

That is, the standard is set by the 4th highest maximum 8-hour concentration.

Ground level ozone today remains a pervasive pollution problem in the United States. About 51 million people live in areas with design values above the level of the 1-hour ozone standard based on three years of data (1999–2001). In addition, about 111 million people live in areas with design values above the 8-hour ozone standard based on those three years of data.

Approximately 61 million of these people live in areas with design values above the 8-hour standard but are below the design standard for the 1-hour ozone standard (*i.e.*, they are attaining the 1-hour standard). The remainder of these people live in areas with design values above the 8-hour ozone standards but are above the design value for the 1-hour ozone standard (*i.e.*, they are not attaining the 1-hour standard).<sup>9</sup> This represents 291 counties with design values above the level of the 8-hour standard.

Over the last decade, declines in ozone levels were found mostly in urban areas, where emissions are heavily influenced by controls on mobile sources and their fuels. Twenty-three metropolitan areas have realized a decline in ozone levels since 1989, but at the same time ozone levels in 11 metropolitan areas with 7 million people have increased.<sup>10</sup> Regionally, California and the Northeast have recorded significant reductions in peak ozone levels, while four other regions (the Mid-Atlantic, the Southeast, the Central and Pacific Northwest) have seen ozone levels increase. The highest ambient concentrations are currently found in suburban areas, consistent with downwind transport of emissions from urban centers. Concentrations in rural areas have risen to the levels previously found only in cities.

**b. Particulate Matter.** Category 3 marine engines contribute to ambient levels of particulate matter through direct emissions of particulate matter, especially sulfates.

Particulate matter represents a broad class of chemically and physically diverse substances. It can be principally characterized as discrete particles that

exist in the condensed (liquid or solid) phase spanning several orders of magnitude in size. All particles equal to and less than 10 microns are called PM<sub>10</sub>. Fine particles can be generally defined as those particles with an aerodynamic diameter of 2.5 microns or less (also known as PM<sub>2.5</sub>), and coarse fraction particles are those particles with an aerodynamic diameter greater than 2.5 microns, but equal to or less than a nominal 10 microns.

Particulate matter, like ozone, has been linked to a range of serious respiratory health problems. Scientific studies suggest a likely causal role of ambient particulate matter (which is attributable to several sources including mobile sources) in contributing to a series of health effects.<sup>11</sup> The key health effects categories associated with ambient particulate matter include premature mortality, aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, work loss days, and restricted activity days), aggravated asthma, acute respiratory symptoms, including aggravated coughing and difficult or painful breathing, chronic bronchitis, and decreased lung function that can be experienced as shortness of breath. Observable human noncancer health effects associated with exposure to diesel PM include some of the same health effects reported for ambient PM such as respiratory symptoms (cough, labored breathing, chest tightness, wheezing), and chronic respiratory disease (cough, phlegm, chronic bronchitis and suggestive evidence for decreases in pulmonary function). Symptoms of immunological effects such as wheezing and increased allergenicity are also seen. Exposure to fine particles is closely associated with such health effects as premature mortality or hospital admissions for cardiopulmonary disease.

PM also causes adverse impacts to the environment. Fine PM is the major cause of reduced visibility in parts of the United States. Other environmental impacts occur when particles deposit onto soils, plants, water or materials. For example, particles containing nitrogen and sulphur that deposit on to land or water bodies may change the nutrient balance and acidity of those environments. Finally, PM causes soiling and erosion damage to materials,

including culturally important objects such as carved monuments and statues. It promotes and accelerates the corrosion of metals, degrades paints, and deteriorates building materials such as concrete and limestone.

There are two indicators related to PM NAAQS. The first indicator is PM<sub>10</sub>, and the second is PM<sub>2.5</sub>. Concentrations above the PM<sub>2.5</sub> standard are much more widespread than are violations of the PM<sub>10</sub> standard, and emission reductions needed to attain the PM<sub>2.5</sub> standards will also lead to attainment of the PM<sub>10</sub> standards. The NAAQS for PM<sub>10</sub> was established in 1987. According to these standards, the short term (24-hour) standard of 150 µg/m<sup>3</sup> is not to be exceeded more than once per year on average over three years. The long-term standard specifies an expected annual arithmetic mean not to exceed 50 µg/m<sup>3</sup> over three years. Recent PM<sub>10</sub> monitoring data indicates that there are 8 serious and 58 moderate PM<sub>10</sub> nonattainment areas with about 30 million people in 63 mainly western counties. The NAAQS for PM<sub>2.5</sub> indicator was established in 1997. According to these standards, the short term (24-hour) standard is set at 65 µg/m<sup>3</sup> based on the 98th percentile averaged over three years. The long-term standard specifies an expected annual arithmetic mean not to exceed 15 µg/m<sup>3</sup> over three years.

Current PM<sub>2.5</sub> monitored values for 1999–2001, which cover about a quarter of the nation's counties, indicate that at least 65 million people in 129 counties live in areas where design values of ambient fine particulate matter levels are at or above the PM<sub>2.5</sub> NAAQS. Three years of complete data are required to make regulatory determinations of attainment or nonattainment but, based on more limited available data, there are an additional 9 million people in 20 counties where levels exceeding the NAAQS are being measured, but there are insufficient data at this time to make an official estimate of the design value. In total, this represents 39 percent of the population in the areas with monitors.<sup>12</sup> To estimate the current number of people who live in areas where long-term ambient fine particulate matter levels are at or above 16 µg/m<sup>3</sup> but for which there are no monitors, we can use modeling performed for the Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control rule (also called the "HD07" rule) described

<sup>9</sup>Memorandum to Docket A–2001–11 from Fred Dimmick, Group Leader, Air Trends Group, "Summary of Currently Available Air Quality Data and Ambient Concentrations for Ozone and Particulate Matter," December 3, 2002, Air Docket A–2001–11, Document No. IV–B–3.

<sup>10</sup>National Air Quality and Emissions Trends Report, 1998, March, 2000, at 28. This document is available at <http://www.epa.gov/oar/aqtrnd98>. Relevant pages of this report can be found in Memorandum to Air Docket A–2000–01 from Jean Marie Revett, September 5, 2001, (incorporated into Docket A–2001–11 at Document II–A–58).

<sup>11</sup>EPA (1996) Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information OAQPS Staff Paper, EPA452–R–96–013. Docket No. A–2001–11, Document II–A–52. The particulate matter air quality criteria documents are also available at <http://www.epa.gov/ncea/partmatt.htm>.

<sup>12</sup>Memorandum to Docket A–2001–11 from Fred Dimmick, Group Leader, Air Trends Group, "Summary of Currently Available Air Quality Data and Ambient Concentrations for Ozone and Particulate Matter," December 3, 2002, Air Docket A–2001–11, Document No. IV–B–3.