Priscilla Andrea Ulloa Menares

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Para: Priscilla Andrea Ulloa Menares
CC: Smith, Linda@ARB
Asunto: California and U.S. PM10 Standard
Datos adjuntos: Federal Register_PM_2006_October_17.pdf; PMfinal_FSOR_2002.pdf

Hello Ms. Priscilla Andrea Ulloa Menares,

Dr. Linda Smith has asked me to respond to your questions regarding the differences between California's and the U.S. EPA's PM10 standards.

The California PM10 Standard was last revised in 2002. Its goal was to define an acceptable level of ambient exposure to particulate matter with a diameter less than 10 microns. This size fraction also includes PM2.5. Based on a literature review performed prior to 2002, there was enough data supporting an annual average standard to protect against the long-term health effects of PM10 exposure.

Unlike the California PM10 standard, beginning in 2006, the U.S. EPA wanted to set a new standard for the coarse fraction of PM (PM10 - PM2.5). Because there was no validated monitoring method to measure the coarse fraction, PM10 was chosen as a surrogate measure for PM10 - PM2.5. Therefore, the U.S. EPA PM10 standard was redefined as a standard to protect against coarse particles (PM10 - PM2.5) – not total PM10. The PM10 standard was originally based on PM10 research, which showed some evidence for a long-term effect, but there were no long-term coarse particle papers that supported retaining the annual average PM10 standard once it was redefined to pertain to only coarse particles (PM10 - PM2.5).

In summary, the California PM10 standards are for PM10 without any distinction, not for coarse particles only (PM10 - PM2.5), like the federal U.S. EPA standard. Thus, the CA and federal PM10 standards are not designed to protect against exposure to same size range of particles, and are not really comparable. Also, the CA standard was last revised in 2002, predating the revision of the federal standard in 2006.

The final rule with the rationale that removed the federal annual standard can be found in the Federal Register / Vol. 71, No. 200 / Tuesday, October 17, 2006 / Rules and Regulations (40 CFR Part 50 National Ambient Air Quality Standards for Particulate Matter; Final Rule). I have attached that document and the PM10 standard ruling can be found on page 61145 of the official document, page 3 of the attached PDF.

The California Air Resources Board's staff rationale for maintaining an annual average standard for PM10 can be found in section 7.10.1, on page 220 of the Initial Statement of Reasons Staff Report, which I have also attached.

If you have any further questions, please feel free to contact me.
-Brian Moore

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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

Release Date:

May 3, 2002

"The California Air Resources Board's staff rationale for maintaining an annual average standard for PM10 can be found in section 7.10.1, on page 220 of the Initial Statement of Reasons Staff Report, which I have also attached."

Se adjunta extracto referenciado vía correo electrónico, por Brian Moore, PhD. | Air Resources Board | Health and Exposure Assessment.

would include, among others, potential health hazards that have not been identified, factors determining variability in response to PM among susceptible subpopulations, micro-environmental variability in PM exposure related to indoor penetration of PM, activity patterns, and geographic proximity to point and area sources. The incorporation of a safety margin has been recognized by the California Supreme Court as integral to the process of promulgating ambient air quality standards [See Western Oil and Gas Association v. Air Resources Board, 37 Cal.3d, 502 (1984)].

As described in the preceding chapters, using the current epidemiological data and analytic techniques, researchers have been unable to detect a level of PM exposure below which no adverse health effects would ever be expected to occur, which creates substantial uncertainties in the prediction of health impacts of low-level PM exposure. To the extent that health effects associated with ambient PM have occurred at relatively low levels of exposure, and that there is substantial inter-individual variability in response to environmental insults, it is difficult to promulgate any PM standard that will provide universal protection for every individual against all possible PM-related effects.

Nevertheless, taking into account the current knowledge regarding the health impacts of PM, the limitations of the scientific data and the methods available to analyze this data, as well as variability in real-world exposures and human responses to PM, we have operationalized the concept of an adequate margin of safety by recommending multiple standards that, in combination, should protect nearly all of the California population, including infants and children, against PM-associated effects throughout the year. We have reviewed the available scientific literature and proposed standards that, when attained, will avoid exposures that have been reported to produce health effects in published studies.

7.10.1 Adequacy of Current California AAQS for PM in Protecting Public Health

The extensive epidemiologic data on the health effects of PM, supported by clinical and toxicological evidence, suggests that, in combination, the current annual average standard for PM10 of 30 $\mu g/m^3$ and the 24-hour average of 50 $\mu g/m^3$ do not offer sufficient protection of public health, including that of infants and children (ARB, 2000). Chronic exposures to ambient PM appear to be especially deleterious, and may influence responses to shorter-term (usually daily) exposures. Nonetheless, as reviewed in the above sections, there are strong and consistent associations between daily exposure to PM (measured as PM10, PM10-PM2.5, or PM2.5) and a range of adverse outcomes, including premature mortality, hospital admissions, emergency room and urgent care visits, asthma exacerbation, chronic and acute bronchitis, restrictions in activity, school absenteeism, respiratory symptoms, and reductions in lung function. These studies have been conducted in a wide range of cities on five continents, with differing PM sources, climates, seasonal patterns, co-pollutants, and population characteristics. The more severe outcomes are experienced primarily by the elderly and by people with pre-existing chronic heart or lung disease. However, several epidemiological studies suggest that children under age five may also experience serious adverse outcomes from exposure to PM10, including premature mortality and hospitalization for respiratory conditions (See section 7.7.3.2).

As indicated in section 7.3, many of the epidemiologic studies demonstrate associations between PM10 and the risk of premature mortality. The extent of early mortality or life shortening may be from days to years. Because the exposure-response relationship between ambient PM and daily mortality appears to be linear with no identifiable threshold, it is possible that associations between PM10 and adverse health effects may occur throughout the range of concentrations reported in each study. However, these occurrences are intuitively more likely when particle levels are elevated, especially in the upper portion of the PM distribution. Although we cannot know at what concentration health impacts of PM

exposures begin, for purposes of these recommendations, the staff has identified the mean PM10 concentration in any given study as representing a likely minimum effects level. This approach is consistent with that taken in the recommendation for the California 24-hour standard for sulfur dioxide. At higher mean concentrations however, the probability increases that adverse health outcomes will occur below the mean, in contrast, as concentrations decrease, the associated risks incorporate a larger range of uncertainty (see section 7.3). In view of the current state of the science, it is not possible to identify specific levels at which no PM-related adverse effects will occur; however, the strength of the association of interest in any given study is likely to be greatest at the mean PM concentration.

Analyses of mortality (summarized in sections 7.3 and 7.4, Tables 7.1 and 7.7, as well as Figure 7.1) and morbidity (summarized in sections 7.5 and 7.6) demonstrate that numerous epidemiological investigations have found associations of adverse health effects with PM10 when the long term (i.e., months to years) study mean concentrations are at or below the annual average standard of 30 $\mu g/m^3$. Both of the studies reporting associations between long-term exposure and mortality have mean concentrations of PM10 or its equivalent at or below the current annual average standard in California (Pope et al., 1995; Dockery et al., 1993). In the report by Dockery et al. (1993), the long-term average for PM10 ranged from 18 to 46.5 $\mu g/m^3$ in the six cities studied, with an overall mean of 30 $\mu g/m^3$. A stronger association was found for PM2.5, which ranged from 11 to 29.6 $\mu g/m^3$, in which the overall mean concentration was 18 $\mu g/m^3$. Likewise, Pope et al. (1995) reported associations of mortality with PM2.5 in the analysis of the American Cancer Society cohort, with an overall study mean of 20 $\mu g/m^3$. If the ratio of PM2.5 to PM10 is approximately 0.65, as it was in many urban areas included in the American Cancer Society study, this would convert to a PM10 average of about 28 $\mu g/m^3$. Therefore, it appears that the current annual ambient standard does not incorporate an adequate margin of safety against the occurrence of mortality associated with long-term exposures.

Numerous epidemiological studies have demonstrated small, but consistent, relationships between health outcomes and daily variations in PM concentrations. It should be noted, however, that the impacts associated with the underlying chronic exposure cannot be fully separated from the health effects attributed to daily peak PM10 or PM2.5 exposures. The notion that chronic exposures exert a major influence on health outcomes is reinforced when one examines the mortality risks associated with daily versus chronic exposure. Most of the time-series studies demonstrate a 0.5 to 1% increase in total mortality per 10 $\mu g/m^3$ change in PM10 (section 7.3). In contrast, based on the American Cancer Society cohort study, the estimated mortality effect of chronic PM10 exposure is in the range of four to seven percent per 10 $\mu g/m^3$ change in the long-term average of PM10 (Pope et al., 1995; section 7.4). These results suggest that longer-term exposures (i.e., several days to several years) account for a substantial fraction of PM10-related mortality.

While relationships between health outcomes and daily exposure measurements have been identified through time-series analysis, it is not possible to completely disentangle the influence of low-level chronic exposures. Nonetheless, recognizing the limitations of the existing epidemiological data, the literature suggests that, when long-term mean PM10 or PM2.5 concentrations are within the ranges reported in the published literature, it is possible to document a variety of adverse health outcomes in relation to day-to-day PM fluctuations.

Long-term mean PM10 levels near and below that of the current ambient California 24-hour standard have been consistently linked with respiratory symptoms and exacerbations of asthma in children. Although there are a few studies linking infant mortality to ambient PM, it is not clear, based on existing data, whether infants and children are more or less susceptible to PM-associated premature mortality than older adults with chronic heart and lung disease.

For example, it is possible that children who die of sudden infant death syndrome may have physiological abnormalities that render them unusually susceptible to the effects of PM; however, the database of published studies is too sparse for causal inference. As indicated in section 7.7.3.2, most studies of infant mortality consist of either: (I) cross-sectional study designs, in which statistical control for all potential confounders is difficult and causal inference problematic, or (ii) time-series studies conducted in cities outside of the United States in which the PM levels are much greater than in California. In the latter group of studies, factors related to infant nutrition, health care and exposures may not be generalizable to the United States. Given the current state of knowledge, it is uncertain whether infants and children represent an additional susceptible subpopulation with respect to air pollution-associated mortality at current ambient concentrations of PM. However, childhood respiratory morbidity does appear to be consistently linked with different measures of PM, within the same concentration ranges as those associated with mortality in adults with chronic heart and lung disease (See sections 7.3 and 7.5).

The voluminous published data suggest that, taken together, the current PM10 AAQSs are probably not adequately protective of public health, particularly for the elderly and individuals with pre-existing heart or lung disease. In addition, the available evidence suggests the need for new standards for PM2.5. From the perspective of public health protection, the principal shortcoming appears to be related to chronic PM exposures, though short-term effects on morbidity and mortality are also clearly important. The quantitative benefits assessment (section 9) suggests that significant mortality and morbidity benefits will result from reducing population exposures to PM.

7.10.2 Recommended Pollution Indicators

The scientific evidence suggests a need for standards to encompass fine particles as well as PM10. We therefore recommend that the PM10 indicator be retained and that both long- and short-term standards for PM2.5 be promulgated as well. These recommendations are predicated on the following rationale:

- PM10 and PM2.5 are both associated with a wide range of serious adverse health outcomes, including premature mortality, hospitalizations, and asthma exacerbation, among others.
- Dosimetry studies indicate that both fine and coarse particles deposit throughout the respiratory tract (see section 7.1). Fine particles are more likely to deposit in the alveolar region (or gas exchange zone) and may initiate inflammatory responses, with both local and systemic effects. Coarse particles (PM10 – PM2.5) can also deposit in significant quantities in the conducting airways and, to a lesser extent, in the gas exchange region of the lung. Moreover, multiple studies in which the health impacts of PM2.5 and coarse mode have been examined have reported adverse effects associated with both metrics.
- Particles larger than 10 μm in median aerodynamic diameter have limited deposition in either the alveolar or tracheobronchial region, but rather deposit preferentially in the nose and oropharynx. The health impacts related to particle deposition in the ET region have not been extensively explored. Therefore, staff does not recommend an ambient air quality standard for particles larger than 10 μm.
- Ultrafine particles (particles with aerodynamic diameters between 0.001 and 0.1 μm), which can deposit in significant quantities throughout the respiratory tract, have been linked with serious health impacts, including premature mortality and asthma exacerbation. There is a small but growing toxicological database suggesting that ultrafine particles may be more toxic, on a mass basis, than fine particles of similar composition. However, there are few epidemiologic studies of ultrafine particles and findings are mixed.

Federal Register

Tuesday,
October 17, 2006

Part II

Environmental Protection Agency

40 CFR Part 50
National Ambient Air Quality Standards for Particulate Matter; Final Rule

"The final rule with the rationale that removed the federal annual standard can be found in the Federal Register / Vol. 71, No. 200 / Tuesday, October 17, 2006 / Rules and Regulations (40 CFR Part 50 National Ambient Air Quality Standards for Particulate Matter; Final Rule). I have attached that document and the PM10 standard ruling can be found on page 61145 of the official document, page 3 of the attached PDF."

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I. Background

A. Summary of Revisions to the PM NAAQS

Based on its review of the air quality criteria and national ambient air quality standards (NAAQS) for particulate matter (PM), EPA is making revisions to the primary and secondary NAAQS for PM to provide increased protection of public health and welfare, respectively.

With regard to primary standards for fine particles (generally referring to particles less than or equal to 2.5 micrometers (μm) in diameter, $PM_{2.5}$), EPA is revising the level of the 24-hour $PM_{2.5}$ standard to 35 micrograms per cubic meter μg/m³), providing increased protection against health effects associated with short-term exposure (including premature mortality and increased hospital admissions and emergency room visits), and retaining the level of the annual $PM_{2.5}$ standard at 15 μg/m³, continuing protection against health effects associated with long-term exposure (including premature mortality and development of chronic respiratory disease). The EPA is revising the form of the annual $PM_{2.5}$ standard with regard to the criteria for spatial averaging, such that averaging across monitoring sites is allowed if the annual mean concentration at each monitoring site is within 10 percent of the spatially averaged annual mean, and the daily values for each monitoring site pair yield a correlation coefficient of at least 0.9 for each calendar quarter.

With regard to primary standards for particles generally less than or equal to 10μm in diameter (PM_{10}), EPA is retaining the 24-hour PM_{10} standard to protect against the health effects associated with short-term exposure to coarse particles (including hospital admissions for cardiopulmonary diseases, increased respiratory symptoms and possibly premature mortality). Given that the available evidence does not suggest an association between long-term exposure to coarse particles at current ambient levels and health effects, EPA is revoking the annual PM_{10} standard.

With regard to secondary PM standards, EPA is revising the current 24-hour $PM_{2.5}$ secondary standard by making it identical to the revised 24-hour $PM_{2.5}$ primary standard, retaining the annual $PM_{2.5}$ and 24-hour PM_{10} secondary standards, and revoking the annual PM_{10} secondary standard. This suite of secondary PM standards is intended to provide protection against PM-related public welfare effects, including visibility impairment, effects on vegetation and ecosystems, and materials damage and soiling.

B. Legislative Requirements

Two sections of the Clean Air Act (CAA) govern the establishment and revision of the NAAQS. Section 108 (42 U.S.C. 7408) directs the Administrator to identify and list "air pollutants" that "in his judgment, may reasonably be anticipated to endanger public health and welfare" and whose "presence * * * in the ambient air results from numerous or diverse mobile or stationary sources" and to issue air quality criteria for those that are listed. Air quality criteria are intended to "accurately reflect the latest scientific knowledge useful in indicating the kind and extent of identifiable effects on public health or welfare which may be expected from the presence of [a] pollutant in ambient air * * *."

Section 109 (42 U.S.C. 7409) directs the Administrator to propose and promulgate "primary" and "secondary" NAAQS for pollutants listed under section 108. Section 109(b)(1) defines a primary standard as one "the attainment and maintenance of which in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health." [1] A secondary standard, as defined in section 109(b)(2), must "specify a level of air quality the attainment and maintenance of which, in the judgment of the Administrator, based on such criteria, is requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of [the] pollutant in the ambient air." [2]

The requirement that primary standards include an adequate margin of safety was intended to address uncertainties associated with inconclusive scientific and technical information available at the time of standard setting. It was also intended to provide a reasonable degree of protection against hazards that research has not yet identified. *Lead Industries Association* v. *EPA*, 647 F.2d 1130, 1154 (D.C. Cir 1980), *cert. denied*, 449 U.S. 1042 (1980); *American Petroleum Institute* v. *Costle*, 665 F.2d 1176, 1186 (D.C. Cir. 1981), *cert. denied*, 455 U.S. 1034 (1982). Both kinds of uncertainties are components of the risk associated with pollution at levels below those at which human health effects can be said to occur with reasonable scientific certainty. Thus, in selecting primary standards that include an adequate margin of safety, the Administrator is seeking not only to prevent pollution levels that have been demonstrated to be harmful but also to prevent lower pollutant levels that may pose an unacceptable risk of harm, even if the risk is not precisely identified as to nature or degree. The CAA does not require the Administrator to establish a primary NAAQS at a zero-risk level or at a background concentration level (see *Lead Industries Association* v. *EPA*, *supra*, 647 F.2d at 1156 n. 51), but rather at a level that reduces risk sufficiently so as to protect public health with an adequate margin of safety.

In addressing the requirement for an adequate margin of safety, EPA considers such factors as the nature and severity of the health effects involved, the size of the sensitive population(s) at risk, and the kind and degree of the uncertainties that must be addressed. The selection of any particular approach to providing an adequate margin of safety is a policy choice left specifically to the Administrator's judgment. *Lead*

[1] The legislative history of section 109 indicates that a primary standard is to be set at "the maximum permissible ambient air level * * * which will protect the health of any [sensitive] group of the population," and that for this purpose "reference should be made to a representative sample of persons comprising the sensitive group rather than to a single person in such a group" [S. Rep. No. 91–1196, 91st Cong., 2d Sess. 10 (1970)].

[2] Welfare effects as defined in section 302(h) [42 U.S.C. 7602(h)] include, but are not limited to, "effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being."

Industries Association v. *EPA, supra,* 647 F.2d at 1161–62.

In setting standards that are "requisite" to protect public health and welfare, as provided in section 109(b), EPA's task is to establish standards that are neither more nor less stringent than necessary for these purposes. In establishing primary and secondary standards, EPA may not consider the costs of implementing the standards. See generally *Whitman* v. *American Trucking Associations,* 531 U.S. 457, 465–472, 475–76 (2001).

Section 109(d)(1) of the CAA requires that "not later than December 31, 1980, and at 5-year intervals thereafter, the Administrator shall complete a thorough review of the criteria published under section 108 and the national ambient air quality standards * * * and shall make such revisions in such criteria and standards and promulgate such new standards as may be appropriate in accordance with [the provisions in section 109(b) on primary and secondary standards]." This includes the authority to modify or revoke a standard or standards, as appropriate under these provisions. Section 109(d)(2) requires that an independent scientific review committee "shall complete a review of the criteria * * * and the national primary and secondary ambient air quality standards * * * and shall recommend to the Administrator any new * * * standards and revisions of existing criteria and standards as may be appropriate * * *." This independent review function is performed by the Clean Air Scientific Advisory Committee (CASAC) of EPA's Science Advisory Board.

C. Overview of Air Quality Criteria and Standards Review for PM

Particulate matter is the generic term for a broad class of chemically and physically diverse substances that exist as discrete particles (liquid droplets or solids) over a wide range of sizes. Particles originate from a variety of anthropogenic stationary and mobile sources as well as from natural sources. Particles may be emitted directly or formed in the atmosphere by transformations of gaseous emissions such as sulfur oxides (SO_X), nitrogen oxides (NO_X), and volatile organic compounds (VOC). The chemical and physical properties of PM vary greatly with time, region, meteorology, and source category, thus complicating the assessment of health and welfare effects.

More specifically, the PM that is the subject of the air quality criteria and standards reviews includes both fine particles and thoracic coarse particles, which are considered as separate subclasses of PM pollution based in part on long-established information on differences in sources, properties, and atmospheric behavior between fine and coarse particles (EPA, 2005, section 2.2). Fine particles are produced chiefly by combustion processes and by atmospheric reactions of various gaseous pollutants, whereas thoracic coarse particles are generally emitted directly as particles as a result of mechanical processes that crush or grind larger particles or the resuspension of dusts. Sources of fine particles include, for example, motor vehicles, power generation, combustion sources at industrial facilities, and residential fuel burning. Sources of thoracic coarse particles include, for example, traffic-related emissions such as tire and brake lining materials, direct emissions from industrial operations, construction and demolition activities, and agricultural and mining operations. Fine particles can remain suspended in the atmosphere for days to weeks and can be transported thousands of kilometers, whereas thoracic coarse particles generally deposit rapidly on the ground or other surfaces and are not readily transported across urban or broader areas.

The last review of PM air quality criteria and standards was completed in July 1997 with notice of a final decision to revise the existing standards (62 FR 38652, July 18, 1997). In that decision, EPA revised the PM NAAQS in several respects. While EPA determined that the PM NAAQS should continue to focus on particles less than or equal to 10 μm in diameter (PM_{10}), EPA also determined that the fine and coarse fractions of PM_{10} should be considered separately. The EPA added new standards, using $PM_{2.5}$ as the indicator for fine particles (with $PM_{2.5}$ referring to particles with a nominal aerodynamic diameter less than or equal to 2.5 μm), and using PM_{10} as the indicator for purposes of regulating the coarse fraction of PM_{10} (referred to as thoracic coarse particles or coarse-fraction particles; generally including particles with a nominal aerodynamic diameter greater than 2.5 μm and less than or equal to 10 μm, or $PM_{10-2.5}$). The EPA established two new $PM_{2.5}$ standards: An annual standard of 15 $\mu g/m^3$, based on the 3-year average of annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors; and a 24-hour standard of 65 $\mu g/m^3$, based on the 3-year average of the 98th percentile of 24-hour $PM_{2.5}$ concentrations at each population-oriented monitor within an area. Also, EPA established a new reference method for the measurement of $PM_{2.5}$ in the ambient air and adopted rules for determining attainment of the new standards. To continue to address thoracic coarse particles, EPA retained the annual PM_{10} standard, while revising the form, but not the level, of the 24-hour PM_{10} standard to be based on the 99th percentile of 24-hour PM_{10} concentrations at each monitor in an area. The EPA revised the secondary standards by making them identical in all respects to the primary standards.

Following promulgation of the revised PM NAAQS, petitions for review were filed by a large number of parties, addressing a broad range of issues. In May 1999, a three-judge panel of the U.S. Court of Appeals for the District of Columbia Circuit issued an initial decision that upheld EPA's decision to establish fine particle standards, holding that "the growing empirical evidence demonstrating a relationship between fine particle pollution and adverse health effects amply justifies establishment of new fine particle standards." *American Trucking Associations* v. *EPA,* 175 F.3d 1027, 1055–56 (D.C. Cir. 1999) ("ATA I") rehearing granted in part and denied in part, 195 F.3d 4 (D.C. Cir. 1999) ("ATA II"), affirmed in part and reversed in part, *Whitman* v. *American Trucking Associations,* 531 U.S. 457 (2001). The Panel also found "ample support" for EPA's decision to regulate coarse particle pollution, but vacated the 1997 PM_{10} standards, concluding that EPA's justification for the use of PM_{10} as an indicator for coarse particles was arbitrary. 175 F.3d at 1054–55. Pursuant to the court's decision, EPA removed the vacated 1997 PM_{10} standards from the regulations (CFR) (69 FR 45592, July 30, 2004) and deleted the regulatory provision (at 40 CFR 50.6(d)) that controlled the transition from the pre-existing 1987 PM_{10} standards to the 1997 PM_{10} standards (65 FR 80776, December 22, 2000). The pre-existing 1987 PM_{10} standards remained in place. *Id.* at 80777.

More generally, the panel held (over one judge's dissent) that EPA's approach to establishing the level of the standards in 1997, both for PM and for ozone NAAQS promulgated on the same day, effected "an unconstitutional delegation of legislative authority." *Id.* at 1034–40. Although the panel stated that "the factors EPA uses in determining the degree of public health concern associated with different levels of ozone and PM are reasonable," it remanded the rule to EPA, stating that when EPA considers these factors for potential non-threshold pollutants "what EPA lacks is any determinate criterion for

drawing lines'' to determine where the standards should be set. Consistent with EPA's long-standing interpretation and D.C. Circuit precedent, the panel also reaffirmed prior rulings holding that in setting NAAQS EPA is ''not permitted to consider the cost of implementing those standards.'' *Id.* at 1040–41.

Both sides filed cross appeals on these issues to the United States Supreme Court, and the Court granted *certiorari.* In February 2001, the Supreme Court issued a unanimous decision upholding EPA's position on both the constitutional and cost issues. *Whitman* v. *American Trucking Associations,* 531 U.S. 457, 464, 475–76 (2001). On the constitutional issue, the Court held that the statutory requirement that NAAQS be ''requisite'' to protect public health with an adequate margin of safety sufficiently guided EPA's discretion, affirming EPA's approach of setting standards that are neither more nor less stringent than necessary. The Supreme Court remanded the case to the Court of Appeals for resolution of any remaining issues that had not been addressed in that court's earlier rulings. *Id.* at 475–76. In March 2002, the Court of Appeals rejected all remaining challenges to the standards, holding under the traditional standard of judicial review that EPA's $PM_{2.5}$ standards were reasonably supported by the administrative record and were not ''arbitrary and capricious.'' *American Trucking Associations* v. *EPA,* 283 F. 3d 355, 369–72 (D.C. Cir. 2002) (''*ATA III*'').

In October 1997, EPA published its plans for the current periodic review of the PM criteria and NAAQS (62 FR 55201, October 23, 1997), including the 1997 $PM_{2.5}$ standards and the 1987 PM_{10} standards. The approach in this review continues to address fine and thoracic coarse particles separately. This approach has been reinforced by new information that has advanced our understanding of differences in human exposure relationships and dosimetric patterns characteristic of these two subclasses of PM pollution, as well as the apparent independence of health effects that have been associated with them in epidemiologic studies (EPA, 2004a, section 3.2.3). See also *ATA I,* 175 F. 3d at 1053–54, 1055–56 (EPA justified in establishing separate standards for fine and thoracic coarse particles).

As part of the process of preparing an updated Air Quality Criteria Document for Particulate Matter (henceforth, the ''Criteria Document''), EPA's National Center for Environmental Assessment (NCEA) hosted a peer review workshop in April 1999 on drafts of key Criteria Document chapters. The first external review draft Criteria Document was reviewed by CASAC and the public at a meeting held in December 1999. Based on CASAC and public comment, NCEA revised the draft Criteria Document and released a second draft in March 2001 for review by CASAC and the public at a meeting held in July 2001. A preliminary draft of a staff paper, Review of the National Ambient Air Quality Standards for Particulate Matter: Assessment of Scientific and Technical Information (henceforth, the ''Staff Paper'') prepared by EPA's Office of Air Quality Planning and Standards (OAQPS) was released in June 2001 for public comment and for consultation with CASAC at the same public meeting. Taking into account CASAC and public comments, a third draft Criteria Document was released in May 2002 for review at a meeting held in July 2002.

Shortly after the release of the third draft Criteria Document, the Health Effects Institute (HEI) [3] announced that researchers at Johns Hopkins University had discovered problems with applications of statistical software used in a number of important epidemiological studies that had been discussed in that draft Criteria Document. In response to this significant issue, EPA took steps in consultation with CASAC and the broader scientific community to encourage researchers to reanalyze affected studies and to submit them expeditiously for peer review by a special expert panel convened at EPA's request by HEI. The results of this reanalysis and peer-review process were subsequently incorporated into a fourth draft Criteria Document, which was released in June 2003 and reviewed by CASAC and the public at a meeting held in August 2003.

The first draft Staff Paper, based on the fourth draft Criteria Document, was released at the end of August 2003, and was reviewed by CASAC and the public at a meeting held in November 2003. During that meeting, EPA also consulted with CASAC on a new framework for the final chapter (integrative synthesis) of the Criteria Document and on ongoing revisions to other Criteria Document chapters to address previous CASAC comments. The EPA held additional consultations with CASAC at public meetings held in February, July, and September 2004, leading to publication of the final Criteria Document in October 2004 (EPA, 2004a). The second draft Staff Paper, based on the final Criteria Document, was released at the end of January 2005, and was reviewed by CASAC and the public at a meeting held in April 2005. The CASAC's advice and recommendations to the Administrator, based on its review of the second draft Staff Paper, were further discussed during a public teleconference held in May 2005 and are provided in a June 6, 2005 letter to the Administrator (Henderson, 2005a). The final Staff Paper takes into account the advice and recommendations of CASAC and public comments received on the earlier drafts of this document. The Administrator subsequently received additional advice and recommendations from the CASAC, specifically on potential standards for thoracic coarse particles, in a teleconference on August 11, 2005, and in a letter to the Administrator dated September 15, 2005 (Henderson, 2005b). The final Staff Paper was reissued in December 2005 to add CASAC's final letter as an attachment (EPA, 2005).

The schedule for completion of this review is governed by a consent decree resolving a lawsuit filed in March 2003 by a group of plaintiffs representing national environmental organizations. The lawsuit alleged that EPA had failed to perform its mandatory duty, under section 109(d)(1), of completing the current review within the period provided by statute. *American Lung Association* v. *Whitman* (No. 1:03CV00778, D.D.C. 2003). An initial consent decree was entered by the court in July 2003 after an opportunity for public comment. The consent decree, as modified by the court, provides that EPA will sign for publication notices of proposed and final rulemaking concerning its review of the PM NAAQS no later than December 20, 2005 and September 27, 2006, respectively.

On December 20, 2005, EPA issued its proposed decision to revise the NAAQS for PM (71 FR 2620, January 17, 2006) (henceforth ''proposal''). In the proposal, EPA identified proposed revisions to the standards, based on the air quality criteria for PM, and to related data handling conventions and federal reference methods for monitoring PM. The proposal solicited public comments on alternative primary and secondary standards and related matters.

The EPA held several public hearings across the country to provide direct opportunities for public comment on the proposed revisions to the PM NAAQS. On March 8, 2006, EPA held three concurrent 12-hour public hearings in Philadelphia, PA; Chicago, IL; and San Francisco, CA. At these public hearings, EPA heard testimony

[3] The HEI is a non-profit, independent research institute jointly and equally funded by EPA and multiple industries that conducts research on the health effects of air pollution.

from 280 individuals representing themselves or specific interested organizations.

More than 120,000 comments were received from members of the public and various interested groups on the proposed revisions to the PM NAAQS by the close of the public comment period on April 17, 2006. CASAC provided additional advice to EPA in a letter to the Administrator requesting reconsideration of CASAC's recommendations for both the primary and secondary $PM_{2.5}$ standards as well as standards for thoracic coarse particles (Henderson, 2006). Major issues raised in the public comments are discussed throughout the preamble of this final action. A comprehensive summary of all significant comments, along with EPA's responses (henceforth "Response to Comments"), can be found in the docket for this rulemaking (Docket No. EPA–HQ–OAR–2001–0017).

In the proposal, EPA recognized that there were a number of new scientific studies on the health effects of PM that had been published recently and therefore were not included in the Criteria Document.[4] The EPA committed to conduct a review and assessment of any significant "new" studies, including studies submitted during the public comment period. The purpose of this review was to ensure that the Administrator was fully aware of the "new" science before making a final decision on whether to revise the current PM NAAQS. The EPA screened and surveyed the recent literature, including studies submitted during the public comment period, and conducted a provisional assessment (EPA, 2006a) that places the results of those studies of potentially greatest policy relevance in the context of the findings of the Criteria Document.

The provisional assessment found that the "new" studies expand the scientific information and provide important insights on the relationship between PM exposure and health effects of PM. The provisional assessment also found that "new" studies generally strengthen the evidence that acute and chronic exposure to fine particles and acute exposure to thoracic coarse particles are associated with health effects; some of the "new" epidemiologic studies report effects in areas with lower concentrations of $PM_{2.5}$ or $PM_{10-2.5}$ than those in earlier reports; "new" toxicology and epidemiologic studies link various health effects with a range of fine particle sources and components; and "new" toxicology studies report effects of thoracic coarse particles but do not provide evidence to support distinguishing effects from exposure to urban and rural particles. Further, the provisional assessment found that the results reported in the studies do not dramatically diverge from previous findings, and, taken in context with the findings of the Criteria Document, the new information and findings do not materially change any of the broad scientific conclusions regarding the health effects of PM exposure made in the Criteria Document.

The EPA believes it was important to conduct a provisional assessment in this case, so that the Administrator would be aware of the science that developed too recently for inclusion in the Criteria Document. However it is also important to note that EPA's review of that science to date has been limited to screening, surveying, and preparing a provisional assessment of these studies. Having performed this limited provisional assessment, EPA must decide whether to consider the newer studies in this review and take such steps as may be necessary to include them in the basis for the final decision, or to reserve such action for the next review of the PM NAAQS.

As in prior NAAQS reviews, EPA is basing its decision in this review on studies and related information included in the Criteria Document and Staff Paper, which have undergone CASAC and public review. The studies assessed in the Criteria Document, and the integration of the scientific evidence presented in that document, have undergone extensive critical review by EPA, CASAC, and the public during the development of the Criteria Document. The rigor of that review makes these studies, and their integrative assessment, the most reliable source of scientific information on which to base decisions on the NAAQS, decisions that all parties recognize as of great import. NAAQS decisions can have profound impacts on public health and welfare, and NAAQS decisions should be based on studies that have been rigorously assessed in an integrative manner not only by EPA but also by the statutorily mandated independent advisory committee, as well as the public review that accompanies this process. As described above, the provisional assessment did not and could not provide that kind of in-depth critical review.

This decision is consistent with EPA's practice in prior NAAQS reviews. Since the 1970 amendments, the EPA has taken the view that NAAQS decisions are to be based on scientific studies and related information that have been assessed as a part of the pertinent air quality criteria. See *e.g.*, 36 FR 8186 (April 30, 1971) (EPA based original NAAQS for six pollutants on scientific studies discussed in air quality criteria documents and limited consideration of comments to those concerning validity of scientific basis); 38 FR 25678, 25679–25680 (September 14, 1973) (EPA revised air quality criteria for sulfur oxides to provide basis for reevaluation of secondary NAAQS). This longstanding interpretation was strengthened by new legislative requirements enacted in 1977, which added section 109(d)(2) of the Act concerning CASAC review of air quality criteria. EPA has consistently followed this approach. 52 FR 24634, 24637 (July 1, 1987) (after review by CASAC, EPA issued a post-proposal addendum to the PM Criteria Document, to address certain new scientific studies not included in the 1982 Criteria Document); 61 FR 25566, 25568 (May 22, 1996) (after review by CASAC, EPA issued a post-proposal supplement to the 1982 Criteria Document to address certain new health studies not included in the 1982 Criteria Document or 1986 Addendum). The EPA recently reaffirmed this approach in its decision not to revise the ozone NAAQS in 1993, as well as in its final decision on the PM NAAQS in the 1997 review. 58 FR 13008, 13013–13014 (March 9, 1993) (ozone review); 62 FR 38652, 38662 (July 18, 1997) (The EPA conducted a provisional assessment but based the final PM decision on studies and related information included in the air quality criteria that had been reviewed by CASAC).

As discussed in EPA's 1993 decision not to revise the NAAQS for ozone, new studies may sometimes be of such significance that it is appropriate to delay a decision on revision of NAAQS and to supplement the pertinent air quality criteria so the new studies can be taken into account (58 FR at 13013–13014, March 9, 1993). In the present case, the provisional assessment of recent studies concludes that, taken in context, the new information and findings do not materially change any of the broad scientific conclusions regarding the health effects of PM exposure made in the Criteria

[4] For ease of reference, these studies will be referred to as "new" studies or "new" science, using quotation marks around the word *new*. Referring to studies that were published too recently to have been included in the 2004 Criteria Document as "new" studies is intended to clearly differentiate such studies from those that have been published since the last review and are included in the 2004 Criteria Document (these studies are sometimes referred to as new (without quotation marks) or more recent studies, to indicate that they were not included in the 1996 Criteria Document and thus are newly available in this review).

Document. For this reason, reopening the air quality criteria review would not be warranted even if there were time to do so under the court order governing the schedule for this rulemaking. Accordingly, EPA is basing the final decisions in this review on the studies and related information included in the PM air quality criteria that have undergone CASAC and public review. The EPA will consider the newly published studies for purposes of decision making in the next periodic review of the PM NAAQS, which will provide the opportunity to fully assess them through a more rigorous review process involving EPA, CASAC, and the public.

In order to facilitate a comprehensive and timely review of the newly available science, the Administrator has directed EPA staff to begin the next review of the PM NAAQS immediately.[5]

D. Related Control Programs To Implement PM Standards

States are primarily responsible for ensuring attainment and maintenance of ambient air quality standards once EPA has established them. Under section 110 of the CAA (42 U.S.C. 7410) and related provisions, States are to submit, for EPA approval, State implementation plans (SIPs) that provide for the attainment and maintenance of such standards through control programs directed to sources of the pollutants involved. The States, in conjunction with EPA, also administer the prevention of significant deterioration (PSD) program under sections 160–169 of the CAA (42 U.S.C. 7470–7479) for these pollutants. In addition, the Act provides for nationwide reductions in emissions of these and other air pollutants through related programs, such as the Federal Mobile Source Control Program under Title II of the CAA (42 U.S.C. 7521–7574), which involves controls for automobile, truck, bus, motorcycle, nonroad and off-highway engines and aircraft emissions; the new source performance standards under section 111 (42 U.S.C. 7411); and the national emission standards for hazardous air pollutants under section 112 (42 U.S.C. 7412).

As described in a recent EPA report, *The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003* (EPA, 2004b), State and Federal programs have made substantial progress in reducing ambient concentrations of PM_{10} and $PM_{2.5}$. For example, PM_{10} concentrations have decreased 31 percent nationally since 1988. Regionally, PM_{10} concentrations decreased most in areas with historically higher concentrations—the Northwest (39 percent decline), the Southwest (33 percent decline), and southern California (35 percent decline). Direct emissions of PM_{10} have decreased approximately 25 percent nationally since 1988.

Programs aimed at reducing direct emissions of particles have played an important role in reducing PM_{10} concentrations, particularly in western areas. Some examples of PM_{10} controls include paving unpaved roads and using best management practices for agricultural sources of resuspended soil. Of the 87 areas that were designated nonattainment for PM_{10} in the early 1990s, 64 now meet those standards. In cities that have not attained the PM_{10} standards, the number of days above the standards is down significantly.

Nationally, $PM_{2.5}$ concentrations have declined by 10 percent from 1999 to 2003. Generally, $PM_{2.5}$ concentrations have also declined the most in regions with the highest concentrations—the Southeast (20 percent decline), southern California (16 percent decline), and the Industrial Midwest (9 percent decline). With the exception of the Northeast, the remaining regions posted modest declines in $PM_{2.5}$ concentrations from 1999 to 2003. Direct emissions of $PM_{2.5}$ have decreased by 5 percent nationally over the past 5 years.

National programs that affect regional emissions have also contributed to lower sulfate concentrations and, consequently, to lower $PM_{2.5}$ concentrations, particularly in the Industrial Midwest and Southeast. National ozone-reduction programs designed to reduce emissions of volatile organic compounds (VOCs) and nitrogen oxides (NO_X) have also helped reduce carbon and nitrates, both of which are components of $PM_{2.5}$. Additionally, EPA's Acid Rain Program has substantially reduced sulfur dioxide (SO_2) emissions from power plants since 1995 in the eastern United States, contributing to lower PM concentrations. Nationally, SO_2 emissions have declined 9 percent, NO_X emissions have declined 9 percent, and VOC emissions have declined by 12 percent from 1999 to 2003. In eastern States affected by the Acid Rain Program, sulfates decreased 7 percent over the same period.

Over the next 10 to 20 years, national and regional regulations will make major reductions in ambient $PM_{2.5}$ levels. The Clean Air Interstate Rule (CAIR) and the NO_X SIP Call will further reduce SO_2 and NO_X emissions from electric generating units and industrial boilers across the eastern half of the U.S.; regulations to implement the 1997 ambient air quality standards for $PM_{2.5}$ will require direct $PM_{2.5}$ and $PM_{2.5}$ precursor controls in nonattainment areas; and new national mobile source regulations affecting heavy-duty diesel engines, highway vehicles, and other mobile sources will reduce emissions of NO_X, direct $PM_{2.5}$, SO_2, and VOCs. The EPA estimates that these regulations for stationary and mobile sources will cut SO_2 emissions by 6 million tons annually in 2015 from 2001 levels. Emissions of NO_X will be cut by 9 million tons annually in 2015 from 2001 levels. Emissions of VOCs will drop by 3 million tons, and direct $PM_{2.5}$ emissions will be cut by 200,000 tons in 2015, compared to 2001 levels.

In 2005, 39 nonattainment areas were designated as not attaining the $PM_{2.5}$ standards established in 1997. SIPs for these areas are due in April 2008. Nonattainment areas are required to attain the standards as "expeditiously as practicable" based on implementation of federal measures already in place and the adoption of other reasonable control strategies for sources located in the nonattainment area and state. The presumptive timeframe for attainment is within five years of designation, although EPA may approve extended attainment dates of an additional one to five years for areas with more serious problems.

Modeling done by EPA indicates that by 2010, 18 of the 39 currently designated nonattainment areas are projected to come into attainment with those standards just based on regulatory programs already in place, including CAIR, the Clean Diesel Rules, and other Federal measures. Between 2010 and 2015, further reductions in PM concentrations in the eastern U.S. are projected due to existing federal programs alone, on the order of 0.5 to 1.5 $\mu g/m^3$. All areas in the eastern U.S. will have lower $PM_{2.5}$ concentrations in 2015 relative to present-day conditions. In most cases, the predicted improvement in $PM_{2.5}$ ranges from 10 percent to 20 percent.

E. Summary of Proposed Revisions to the PM NAAQS

For reasons discussed in the proposal, the Administrator proposed to revise the current primary and secondary $PM_{2.5}$ and PM_{10} standards. With regard to the primary $PM_{2.5}$ standards, the Administrator proposed to revise the level of the 24-hour $PM_{2.5}$ standard to 35

[5] The EPA has recently conducted a review of the process by which the Agency performs periodic NAAQS reviews to identify ways in which the process could be strengthened and streamlined (EPA, 2006b). The EPA intends to incorporate recommendations from the NAAQS process review into the next PM NAAQS review.

$\mu g/m^3$, and to revise the form of the annual $PM_{2.5}$ standard by changing the constraints on the optional use of spatial averaging to include the criterion that the minimum correlation coefficient between monitor pairs to be averaged be 0.9 or greater, determined on a seasonal basis, and the criterion that differences between monitor values not exceed 10 percent. Related revisions for $PM_{2.5}$ data handling conventions and for the reference method for monitoring PM as $PM_{2.5}$ were also proposed.

With regard to the primary PM_{10} standards, the Administrator proposed to revise the current standards to provide more targeted protection from thoracic coarse particles that are of concern to public health. In part, the Administrator proposed to establish a new indicator for thoracic coarse particles in terms of $PM_{10-2.5}$, the definition of which included qualifications that identified both the mix of such particles that were provisionally determined to be of concern to public health, and were thus included in the indicator, and those for which currently available information was provisionally determined to be insufficient as a basis from which to infer a public health concern, and were thus excluded. More specifically, the proposed $PM_{10-2.5}$ indicator was qualified so as to include any ambient mix of $PM_{10-2.5}$ that is dominated by resuspended dust from high-density traffic on paved roads and PM generated by industrial sources and construction sources, and to exclude any ambient mix of $PM_{10-2.5}$ that is dominated by rural windblown dust and soils and PM generated by agricultural and mining sources. The Administrator also proposed that agricultural sources, mining sources, and other similar sources of crustal material shall not be subject to control in meeting the proposed standard. The Administrator proposed to replace the current primary 24-hour PM_{10} standard with a 24-hour standard defined in terms of this new $PM_{10-2.5}$ indicator. The proposed new standard would be met at an ambient air quality monitoring site when the 3-year average of the annual 98th percentile 24-hour average $PM_{10-2.5}$ concentration is less than or equal to 70 $\mu g/m^3$, which would generally maintain the degree of public health protection afforded by the current PM_{10} standards from short-term exposure to thoracic coarse particles of concern. Requirements for monitoring sites that would be appropriate for determining compliance with this proposed $PM_{10-2.5}$ standard were included as part of proposed revisions to EPA's ambient air monitoring regulations (see 71 FR 2710, 2736–2728 and 71 FR 2706–2707 (proposing to incorporate these requirements as part of the standard)). These proposed requirements included a five-part test for determining whether a potential monitoring site is suitable for comparison to the standard, all five parts of which had to be met. In summary, the suitability test included the following general provisions: a monitoring site must be within an urbanized area that has a population of at least 100,000 persons; the site must be within a block group with a population density greater than 500 people per square mile; the site must be a "population-oriented" site; the site may not be adjacent to a large emissions source or otherwise within the micro-scale environment affected by a large source; and, if the first four provisions are met, a site-specific assessment must show that the ambient mix of $PM_{10-2.5}$ sampled at the site would be dominated by resuspended dust from high-density traffic on paved roads and PM generated by industrial sources and construction sources, and would not be dominated by rural windblown dust and soils and PM generated by agricultural and mining sources. Related new $PM_{10-2.5}$ data handling conventions and a new reference method for monitoring PM as $PM_{10-2.5}$ were also proposed. The Administrator also proposed to revoke and not replace the annual PM_{10} standard.

With regard to the secondary $PM_{2.5}$ and PM_{10} standards, the Administrator proposed to revise the current standards by making them identical in all respects to the proposed primary $PM_{2.5}$ and $PM_{10-2.5}$ standards to address PM-related welfare effects including visibility impairment, effects on vegetation and ecosystems, materials damage and soiling, and effects on climate change.

F. Organization and Approach to Final PM NAAQS Decisions

This action presents the Administrator's final decisions on the review of the current primary and secondary $PM_{2.5}$ and PM_{10} standards. Primary standards for fine particles and for thoracic coarse particles are addressed below in sections II and III, respectively. Consistent with the decisions made by EPA in the last review and with the conclusions in the Criteria Document and Staff Paper, fine and thoracic coarse particles continue to be considered as separate subclasses of PM pollution. Secondary standards for fine and thoracic coarse particles are addressed below in section IV. Related data handling conventions and federal reference methods for monitoring PM are addressed below in sections V and VI, respectively.

Today's final decisions separately addressing fine and thoracic coarse particles are based on a thorough review in the Criteria Document of scientific information on known and potential human health and welfare effects associated with exposure to these subclasses of PM at levels typically found in the ambient air. These final decisions also take into account: (1) Staff assessments in the Staff Paper of the most policy-relevant information in the Criteria Document as well as a quantitative risk assessment based on that information; (2) CASAC advice and recommendations, as reflected in its letters to the Administrator, its discussions of drafts of the Criteria Document and Staff Paper at public meetings, and separate written comments prepared by individual members of the CASAC PM Review Panel [6] (henceforth, "CASAC Panel"); (3) public comments received during the development of these documents, either in connection with CASAC meetings or separately; and (4) extensive public comments received on the proposed rulemaking.

II. Rationale for Final Decisions on Primary $PM_{2.5}$ Standards

A. Introduction

1. Overview

This section presents the Administrator's final decisions regarding the need to revise the current primary $PM_{2.5}$ NAAQS, and, more specifically, regarding revisions to the level of the 24-hour standard and to the form of the annual standard. As discussed more fully below, the rationale for the final decision on appropriate revisions to the primary $PM_{2.5}$ NAAQS includes consideration of: (1) Evidence of health effects related to short- and long-term exposures to fine particles; (2) insights gained from a quantitative risk assessment; and (3) specific conclusions regarding the need for revisions to the current standards and the elements of $PM_{2.5}$ standards (i.e., indicator, averaging time, form, and level) that, taken together, are requisite to protect public health with an adequate margin of safety.

In developing this rationale, EPA has drawn upon an integrative synthesis of the entire body of evidence on associations between exposure to

[6] The CASAC PM Review Panel is comprised of the seven members of the chartered CASAC, supplemented by fifteen subject-matter experts appointed by the Administrator to provide additional scientific expertise relevant to this review of the PM NAAQS.

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1. FEDERAL REGISTER / VOL. 71, NO. 200 / TUESDAY, OCTOBER 17, 2006 / RULES AND REGULATIONS (40 CFR PART 50 NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER; FINAL RULE)
2. "PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER AND SULFATES (CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY AIR RESOURCES BOARD"

Enviados en formato digital vía correo electrónico por Brian Moore, de la Agencia de Protección Ambiental de California, con fecha viernes 3 de junio de 2016, como parte de los antecedentes para la Revisión de la Norma de Calidad Primaria para Material Particulado Respirable MP10, D.S. N° 59.