

**State of California  
AIR RESOURCES BOARD**

**Quarterly Report to the California Legislature  
on the  
Air Resources Board's  
Fine Particulate Matter Program**

**First Quarter 2001**

California Environmental Protection Agency



**Air Resources Board**

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*“The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web site at [www.arb.ca.gov](http://www.arb.ca.gov).”*

## **Executive Summary**

This report provides the first quarterly update of 2001 on the Air Resources Board's (ARB) fine particulate (PM2.5) program required by Fiscal Year 1999-2000 budget language.

On February 27, the U.S. Supreme Court upheld the federal PM2.5 standards and rejected industry's argument that cost should be considered in setting air quality standards. We now expect U.S. Environmental Protection Agency (U.S. EPA) will issue guidance detailing specific planning requirements and timelines for the PM2.5 standards. In the meantime, we have continued progress on the major elements of ARB's particulate program: health and exposure research, air quality monitoring, emission inventory development, air quality modeling, and control strategy development.

Key activities during this quarter (January through March) include the completion of data collection for the annual and winter elements of the California Regional PM10/PM2.5 Study. We are now developing a final database to house the data, as well as data analysis and air quality modeling plans.

We started developing ARB's 2001 Clean Air Plan, which will identify a comprehensive set of new strategies to reduce emissions that contribute to ozone, particulate matter, carbon monoxide, and air toxics (including diesel particles) at the community, regional, and state level. These strategies will build on our existing programs. In February and March, we held a series of kickoff workshops to introduce the Plan to the public and to begin soliciting input on potential emission reduction strategies. This spring, we will hold additional workshops focusing on control strategies and technical components of the Plan.

The initial implementation stages of ARB's Diesel Risk Reduction Plan have involved a series of public consultation meetings. In February and March we held workshops on plan implementation with the agricultural community at eight locations throughout the State. In addition, we conducted a meeting on possible approaches for developing Airborne Toxic Control Measures from new and existing diesel-fueled stationary and portable engines and a workshop on regulatory fuel activities. We are looking to lower the sulfur content of California's diesel fuel to enable the use of advanced emission control technology in diesel-fueled engines and vehicles.

In January, our Board voted to keep California's ten-year old Zero Emission Vehicle (ZEV) mandate, directing vehicle manufacturers to produce between 4,450 and 15,454 electric cars starting in 2003. The number of ZEVs in 2003 will depend on the type of ZEVs each individual manufacturer chooses to bring to the market. ARB's ZEV mandate is meeting its goal of spurring manufacturers to develop not just battery-powered electric vehicles, but also new clean technologies, including fuel cell vehicles, electric-gasoline hybrids, and super clean gasoline vehicles.

## **Introduction**

This is the seventh in a series of quarterly reports to the Legislature on ARB's PM2.5 program required in Fiscal Year 1999-2000 budget language. The major elements of the ARB's particulate matter program are health and exposure research, air quality monitoring, emission inventory development, air quality modeling, planning, and control strategy development. In this report, we highlight last quarter's (January through March) activities in: (1) the California Regional PM10/PM2.5 study; (2) health and exposure research; (3) establishment of the air quality monitoring network; (4) development of ARB's comprehensive 2001 Clean Air Plan; (5) implementation of our Diesel Risk Reduction Plan; (6) amendments to California's ZEV program; and, (7) continuation of the heavy-duty vehicle inspection programs.

On February 27, the U.S. Supreme Court upheld the federal PM2.5 standards and rejected industry's argument that cost should be considered in setting air quality standards. In 1997, the U.S. EPA promulgated new federal standards for PM2.5. The PM2.5 standards were challenged in court by the American Trucking Association and a number of other business and industry groups. In 1999, a three-judge panel of the U.S. Court of Appeals for the District of Columbia returned the standards to U.S. EPA to provide a better rationale for how it selected the particular levels of the standards. In May 2000, the Supreme Court granted a request filed by U.S. EPA and the Department of Justice to review the case. The Supreme Court also granted a separate request from the plaintiffs to review the Court of Appeal's ruling that air quality standards must be based solely on health effects, not on economic costs for meeting the standards.

As a result of the U.S. Supreme Court's ruling, we expect the schedule for implementing the standards will continue as originally envisioned. We will continue collecting PM2.5 monitoring data. Three years of monitoring data are needed to designate areas as attainment or nonattainment. In addition, when U.S. EPA promulgated the PM2.5 standards, it agreed to complete its next health review of the standards prior to designating areas. That review is scheduled to be finished in the 2002-2003 time frame. Thus, we expect nonattainment areas will be designated by 2003, at the earliest. PM2.5 attainment plans would then be due three years later – or 2006 at the earliest. We expect U.S. EPA will be issuing guidance detailing the specific planning requirements and timelines for the PM2.5 standards, now that the court case has been resolved.

## **California Regional PM10/PM2.5 Air Quality Study**

The \$27 million California Regional PM10/PM2.5 Air Quality Study will provide the key technical information needed to develop PM2.5 State Implementation Plans and additional particulate reduction strategies for the San Joaquin Valley and surrounding areas. The now completed field program was divided into: (1) a long-term program from December 1999 through January 2001; (2) a summer field program in July and August of 2000; (3) a fall episodic program in October and November of 2000; and (4) a winter episodic program in December and January 2000/2001. The field program was

conducted over a domain extending from the Pacific Ocean in the west into the Mojave Desert in the east, and from the upper Sacramento Valley in the north to the Tehachapi Mountains in the south.

- ***Annual Field Program***

The annual field program concluded on January 31, 2001. Approximately 50 air quality monitoring sites and 13 meteorological monitoring sites were successfully operated during the 14-month study period.

- ***Fall Field Program***

The fall field program was conducted from October 8, 2000 through November 14, 2000. Unusually early and heavy rainfall occurred during the fall study, suppressing typical levels of fugitive dust. We are conducting some preliminary analysis of the data collected to determine whether the current data will meet study objectives, or whether the study should be repeated during the fall of 2001.

- ***Winter Field Program***

The winter field program commenced on December 1, 2000, and concluded on February 3, 2001. The winter study focused on PM<sub>2.5</sub>, which has historically recorded the highest concentrations during the winter months. Secondary ammonium nitrate and carbonaceous material are the dominant constituents of PM<sub>2.5</sub> during this time period. Specific issues addressed in the winter monitoring program included identification of the sources of carbonaceous material, determination of the limiting precursors for secondary particulate matter (PM) species, surface and aloft transport and mixing mechanisms under low wind speed conditions, and the zone of influence of both primary and secondary sources of PM. The winter measurement program included an expanded set of anchor sites, and an enhanced upper air monitoring network. Emphasis was placed on collection of continuous and species-specific particulate measurements to support both receptor and grid-based modeling approaches. Methods for collecting information on air quality aloft included the use of a 100 meter tower, an elevated site in the Sierra Nevada mountains, and a remotely piloted blimp which was specifically designed to fly under low visibility, stagnant conditions.

On 15 days forecasted to have the highest PM concentrations, additional special measurements were collected including organic species tracers, fog chemistry, time-of-flight mass spectrometry, and comprehensive diurnal measurements of particulate size and composition.

During the two-month study period, forecasting was conducted seven days a week. The forecasts were then posted daily on both the Web and on a voicemail system to alert contractors of upcoming intensive monitoring period operations with a 36-hour notice. The 15 selected intensive monitoring days were grouped into four sampling periods:

- December 15-18, 2000
- December 26-28, 2000
- January 4-7, 2001
- January 31-February 3, 2001

The first intensive monitoring period resulted in fairly low PM concentrations. However, the episode served a useful purpose to test and identify problems in the monitoring network. The second and third intensive monitoring periods represented the beginning and end of an extensive two-week episode that encompassed all of Central California. During this time period, exceedances of the PM<sub>2.5</sub> standard occurred on many days and at numerous sites throughout the monitoring domain. Significant concentrations of carbon and nitrate were observed, especially at many of the urban sites. Preliminary data indicate that maximum concentrations reached 230 ug/m<sup>3</sup> for PM<sub>10</sub> and 159 ug/m<sup>3</sup> for PM<sub>2.5</sub> at Bakersfield on January 6, 2001. The federal 24-hour standards are 150 ug/m<sup>3</sup> for PM<sub>10</sub> and 65 ug/m<sup>3</sup> for PM<sub>2.5</sub>. The final episode resulted in moderate PM concentrations.

At the conclusion of the field program, the monitoring equipment that was purchased for the study was distributed amongst the sponsoring agencies. This equipment will be used to enhance the existing ARB/air district monitoring efforts, supplement the U.S. EPA Supersite in Fresno, and support children's health studies.

- ***Data Analysis***

We are developing a final database structure to house the large amount of data collected during the field programs. The data is currently undergoing review and quality assurance, with final data submittal planned for third quarter, 2001. We are also developing plans for analysis and air quality modeling of the data to support development of clean air plans. The data analysis and modeling will assess the relationships between air quality, meteorology, and emissions in order to elucidate the mechanisms contributing to PM formation, identify contributing sources, and assess the effects of potential control measures.

## **Health and Exposure Research**

ARB has long recognized that PM is harmful and has taken a lead in research to more clearly define how particle pollution impacts the health of Californians. Extensive research programs are underway both nationally and within California to clarify some of the uncertainties regarding who is at risk, whether a safe level of PM can be determined, the mechanism of injury, and the role of specific components of PM in producing harmful health impacts. ARB is also a leader in research on exposure to particles and their toxic components in indoor, outdoor, and in-vehicle environments.

- ***Review of California's PM and Sulfate Standards***

In January, we held a conference call with U.S. EPA to discuss our ongoing review of the state ambient air quality standards for PM10 and sulfates and U.S. EPA's actions to revise the federal PM standards. As required by the Children's Environmental Health Protection Act -- Senate Bill 25, Escutia -- ARB and the Office of Environmental Health Hazard Assessment are currently reviewing the state PM10 and sulfate standards for their ability to adequately protect public health, including that of infants and children. We will present an informal update on PM standard setting issues to our Board later this year and have invited U.S. EPA to participate in the presentation. We expect to bring the final state standards review to our Board for consideration in April 2002. U.S. EPA anticipates finishing its periodical review of the PM standards in the 2002-2003 time frame.

- ***School Bus Study***

In February, the Research Screening Committee approved the proposed study to characterize the range of children's pollutant exposures during school bus commutes. Children who ride buses to school are potentially exposed to high concentrations of diesel exhaust particles and other vehicle pollutants. The objective of this study is to characterize school bus commute exposures experienced by children while riding on buses, waiting at bus stops, or waiting near idling buses during after-school loading. Measurements will be obtained inside and near buses under a variety of scenarios for commutes involving diesel, gasoline, and alternatively fueled buses and diesel-fueled buses retrofitted with particulate traps. We will use the results of this study to better estimate children's exposure to diesel exhaust particles and other bus-related pollutants, and to determine what fraction of children's total exposure is attributable to school bus-related activity. We expect to bring the proposal to our Board for consideration in April.

## **Air Quality Monitoring**

California's air quality monitoring program provides information used for determining which areas violate standards, characterizing the sources that contribute to pollution, assessing pollution transport, and supporting health studies and other research. Monitoring data also provide the ultimate check on the effectiveness of our air quality programs. ARB and local districts are continuing to expand the PM2.5 monitoring network including speciation monitors, continuous samplers, and background monitors. Speciation monitors provide information about the composition and ultimately the sources of PM2.5 pollution. To provide "real time" PM2.5 air quality information, we are adding continuous PM2.5 monitors to our network. Background sites are intended to quantify PM2.5 concentrations in the absence of anthropogenic emissions.

In addition, the Children's Environmental Protection Act -- Senate Bill 25, Escutia -- requires the ARB to measure the levels of air pollution, including PM, in places where children are present, such as schools and parks, in six communities across California.

Information will be collected for about one year and will be used to determine if the State is adequately measuring the levels of air pollution affecting our children with the existing monitoring network.

- ***Speciation Monitors***

As part of the effort to build a national speciation monitoring network, U.S. EPA requires the deployment of filter-based speciation monitors at seven sites in California. During this quarter, we completed the installation of the required monitors, with the set up of samplers in Bakersfield, El Cajon, Riverside, and Simi Valley. Monitors were previously installed in San Jose, Sacramento, and Fresno.

- ***Continuous Mass Monitors***

ARB and local districts have continued to acceptance-test and deploy Beta Attenuation Monitors (BAMs). Approximately 50 BAM units will be part of the PM2.5 monitoring network. ARB purchased 37 of these units with a combination of federal and state funds. About 25 units have been deployed in the State and are now operational, six of which were installed in the first quarter of 2001. We targeted the location of three of these monitors to sample children's exposure to particulates in support of ARB's Children's Environmental Health Protection Program. In the next quarter, we expect to install at least five additional BAM units.

- ***Background Sites***

We have now completed the installation of BAM units and meteorological equipment at the San Nicolas Island and Point Reyes National Seashore sites. In addition, we selected an appropriate location for the San Rafael Wilderness site.

## **Planning**

ARB's goal is to ensure that all individuals in California, especially children and the elderly, can live, work, and play in a healthful environment – free from harmful exposure to air pollution. To continue progress towards this goal, we develop air quality plans, through a combination of established and new air quality programs. The key to clean air is identifying and implementing a comprehensive set of strategies that ARB will pursue to reduce emissions at the source, through the use of zero and near-zero emission technology, reformulation of fuels, and other pollution prevention methods.

- ***ARB's 2001 Clean Air Plan: Strategies for a Healthy Future***

We have started developing ARB's 2001 Clean Air Plan which will identify a comprehensive set of new strategies to reduce emissions that contribute to ozone, PM, carbon monoxide, and air toxics (including diesel particles) at the community, regional, and state level. These strategies will build on our existing programs to protect public health and the environment, as well as to fulfill the Board's obligations to:



- Work with environmental justice communities to develop near-term actions to reduce the health risk from air pollution.
- Identify new measures to reduce emissions by 2005 to aid attainment of the federal ozone and PM standards in the San Joaquin Valley, as part of the region's revision to its federal air quality plan.
- Seek opportunities to increase the effectiveness of two initiatives that culminate in 2010 – our program to reduce exposure to diesel particles statewide, and our strategies to meet the federal one-hour ozone standard in the Los Angeles area.
- Expand the scope of our control program to look beyond 2010. This longer timeframe will enable us to begin defining the next wave of technology-based requirements for the post-2010 timeframe to address continued growth and progress toward health-based state standards. Extending our air quality view to 2020 will also provide better support for transportation planning, which must use a 20-year horizon.

In February and March, we held a series of four kickoff workshops to introduce the Plan to the public and to begin soliciting input on potential emission reduction strategies. This Spring, we will hold additional workshops, focusing on control strategies and on the technical components of the Plan. We anticipate releasing a draft Plan in June and presenting the Plan for the Board's consideration this September.

### **Control Strategy Development and Implementation**

ARB develops control strategies for stationary, area, and mobile sources to reduce emissions and achieve air quality goals. The development of control strategies is based on emission inventories and modeling data, considering the need for additional reductions to meet state and federal requirements, existing controls, and technical feasibility. Control strategies are also evaluated for cost-effectiveness, and socioeconomic and environmental impacts. In addition, we are also pursuing emission reductions from voluntary programs by providing grants. Our assessment of the controls needed to attain state and federal standards will include estimating the PM<sub>2.5</sub> benefits from current and planned control programs for PM<sub>10</sub> and ozone.

Efforts to meet PM air quality standards relate closely to our efforts to characterize and manage the risk associated with toxic particulate emissions from diesel engines. An advisory committee of representatives from industry, environmental groups, government agencies, and the public is assisting with our risk management activities.

- ***Diesel Risk Management***

In September 2000, the ARB approved the Risk Reduction Plan that outlines a comprehensive program to further reduce PM emissions and resultant health risk from diesel-fueled engines and vehicles. Overall, emissions from diesel engines are responsible for the majority of the potential airborne cancer risk in California. The plan builds upon existing regulations and initiatives already underway to reduce diesel PM emissions. The plan includes the development of: (1) new regulatory emission standards for all new diesel-fueled on-road, off-road, and stationary engines and vehicles; (2) new retrofit requirements for existing diesel engines and vehicles where determined to be technically feasible and cost effective; and, (3) new requirements to reduce the sulfur content of diesel fuel. Low-sulfur fuel will enable the use of advanced diesel PM control technology to meet future emission standards. Full implementation of the plan is projected to result in 75 percent reduction of diesel PM emissions and associated health risk by 2010. We have initiated the plan implementation process and have held the following meetings:

- The second meeting of the International Diesel Retrofit Advisory Committee (February) – The committee was formed in September 2000 to advise ARB on retrofit technology and market development. The committee is made up of over 40 members including technical experts and stakeholders representing agricultural, industry, and environmental interests.
- A series of consultation workshops with the agricultural community on plan implementation at eight locations throughout the State (February-March);
- A public consultation meeting to discuss possible approaches for the development of Airborne Toxic Control Measures from new and existing diesel-fueled stationary and portable engines (February);
- Initial meetings with managers of public fleets, refuse removal, and recycling companies on approaches to reducing in-use emissions from off-road vehicles.
- Our first workshop on regulatory fuel activities (February) - We are looking to lower the sulfur content of California's diesel fuel for use in on- and off-road engines and vehicles, as well as requiring use of low-sulfur diesel fuel in stationary diesel engines that have been equipped with retrofit equipment. We anticipate holding regular public workshops and presenting our proposal to the Board for consideration in July 2001.

- ***Amendments to the California Zero Emission Vehicle Regulations***

In January, the Board voted to keep California's ten-year old Zero Emission Vehicle (ZEV) mandate, directing vehicle manufacturers to produce between 4,450 and 15,454 electric cars starting in 2003. The number of ZEVs in 2003 will

depend on the type of ZEVs each individual automaker chooses to bring to the market. Meanwhile, the Board's action also requires about 100,000 other highly clean advanced technology vehicles in 2003, with this number increasing to more than 400,000 by 2006. The Board also decided to begin in 2007 including heavier sport utility vehicles, pickup trucks, and vans in the sales figures used to calculate the number of ZEVs each vehicle manufacturer is required to sell in California. This will increase the number of vehicles used to calculate ZEV requirements from under 1 million to more than 1.5 million. The January Board meeting saw a major automaker for the first time voice acceptance of the ZEV mandate. A spokesman for Ford addressed the Board, saying the automaker is prepared to fulfill its share of the ZEV requirement in 2003. ARB's ZEV mandate is meeting its goal of spurring vehicle manufacturers to develop not just battery-powered electric vehicles, but also other new clean technologies, including fuel cell vehicles, electric-gasoline hybrids, and super clean gasoline vehicles.

- ***Heavy-Duty Vehicle Roadside Inspection Program***

Under the Heavy-Duty Vehicle Inspection Program, inspectors conduct random roadside tests of diesel trucks to ensure that smoke emissions are within acceptable levels and that emission control devices have not been tampered with. Owners of failing vehicles are issued citations and required to make repairs. Through the end of February, we have inspected close to 53,000 vehicles since the program was restarted in June 1998 (with almost 3,000 inspections since our last report). The inspections have resulted in close to 3,000 citations and over 900 non-penalty "fix-it" tickets. The failure rate has decreased from 11 percent when the program was first restarted to a current 7.2 percent. Close to 2,800 trucks and buses have been repaired to date. We have instituted a formal program to pursue those owners who are delinquent in clearing their citations in order to ensure that repairs are made. Industry acceptance of the program is good, as indicated by the low rate of citation appeals – two percent. The penalties that we collect through the inspection program are recycled back to the industry in the form of incentive programs that promote cleaner heavy-duty engines.

- ***Periodic Self-Inspection Program***

The Periodic Smoke Inspection Program requires all California fleets with two or more trucks or buses to perform annual smoke and anti-tampering inspections and repair failing vehicles. The first annual self-inspections of heavy-duty diesel-powered vehicle fleets had to be completed by October 1, 1999. Through the end of February 2001, we have conducted nearly 5,300 fleet audits and found a 48 percent full-compliance rate and 41 percent partial compliance. We are working with owners of partial and full non-complying fleets to bring their fleets into compliance. To date, we have performed three follow-up audits on recalcitrant fleets, wherein owners were issued citations for non-compliant vehicles.