

BUTTE COUNTY AIR QUALITY MANAGEMENT DISTRICT

AIR QUALITY SUMMARY FOR 2008

The following is a summary of Butte County's air quality for 2008. This document gives the reader an overview of the two criteria pollutants of greatest concern - ozone (O₃) and fine particulate matter (PM10 and PM2.5). The data was obtained from the air monitoring sites located within Butte County.

The **Ambient Air Quality Standards** establishes the concentration at which a pollutant is known to cause adverse health effects to sensitive groups within the population, such as children and the elderly. Both the California and federal governments have adopted health-based standards for the *criteria pollutants*, which for this report include ozone, PM10 and PM2.5. In general, the air quality standards are expressed as a measure of the amount of pollutant per unit of air. For example, the particulate matter standards are expressed as micrograms of particulate matter per cubic meter of air (ug/m³) and the ozone standards are expressed as parts per million (ppm).

Ozone is a colorless gas with a pungent odor. It is the chief component of urban smog. Ozone is not directly emitted as a pollutant, but is formed in the atmosphere when reactive hydrocarbons (ROG) and nitrogen oxides (NO_x) precursor emissions react in the presence of sunlight. Meteorology and terrain play major roles in ozone formation. Generally, low wind speeds or stagnant air coupled with warm temperatures and cloudless skies provide for the optimum conditions. As a result, summer is generally the peak ozone season. Because of the reaction time involved, peak ozone concentrations often occur far downwind of the precursor emissions. Therefore, ozone is a regional pollutant that often impacts a widespread area.

Ozone impacts lung function by irritating and damaging the respiratory system. In addition, ozone causes damage to vegetation, buildings, rubber, and some plastics. Recognizing the health impacts of daylong exposure, the United States Environmental Protection Agency promulgated an 8-hour ozone standard in 1997 as a successor to the 1-hour standard, which was established in 1979. The Air Resources Board approved an 8-hour ozone concentration on April 28, 2005 and became effective in early 2006. Table 1 gives the State and National Ozone Standards effective in 2008.

AMBIENT AIR QUALITY STANDARDS - OZONE		TABLE 1
State Ozone Standard: 0.09 ppm for 1 hour, not to be exceeded. 0.07 ppm for 8 hours. not to be exceeded.	National Ozone Standards: --- 0.075 ppm for 8 hours, not to be exceeded, Based on the fourth highest concentration averaged over three years.* * Federal 8-hour ozone standard revised March 2008.	

Ozone Emission Trends air quality as it relates to ozone has improved greatly in all areas of California over the last 20 years, despite significant growth. In the Sacramento Valley Air Basin emission levels are projected to continue decreasing from 2005 to 2020. The overall decline for the 20-year period 1986 – 2006 is 17 percent. Looking at the number of days above the State and

national standards, the trend is much more variable. However, the number of exceedance days has declined since 1988. The maximum measured 1-hour concentrations have also decreased, but with more year-to-year variation.

Emissions of NO_x are trending downward from 1990 to 2020, and downward from 1975 to 2020 for ROG and carbon monoxide (CO). The decreases in NO_x, ROG, and CO are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources are by far the largest contributors to NO_x, ROG and CO emissions in the Sacramento Valley Air Basin. More stringent mobile source emission standards and cleaner burning fuels have largely contributed to the decline in NO_x, ROG and CO emissions.

Between 1980 and 2020, population in the Sacramento Valley Air Basin is projected to grow at a higher rate than the statewide average – a 140 percent increase compared with an 84 percent increase statewide. Population in the Sacramento Valley is projected to grow from 15 million in 1980 to 36 million in 2020. During this same period, the estimated increase in the number of vehicle miles traveled (VMT) each day is projected to be higher than the overall statewide value – a 200 percent increase in the Sacramento Valley Air Basin. VMT are projected to increase from nearly 30 million miles in 1980 to 90 million miles in 2020.

The National 8-hour ozone standard was created in 1997 to provide a level of health protection that is closer to California's own one-hour standard. The eight-hour standard of 0.08 part per million (ppm) provides greater protection against longer exposures at lower levels, the kind of air pollution often seen in the transport-impacted communities of the California foothills, like Paradise. On April 28, 2005, the California Air Resources Board (ARB) approved the nation's most health protective ozone standard with special consideration for children's health. The new 8-hour average standard at 0.070 ppm will further protect California's most vulnerable population from the adverse health effects associated with ground-level ozone, or smog.

The U.S. EPA revised the 8-hour ozone standard on March 12, 2008 to 0.075 parts per million (ppm). The previous standard, set at 0.08 ppm and because ozone is measured out to three decimal places, the standard effectively became 0.084 ppm: areas with ozone levels as high as 0.084 ppm were considered as meeting the 0.08 ppm standard, because of rounding.

In California, urban areas generally experience more pronounced peak ozone levels (during the day), while many downwind rural areas record slightly lower levels but for a more prolonged period (at night). This trend can be seen in the Chico and Paradise monitoring sites. Based on ozone data from the Paradise monitoring site for the period 2001-2003, Butte County was designated as a Basic nonattainment area for the federal 8-hour ozone standard. The District was required to submit a plan, which describes efforts to reduce ground-level ozone. However, the last three years of ozone data (2005-2007) show Butte County in attainment with the previous ozone standard (0.084 ppm). As such U.S. EPA has suspended the planning requirements until such time as the area is redesignated attainment or EPA determines that the area has violated the new 8-hour ozone standard.

On March 12, 2009, ARB submitted its recommendations for area designations for the revised federal 8-hour ozone standard. These recommendations are based on ozone air quality data

collected during 2006 through 2008. Butte County has been recommended as a nonattainment area for the new federal 8-hour standard and will be required to submit a Plan demonstrating compliance with the standards as expeditiously as possible.

Table 2 shows the ozone air quality data for 2008 and Figures 1 through 6 depict the data graphically. *Note: Federal 8-hour Ozone standard is not considered exceeded until the value is 0.075 ppm or above, State 8-hour and 1-hour Ozone standard is not considered exceeded until the value is 0.070 or 0.095 ppm or above respectively.*

BUTTE COUNTY OZONE AIR QUALITY DATA 2008 TABLE 2												
Ozone (ppm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Max. 1-Hour Chico	.043	.069	.058	.072	.072	.111	.096	.078	.077	.071	.046	.037
Days Above State Std.	0	0	0	0	0	1*	1*	0	0	0	0	0
Max. 8-Hour Chico	.040	.050	.054	.065	.064	.097	.084	.072	.067	.052	.032	.036
Days Above State Std.	0	0	0	0	0	6	7	1	2	0	0	0
Days Above Fed. Std.	0	0	0	0	0	1	0	0	0	0	0	0
Max. 1-Hour Paradise	.048	.068	.058	.072	.085	.122	.125	.083	.083	.075	.050	.039
Days Above State Std.	0	0	0	0	0	1*	2*	0	0	0	0	0
Max. 8-Hour Paradise	.046	.056	.057	.069	.074	.108	.108	.072	.080	.065	.048	.039
Days Above State Std.	0	0	0	0	1	9*	10*	1	2	0	0	0
Days Above Fed. Std.	0	0	0	0	0	9*	8*	0	1	0	0	0

*includes exceedances due to wildfire exceptional events.

Particulate Matter (PM10 and PM2.5) refers to particles with an aerodynamic diameter of 10 microns or smaller. For comparison, the average diameter of a human hair is about 70 microns. PM10 is a mixture of substances that includes elements such as carbon, lead, and nickel; compounds such as nitrates, organic compounds, and sulfates; and complex mixtures such as diesel exhaust and soil. These substances occur in the form of solid particles or as liquid droplets. Some particles are emitted directly into the atmosphere. Other particles, referred to as secondary particles, result from gases that are transformed into particles through physical and chemical processes in the atmosphere.

PM10 includes a subgroup of finer particles called PM2.5. The fine particles pose an increased health risk because they can deposit deep in the lung and contain substances that are particularly harmful to human health. The EPA promulgated national PM2.5 standards in 1997, and revised the 24-hour standard effective December 2006. Table 3 shows the State and National PM10 and PM2.5 standards.

On June 20, 2002, the Air Resources Board approved revision to the PM10 annual average standard to 20 ug/m³ and established an annual average standard for PM-2.5 of 12 ug/m³. These standards took effect in February 2003.

AMBIENT AIR QUALITY STANDARDS - PARTICULATE MATTER			TABLE 3
State PM10 Standards: 50 ug/m ³ for 24 hours and 20 ug/m ³ annual arithmetic mean, neither to be exceeded ----- - State PM2.5 Standards: 12 ug/m ³ annual arithmetic mean not to be exceeded	National PM10 Standards: 150 ug/m ³ for 24 hours, not to be exceeded more than once per year and 50 ug/m ³ for annual arithmetic mean averaged over three years.	National PM2.5 Standards: 35 ug/m ³ for 24 hours, not to be exceeded, based on the 98 th percentile concentration averaged over three years and 15 ug/m ³ annual arithmetic mean averaged over 3 years.	

Particulate Matter Emission Trends - direct emissions of PM10 and PM2.5 have increased in the Sacramento Valley Air Basin between 1975 and 2005 and are projected to continue increasing through 2020. Emissions are dominated by contributions from area-wide sources, primarily fugitive dust from paved and unpaved roads, fugitive dust from farm equipment, construction and demolition, and particulates from open burning (agricultural and residential) and residential fuel combustion (woodstoves and fireplaces). Emissions of directly emitted PM10 and PM2.5 from mobile sources and stationary sources have remained relatively steady.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NO_x, SO_x, ROG, and ammonia (secondary PM). On an annual average basis, directly emitted PM10 and PM2.5 contribute approximately 70 percent of the ambient PM10 and PM2.5 in the Sacramento Valley Air Basin.

Table 4 records the particulate matter data for the Chico, Gridley and Paradise sites. Data for the Chico site includes the filter based PM10 high volume mass sampler and PM2.5 mass sampler, which operate once every six days. The Paradise monitor data is a PM10 high volume mass sampler and operates once every six days. The Paradise PM10 monitor ended operation in April 2008. (A continuous PM2.5 mass sampler was installed at the Paradise site in November 2008. This data will be reported in the 2009 annual summary). All high volume mass samplers in the State operate on the same monitoring schedule (6-day) other than special purpose monitors. The one in 6-day monitoring is less resource intensive and provides data for every day of the week as the schedule progresses through the year.

The Chico monitoring station also includes two continuous PM2.5 mass samplers known as BAMM monitors. This data is useful for public reporting and understanding diurnal and episodic behavior of fine particles, background monitoring, and transport assessment. Continuous monitors also provide 24-hour average data for the days when filter-based samplers are not operating. However, continuous PM2.5 monitors have not been approved as a federal reference method and therefore cannot be used to determine attainment status.

In the summer, directly emitted particles from motor vehicle exhaust and dust from paved roads and construction activities are major contributors to fine particulate levels. The data show contributions from secondary sulfate and nitrate formed from reactions in the atmosphere of nitrogen oxides and sulfur oxides from motor vehicle exhaust and other combustion processes. During the winter, wood smoke from residential fireplaces becomes a significant source of fine

particulates. Winter conditions – cool temperatures, low wind speeds, low inversion layers, and high humidity also favor the formation of nitrates.

*Butte County had exceedances in 2008 of the State 24-hour PM10 standard and the federal 24-hour PM2.5 standard occurring during the wildfire exceptional events in June and July. Additional exceedances occurred in January resulting from contributions from residential wood smoke. The Paradise PM10 monitor showed no exceedances during the few months it was in operation.

Figure 7 graphs the PM2.5 maximum 24-hour data for Chico. Butte County data shows 6 exceedances of the federal PM2.5 standard 2 occurring in January and four during the wildfires. It should be noted that this data is collected once every six days and is used for attainment purposes. Data from the continuous PM2.5 monitor shows 34 days exceeding the federal standard due to the wildfires and another 27 days all occurring in the winter season showing the influence of residential wood combustion in the winter months. Figures 8 and 9 graphs the PM10 results for Chico and Paradise, respectively. Figure 10 compares the Chico and Paradise PM10 data. Figure 11 compares the PM2.5 data from the BAMM monitors located at Chico and Gridley. Paradise BAMM data will be available next year.

To account for the limited PM10 data collected with the SSI mass samplers the State calculates an expected day value for the number of days above the PM10 standard. For example: in 2000 the number of days above the PM10 standard monitored by the SSI was 9 days. The calculated expected number of days above the standard reported by the State was 45 days.

Butte County is considered an attainment area for the federal PM2.5 standard based on monitoring data from 2000-2002. Butte County is non-attainment for the State PM2.5 annual average. The federal PM2.5 24-hour standard was changed to 35 ug/m3 effective December 18, 2006. With the change in the standard, most of Butte County is designated as non-attainment for the federal PM2.5 daily standard.

BUTTE COUNTY PM10 & PM2.5 AIR QUALITY DATA 2008												
TABLE 4												
Federal Reference Monitors (FRM)												
PM10 (ug/m3)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Max 24-Hour PM10 Chico	81	34	22	34	21	112	141	33	36	40	36	28
Days Above State Std.	1	0	0	0	0	2	3	0	0	0	0	0
Max 24-Hour PM10 Paradise	9	21	17	30	30	-	-	-	-	-	-	-
Days Above State Std.	0	0	0	0	0	-	-	-	-	-	-	-
Max 24-Hour PM2.5 Chico (FRM)	69	24	12	9	8	94	108	14	12	14	33	33
Days Above Fed. Std.	2	0	0	0	0	2*	2*	0	0	0	0	0
BAMM Continuous Monitors (for reporting purposes only)												
Max 24-Hour PM2.5 Chico (BAMM)	78	44	16	12	15	182	85	25	20	27	45	61
Days Above Fed. Std	7	5	0	0	0	8*	14*	0	0	0	3	8
Max 24-Hour PM2.5 Gridley (BAMM)	36	31	17	10	19	136	57	25	19	43	36	47
Days Above Fed. Std	1	0	0	0	0	6*	6*	0	0	1	1	1

*includes exceedances due to wildfire exceptional events.