

North Coast Unified Air Quality Management District

Particulate Matter (PM10) Attainment Plan

Draft Report

Adopted

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CHAPTER I

INTRODUCTION

All three counties that comprise the North Coast Unified Air Quality Management District, Humboldt, Del Norte, and Trinity, are currently classified as nonattainment for the California Ambient Air Quality Standards for particulate matter under 10 microns (PM10). These air quality standards are set at levels to protect the public health from the deleterious affects of fine particulate. A nonattainment designation means that particulate concentrations in the three counties that comprise the North Coast Unified Air Quality Management District exceed the levels set by California to protect the public health.

Under guidelines set forth by the California Clean Air Act each air quality district in the state is to achieve and maintain the state ambient air quality standards for PM10 by the earliest practicable date. To reasonably expect to achieve the state air quality standard an understanding of the causes of high PM10 levels is necessary. The District has already undertaken a study to identify the major contributors of PM10 on the North Coast and is ready to proceed to the next step; which is the development and implementation of control measures designed to reduce emissions of PM10 to bring ambient levels of PM10 down to below the state ambient air quality standards.

This Attainment Plan has been prepared to present available information about the nature and causes of exceedences of the PM10 standards, and to identify cost-effective control measures which can be implemented to bring ambient PM10 levels down to levels that will meet the California Ambient Air Quality Standards for PM10.

CHAPTER II

DESCRIPTION OF PLANNING AREA

Physical Setting

The North Coast Unified Air Quality Management District is comprised of three counties, Humboldt, Del Norte, and Trinity, located in the far northwestern portion of California. The District contains 7767 square miles, or approximately 5 percent of the total area of California. It is bordered on the west by the Pacific Ocean and extends from the Oregon Border south approximately 140 miles to the Mendocino County line, and varies between 30 to 100 miles in width inland.

Land use and development has occurred mainly along the coastal regions and along the main east-west route heading inland. Much of the District remains unpopulated forest land, although some increased population growth has occurred over the last couple of decades. Most of the population growth has occurred around Humboldt Bay, where the largest urban area in the District is located, and to a lesser extent in Crescent City and Weaverville, the two largest cities in Del Norte and Trinity Counties respectively.

North Coast Unified Air Quality Management District
Population and Land Area Distribution

<u>County</u>	<u>1995 Population</u>	<u>Total Area (sq. mi.)</u>
Humboldt	128,900	3573
Del Norte	29,250	1003
Trinity	13,950	3191

Table 1

Topography

The topography of the District is mountainous. There is some fairly level terrain found along the coast and in isolated mountain valleys but in general the entire District is covered in mountains that are generically known as the Coast Range. Elevation varies from sea level to over 9,000 feet. The mountain ranges generally run north to south, divided by deep canyons cut by the many rivers in this area. Most of the rivers in this area flow into the Pacific Ocean within the boundaries of the District, while often having their origins in areas outside the District.

Meteorology

The weather in the District is very dependent on how far from the ocean you are and what your elevation is. The coastal areas have cool summers with frequent fog and mild winters with lots of rain. This changes as you travel inland to very hot, dry summers and cold, snowy winters. At inland areas the higher you are the cooler the summers and the more snow experienced in the winter. At coastal areas the ocean helps to moderate temperatures year-round. Some portions of the District have some of the highest rainfall totals found in the United States, over 60 inches some years, which all occurs during the winter rainy season.

Dominant winds also exhibit a seasonal pattern on the North Coast, particularly in coastal areas. During the summer north to northwesterly winds, frequently strong, are common, while in the winter storms from the south Pacific increase the percentage of days winds are from southerly quadrants. In the river canyons that empty into the Pacific a diurnal pattern is often present in wind direction. In the morning hours cool air from higher elevations flows down the valleys while later in the day as the lower elevation air heats up this pattern is reversed and the air flow heads up the canyon. These air flows can frequently be very strong. Offshore and onshore flows are also common along the coast and are associated with pressure systems in the area. Onshore flows frequently bring foggy cool weather to the coast, while offshore flows often blow fog away from the coast and bring sunny warm days.

Temperature inversions are a common occurrence in the District. Vertical air movement is important in spreading pollutants through a thicker layer of air. Horizontal movement is important in spreading pollutants over a wider area. Upward dispersion of pollutants is hindered wherever the atmosphere is stable; that is, where warm air overlies cooler air below. This situation is known as a temperature inversion. There are two types of temperature inversions that are common on the North Coast, the radiation inversion and the subsidence inversion. The coastal regions of the District is also at times affected by an inversion known as a modified subsidence inversion.

A radiation inversion is caused by cooling of the air layer near the surface of the ground and may extend upward several hundred feet. This inversion type is found almost daily the year-round during the night and early morning hours and little, if any, vertical mixing takes place in the inversion layer. The inversion is destroyed when heat from the sun the following day heats the lower layers of air, and mixing once again commences through the inversion layer. Although this inversion is almost a daily occurrence, it is more prominent from late fall through early spring when heating from the sun is weaker and hours of sunshine are less. While the radiation inversion is almost always destroyed by mid-morning in the summer months, it may persist until near noon in the winter months, and at times is not destroyed during the whole day or for several days. This type of inversion is more of a problem in the inland valleys, especially during the winter months, although it also occurs in the coastal areas.

A subsidence inversion is caused by downward moving air aloft, which is common in the area of high pressure along and off the coast of California. As the air descends, it warms at a rate of 5.5 degrees Fahrenheit per 1,000 feet. Thus, it arrives at a lower height warmer than the air just below. This limits vertical mixing of the air. This type of inversion can frequently affect large areas and is common during the summer months. The modified subsidence inversion is the normal subsidence inversion intensified by cooling of the lower layers from the cool ocean water found off our coast. Thus, not only are the upper layers warmed, but the lower layers are cooled giving a very strong, shallow inversion. This inversion is present mainly from late spring through early fall and generally affects only the coastal areas of the District.

Land Use

The North Coast Air Quality District is predominately forest land, which has historically been devoted to timber and timber products production. Approximately 49% of the total land area in the District is under public ownership. Major land holdings by the Federal Government account for 96% of the total public-owned land, with National Forests and National Parks accounting for the majority of it. Much of this public land has historically been managed for multiple uses, including timber production, but in recent years severe curtailment of timber production activities has been enacted and the future of these lands for timber production are in serious doubt. As a result commercial timber activities have been shrinking and are not as common as in past years.

The North Coast Air Quality District is not heavily industrialized. Presently, the majority of industry is related to the production of timber derived products and providing products or services associated with timber. As previously stated this activity has been declining at a rapid pace. Other industrial activities scattered throughout the District include sand and gravel mining with asphalt batch plants, a small but thriving dairy industry, and a struggling fishing industry with some minor fish products processing. There are also some small manufacturing facilities making a variety of products, located mostly around Humboldt Bay.

Recreational land use is significant within the District. Tourism is a major activity in the District and draws substantial money into the area. Boating, hiking, camping, packing, fishing, and hunting are undertaken by many people during the seasons, many from out of the area. Large wilderness areas, extensive forests, scenic rivers, and numerous national, state and local parks serve as the major attractions. As the timber products industry declines more emphasis has been placed on tourism as a major economic factor and this trend is expected to continue in the future.

Transportation

The District has a very limited transportation system. There is basically only one highway corridor running north and south, Highway 101, and several smaller roads running east and west, Highway 299 through Weaverville being the best one. All of these roads are subject to closure during bad weather from mudslides, fallen trees, and other obstacles. Highway 101 passes through several cities and towns on its way through the District, becoming severely congested at times in places like Eureka, and also passes through some park areas where the road becomes narrow and winding.

One rail system serves the North Coast, coming from the south and ending in Eureka. This railroad is also subject to closures for a variety of reasons and the improvement and better utilization of this system has been an issue in the District for some time. The railroad is used primarily for the shipping of freight, although some passenger usage associated with the tourism industry occurs.

Humboldt Bay is the only deep-water port between San Francisco and Portland, Oregon. Products from the timber industry comprise the majority of shipping out of the port, although a fishing fleet is also based here. There are efforts underway to better utilize this port through improved dock facilities and harbor excavation. Efforts are also underway to attract tourism through the port via cruise ships and the like. Commercial jet passenger and freight service is available at the Eureka-Arcata Airport located in McKinleyville, although flight destinations direct from the North Coast are limited.

CHAPTER III

AIR QUALITY

Definition and Standards

There are many ways to define the term "air pollutant". A commonly accepted definition is that air pollution can be regarded as any substance anthropogenically added to the atmosphere, which adversely affects humans, animals, vegetation, or other materials. It is perhaps important to differentiate between a pollutant and a contaminant. Contaminants are introduced by both natural sources, such as volcanic eruptions, forest fires, and by man. Dust and pollen are generally thought of as contaminants. Pollutants are associated only with man's activities -- thus the word anthropogenic in the definition.

In its natural state, air is almost never pure. There are varying levels of naturally occurring contaminants such as smoke, dust, sea salts, odors, water vapor, and other impurities always present in the natural environment. Generally, air with natural impurities is not perceived as being polluted. Air pollution, to most people, refers to the introduction of large volumes of unnatural, man-made materials into the atmosphere.

For PM₁₀, however, some natural sources such as windblown dust, seas salts, and natural fires are referred to as fugitive sources which can be significant contributors to the problem. PM₁₀ itself can be defined as any combination of dust, mist, ash, smoke, and/or fumes in liquid or solid particles under 10 microns in diameter.

The Clean Air Act of 1970 required the Environmental Protection Agency to establish standards to limit the concentration of harmful pollutants occurring in the ambient air of this country. Subsequently, both the Federal Government and the State of California have adopted standards for a number of pollutant types. The primary purpose of the standards is protection of the public from exposure to harmful levels of air pollution. Although the secondary standards have also been established which relate to damage to property and vegetation, the main thrust of the standards is the protection of public health.

In July 1987, EPA promulgated a new standard for particulate matter. It is based upon scientific research which demonstrates that particles less than 10 microns in size are most damaging to human health and are not filtered out by normal body mechanisms. Thus, the PM₁₀ standard was created. This standard is as follows:

<u>Averaging Time</u>	<u>Federal Standard</u>	<u>California Standard</u>
Annual Arith. Mean	50 ug/m ³	30 ug/m ³
24 Hour Average	150 ug/m ³	50 ug/m ³

Monitored Data

Measurements of PM10 concentrations on the North Coast began in 1985. Prior to that particulate had been measured as total suspended particulate (TSP), which measured the fraction up to around 40 microns. On the North Coast PM10 has been determined to comprise approximately 60% of TSP concentrations. Particulate monitoring has been conducted at various locations in the District and the results of that monitoring are presented in Table 2.

Location	Year	Particulate Monitoring Results ¹		PM10	
		TSP			
		Maximum 24-Hour Value	Annual Average	Maximum 24-Hour Value	Annual Average
Crescent City	1956	1006.0	171.0	604.0 ²	102.6 ²
Arcata	1959	387.0	219.0		
Eureka	1959	175.0	92.0		
Trinidad	1963	76.0	36.0		
Eureka	1964	182.0	92.0		
Trinidad	1966	158.0	43.0		
Eureka	1969	166.0	81.7		
Arcata	1969	162.0	60.5		
Arcata	1970	136.0	64.0		
Eureka	1970	214.0	60.0		
Arcata	1971	160.0	54.3		
Eureka	1971	188.0	51.3		
Arcata	1972	130.0	55.4		
Eureka	1972	84.0	55.7		
Crescent City	1972	138.0	54.8		
Arcata	1973	127.0	58.4		
Eureka	1973	122.0	53.3		
Crescent City	1973	109.0	50.8		
Weaverville	1973	197.0	79.8		
Arcata	1974	125.0	50.6		
Eureka	1974	123.0	58.1		
Crescent City	1974	112.0	59.5		
Weaverville	1974	61.0	32.5		
Arcata	1975	109.0	52.4		
Eureka	1975	141.0	59.5		
Crescent City	1975	134.0	55.0		
Weaverville	1975	86.0	36.4		
Arcata	1976	120.0	48.6		
Eureka	1976	142.0	55.6		
Crescent City	1976	91.0	39.4		
Weaverville	1976	71.0	31.4		
Arcata	1977	137.0	47.4		
Eureka	1977	145.0	57.4		
Crescent City	1977	113.0	43.7		
Weaverville	1977	139.0	31.1		
Arcata	1978	93.0	41.5		
Eureka	1978	137.0	50.6		
Crescent City	1978	69.0	39.3		

Particulate Monitoring Results¹
(continued)

Location	Year	TSP		PM10	
		Maximum 24-Hour Value	Annual Average	Maximum 24-Hour Value	Annual Average
Weaverville	1978	96.0	33.1		
Arcata	1979	112.0	39.3		
Eureka	1979	105.0	45.4		
Fortuna	1979	75.0	28.7		
Arcata	1980	117.0	45.1		
Eureka	1980	131.0	51.6		
Arcata	1981	100.0	39.1		
Eureka	1981	129.0	49.2		
Arcata	1982	81.0	35.3		
Eureka	1982	110.0	45.2		
Eureka	1983	115.0	37.1		
Eureka	1984	137.0	48.5		
Hayfork	1984	140.0	40.2		
Eureka	1985	121.0	48.1	75.0	32.7
Eureka	1986	137.0	46.9	98.0	28.6
Eureka	1987	141.0	52.9	98.0	31.7
Crescent City	1987			66.0	25.0
Weaverville	1987			78.0	21.8
Eureka	1988	129.0	51.6	98.0	35.0
Crescent City	1988			46.0	21.3
Weaverville	1988			125.0	20.3
Eureka	1989			92.0	28.2
Eureka	1990			83.0	24.4
Arcata	1990			43.0	11.8
Eureka	1991			68.0	29.5
Eureka	1992			88.0	24.3
Eureka	1993			59.4	21.1
Crescent City	1993			37.7	19.8
Weaverville	1993			92.6	25.6

1. All values in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)

2. Estimated PM10 value (TSP x 60%)

ns = no applicable standard

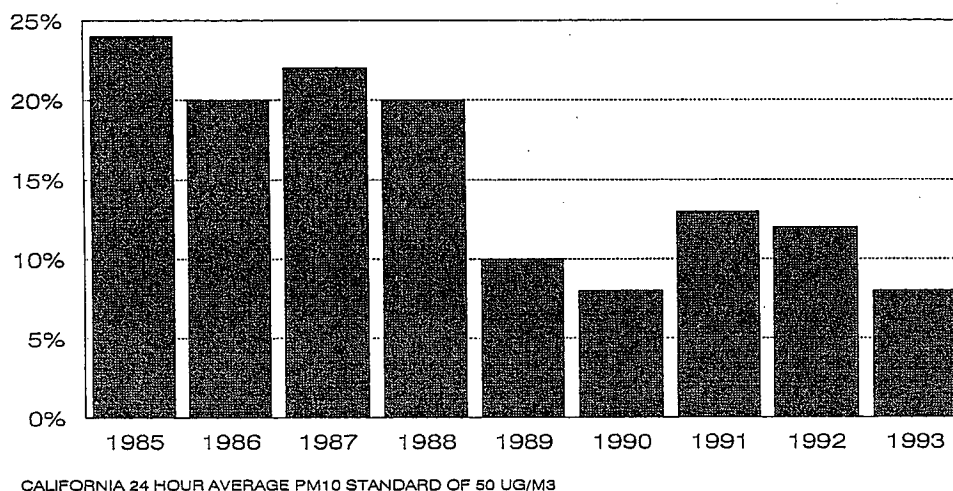
Bold Type = exceedence of applicable standard

(Table 2)

As the data indicates, the three largest cities in each of the three counties in the District have had exceedences of the 24-hour standard for PM-10. The site with the greatest quantity of PM-10 measurements has been Eureka, where a particulate monitoring station has been operated at the same site continuously since 1969. Crescent City and Weaverville have had only sporadic particulate monitoring over the history of the District; although it appears that Weaverville may have the most severe PM-10 problem in the District. Crescent City has not had a recorded PM10 exceedence since 1987 and if the proper monitoring effort was made may be shown to be in attainment with the PM10 standards. Until this effort is made however Crescent City must be assumed to also be nonattainment for PM10 for lack of better information.

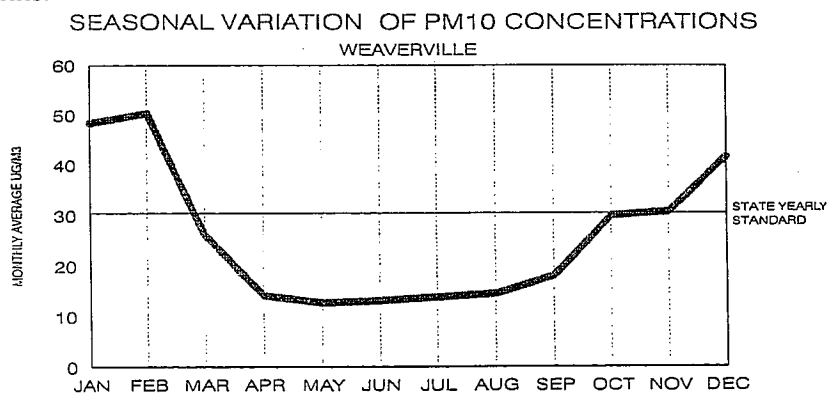
To determine the severity of an areas PM10 problem not just the maximum PM10 value must be known but the frequency of exceedences must also be determined. The following graph shows the percentage of days the 24 hour PM10 standard has been exceeded at the Eureka monitoring site since 1985. While the percentage of days the 24 hour standard has been exceeded in Eureka has been decreasing over the past few years the standard is still exceeded on several days every year, usually in the winter months. Not enough monitoring has been conducted in Crescent City or Weaverville to determine if a similar trend is occurring in these areas.

PERCENT OF DAYS PM10 STANDARD EXCEEDED
at
HUMBOLDT COUNTY DEPT OF HEALTH



(Figure 1)

The monitored data collected over the years at the various sites in the District has revealed a distinct seasonal pattern to PM10 levels on the North Coast. PM10 levels typically increase during the winter months and are at their lowest levels during the summer months.



(Figure 2)

CHAPTER IV

EMISSION INVENTORY

ARB Emission Inventory

The California Air Resources Board (ARB), in conjunction with the local Districts, maintains an emission inventory of various source categories and their emissions of PM10 for each county in the state. Based on this inventory the District can calculate the quantity of PM10 emissions occurring in each county in the District and estimate the amount of these emissions that are contributing to PM10 levels in the areas that exceed the state PM10 standard.

The following tables shows the 1991 emission inventories for Humboldt, Del Norte, and Trinity Counties. The "area" emissions columns are the estimates of PM10 emissions from source categories that affect the problem PM10 areas in the counties; namely Eureka in Humboldt County, Crescent City in Del Norte County, and Weaverville in Trinity County. The estimates are based, where appropriate, on known source emissions in each area, population in each area, estimated fraction of sources for each area, and/or spatial characteristics of the individual areas.

Humboldt County - Eureka

Source Category	Total Emissions (tons/year)	Area Emissions (tons/year)
commercial fuel combustion	291	146
residential fuel combustion	1,095	602
forest management burning	729	0
open waste burning	73	40
industrial wood and paper	949	474
mineral processes	36	0
agricultural operations	218	11
construction and demolition	620	341
paved road dust	4,015	400
unpaved road dust	3,613	180
unplanned fires	36	20
windblown dust	73	7
on road gas vehicles	109	55
on road diesel vehicles	219	112
off road vehicles	219	11
other mobile sources	109	50
other miscellaneous	73	36
total	12,477	2,485

(table x)

Del Norte County - Crescent City

Source Category	Total Emissions (tons/year)	Area Emissions (tons/year)
commercial fuel combustion	36	36
residential fuel combustion	292	146
forest management burning	1,168	0
open waste burning	73	36
agricultural operations	73	0
construction and demolition	438	219
paved road dust	876	88
unpaved road dust	1,460	365
unplanned fires	36	18
windblown dust	36	4
on road gas vehicles	36	18
on road diesel vehicles	36	18
off road vehicles	73	7
other mobile sources	36	18
other miscellaneous	36	18
total	4,705	991

(Table x)

Trinity County - Weaverville

Source Category	Total Emissions (tons/year)	Area Emissions (tons/year)
commercial fuel combustion	36	18
residential fuel combustion	328	164
forest management burning	584	58
open waste burning	36	18
construction and demolition	36	18
paved road dust	584	58
unpaved road dust	7,300	730
unplanned fires	438	219
windblown dust	109	11
on road gas vehicles	36	18
on road diesel vehicles	36	18
off road vehicles	36	18
other mobile sources	36	18
other miscellaneous	36	18
total	9,631	1,384

(Table x)

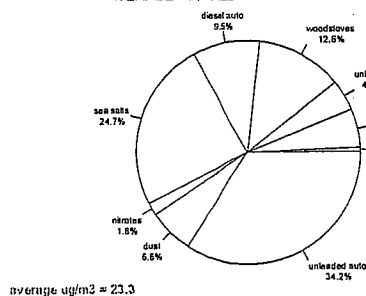
Receptor Source Apportionment

In 1992 the District conducted a chemical mass balance (CMB) PM10 source apportionment study which characterized the sources of PM10 in the three counties in the District. The CMB model uses the chemical characteristics of both PM10 sources and ambient PM10 samples in an area to apportion the percentage contribution of the sources to the ambient samples. This allows the user to determine the contribution various sources contribute to an areas PM10 levels to better focus potential control efforts.

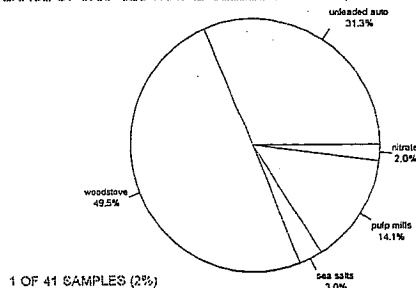
The sampling for the CMB modeling took place over a one year period in Eureka, Crescent City, and Weaverville. Results of the study showed that woodstove emissions during the winter months, when added to the ever-present emissions of vehicles and sea salts, are the primary cause of high PM10 values in the District. Industrial emissions, open burning, road dust and windblown dust do not seem to contribute to a large degree to PM10 levels in the District.

The following graphs show CMB modeling results for each site for both the average PM10 apportionment over a year and for the PM10 source apportionment that occurred during periods of high PM10 episodes. As can be seen the percentage contribution from woodstoves changes substantially when higher PM10 levels are experienced.

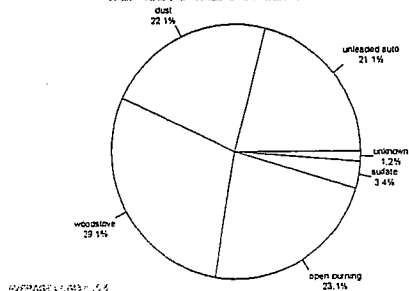
EUREKA PM10 SOURCE APPORTIONMENT
AVERAGE FOR ALL SAMPLES COLLECTED



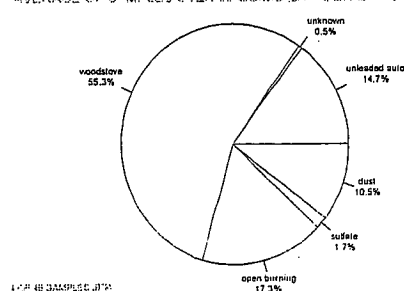
EUREKA PM10 SOURCE APPORTIONMENT
AVERAGE OF SAMPLES THAT EXCEEDED 50 UG/M3 (24 HOUR STATE STANDARD)



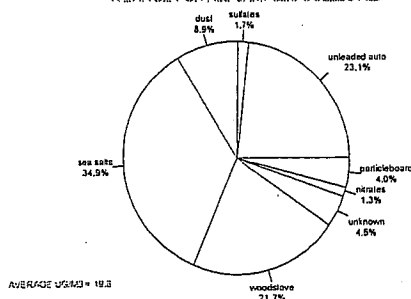
WEAVERVILLE PM10 SOURCE APPORTIONMENT
AVERAGE FOR ALL SAMPLES COLLECTED



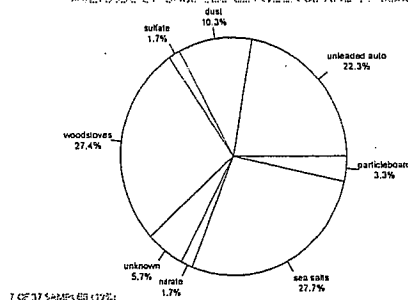
WEAVERVILLE PM10 SOURCE APPORTIONMENT
AVERAGE OF SAMPLES OVER 50 UG/M3 (24 HOUR STATE STANDARD)



CRESCENT CITY PM10 SOURCE APPORTIONMENT
AVERAGE FOR ALL SAMPLES COLLECTED



CRESCENT CITY PM10 SOURCE APPORTIONMENT
AVERAGE OF SAMPLES BETWEEN 30 AND 50 LEGAL



Crescent City did not have an exceedence of the state 24 hour PM10 standard during the CMB study; and may be shown to be meeting the state standard if appropriate monitoring was to be conducted. Weaverville had the most severe exceedences of the 24 hour standard during the monitoring period, due almost exclusively to heavy woodstove use during the winter months. Eureka also exceeded the 24 hour standard during the winter due to high woodstove emissions combined with poor dispersion conditions.

The CMB sampling results presents a different picture of the percent contributions to total PM10 than the emissions inventory presented in the previous section. The CMB results are based on actual monitored data, while the emissions inventory is based mostly on emissions estimates developed by the Air Resources Board. In developing an attainment plan control measures should take into account the two different evaluations and base its recommendations accordingly.

IV-4
CHAPTER V

ATTAINMENT GOALS

Design Values

Attainment of the California PM10 standard is based on an area not exceeding the 24 hour average of 50 ug/m^3 or the annual geometric mean of 30 ug/m^3 . If an area has a 24 hour PM10 value of over 50 ug/m^3 , or if an areas annual geometric mean of all 24 hour values exceeds 30 ug/m^3 , then the area is designated as nonattainment. All three counties in the North Coast Air Quality District are currently designated as nonattainment. The highest 24 hour value recorded at a site is the design value used for attainment determination. Three continuous years of sampling data are needed to verify attainment with the state standard, although a shorter time period is acceptable if the values are substantially lower than the standard.

California allows the flagging of a measurement if it is influenced by an exceptional event. An exceptional event is defined as an event that is not expected to recur routinely at a given location. An example might be were there are unusually high winds, no precipitation, and a great amount of windblown dust contributing to the PM10 sample. Wildfires and unplanned structure fires are also examples of exceptional events.

Based on the monitoring data shown in Table 2, the design values for Humboldt, Del Norte, and Trinity County are as follows:

PM10 DESIGN VALUES

Site Name	24 hour	% above	AGM	% above
Humboldt Co. Eureka	98	96	21	NA
Del Norte Co. Crescent City	66	32	20	NA
Trinity Co. Weaverville	125	125	26	NA

(Table xx)

Required Reductions

The emissions inventory tables shown in Chapter IV present a proportional value for each area and source in the District. Based on the estimated emissions presented in that those tables and the design value exceedences presented in the previous table, the percent emissions reductions needed to meet the California 24 hour standard for each area are as follows:

PM10 Emissions Reductions

<u>County - Area</u>	<u>Design Value</u>	<u>Area Emissions T/Y</u>	<u>% Reduction Needed</u>	<u>Reductions Needed T/Y</u>
Humboldt Eureka	98	2,485	49	1,218
Del Norte Crescent City	66	991	24	238
Trinity Weaverville	125	1,384	60	830

(Table xx)

These reductions represent an estimate of the required reductions in yearly PM10 emissions from 1991 levels to prevent exceedences of the state 24 hour standard based on previous measurements and the design values. The actual amount of PM10 emissions reductions needed may be different from these estimates when changes to the emissions inventory that have taken place since 1991 are factored in. Further study of actual PM10 emissions in the subject areas would be valuable to gain a better grasp of the real levels of emissions. As an example, in the emission inventory entrained road dust is estimated to account for over 60% of PM10 emissions; while the CMB model only apportioned about 7% of total ambient PM10 to road dust. In developing the area emission inventory estimates the CMB data was used to help estimate the area fraction of county-wide emissions (i.e.: 10% of the county-wide road dust amount used for area emissions), but further clarification and refinement of these estimates would be helpful.

CHAPTER VI

CONTROL STRATEGIES

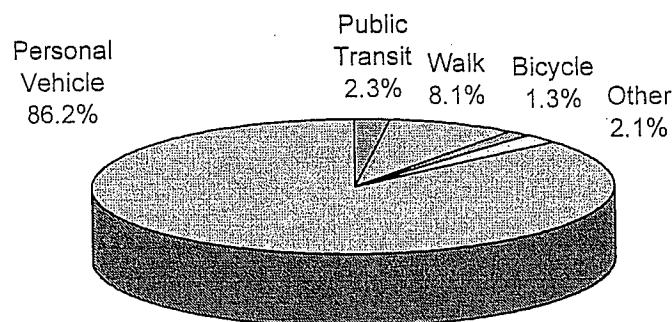
Transportation Control Measures:

A key element in attaining the State Ambient Air Quality Standards for PM-10 is Transportation Control Measures (TCM's). Unlike many areas in California, the North Coast's air quality is not severely degraded and therefore, has greater flexibility in selecting the most effective as well as the least disruptive measures. It should be noted that these TCM's are directed at reducing PM-10 emissions but will also have the benefit of reducing ozone precursors, carbon monoxide, as well as toxics.

PM-10 emissions from motor vehicles come from several mechanisms. PM-10 is emitted directly from vehicle exhaust and is also formed by secondary reactions in the atmosphere from other combustion gases. In addition, there are PM-10 emissions from tirewear, brakewear and from entrainment of road dust.

According to a recent statewide study of travel modes in California, about 86% of personal travel is by automobile, motorcycle or light-duty truck. Walking and bicycling together comprise about 9% total travel, while public transit accounts for only about 2%.

Modes of Travel in California, 1991



The TCM's quantitative effect on reducing PM-10 emissions is not currently well defined (and in many cases very difficult to quantify). In order to determine the effectiveness of TCM's and other PM-10 control measures the District will implement a program of air monitoring and analyzing the improvement in air quality levels. PM-10 monitors are currently in operation in Crescent City, Eureka and Weaverville.

A great deal of work is currently underway at the larger urban air district offices and at ARB to develop mechanisms to evaluate emission reducing capabilities of TCM's. In addition, several large districts have adopted criteria for selecting TCM projects to fund.

These criteria greatly help in selecting projects that provide the greatest benefit for the dollars spent. These criteria are being consolidated into one document to assist all districts involved in funding TCM projects. The North Coast plans to capitalize on this effort in developing future criteria for the Board's consideration.

The following TCM's offer a brief description and in some cases a brief analysis of measures that could reduce vehicle related PM-10 emissions and improve air quality:

Public Transit:

Public transportation provides a valuable public service in Humboldt County. This bus service is primarily provided by Humboldt Transit Authority with routes throughout the County. In addition both Eureka and Arcata operate bus systems that serve local schools, HSU, CR, governmental offices, shopping centers, medical facilities, etc.

This public transportation system, like in other areas of California, predominantly serves the transportation dependent group of citizens. It appears to offer little, if any, help of attracting motorists out of their cars and therefore, offers little opportunity of providing transit related particulate emission reduction.

Replacement of diesel powered buses with propane or natural gas fueled buses offers some potential PM-10 emission reductions.

Rideshare Programs:

Caltrans has operated a rideshare program for approximately 10 years. Each year 10,000 applications are distributed in an attempt to match persons traveling to and or from the same destinations. The major areas that are targeted are colleges (HSU, CR), major employers including Humboldt County. The application approach is augmented by use of rideshare road signs. It has been estimated that less than 5% of the applications are ever returned and therefore, offers little help for particulate emission reducing potential from this transportation measure. It appears that Caltrans, because of statewide financial problems and ensuing cutbacks, will significantly reduce or eliminate the rideshare program.

Park and Ride Lots:

Park and ride lots have been created to accommodate ridesharing and reduce the number of single rider trips. Two designated park and ride lots are located in the Eureka area. Several other large shopping center parking lots are available and may be used for car pooling purposes.

In observing the designated park and ride lots, it is obvious that the lots are being used but a considerable number of additional spaces are available.

To expand the park and ride lots on the North Coast at this point appears to be unnecessary. The limited transportation related funds could therefore, be more effectively used on other measures.

Vehicle Buy Back Program:

This program would be directed at permanently removing generally older, high polluting vehicles from the highways. Some refer to this as a vehicle crushing or scrappage program. The program is a voluntary effort that offers some financial incentives for removing a vehicle from highway use. The incentive funds are generated from the AB-2766 Program that levees a \$1/motorized vehicle on the North Coast. This program is being used similarly in many areas of the state. The same funds have been used by the District to perform the year long research study to determine the various sources and their respective contributions to the PM-10 levels in Eureka, Crescent city and Weaverville.

Smoking Vehicle Program:

This approach sets up a program with the assistance of the Department of Motor Vehicles to notify a vehicle owner of a citizen's report of excessive emissions from a vehicle. Districts also include information to the owner about the benefits of correcting any excess visible emissions, i.e., impact on air quality, improved fuel efficiency and to avoid large fines if cited by a California Highway Patrolman.

Billboard signs are generally used to inform the public about where to call if they observe a smoking vehicle.

This program allows the public to participate in an approach to help identify the small number of vehicles that contributes a disproportionate share of the PM-10 emissions that ultimately have significant impacts on air quality.

This program relies heavily on public education and voluntary correction of any excess vehicular emissions. It may also help develop an inventory of vehicles that may be candidates for a vehicle scrappage (vehicle buy back) program. This may be the case, particularly, if the repair cost to a smoking vehicle are excessive or exceed the value of the vehicle.

Traffic Flow Improvements:

The proper flow of traffic through an urbanized area can have a beneficial effect on vehicular emissions. A smooth flow of traffic tends to minimize the amount of vehicular related exhaust emissions, including fine particulate matter. This is particularly true with heavy duty diesel fueled vehicles. Stop and go traffic, accounts for a large portion of vehicular related PM-10 emissions.

Signalization is a means of synchronizing signal lights to provide the optimum traffic flow through a community. The manner in which the signals are programmed and operated may vary within the day to accommodate commuter traffic and may vary by season to accommodate the peak tourism season.

This traffic related measure offers potential for improvement, particularly where Highway 101 passes through the Eureka area. The downtown Eureka corridor was one of the air quality sampling sites the District used to characterize PM-10 sources of origin. The Eureka sampling site indicated that about 34% of collected PM-10 originated from motor vehicle exhausts.

Bicycling Program:

A program that would accommodate the use of bicycles as an alternative to motorized transport could result in diminished vehicle miles traveled and fuel consumption, as well as, reduced traffic and parking congestion.

Note: It should be noted that in each of the TCM's described above there are numerous other players involved in planning, coordinating, financing and implementation. Clearly identifying the Districts role will be critical to avoiding turf conflicts, duplication of effort and obtaining the most efficient use of public funds. These details will be more clearly articulated as funding of future projects come under consideration.

Land Use Measures:

The District understands the importance and supports the integration of land use, transportation and air quality planning in the North Coast Unified Air Quality Management District. This integration will help prevent air quality degradation related to future developments and help avoid many of the draconian control measures associated with large urban areas of California as a result of poor air quality.

Land uses that enable people to walk to or use public transportation for shopping or employment, rather than relying on their car, tend to be good for air quality. Other benefits besides air quality can result from land use strategies. These benefits include a reduction in transportation cost to individuals, lower infrastructure costs to local governments, special districts, and developers in building and maintaining roads, water, sewer and utility facilities for developments.

To help achieve these land use and transportation planning goals for local governments, the District will encourage and assist local land use agencies in the development of an air quality element. Current law does not require an air quality element as part of General Plans.

The District will develop and request the Board to adopt an "Air Quality Guidelines for General Plans" that could be used by cities and counties when General Plans are revised. This would be a voluntary commitment of local governments to plan the land use and transportation systems of their communities in ways that reduces vehicle trips, miles traveled and development related emissions.

Open Burning Measures:

Forest Management, Range Improvement and Wildland Vegetation Management burning can contribute to PM-10 emissions in communities. The District operates a very active smoke management program with each of these burning practices. The goal of our program is to properly plan each burn with the air quality emphasis of keeping smoke out of the breathing zone of urban dwellers. This program is not problem free but has encountered major improvements over the past few years. We are not proposing any changes at this time to this program.

Residential Burning/Property Development:

Residential burning, unlike all other urbanized areas of California, is still allowed on the North Coast. In the Humboldt Air Basin, burning of household paper, cardboard and yard prunings is allowed on designated permissive burn days. In all other areas, including Del Norte and Trinity counties, residential burning is not restricted to permissive burn days.

Particularly in Weaverville, alternatives to unlimited residential open burning to reduce PM-10 should be further evaluated. Options might include restricting burns to permissive burn days, restricting burning to certain seasons that are known to be good dispersion time periods, only allowing vegetative waste to be burned at designated waste disposal sites that would cause no impact on the Weaverville area, or a ban on all residential burning in Weaverville during the high PM-10 winter months.

Woodstove PM-10 Control Strategies:

Residential wood combustion in California follows seasonal and regional patterns. During the cold winter months, wood is burned more often than any other time of the year. On a per-household basis, wood consumption is higher in rural mountainous regions than in urban regions. When we speak of woodstoves, we mean fireplace inserts, wood burning stoves and pellet type stoves.

In 1987, Northern California Research Associated (NCRA) conducted a survey of residential wood combustion for ARB. Approximately 2,700,000 cords (6 million tons) of wood are burned annually in residential wood-burning appliances in California. Open fireplaces account for 51 percent of the wood burned, woodstoves 32 percent, and fireplace inserts 16 percent. The remaining 1 percent of the wood consumed is burned in furnaces,

cook stoves, and other devices that are not the subject of this control measure. In urban areas, fireplaces burned 65 percent of the wood, and woodstoves and fireplace inserts burned 35 percent of the wood. In rural areas, fireplaces burned 27 percent of the wood, woodstoves and fireplace inserts burned 72 percent of the wood, and 1 percent of the wood is burned in miscellaneous wood burning appliances.

Health Affects From Wood Smoke:

The need for improved wood burning regulations is necessary to protect human health. Wood smoke contains PM-10, carbon monoxide, formaldehydes, toxic, and carcinogenic compounds. PM-10 is small enough to be inhaled, and large enough to be imbedded in lung tissue. Carbon monoxide can mix with the hemoglobin in blood, and decrease the oxygen carrying capacity of blood. Formaldehydes can cause headaches, dizziness, and many other types of illnesses. Carcinogenic compounds are those known to cause cancer. Most notably, carcinogenic compounds from wood smoke are known to cause lung cancer.

There are many studies indicating that residential wood combustion is the source of many short and long term illnesses. Many people can experience eye, nose, and throat irritation due to wood smoke. Wood smoke is the cause of many aggravated cases of respiratory illnesses, such as asthma and bronchitis, and increases risk in heart patients. The elderly and children are especially susceptible to illnesses from wood smoke. EPA estimates that on a given bad air pollution day, breathing wood smoke particles is equivalent to smoking 16 cigarettes for that day.

Sierra Research, Inc. in October 1989 prepared a report for the U.S. Environmental Protection Agency, entitled "Residential Wood Use in California". One interesting statistic from this report was that Trinity County had one of the highest county averages of household wood burning usages in California. This information coupled with the physical setting in Weaverville and potential for strong temperature inversions, explains many of the wintertime high PM-10 levels monitored in that community.

The Residential Wood Burning Control Measures are described as follows:

- (a) Enhanced woodstove operation - Encourage improved performance of wood burning devices by establishing a program to identify deficiencies in stove operation and maintenance. Also providing a voluntary dryness certification program for dealers and or making free or inexpensive wood moisture checks available to residents. The District has developed and distributed a brochure which provides tips for reducing air pollution from wood heating. Public education is an important and ongoing part of this measure. Even with new EPA Certified Woodstoves, proper operation must be followed to achieve the designed PM-10 emission reductions.
- (b) Replacement of Conventional Woodstoves - Encourage and or require the accelerated changeover of existing devices to EPA Phase II or similar standards by

such approaches as subsidized stove purchases, tax credits, or other incentives. Other possible methods would be to encourage a reduction of wood burning devices by offering incentives for changeout, removal, or disabling the device.

The District has set aside \$25,000 in noncompliance penalty funds to be returned to the community as an incentive for replacement of conventional, higher polluting woodstoves with a more energy efficient less polluting EPA certified stove. Several options are available to use this financial incentive. A certain amount could be used as an outright grant for replacement. The funds could be used to purchase a certified replacement stove, with homeowner making monthly payments with zero or almost zero interest. This approach could subject the District to some risk of non-payment.

In areas, such as, Weaverville and Eureka, where woodstove emissions are a sizable portion of the PM-10 problem, older, inefficient conventional stoves that can last for 20 to 30 years or longer, must somehow be replaced or eliminated. This may be very difficult if relatively inexpensive alternative sources of heat are not available.

Another approach in upgrading existing woodstoves to the efficient EPA Certified Woodstove is utilized in Mammoth Lakes area and in Washoe County Nevada (Reno) area. This approach requires that during the sale of a home that the existing non-approved woodstove must be made inoperable and replaced with an EPA Certified stove. The circumstances that occur during a home sale, when funds are changing hands, is usually conducive for a transaction of this sort. A smooth, quick process would need to be set up to verify the completion of a certified stove installation as well as disposal of the old stove. Any delays could jeopardize the escrow and closing of a property sale.

- (c) New Housing Developments - Many communities prohibit the sale or installation of wood burning stoves in new homes unless they are EPA certified or equivalent. Equivalent devices would be a natural gas fired fireplaces or fireplace insert. Provisions may be added to the Air Quality Guidelines for General Plans which would encourage cities and counties to adopt general plan policies which limit wood burning devices in new residential developments. Some jurisdictions prohibit the installation of woodstoves in new multi-family dwelling units. The town of Mammoth Lakes allows one device per household and one device per apartment and or hotel complex.
- (d) Using Opacity of Smoke - Some Districts utilize opacity as an indication of improper stove use, improperly dried fuel, faulty equipment or non-certified stoves. This provides a basis for direct education on proper burning techniques, a means of clearly identifying common causes for excess smoke generation in a community, or it could be a direct basis for enforcement action.

- (e) Green, Yellow, Red - Woodstove Curtailments - Some agencies have developed a woodstove program on a signal light format for predicting good to poor dispersion of smoke days.

Red Days Predicted to be stagnant and no woodstove usage allowed, except if wood is the sole source of heat.

Yellow Days Only limited amount of woodstove usage is allowed. Only EPA certified stoves can be used. Conventional woodstove usage is prohibited.

Green Days Very good smoke dispersion days. All woodstoves can be used today.

This program requires some predictive meteorological expertise and some means to disseminate the information.

The San Francisco Bay Area operates a woodstove program along these lines titled "Don't Light Tonight". This is a voluntary program that targets several large employers (100+ employees). Employees are all notified of any predicted stagnate air conditions that are expected and requested to avoid use of their woodstove. This program has apparently met with good success.

- (f) Public Education - The District is very sensitive to programs like the woodstove program, that have a tendency to invade people's privacy. We believe that public education will continue to be an important cornerstone to the success to any woodstove control strategy. We will continue to promote education and encouragement. We will take advantage of the U.S. Forest Service wood cutting permit process to incorporate our brochure on "Wood Heating and Air Pollution". This assures the burning techniques advocated are getting to those individuals who will be using woodstoves.

- (g) Home Weatherization - Promote the need for less residential heating through better insulation techniques, through installation of double-paned windows, installation of weather stripping around doors and windows and so forth.

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