

California Environmental Protection Agency



Air Resources Board

Staff Report:

**Public Hearing to Consider Amendments to the
Ambient Air Quality Standards for
Particulate Matter and Sulfates**

**Prepared by the Staff of
the Air Resources Board and
the Office of Environmental Health Hazard Assessment**

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1. Executive Summary

In this report, the staff of the Air Resources Board proposes amendments to the state Ambient Air Quality Standards (AAQS) for particulate matter. The potential health impacts from exposure to particulate matter (PM) air pollution are significant. Health effects associated with PM exposure include: premature mortality, increased hospital admissions for cardiopulmonary causes, acute and chronic bronchitis, asthma attacks and emergency room visits, respiratory symptoms, and days with some restriction in activity. These adverse health effects have been reported primarily in infants, children, the elderly, and those with pre-existing cardiopulmonary disease.

The Children's Environmental Health Protection Act (Senate Bill 25, Senator Martha Escutia; Stats. 1999, Ch. 731, Sec. 3) requires the Air Resources Board (ARB or Board), in consultation with the Office of Environmental Health Hazard Assessment (OEHHA), to "review all existing health-based ambient air quality standards to determine whether, based on public health, scientific literature, and exposure pattern data, these standards adequately protect the health of the public, including infants and children, with an adequate margin of safety" (Health & Safety Code section 39606(d)(1)). In December 2000, as a result of that requirement, the ARB approved a joint ARB/OEHHA staff report (ARB and OEHHA, 2000) that contained preliminary reviews of all of the health-based California ambient air quality standards. These reviews were not exhaustive, but were narrowly targeted to two purposes: (1) to determine whether the existing ambient air quality standards adequately protect the health of the public, including infants and children, with an adequate margin of safety; and (2) to prioritize for full review those standards determined not to adequately protect public health (Health & Safety Code section 39606(d)(1) and (2)).

The staff recommended, and the Board concurred, that among several standards deemed possibly inadequate, the existing standards for particulate matter less than 10 micrometers in aerodynamic diameter (PM₁₀) should be the first to undergo full review. This recommendation was based on the assessment that almost everyone in California is exposed to levels at or above the current State PM₁₀ standards during some parts of the year, and that the statewide potential for significant health impacts associated with PM exposure was determined to be large and wide-ranging. Finally, the staff recommended, and the Board concurred, that the standard for sulfates be reviewed concurrently with the PM₁₀ standards since sulfates are a component of particulate matter.

This report presents the findings and recommendations of a joint ARB/OEHHA review of the health and scientific literature on PM and sulfates, as well as exposure pattern data for PM and sulfates in California. The proposed amendments to the AAQS for particulate matter are based on a health effects review and recommendations from OEHHA. The scientific review suggests the need for separate standards for PM_{2.5} (particulate matter less than 2.5 micrometers in aerodynamic diameter) in addition to revising the standards for PM₁₀ to make them more health protective. The review also concluded that the standard for sulfates should be retained.

In accordance with Health & Safety Code section 57004, the proposed amendments were peer reviewed by the Air Quality Advisory Committee (AQAC), an external scientific peer review committee, comprised of world-class scientists in the PM field and appointed by the Office of the President of the University of California.

As part of the review process, a joint ARB/OEHHA staff report entitled "Review of the California Ambient Air Quality Standards for Particulate Matter and Sulfates" was submitted to the AQAC for their review. This report, containing recommendations for revising the PM

standards, was released to the AQAC and the public on November 30, 2001. Public workshops to receive community input on the proposal to review the standards were held during December 2001 in Sacramento, Oakland, Bakersfield, El Monte, Mira Loma, and Huntington Park.

The AQAC met on January 23 and 24, 2002, to review the scientific basis of the recommendations and comments received from the public. The AQAC's major findings were that the recommendations for amending the PM standards in the November 30, 2001 report were based upon sound scientific knowledge, methods, and practices and supported by the scientific literature. However, the AQAC did not concur with the lack of a recommendation for a 24-hour standard for PM_{2.5}. The AQAC concluded that there was adequate information in the scientific literature and in the studies reviewed in the November 30, 2001 report to support a 24-hour standard for PM_{2.5}. The AQAC requested staff to develop a proposal to establish a 24-hour PM_{2.5} standard and to incorporate it into the overall staff recommendation. In response, staff from ARB and OEHHA developed a proposal entitled "Draft Proposal to Establish a 24-hour Standard for PM_{2.5}, Report to the Air Quality Advisory Committee." This draft proposal and associated public comments were reviewed and approved by the AQAC at its meeting on April 3, 2002. Following that AQAC meeting, the staff report was revised to incorporate the proposal to establish a 24-hour PM_{2.5} standard along with written and oral comments received from the AQAC and the public.

Proposed Amendments to the Ambient Air Quality Standards for Particulate Matter:

The proposed amendments to the standards are largely based on results from epidemiological studies in hundreds of cities. These studies indicate strong associations between both long- and short-term exposure to PM and a variety of adverse health effects, as described above. California ambient air quality standards have four elements (see Health and Safety Code section 39014, and title 17, California Code of Regulations, sections 70100 and 70200): (1) definition of the air pollutant, (2) an averaging time, (3) a pollutant concentration, and (4) a monitoring method to determine attainment of the standard. Staff's recommendations for amending the ambient air quality standards for PM and sulfates are summarized below.

Pollutant, Concentrations and Averaging Times:

- PM₁₀ Annual-Average Standard – Lower the annual-average standard for PM₁₀ from 30 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to **20 mg/m³, not to be exceeded**. Revise the averaging method from an annual geometric mean to an annual arithmetic mean. This recommendation is based on the results of numerous epidemiological studies which have found associations between long-term PM₁₀ exposure and adverse health effects, such as mortality and morbidity from cardiopulmonary causes.
- PM₁₀ 24-hour-Average Standard – Retain the 24-hour-average standard for PM₁₀ at **50 mg/m³, not to be exceeded**.
- PM_{2.5} Annual-Average Standard – Establish a new annual-average standard for PM_{2.5} at **12 mg/m³, not to be exceeded**. Establish the new PM_{2.5} standard as an annual arithmetic mean. This recommendation is based on a growing body of epidemiological and toxicological studies showing significant toxicity (resulting in mortality and morbidity) related to exposure to fine particles.
- PM_{2.5} 24-hour-Average Standard – Establish a new 24-hour-average standard for PM_{2.5} at **25 mg/m³, not to be exceeded**. This recommendation is based on epidemiological

studies showing associations between ambient PM_{2.5} levels and mortality and morbidity resulting from cardiopulmonary causes.

- Sulfates 24-hour-Average Standard – Retain the 24-hour-average standard for sulfates at **25 mg/m³**.

Monitoring Methods, Samplers, and Instruments:

- PM₁₀ Monitoring Method – Adopt the Federal Reference Method (FRM) for PM₁₀ as the method for California.
- PM_{2.5} Monitoring Method – Adopt the Federal Reference Method (FRM) for PM_{2.5} as the method for California.
- Continuous PM Samplers – Adopt those continuous PM samplers which have been found to be suitable for determining compliance with the state PM₁₀ and PM_{2.5} AAQS, and designate them as California approved samplers (CAS).
- Sulfates Monitoring Method – Revise the sulfates monitoring method by deleting the current total suspended particle (TSP) sulfates method, ARB method MLD 033, and replacing it with the existing ARB method for PM₁₀ sulfates, ARB method MLD 007.

Health Benefits:

The health benefits from attaining the proposed standards are substantial. For example, a quantitative risk assessment estimated that attainment of the proposed annual PM₁₀ standard from current ambient levels would result in a reduction of approximately 6,500 cases (3,200 – 9,800 for a 95 percent confidence interval (95% CI)) of premature mortality per year. This estimate is based on the assumption that mortality is primarily associated with exposure to PM_{2.5} rather than with the coarse PM fraction. Estimated annual reductions in hospitalizations related to attaining the proposed PM₁₀ standards are 1,200 (66-2,300, 95% CI) for chronic obstructive pulmonary disease, 1,700 (760-2,600, 95% CI) for pneumonia, 3,100 (2,500-3,600, 95% CI) for cardiovascular causes, and 960 (400-1,500, 95% CI) for asthma. Among children ages 7 to 14, attainment of the PM₁₀ standard is estimated to result in about 389,000 (161,000 –573,000, 95% CI) fewer days of lower respiratory symptoms per year. Of these, approximately half of the days of lower respiratory symptoms may be associated with attainment of the proposed PM_{2.5} standard.

Other Recommendations:

- Staff recommends that the standards for PM and sulfates be revisited within five years, to evaluate new evidence regarding the health effects associated with averaging time, particle size, chemistry, and concentration.
- Staff also recommends that further scientific information be gathered and research be conducted into the health effects of short-term exposures to PM, especially effects from less than 24-hour exposures. This information should be considered when staff revisits the PM standards to determine if AAQS with averaging times of less than 24 hours would be appropriate.

Environmental and Economic Impacts:

The proposed ambient air quality standards will in and of themselves have no environmental or economic impacts. Standards simply define acceptable air quality. Local air pollution control or air quality management districts (Districts) are responsible for the adoption of rules and regulations to control emissions from stationary sources, while the Board is responsible for controls related to mobile sources. A number of different control measures are possible,

and each will have its own environmental and economic impacts. These impacts will be evaluated when specific control measures are proposed by the ARB or the Districts.

Environmental Justice Concerns:

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. Ambient air quality standards define clean air, therefore, all of California's communities will benefit from the proposed health-based standards.

Comment Period and Board Hearing:

Release of this staff report opens the official 45-day comment period required by the Administrative Procedure Act. Please direct all comments to either the following postal or electronic mail address:

Clerk of the Board
Air Resources Board
1001 "I" Street, 23rd Floor
Sacramento, California 95814
aaqspm@listserv.arb.ca.gov

To be considered by the Board, written submissions not physically submitted at the hearing must be received at the ARB no later than 12:00 noon, June 19, 2002.

Public workshops are scheduled for June 2002 to present the recommendations and receive public input on the Report. Information on these workshops, as well as summaries of the presentations from past workshops and meetings are available by calling (916) 445-0753 or at the following ARB website: www.arb.ca.gov/research/aaqs/std-rs/std-rs.htm.

The final recommendations for revising the PM and sulfate standards will be presented to the Board at a public hearing scheduled for June 20, 2002.

The staff recommends that the Board adopt the proposed amendments to the Ambient Air Quality Standards for Particulate Matter and Sulfates. The proposed amendments and their basis are described in detail in this staff report.

1.1 References

Air Resources Board and Office of Environmental Health Hazard Assessment (2000). Adequacy of California Ambient Air Quality Standards: Children's Environmental Health Protection Act. Staff Report. Sacramento, CA. Available at <http://www.arb.ca.gov/ch/ceh/airstandards.htm>.