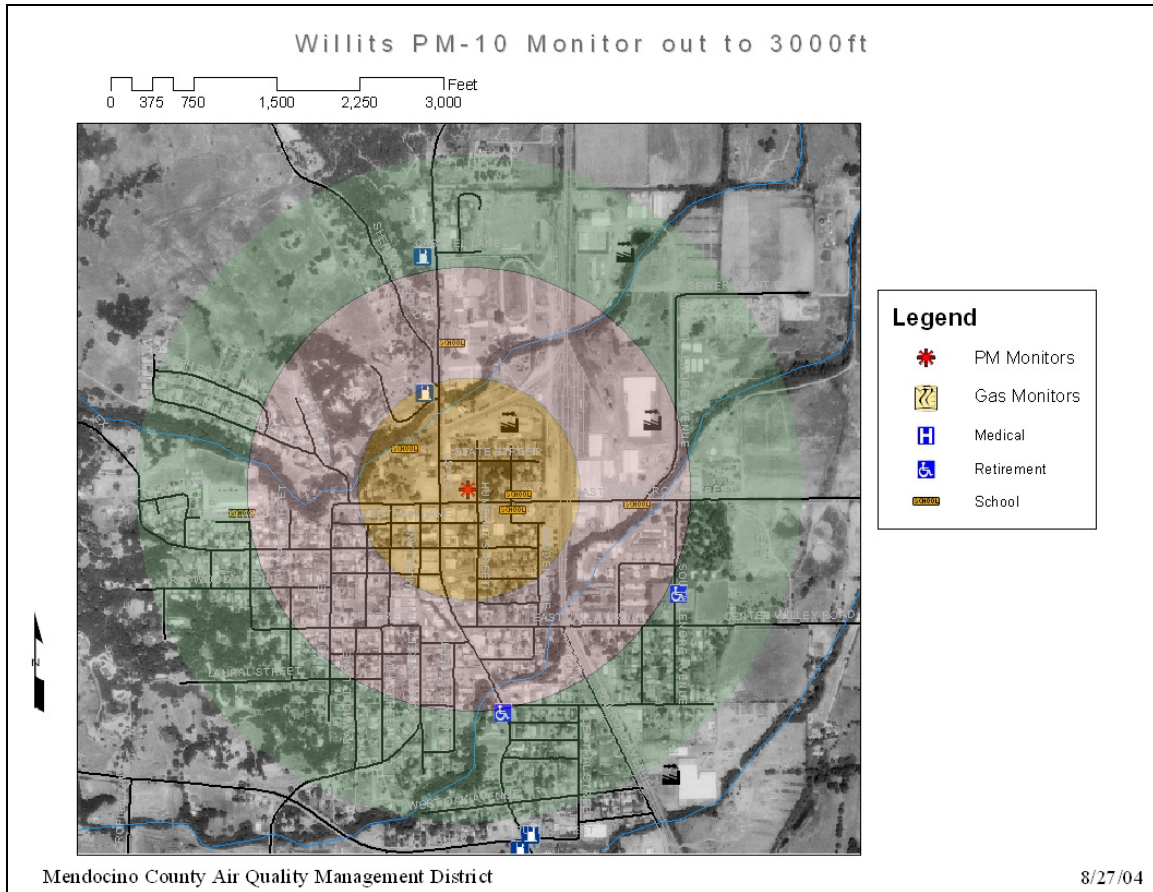
### Monitor Location Maps

All District monitors are located, audited and monitored according to the Code of Federal Regulations Title 40 part 58, subpart A and the California Air Resources Board Quality Assurance Manual. The Mendocino County Air Quality Management District has received no AQDA (Air Quality Data Assurance) warnings or deficiencies for any site locations.

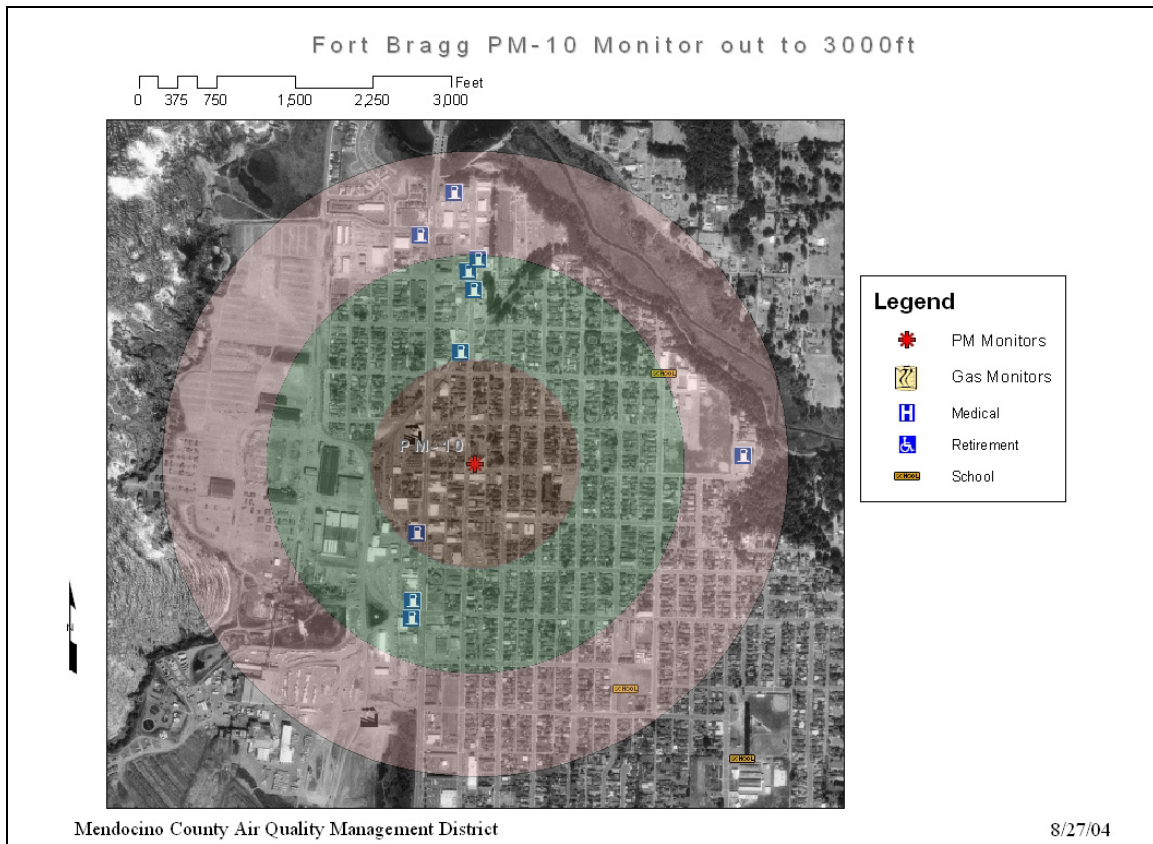
The Ukiah PM<sup>10</sup> and PM<sup>2.5</sup> monitors are on the roof of the library building at the corner of Main and Perkins.



The Willits Monitor is on the Roof of the Willits Firehouse on Commercial St.



The Fort Bragg Monitor is on the roof of Fort Bragg City Hall on N. Franklin St.



## Appendix D

### Cost Effectiveness for PM Control Measures

The list below is based on the Cost Effectiveness information developed by the Air Resources Board to comply with SB 656. This information is provided for information only and has not been verified or confirmed by Mendocino County AQMD. In general, Cost-Effectiveness numbers for PM control measures varies widely and has not been confirmed by peer-reviewed studies. Information not relevant to the control measures discussed in the Plan has been deleted (i.e. organic vapor handling).

| Category                            | District                  | Rule #  | Title  | Date*   | Date Notes                | C.E. Notes  | C.E. (\$/ton reduced)                              |
|-------------------------------------|---------------------------|---------|--|---------|---------------------------|---|--|
| Wood Burning Fireplaces and Heaters | SJVAPCD                   | 4901    | Public Awareness Program   | 7/17/03 | Amended (Adopted 7/15/93) | Program already in place when rule was updated  | Unknown (emission reductions cannot be quantified) |
| Wood Burning Fireplaces and Heaters | SJVAPCD                   | 4901    | Curtailment - Mandatory  | 7/17/03 | Amended (Adopted 7/15/93) | Voluntary program already in place when rule was updated  | Unknown (emission reductions cannot be quantified) |
| Wood Burning Fireplaces and Heaters | GBVAPCD for Mammoth Lakes | 431     | Curtailment - Mandatory  | 12/7/90 | Adopted                   |   | Not estimated                                      |
| Wood Burning Fireplaces and Heaters | SCAQMD, YSAQMD, SLOAPCD   |         | Curtailment - Voluntary  |         |                           |   | Unknown (emission reductions cannot be quantified) |
| Wood Burning Fireplaces and Heaters | SJVAPCD                   | 4901    | Installed Wood-Burning Heaters must be U.S. EPA Phase II certified                         | 7/17/03 | Amended (Adopted 7/15/93) | Provision in previous rule version (Note: all new heaters produced in the U.S. now are U.S. EPA Phase II certified) | Unknown  |
| Wood Burning Fireplaces and Heaters | NSCAPCD                   | 4-1-400 | Wood-Burning Heaters and Wood-Burning Fireplaces must meet U.S. EPA Phase II certification | 2/2/93  | Adopted                   |   | Not available                                      |

|                                     |                           |      |  |          |                           |  |   |
|-------------------------------------|---------------------------|------|--|----------|---------------------------|--|---|
| Wood Burning Fireplaces and Heaters | SLOAPCD                   | 504  | Wood-Burning Heaters and Wood-Burning Fireplaces must meet U.S. EPA Phase II certification | 10/19/93 | Adopted                   | <ul style="list-style-type: none"> <li>Installation in new homes.</li> <li>Reduces PM10, NOx, and ROG by retrofitting existing stove or fireplace w/compliant appliance at point of home sale. (Clean Air Plan, Dec 1991, Appendix C)</li> </ul> | <ul style="list-style-type: none"> <li>Very small</li> <li>\$3,095 to \$5,216 (1991\$)</li> </ul> |
| Wood Burning Fireplaces and Heaters | GBUAPCD for Mammoth Lakes | 431  | Prohibits Installation of Non-EPA Appliances   | 12/7/90  | Adopted                   | Non-certified woodstoves are less efficient and would cost more to operate. Gas fireplaces are encouraged as they are more energy efficient.   | Unknown   |
| Wood Burning Fireplaces and Heaters | SJVAPCD                   | 4901 | Limits Number of Units in New Residential Developments                                     | 7/17/03  | Amended                   |  | \$0 to \$1,719 (2003\$)   |
| Wood Burning Fireplaces and Heaters | GBUAPCD for Mammoth Lakes | 431  | Limits the Number of Units in New Non-Residential Properties                               | 12/7/90  | Adopted                   | No basis for cost provided   | Unknown   |
| Wood Burning Fireplaces and Heaters | GBUAPCD for Mammoth Lakes | 431  | Limits Number of Additional Units in Existing Properties                                   | 12/7/90  | Adopted                   | No basis for cost provided   | Unknown   |
| Wood Burning Fireplaces and Heaters | SJVAPCD                   | 4901 | Replacement of Non-Certified Appliances  | 7/17/03  | Amended                   |  | \$8,680 to \$12,060 (2003\$)  |
| Wood Burning Fireplaces and Heaters | GBUAPCD for Mammoth Lakes | 431  | Replacement of Non-Certified Appliances  | 12/7/90  | Adopted                   | Cost to change out stoves without regard to savings (\$1,500 per stove, 20 year life, 5,946 stoves, \$1,865 lbs/day emission reduction). Woodstoves used for heating will result in savings after 5-12 years.                                    | Cost savings to cost of \$5,240 (2003\$)  |
| Wood Burning Fireplaces and Heaters | SJVAPCD                   | 4901 | Control of Wood Moisture Content   | 7/17/03  | Amended (Adopted 7/15/93) | Provision in previous rule version   | Unknown   |

| Wood Burning Fireplaces and Heaters | SJVAPCD | 4901           | Prohibit Fuel Types   | 7/17/03  | Amended (Adopted 7/15/93) | Provision in previous rule version  | Unknown                      |
|-------------------------------------|---------|----------------|---|----------|---------------------------|---|------------------------------|
| Non-Agricultural Open Burning       | SJVAPCD | 4103<br>4106   | Prohibit All Outdoor Residential Open Burning                             | 6/21/01  | Amended (Adopted 6/18/92) | 6/21/01 amendment: No significant costs associated w/rule implementation                                      | Not estimated                |
| Non-Agricultural Open Burning       | MBUAPCD | 438            | Prohibit Burning Where Waste Service is Available                         | 4/16/03  | Adopted                   |   | Not estimated                |
| Non-Agricultural Open Burning       | SMAQMD  | 407            | Prohibit Burning in Specified Highly Populated Areas                      | 6/4/98   | Amended                   |   | \$4,600 to \$19,800 (1996\$) |
| Non-Agricultural Open Burning       | LCAQMD  | 433            | Prohibit Burning within Small Lots and Sebacks                            | 10/15/02 | Amended                   |   | Not estimated                |
| Non-Agricultural Open Burning       | MBUAPCD | 438            | Prohibit Burning during Periods with Predicted High PM or Ozone Levels    | 4/16/03  | Adopted                   |   | Not estimated                |
| Non-Agricultural Open Burning       | MBUAPCD | 438            | Control Smoke Production Limits During Burn Days in Smoke Sensitive Areas | 4/16/03  | Adopted                   |   | Not estimated                |
| Non-Agricultural Open Burning       | ShCAQMD | 2.6            | Control Smoke Production - Emission Limits for Mechanized Burners         | 9/24/02  | Amended (also on 3/9/04)  |   | Not estimated                |
| Non-Agricultural Open Burning       | BAAQMD  | Reg. 5         | Drying Times  | 11/2/94  | Amended                   | Socioeconomic analysis found cost below level of significance (total cost from \$2,400/year to \$10,600/year) | Not estimated                |
| Non-Agricultural Open Burning       | LCAQMD  | 431 -<br>433.5 | Burn Duration   | 10/15/02 | Amended                   |   | Not estimated                |
| Non-Agricultural Open Burning       | MaCAPCD | 300            | Preparation of Fuels & Management of Burns                                | 7/19/88  | Amended                   |   | Not estimated                |
| Non-Agricultural Open Burning       | MBUAPCD | 438            | Preparation of Fuels & Management of Burns                                | 4/16/03  | Adopted                   |   | Not estimated                |

| Non-Agricultural Open Burning | NCUA QMD | Reg. 2 | Permits Required                 | 7/18/02  | Amended | Permit fee for:  | Not applicable (emission reductions cannot be quantified)   |
|-------------------------------|----------|--------|----------------------------------|----------|---------|--|---|
| Fugitive Dust                 | SJVAPCD  | 8021   | Construction: Earthmoving        | 11/15/01 | Adopted | <ul style="list-style-type: none"> <li>Residential burn = \$12/year</li> <li>Non-residential burn depends on acreage burned</li> </ul>   | \$304 (2001\$)  |
| Fugitive Dust                 | SCAQMD   | 403    | Construction: Earthmoving        | 2/14/97  | Amended | RACM to BACM upgrade (Final Report 2/14/97)  | \$197 (1996\$)  |
| Fugitive Dust                 | SJVAPCD  | 8021   | Construction: Demolition         | 11/15/01 | Adopted |  | Not estimated   |
| Fugitive Dust                 | SCAQMD   | 403    | Construction: Demolition         | 2/14/97  | Amended | RACM to BACM upgrade (Final Report 2/14/97)  | \$197 (1996\$)  |
| Fugitive Dust                 | SJVAPCD  | 8021   | Construction: Grading Operations | 11/15/01 | Adopted | Pre-watering (Draft Report 9/27/01)  | Not estimated   |
| Fugitive Dust                 | SCAQMD   | 403    | Construction: Grading Operations | 2/14/97  | Amended | RACM to BACM upgrade (Final Report 2/14/97)  | \$197 (1996\$)  |
| Fugitive Dust                 | SJVAPCD  | 8021   | Inactive Disturbed Land          | 11/15/01 | Adopted |  | Not estimated   |
| Fugitive Dust                 | SCAQMD   | 403    | Inactive Disturbed Land          | 2/14/97  | Amended | RACM to BACM upgrade (Final Report 2/14/97)  | \$197 (1996\$)  |
| Fugitive Dust                 | SJVAPCD  | 8031   | Bulk Materials: Handling/Storage | 11/15/01 | Adopted | Watering (estimated emission reductions from handling >> storage) (Draft Report 9/27/01)   | \$1,151(handling) to \$28,293 (storage) (2001\$)  |
| Fugitive Dust                 | SCAQMD   | 403    | Bulk Materials: Handling/Storage | 2/14/97  | Amended | RACM to BACM upgrade (Final Report 2/14/97)  | \$197 (1996\$)  |
| Fugitive Dust                 | SJVAPCD  | 8041   | Carryout and Track-out           | 11/15/01 | Adopted | (From Draft Report 9/27/01): <ul style="list-style-type: none"> <li>By manual sweeping (From 2003 SIP):</li> <li>Purchase 1 efficient sweeper</li> <li>Sweep once per month</li> <li>Control devices installed at</li> </ul> | <ul style="list-style-type: none"> <li>\$3,541 (2001\$)</li> <li>\$792</li> <li>\$1,070</li> <li>\$13,700 to \$322,000</li> </ul> |

|               |                           |      |  |          |         |  |   |                               |  |  |
|---------------|---------------------------|------|--|----------|---------|--|---|-------------------------------|--|--|
|               |                           |      |  |          |         |  |   | access points to public roads |  |  |
| Fugitive Dust | SCAQMD                    | 403  | Carryout and Track-out                                 | 2/14/97  | Amended | <ul style="list-style-type: none"> <li>Length of paved interior roads</li> </ul>   | <ul style="list-style-type: none"> <li>\$7,930 to \$186,000</li> </ul>                                  |                               |  |  |
| Fugitive Dust | SJVAPCD                   | 8041 | Carryout and Track-out: Clean-up Methods               | 11/15/01 | Adopted |  | Not estimated   |                               |  |  |
| Fugitive Dust | SJVAPCD                   | 8051 | Disturbed Open Areas                                   | 11/15/01 | Adopted | Water application (5 acres)  | \$7,020 (2001\$)  |                               |  |  |
| Fugitive Dust | SCAQMD                    | 403  | Disturbed Open Areas                                   | 2/14/97  | Amended | RACM to BACM upgrade (Final Report 2/14/97)  | \$197 (1996\$)  |                               |  |  |
| Fugitive Dust | SJVAPCD                   | 8061 | Paved Road Dust: New/Modified Public and Private Roads | 11/15/01 | Adopted | Paved shoulders (4 ft on 50% of highest ADVT existing roads) (From 2003 SIP)   | \$7,290 to \$11,300 (2003\$)  |                               |  |  |
| Fugitive Dust | SCAQMD                    | 1186 | Paved Road Dust: New/Modified Public and Private Roads | 2/14/97  | Adopted | Curb & gutter road shoulder (Final Report 2/14/97)   | \$5,577 (1996\$)  |                               |  |  |
| Fugitive Dust | SCAQMD                    | 1186 | Paved Road Dust: Street Sweeping                       | 2/14/97  | Amended | <ul style="list-style-type: none"> <li>Price of PM10-efficient sweeper is \$37,000 over previous sweeper</li> <li>Street sweeping</li> <li>Post-event cleaning</li> </ul> (Final Report 2/14/97) | <ul style="list-style-type: none"> <li>\$1,119</li> <li>&lt; \$100</li> <li>(Both in 1996\$)</li> </ul> |                               |  |  |
| Fugitive Dust | GBUAPCD for Mammoth Lakes | 431  | Paved Road Dust: Street Sweeping Sand & Cinders        | 12/7/90  | Adopted | Capital cost = \$240,000; 10 year life time; \$15,000/year for O&M, cost is \$427/winter-day; 2,429 lb/day PM10 emission reductions at 34% control efficiency.                                   | \$350 (1996\$)  |                               |  |  |

|               |                        |                       |  |          |         |  |   |
|---------------|------------------------|-----------------------|--|----------|---------|--|---|
| Fugitive Dust | SJVAPCD                | 8061                  | Unpaved Parking Lots/Staging Areas           | 11/15/01 | Adopted | Unpaved traffic areas: apply water, gravel, chemical or dust suppressant, or pave (150 trips/day; use 220 or 60 days/year)   | \$344 to \$12,293 (2001\$)  |
| Fugitive Dust | SJVAPCD                | 8061                  | Unpaved Roads: Control Requirements          | 11/15/01 | Adopted | <ul style="list-style-type: none"> <li>Apply water, dust suppressant, gravel, pave (150 trips/day; use 220 or 60 days/year)</li> <li>Paving (2003 SIP) (Final Report 2/14/97)</li> </ul> | <ul style="list-style-type: none"> <li>\$56 to \$1,481 (2001\$)</li> <li>\$2,160 to \$5,920 (2003\$)</li> </ul> |
| Fugitive Dust | SCAQMD                 | 1186                  | Unpaved Roads: Control Requirements          | 2/14/97  | Amended |  | \$958 (1996\$)  |
| Fugitive Dust | SJVAPCD                | 8021                  | Weed Abatement Activities                    | 11/15/01 | Amended |  | Not estimated   |
| Fugitive Dust | SCAQMD                 | 403                   | Weed Abatement Activities                    | 7/9/93   | Amended |  | Not estimated   |
| Fugitive Dust | SCAQMD                 | 403                   | Windblown Dust: Definitions                  | 2/14/97  | Amended |  | Not applicable  |
| Fugitive Dust | SCAQMD                 | 403                   | Windblown Dust: Construction/Earthmoving     | 2/14/97  | Amended | <ul style="list-style-type: none"> <li>RACM to BACM upgrade (Final Report 2/14/97)</li> </ul>  | \$197 (1996\$)  |
| Fugitive Dust | SCAQMD                 | 403                   | Windblown Dust: Disturbed Areas              | 2/14/97  | Amended | <ul style="list-style-type: none"> <li>RACM to BACM upgrade (Final Report 2/14/97)</li> </ul>  | \$197 (1996\$)  |
| Fugitive Dust | SCAQMD                 | 403                   | Windblown Dust: Bulk Materials/Storage Piles | 2/14/97  | Amended | <ul style="list-style-type: none"> <li>RACM to BACM upgrade (Final Report 2/14/97)</li> </ul>  | \$197 (1996\$)  |
| Fugitive Dust | SCAQMD                 | 403.1                 | Windblown Dust: Bulk Materials/Storage Piles | 1/15/93  | Adopted | Draft Staff Report 12/92   | \$325 to \$462 (1992\$)   |
| Fugitive Dust | GBUAPCD for Owens Lake | Board Order 981116-01 | Windblown Dust: Open Areas                   | 11/16/98 | Adopted | Annualized capital cost over 25 years = \$29 MM; O&M = \$27MM; annual cost = \$56MM; annual emission reductions = 80,400 tons of PM10. (Owens Valley PM10 SIP 2003).                     | \$697 (2003\$)  |

|  |         |       |                         |          |         |  |   |
|--|---------|-------|-------------------------|----------|---------|--|---|
| Fugitive Dust  | SJVAPCD | 8081  | Agricultural Operations | 11/15/01 | Adopted |  | Not estimated   |
| Fugitive Dust  | SCAQMD  | 403   | Agricultural Operations | 2/14/97  | Amended | 12/11/98 amendment:<br>High wind tilling prohibition &<br>stabilization of fallow fields | \$134 (1996\$)  |
| Fugitive Dust  | SCAQMD  | 403.1 | Agricultural Operations | 1/15/93  | Adopted | Draft Staff Report 12/92   | \$8 (1992\$)  |
| Fugitive Dust  | SCAQMD  | 1186  | Agricultural Operations | 2/14/97  | Amended | Livestock operations - unpaved<br>roads (Final Report 2/14/97)                           | \$958 (1996\$)  |
| Fugitive Dust  | ICAPCD  | 420   | Agricultural Operations | 8/13/02  | Amended |  | Data pending  |
| Miscellaneous  | SCAQMD  | 1137  | Woodworking Operations  | 2/1/02   | Adopted | (PM10)   | \$3,200<br>(2001\$)   |
| General Rules to<br>Reduce Directly<br>Emitted PM from<br>Stationary and Area<br>Sources | MaCAPCD | 202   | Visible Emission Limits | 9/17/74  | Adopted | (PM10, PM2.5)  | Not applicable<br>(emission reductions cannot be<br>quantified) |