BEFORE THE
ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.

In the Matter of:	)	
	)	70 Fed. Reg. 65983
PROPOSED RULE TO IMPLEMENT THE FINE PARTICLE NATIONAL AMBIENT AIR QUALITY STANDARDS	)	(November 1, 2005)

COMMENTS OF THE NATIONAL STONE, SAND AND GRAVEL ASSOCIATION

Introduction and Summary

The National Stone, Sand and Gravel Association (NSSGA) offers the following comments on EPA's proposed rule to implement the National Ambient Air Quality Standards for (NAAQS) for fine particulate matter (PM) originally adopted in 1997.[1]

Emissions of PM from aggregate operations consist primarily of coarse PM. Small amounts of fine PM in aggregate emissions should be excluded from fine PM regulation because they do not make any significant contribution to local fine PM concentrations, have not been associated with the health risks addressed by the fine PM standards and are subject to coarse PM regulation. In addition, fine PM

[1] Based near the nation's capital, NSSGA is the world's largest mining association by product volume. Its member companies represent more than 90 percent of the crushed stone and 70 percent of the sand and gravel produced annually in the U.S. and approximately 115,000 working men and women in the aggregates industry. During 2004, a total of about 2.86 billion metric tons of crushed stone, sand and gravel, valued at $16 billion, were produced and sold in the United States.

emissions from aggregate operations would be extremely difficult to quantify and control, imposing substantial costs with little or no corresponding public health benefits.

These conclusions are supported by a series of studies of $PM_{2.5}$ emission factors from stone crushing operations as well as three detailed and comprehensive studies of ambient $PM_{2.5}$ concentrations upwind and downwind of stone crushing plants representative of those found throughout the industry. Copies of the reports on the NSSGA studies have been previously submitted to EPA, and NSSGA has presented the study results to EPA staff and to the Clean Air Scientific Advisory Committee's (CASAC) subcommittee on particle monitoring issues.

Beyond these points, NSSGA suggests a number of measures to improve the final regulations. Several key words and phrases are not properly defined in EPA's proposal, and without clear and complete definitions, it is not possible to adequately review the proposed regulations. In addition, EPA's proposal misstates the capabilities and limitations of EPA test methods and should be corrected. EPA should take various steps to improve the uncertainties of existing fugitive dust emissions inventories and to improve control strategies for long range transport. NSSGA recognizes that EPA has concluded that there is a need to pursue emission reductions on national, regional, and local levels simultaneously. NSSGA encourages EPA to require $PM_{2.5}$ control strategies that include many of the non-traditional emission sources that can contribute significantly to local $PM_{2.5}$ ambient concentrations.

These points are discussed in detail below and in the attached Legal Memorandum supporting these comments.

PM Emissions From Aggregate Operations

Fine PM emissions. NSSGA has sponsored a series of studies of $PM_{2.5}$ emission factors from stone crushing operations as well as three detailed and comprehensive studies of ambient $PM_{2.5}$ concentrations upwind and downwind of stone crushing plants representative of those found throughout the industry. Copies of the reports on the NSSGA studies have been previously submitted to EPA, and NSSGA has presented the study results to EPA staff and to the Clean Air Scientific Advisory Committee's (CASAC) subcommittee on particle monitoring issues.[2] It is NSSGA's impression that both EPA staff and the CASAC subcommittee were favorably impressed with both the quality and the results of the NSSGA studies.

The primary conclusions of the NSSGA studies are

- Stone crushing plants either had no detectable effect on 24-hour average ambient $PM_{2.5}$ concentrations, or the measured effect was extremely small (less than 1 microgram per cubic meter).
- Mineral particulate, the type of dust emitted by stone crushing operations, was either not detectable at the downwind monitoring locations, or the detectable quantity was extremely small.
- The $PM_{2.5}$ in the vicinity of the plants generally was dominated by organics, including sulfates, nitrates, ammonium and chloride compounds, none of which are products or byproducts of the plants or plant activities. This is another indication that

[2] Richards, et al., $PM_{2.5}$ and PM_{10} Ambient Air Monitoring at a Stone Crushing Plant (December 1997); Richards, et al., $PM_{2.5}$ Upwind-Downwind Ambient Air Monitoring at the Luck Stone Corporation Leesburg, Virginia Stone Crushing Plant (June 1998); Richards, et al., $PM_{2.5}$ Ambient Air Monitoring at the Camas Colorado, Inc. Morrison, Colorado Stone Crushing Plant (October 1998). The first of these is provided in the Appendix to NSSGA's Petition to EPA on these issues, discussed further below, which also includes copies of the emission factor studies.

$PM_{2.5}$ in the vicinity of these facilities is attributable to other sources.

- The filters obtained using EPA's $PM_{2.5}$ ambient monitoring technique can readily be analyzed to determine the maximum fraction of solids attributable to geologic crustal particulate matter. Accordingly, EPA's ambient $PM_{2.5}$ monitoring method is compatible with compositionally based exclusions of geologic crustal particulate matter.

Coarse PM emissions. As discussed in the NSGA studies, PM emissions from aggregate operations generally consist of 80%-90% coarse PM (PM2.5-10). EPA's recent PM Criteria Document (PM) and Staff Paper (SP) conclude that coarse and fine PM are fundamentally different for many reasons and should be regulated separately.[3] For example, the PM CD concludes:

> Particle size distributions show that atmospheric particles exist in two classes, fine particles and coarse particles. Fine and coarse particles are defined primarily in terms of their formation mechanisms and size; and they also differ in sources, chemical composition, and removal processes (see Table 2-2). Subsequent chapters will show that fine and coarse particles also differ with regard to aspects of concentration, exposure, dosimetry, toxicology, and epidemiology. <u>These differences support the setting of separate standards for fine and coarse particles. Fine and coarse particles overlap in the size range between 1 and 3 µm where PM concentrations are at a minimum. Coarse particles are generally larger than this minimum and are generally formed by mechanical processes.</u> Coarse particles and coarse-mode particles are equivalent terms. Fine particles are generally smaller than the minimum and are generally formed by coagulation and condensation of gases (p. 2-111, emphasis added)

Significant differences between fine and coarse PM sources and emissions are described further in CD Chapter 3:

> The results of receptor modeling studies throughout the United States indicate that the combustion of fossil and biomass fuels is the major source of measured ambient PM2.5. Fugitive dust, found mainly in the PM10-2.5 range size, represents the largest source of measured ambient PM10 in many locations in the western United States . . . As seen in Table

[3] References to the PM CD and SP are to EPA's *Air Quality Criteria for Particulate Matter* (October 2004) and *Review of National Ambient Air Quality Standards for Particulate Matter, Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper* (December 2005).

> 3-8, emissions of mineral dust, organic debris, and sea spray are concentrated mainly in the coarse fraction of PM10 (> 2.5 µm). A small fraction of this material is in the PM2.5 size range (< 2.5 µm) (pp. 3-103-104).

The PM SP contains a detailed discussion of these differences and the reasons why they justify separate regulation of fine and coarse particles:

> Fine particles and coarse particles, which are defined in Section 2.2.1.1, are relatively distinct entities with fundamentally different sources and formation processes, chemical composition, atmospheric residence times and behaviors, transport distances, and optical and radiative properties. The CD concludes that these differences justify consideration of fine and coarse particles as separate subclasses of PM pollution (CD, pp. 2-111 and 9-21) (p. 2-1).
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> <u>As illustrated in panel (c) of Figure 2-1, volume distributions typically measured in ambient air in the U.S. are found to be bimodal, with overlapping tails, and an intermodal minimum between 1 and 3 µm (CD, p. 2-25). The distribution of particles that are mostly larger than this minimum make up the coarse mode and are called "coarse particles," and the distribution of particles that are mostly smaller than the minimum are called "fine particles</u>" . . . Because of the overlap in the size distributions of fine and coarse-mode ambient particles, and the fact that inlets do not have perfectly sharp cut points, no single sampler can completely separate them. Given a specific size cut, the smaller the particles the greater the percentage of particles that are captured. The objective of size-selective sampling is usually to measure particle size fractions that provide a relationship to human health impacts, visibility impairment, or emissions sources (p. 2-4. emphasis added).
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> Coarse particles are generally primary particles, meaning they are emitted from their source directly as particles. Most coarse particles result from mechanical disruption of large particles by crushing or grinding, from evaporation of sprays, or from dust resuspension. Specific sources include industrial process emissions, fugitive emissions from storage piles, traffic related emissions including tire and paving materials and grinding and resuspension of crustal, biological, industrial, and combustion materials that have settled on or near roadways, construction and demolition activities, agriculture, mining and mineral processing, sea spray, and wind-blown dust and

> biological materials. The amount of energy required to break down primary particles into smaller particles normally limits coarse particle sizes to greater than 1.0 µm diameter (EPA 1996a, p. 13-7). Some combustion-generated particles, such as fly ash, are also found as coarse particles. By contrast, a significant amount of fine particles are produced through combustion processes and atmospheric transformation processes of precursor gases (p. 2-6).

As these passages emphasize, coarse PM emissions often contain small amounts of fine PM as well, generally in the 1-3 micrometer range. However, this fine PM "tail" displays the composition and other salient characteristics of the coarse PM emission and is considered to be a part of the coarse PM emission, rather than a separate emission of fine PM. This is clarified in the SP definitions of fine and coarse particles:

> Coarse Particles: The distribution of particles that are mostly larger than the intermodal minimum in volume or mass distributions; also referred to as coarse-mode particles. This intermodal minimum generally occurs between 1 and 3 µm.
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> Thoracic Coarse Particles: A subset of coarse particles that includes particles that can be inhaled and penetrate to the thoracic region (i.e., the tracheobronchial and the gas-exchange regions) of the lung. This subset includes the smaller coarse particles, ranging in size up to those with a nominal aerodynamic diameter less than or equal to 10 microns.
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> Fine Particles The distribution of particles that are mostly smaller than the intermodal minimum in volume or mass distributions; this minimum generally occurs between 1 and 3 µm (Table 2-1, p. 2-7, emphasis added).

The SP also emphasizes the differences in chemical composition between fine and coarse PM emissions:

> Based on studies conducted in most parts of the U.S., the CD reports that a number of chemical components of ambient PM are found predominately in fine particles including: sulfate, ammonium, and hydrogen ions; elemental carbon, secondary organic compounds, and primary organic species from cooking and combustion; and certain metals, primarily from combustion processes. Chemical components

> found predominately in coarse particles include: crustal-related materials such as calcium, aluminum, silicon, magnesium, and iron; and primary organic materials such as pollen, spores, and plant and animal debris (CD, p. 2-38) (pp. 2-8-9).

Potential health effects. The differences discussed above have led to dramatically different conclusions with respect to the potential health effects of fine PM emissions from combustion sources and coarse PM emissions from aggregate operations. The PM CD and SP repeatedly underscore the affirmative evidence indicating that exposure to emissions of crustal material is unlikely to be harmful at environmental exposure levels. On this issue, the CD concludes:

> Other studies suggest that particles of crustal origin are generally unlikely to exert notable health effects under most ambient exposure conditions. Some exceptions may include situations where crustal particles have come to be heavily contaminated by metals originally emitted as fine particles from smelting operations but deposited over many years on soils around smelters, steel mills, etc. (p. 8-339).
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> Certain classes of ambient particles appear to be distinctly less toxic than others and are unlikely to exert human health effects at typical ambient exposure concentrations (or perhaps only under special circumstances). For example, particles of crustal origin, which are predominately in the coarse fraction, are relatively non-toxic under most circumstances, compared to combustion-related particles (such as from coal and oil combustion, wood burning, etc.) (p. 8-344).
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> The SP discusses the regulatory consequences of these findings:
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> Taken together, the epidemiologic studies that examine exposures to thoracic coarse particles generally found in urban environments and to natural crustal materials support the view that urban thoracic coarse particles are of concern to public health, in contrast to uncontaminated natural crustal dusts.
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> By contrast, recent evidence from epidemiologic studies has suggested that mortality and possibly other health effects are not associated with thoracic coarse particles from dust storms or other such wind-related events that result in suspension of natural crustal materials of geologic

> origin. The clearest example is provided by a study in Spokane, WA, which specifically assessed whether mortality was increased on dust-storm days using case-control analysis methods. The average PM10 level was more than 200 µg/m3 higher on dust storm days than on control days, and the authors report no evidence of increased mortality on these specific days (Schwartz et al., 1999) . . . the Spokane study provides no suggestion of significant health effects from uncontaminated natural crustal materials that would typically form a major fraction of coarse particles in non-urban or rural areas (pp. 5-56-57).

The SP then goes on to conclude that there is currently no evidence of adverse effects from exposure to coarse PM emissions from mining operations:

> Beyond the urban and rural distinctions discussed above, staff has also considered the extent to which there is evidence of effects with exposure to ambient thoracic coarse particles in communities predominantly influenced by agricultural or mining sources. For example, in the last review, staff considered health evidence related to long-term silica exposures from mining activities, but found that there was a lack of evidence that such emissions contribute to effects linked with ambient PM exposures (EPA, 1996b, p. V-28). Similarly in this review, there is an absence of evidence related to such community exposures. While dust generated from agricultural activity can include biological material such as fungal or bacterial material, and some occupational studies discussed in the CD report effects at occupational exposure levels (Table7B-3, p. 7B-11), such studies do not provide relevant evidence for much lower levels of community exposures. Further, it is unlikely that such sources contribute to the effects that have been observed in the recent urban epidemiologic studies . . .
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> This is consistent with CASAC's conclusion that the available evidence from health studies suggests that the focus of an indicator for thoracic coarse particles should be on such particles found in urban, not rural environments (Henderson, 2005). The staff assessment of the available evidence relevant to the appropriate scope of an indicator for coarse particles can be summarized as follows. Thoracic coarse particle concentrations generally reflect contributions from local sources, and the limited information available from speciation of thoracic coarse particles and emissions inventory data indicate that the sources of urban thoracic coarse particles generally differ from those found in nonurban areas. As a result, the kinds of thoracic coarse particles people are exposed to in urban areas can be expected to differ significantly from the kinds found in non-urban or rural areas. Ambient PM10-2.5 exposure is associated with health effects in studies conducted in urban areas, and the limited available health evidence more strongly implicates coarse particles from industrial and

> traffic-related sources than from uncontaminated soil or geologic sources. The limited evidence does not support either the existence or the lack of causative associations for community exposures to agricultural or mining industries. Given the apparent differences in composition and in the epidemiologic evidence, it is not appropriate to conclude that evidence of associations with health effects related to urban coarse particles would also apply to nonurban or rural coarse particles.

As the SP notes, EPA's Clean Air Scientific Advisory Committee (CASAC) has concurred that PM emissions from mining operations have not been shown to pose any significant public health threat. In its initial review of the draft PM SP,[4] the Committee concluded:

> It was acknowledged that the scientific basis supporting a causal role of PM10-2.5 in an array of adverse health effects is weaker than that of PM2.5. Regardless, most of the Panel members felt that the evidence that exists supports a causal role for health effects for PM10-2.5 . . . Because the evidence for the toxicity of PM10-2.5 comes from studies conducted primarily in urban areas and is related, in large part, to the re-entrainment of urban and suburban road dusts as well as primary combustion products, there is concern that the associations of adverse effects with PM10-2.5 may not apply to rural areas where the PM10-2.5 is largely composed of less-toxic components of windblown soil or products of agricultural operations for which there is either no or limited evidence of health issues (p. 7).

* * * *

> One of the major reservations expressed by the Panel in recommending a 24-hour PM10- 2.5 NAAQS related to the non-specificity of the PM10-2.5 mass metric. Given that most evidence indicates that the component of the coarse fraction in most rural areas has little or no toxicity at environmental concentrations, it was felt important to qualify the PM10-2.5 standard by somehow allowing exceptions for regions where the coarse fraction was composed largely of material that was not contaminated by industrial- or motor vehicle traffic-associated sources. Options discussed by members of the Panel for attempting to achieve this approach included limiting the standard to cover "all" urban areas, the judicious siting of monitors with a focus on urban areas, or regulatory

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[4] Letter from Dr. Rogene Henderson, Chair, to Administrator Stephen L. Johnson re: CASAC Review of Draft Staff Paper (June 6, 2005).

> exceptions for regions where road dust is not an issue or where rural components dominate the source (p. 8).

These conclusions are confirmed in the Committee's letter[5] to Administrator Johnson on the final SP:

> CASAC generally agrees with EPA staff conclusions that thoracic coarse particles in urban areas can be expected to differ in composition from those in rural areas and that evidence of associations with health effects related to urban coarse-mode particles would not necessarily apply to non-urban or rural coarse particles (although it is likely that there will be some overlap of the same contaminants in both areas.) Most Panel members concurred that the current scarcity of information on the toxicity of rural dusts makes it necessary for the Agency to base its regulations on the known toxicity of urban-derived coarse particles, and that an urban coarse particle indicator should be specified as UPM10-2.5 (p. 4).

On the basis of the foregoing findings and conclusions, EPA recently proposed to replace the current PM10 standards with new standards based on an urban particle indicator. See 71 Fed. Reg. 2619 (January 17, 2006). The proposed standard would not be restricted to urban areas per se, but would be a nationwide standard that would apply in any area where the ambient mix of coarse PM is dominated by resuspended dust from high density traffic on paved roads and PM generated by industrial and construction sources. The standard would not apply in areas where the ambient mix of coarse PM is dominated by rural windblown dust and soils or PM generated by mining sources. EPA also has proposed a specific exclusion for mining sources in all areas:

> The standard for PM10-2.5 includes any ambient mix of PM10-2.5 that is dominated by resuspended dust from high-density traffic on paved roads and PM generated by industrial sources and construction sources, and excludes any ambient mix of PM10-2.5 that is dominated by rural windblown dust and soils and PM generated by agricultural and mining sources. Agricultural sources, mining sources, and other similar sources of

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[5] Letter from Dr. Rogene Henderson, Chair, to Administrator Stephen L. Johnson re: CASAC Review of EPA Staff Recommendations Concerning a Potential Thoracic Coarse PM Standard in the Final PM Staff Paper (September 15, 2005).

> crustal material shall not be subject to control in meeting this standard (71 Fed. Reg. 2698-99).

The preamble to the proposal provides the following explanation of this proposed regulation:

> The regulation for the proposed thoracic coarse particle indicator states that "[a]gricultural sources, mining sources, and other similar sources of crustal material shall not be subject to control in meeting this standard." <u>This proposed language reflects that the information supporting the proposed standard for thoracic coarse particles does not support extending controls to thoracic coarse particles from agricultural, mining sources, and other similar sources of crustal material.</u> <u>This statement in the regulations therefore is designed to make clear that there is no need nor basis to control these sources to obtain the public health benefits intended by the proposed indicator</u> (71 Fed. Reg. 2668, emphasis added).

<u>Coarse PM regulation</u>. Coarse PM emissions from aggregate operations currently are subject to regulation under the NAAQS for PM10. As discussed above, EPA has proposed a new standard for coarse PM that would exclude mining emissions. However, aggregate and other mining emissions remain subject to the PM10 standards until they are revoked and replaced. In addition, EPA's proposal would retain the PM10 standards for a time in current nonattainment areas (see 71 Fed. Reg. 2674). In all areas where aggregate emissions remain subject to PM10 regulation, they cannot be subjected to fine PM regulation as well. Apart from the absence of health concerns, as discussed above, that would result in dual regulation, which the courts have prohibited. See 71 Fed. Reg. 2673 (January 17, 2006), discussing *American Trucking Associations v. EPA*, 175 F. 3d 1027, 1054-55 (D.C. Cir. 1999)(vacating 1997 PM10 standards).

As discussed above, if aggregate emissions eventually are excluded from the coarse PM standards, regulation under the fine PM standards also is precluded. However, it is important to remember that other regulatory authorities are available to address any coarse PM emissions that truly threaten public health. In *Alabama Power Co. v. Costle,* 636 F.2d 323, 370 & n.134 (D.C. Cir. 1979), the court addressed EPA's authority to exclude from NAAQS pollutants, or subsets of them, that do not present "substantial public health or welfare concerns." In that case, the court was reviewing a PSD exemption adopted by EPA for fugitive emissions. The court vacated the exemption, finding it unnecessary as a result of other provisions in the Act. However, the court also provided EPA with a blueprint for excluding pollutants for which ambient standards are not justified:

> EPA has discretion to define the pollutant termed" particulate matter" to exclude particulates of a size or composition determined not to present substantial public health or welfare concerns. Such "excluded particulates" would remain "air pollutants" within the meaning of the Act, section 302(g), but would be dropped from the list of pollutants compiled by the EPA Administrator under section 108(a)(1) a list comprised of air pollutants the "emissions of which, in his judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare." Since national ambient air quality standards may exist only for those pollutants lists under section 108(a)(1), "excluded particulates" would not be subject to NAAQS.

The court went on to note that exclusion of some PM emissions from the ambient standards does not mean that they will not be regulated, because they would continue to constitute an "air pollutant" subject to regulation under other provisions of the Act. In addition, coarse PM emissions generally are regulated under state law as well. In short, there are other ways to address coarse PM emissions that truly pose significant risks, and this is yet another reason to exclude them from fine PM implementation plans.

<u>Control Measures and Costs</u>

As discussed above, the available evidence indicates that regulation of the fine PM "tail" of aggregate emissions would not provide any significant public health benefits. Substantial measurement and monitoring issues surround all of these emissions as well. These and other issues would lead to major problems in developing a coherent control strategy for these very minor emissions.

One of these problems is substantial uncertainty concerning the emission rates for natural sources, a dominant source of ambient mineral particulate matter. This uncertainty is summarized in the following excerpts from the CD concerning windblown dusts:

> Fugitive dust sources, as mentioned above, are extremely difficult to quantify; and stated emission rates may represent only order-of-magnitude estimates. Although crustal dust emissions constitute about 50% of the total primary $PM_{2.5}$ inventory, they constitute less than about 15% of the source strengths inferred from the receptor modeling studies shown in Table 3-9. However, it should be remembered that secondary components (sulfate, nitrate, and some fractions of OC) often account for most of the mass of ambient $PM_{2.5}$ samples. Although mineral dust sources represent the major category in Table 3-11, their contributions are distributed much more widely than are those from combustion sources.
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> Watson and Chow (2000) reexamined the methodology used to determine emissions of fugitive dust. The standard methods use data obtained by particle monitors stacked at several elevations from 1 to 2 m up to 7 to 10 m above the surface. However, small-scale turbulent motions and variable winds characterize atmospheric flow patterns immediately adjacent to the surface in thisheight range (Garratt, 1994). The depth of this turbulent layer is determined by surface roughness elements, and there is a high probability of particles being entrained in turbulent eddies and redepositing on the ground within a very short distance. In addition to the source sampling problem referred to above, it should be remembered that dust often is raised in remote areas far removed from population centers. Precipitation or scavenging by cloud droplets and dry deposition removes particles during transport from the source area. In addition, gravitational settling can be an important loss mechanism for particles larger than a few micrometers in aerodynamic diameter.

> As rough estimates, uncertainties in emissions estimates could be as low as 10% for the best characterized source categories; whereas emissions figures for windblown dust should be regarded as order-of-magnitude estimates (pp. 3-99-100)

Fugitive dust emissions are not constant. The ambient impact of these emissions is not fully described by their annual average emissions. The episodic nature of natural fugitive dust emissions must be taken into account as indicated in the following excerpts from the Criteria Document.

> Ideally, an emissions inventory should include all major sources of a given pollutant. This may be an easy task for major point sources. However, area sources of both primary PM and precursors to secondary PM formation are more difficult to characterize than point sources; and, thus, they require special emphasis when preparing emission inventories. Further research is needed to better characterize the sources of pollutants to reduce this source of uncertainty. Errors also can arise from the misreporting of data, and arithmetic errors can occur in the course of compiling entries from thousands of individual sources. A quality assurance program is required to check for outliers and arithmetic errors. Because of the variability in emissions rates, there can be errors in the application of inventories developed on an annually averaged basis (as are the inventories shown in Tables 3-11 and 3-12) to episodes occurring on much shorter time scales. As an example, most modeling studies of air pollution episodes are carried out for periods of a few days (p. 3-99)

> Data for $PM_{10-2.5}$ are not as abundant as they are for $PM_{2.5}$, and their interpretation is complicated by the difference method used to determine their concentrations. The more sporadic nature of sources of $PM_{10-2.5}$ and its shorter atmospheric lifetime tend to result in lower spatial correlations for $PM_{10-2.5}$ than for $PM_{2.5}$ concentrations. Errors in the measurement of $PM_{2.5}$ and PM_{10} also result in calculations of lower spatial correlations of $PM_{10-2.5}$. Calculated concentrations of $PM_{10-2.5}$ are occasionally negative as reflected by $PM_{2.5}$ to PM_{10} ratios greater than one. Because analytical errors are generally larger for individual species than for total mass, similar problems arise in their determination in $PM_{10-2.5}$ samples by the difference approach. Some, but not all of these problems could be resolved by the use of dichotomous samplers that also provide a direct sample of $PM_{10-2.5}$ for compositional analyses (p. 3-102).

In addition to the uncertainty regarding the actual emission quantities of mineral particulate matter, there are uncertainties regarding removal mechanisms. As discussed inn the CD excerpts reprinted above, due to the tendencies of large particles to be removed by inertial impact on and gravitational settling, the quantities remaining airborne may be smaller than anticipated.

Global transport of dust plumes from the Sahara Desert and other arid areas further complicate the evaluation of mineral dust emission quantities and ambient concentration variability. As indicated in the excerpt below, a major fraction of the observed dust levels in the eastern U.S. can occur due to the westward movement of these mineral dust plumes.

> Many areas in the East are affected by dust transported from northern Africa, and it has recently become apparent that many areas, especially, but not limited to the Northwest, are affected by dust transported from the deserts of Asia. In addition to crustal material, pollutantsand primary biological aerosol particles (PBPs) are also transported during intercontinental transport events. Many areas are also affected by smoke from wildfires occurring within the United States or in Canada, Mexico, or Central America. Storms, in which the winds can suspend material from the surface of the land or seas, also contribute soil, sea spray and PBP. Contributions of primary PM from natural sources and sources outside Northern America as given above are all episodic. Because concentrations of PBP are so poorly quantified, even though they can constitute significant portions of the organic fraction of the atmospheric aerosol, estimates of PRB concentrations will remain highly uncertain. Estimates of annually averaged PRB concentrations or their range have not changed from the 1996 PM AQCD (pp. 3-104-05).

The Sahara $PM_{2.5}$ mineral particulate dust plume is discussed extensively in both the Criteria Document and the EPA PM Staff Paper. Some of the original research was conducted by Dr. Wolff, former Chairman of the CASAC Committee. His work and the other global transport related papers clearly demonstrate the need to further evaluate this phenomenon. The unpredictable penetration of this global $PM_{2.5}$ mineral particulate air mass significantly complicates the development of SIP control strategies, especially for the East Coast states.

Thus, the efforts of state and local agencies to develop effective fine PM control strategies for aggregate emissions would be significantly complicated by: (1) uncertainties in the natural emission rate of fine PM in fugitive dust; (2) uncertainties in stationary source emissions inventories fine PM in fugitive dust; and (3) the episodic nature of natural emissions. Resulting control strategies would be costly for state and local authorities to develop and likely would impose substantial additional costs on operators of aggregate facilities, with little or no corresponding public health benefits. Exclusion of aggregate emissions from fine PM control strategies would not pose any significant public health risk and would allow state and local agencies to avoid these complications, and the resulting costs, while focusing on the fine PM sources of public health concern.

Definitions

A number of important words and phrases are not properly defined in the proposed regulations. These words and phrases are critical to the interpretation of EPA's intent with respect to the implementation of the fine particle National Ambient Air Quality Standards (NAAQS). Without clear and complete definitions, it is not possible to adequately review the proposed regulations. These undefined or improperly defined terms include the following.

- Crustal particulate matter (e.g. improper terminology on page 65988 column 1; 65992 columns 1 and 2; page 65994 Table 3 and column 2; page 66014, column 3)
- Urban and Rural (Undefined terms on page 65993, Table 2)

- Gases and Vapors (e.g. improper terminology on page 65994 column 3; page 65995 column 1; page 66052, column 1)

<u>Crustal Particulate Matter</u> - NSSGA believes that the term "crustal" particulate matter is ambiguous in the proposed regulation. In portions of the preamble to the proposed regulations, EPA refers to crustal particulate matter generated by construction, agricultural, mineral industry, and geogenic sources. These materials should be described as "geologic crustal particulate matter" to indicate that the particles are composed of matter that has been removed from parent materials due to physical attrition and entrained in the ambient air. Almost all of the geologic crustal particles entrained from a source are in the coarse mode discussed in Figure 2-4 of the Criteria Document (EPA/600/P-99/002aF, page 2-11). Control of coarse mode particulate matter has a beneficial impact on the "tail" of the geologic crustal particulate matter distribution that extends into the fine mode, especially the inter-modal range of 1 to 2.5 micrometers[6].

In other portions of the preamble, EPA refers to crustal particulate matter from coal-fired power plants. With respect to power plants, EPA has confused the elements that are commonly found in geological crustal particulate matter with flyash that has formed due to the burnout and fusion of inorganic elements in ash particles during movement through extremely high temperature combustion processes. Flyash is quite different in composition and size from geologic crustal particulate matter. The inorganic compounds present in flyash share some of the same chemical elements as geologic crustal particulate; however, the composition and morphology of the flyash particles are quite different. A major fraction of the flyash particles from coal-fired boilers is less than 2.5

[6] All particle size data in these comments are expressed in units of aerodynamic diameter.

micrometers and is composed of fused and hollow glassy spheres. Most of the flyash emitted by fossil fuel-fired boilers sources controlled by electrostatic precipitators and reverse air fabric filters is in the fine mode with slight penetration upward into the inter-modal and coarse distributions. Control of these sources aimed at the coarse mode will have little, if any, beneficial impact.

The submicrometer-sized fine mode flyash particles are vulnerable to surface enrichment in toxic metals due to their high surface area and their exposure to vapor phase metal compounds condensing in the heat exchange areas of the boiler. Enrichment in metals such as arsenic, selenium, mercury, cadmium, and lead is very common. Enrichment is far less likely for the much larger geologic crustal particles that are not exposed to hot gas streams with vapor phase metals and acids.

The only similarity between flyash and geologic crustal particulate matter is the presence of elements such as aluminum, silicon, calcium, sodium, potassium, and iron.

The term “crustal” clearly should be reserved for use in discussing particles that are:

(1) Derived directly by the reentrainment of naturally occurring minerals from the earth’s crust at ambient temperature,

(2) Composed of particles primarily in the coarse mode, and

(3) Not exposed to the heterogeneous nucleation of vapor phase metals and acids.

The term “flyash” should be used to refer to particles that are

(1) Derived from combustion and/or industrial processes that change the chemical compounds present in the particle,

(2) Composed of particles primarily in the fine mode, and

(3) Exposed to temperatures in excess of 1,500ºF and subject to heterogeneous nucleation by vapor phase metals and acids that are also generated in the combustion gas stream.

Proper terminology for geologic crustal particulate matter and flyash is critical to developing appropriate and effective $PM_{2.5}$ control strategies to protect public health. The control regulations must be aimed at different modes of particulate matter and different source categories. Lumping flyash with geologic crustal mineral particles is a little like shoving a mad dog into a group of newborn puppies and then claiming that the group is potentially violent.

Urban, Rural, and Local - These undefined, but very important terms are used at numerous locations in the preamble to this regulation. Based on the context of the discussions in the preamble, NSSGA assumes that the term "Urban" applies to densely populated areas with a Metropolitan Statistical Area or a Consolidated Metropolitan Statistical Area. The term "Rural" should be defined as all areas that are not "Urban." The term "Local" should be defined as sources with the jurisdiction of a State or local agency.

Gases and Vapors - Throughout the preamble, EPA uses the word "gases" when referring to compounds that could potentially condense in an EPA reference method condensable particulate matter sampling train. "Gases" is inappropriate in this context. Gases are compounds that cannot convert to a liquid or solid form unless compressed and/or cooled to temperatures well below ambient levels. The proper term is "vapors." Vapors are compounds that have been formed chemically or volatilized and can re-condense to form liquids or solids at ambient temperature. Gases and vapors can and do co-exist in the gas streams of combustion sources such as coal-fired boilers. For example, a coal-fired boiler can have a mixture of gases that includes oxygen, carbon dioxide, nitrogen, and sulfur dioxide plus one or more vapors such as sulfuric acid vapor and water vapor. A condensable particulate matter sampling method is designed to capture vapor phase materials, not gases.

<u>Local and Regional Emissions Reductions</u>

NSSGA recognizes that EPA has concluded that there is a need to pursue emission reductions on national, regional, and local levels simultaneously. NSSGA encourages EPA to require $PM_{2.5}$ control strategies that include many of the non-traditional emission sources that can contribute significantly to local $PM_{2.5}$ ambient concentrations. These control strategies should focus on the general categories of contaminants identified by speciation. As indicated in Table 2 on FR65993, carbonaceous material accounts for 35% to 59% of the urban site $PM_{2.5}$. Considering that EPA has proposed excluding VOC emissions as $PM_{2.5}$ precursors, it will be especially important for local source control strategies to emphasize local sources of condensed organic particulate matter. Non-traditional sources of condensed organic $PM_{2.5}$ include (1) wood-burning stoves and fireplaces, (2) auto repair shops, (3) restaurants, and (4) surface coating operations.

NSSGA agrees with the statement on FR66021 that, "A significant fraction of $PM_{2.5}$ mass in most areas violating the standards is attributed to secondarily formed components such as sulfate, nitrates, and carbonaceous PM, and EPA believes that certain stationary sources of these precursors may be poorly controlled." There are numerous non-traditional sources of primary carbonaceous $PM_{2.5}$ emissions. Unfortunately, a number of these sources, such as restaurants, are not presently included in EPA's emission factor database. EPA should fill the necessary gaps in the emission factor database to help state and local agencies accurately determine the sources of local primary $PM_{2.5}$ emissions in their jurisdiction

Fine PM Emission Inventories and EPA Test Methods

In Section III P, 1 and 2, the capabilities and limitations of EPA test methods are misstated. EPA Conditional Method 040[7] was originally developed by NSSGA member company Air Control Techniques, P.C. for the Portland Cement Association. It was used initially in 1997 as part of an NSSGA sponsored emission factor test program to compile primary $PM_{2.5}$ emission factors. When Conditional Method 040 is used at ambient temperature during tests at stone, sand & gravel plants, it provides $PM_{2.5}$ emissions data for both filterable and condensable particulate matter. The emission factor data compiled by NSSGA and included by EPA in AP42 Section 11.19.2 was obtained by Conditional Method 040 and represents total particulate matter, not only filterable particulate matter. When EPA Methods 5 or 17 are operated at ambient temperature, they also provide total particulate matter data, not only filterable particulate matter data. The type of particulate matter data provided by these EPA reference methods as a function of sampling temperature should be clarified.

It is also important to note that many sources of fugitive dust do not generate condensable particulate matter because the process materials and gas streams are not heated, and no vapor phase materials are released. For sources at which condensable particulate matter cannot form, the EPA methods provide total primary $PM_{2.5}$ emission

[7] Conditional Method 040 has been previously termed by EPA as Preliminary Method 4 and Draft Method 201B. The method is an extension of EPA Method 201A used for the measurement of PM_{10} particulate matter.

factor data. The discussion in Section III P should be corrected to adequately describe the types of emission factor data available from the EPA test methods.

Fugitive Dust Emission Inventory Uncertainties

In other portions of these comments, NSSGA advocates the exemption of sources for geologic crustal particulate matter. NSSGA believes that this exemption is consistent with (1) the low "crustal" content of ambient $PM_{2.5}$ data in most regions as summarized in the Particulate Matter Criteria Document Table 2-2 of the Preamble (FR65993) and (2) the health effects data compiled in the Particulate Matter Criteria Document. The exclusion of geologic crustal particulate matter would substantially simplify the development of effective $PM_{2.5}$ control strategies. The following excerpts from EPA documents continue to provide a valid summary of the numerous significant uncertainties involved in evaluating emissions of geologic crustal particulate matter.

> "Geological or soil particles become airborne when natural soils are mechanically disturbed. While soil sources contribute up to 85% of observed PM_{10} concentrations, analysis of ambient samples reveals only small contributions (10% to 15%) of soil sources to the total in most locations. That trend toward small contributions from soils is also seen in the data collected in Canada. The primary sources of geological particles are agricultural tilling, construction activities, road dust from both unpaved and paved roads, and windblown dust. Soil particles contain common metals including Al, Si, K, Fe, Ca, and other trace metals. It is not expected that soil particles will be significant in terms of control strategies for $PM_{2.5}$ in most areas." State-of-the-Science Paper on the Status of Emissions Inventory Methods for $PM_{2.5}$, Page 7

> "Much of the mass of $PM_{2.5}$ directly emitted emissions in the current inventory is attributed to fugitive dust sources. Many of these estimates are based on the application of a scaling factor that is derived from size distribution functions that were available from analyses that supported PM_{10} planning efforts. While these emissions are likely to be representative of the source strength in many cases, they are not necessarily consistent with ambient air quality speciation data which implies that a portion of those emissions ultimately are removed by some

other mechanical deposition process. Differences between the spatial and temporal nature of the inventories and air quality data are also likely to contribute to discrepancies. Therefore, emission estimates for $PM_{2.5}$ from fugitive sources are suspect and in need of improvement." State-of-the-Science Paper on the Status of Emissions Inventory, Page 17

"Estimates of the emissions magnitude for some sources of $PM_{2.5}$ are sometimes inconsistent with the resulting ambient concentrations measured at nearby monitoring sites. This effect is observed most clearly with respect to surface fugitive dust sources of primary emissions. The causes for these discrepancies are not well established at this time." State-of-the-Science Paper on the Status of Emissions Inventory Methods for $PM_{2.5,}$ Page 7

"Currently, the mechanisms that produce fugitive emissions and affect the transport of those emissions to potential receptor sites are not well represented in the emissions estimation methods. Therefore, the confidence in $PM_{2.5}$ emissions estimates from fugitive dust sources is low." State-of-the-Science Paper on the Status of Emissions Inventory Methods for $PM_{2.5}$, Page 8

"Data on source strengths based on size distribution functions suggest that there is indeed a large amount of mass in the [fugitive dust] emissions of particles under 2.5 μm. The ambient data collected, usually at more than kilometer distances away from these sources, suggest that the amount of mass that is entrained into the prevailing transport regime, and ultimately to be collected at ambient samplers, is much lower than that emitted. There are several potential physical processes that could remove or alter the fine particulate before it can reach the transport layer. ... Once these investigations are completed, additional information will be made available to assist in the development of fugitive dust emissions of $PM_{2.5}$. In the meantime, estimates based on current factors and estimation methods that have been made available at the national-level are suspect." State-of-the-Science Paper on the Status of Emissions Inventory Methods for $PM_{2.5}$, Page B-3

NSSGA recommends that EPA devote considerably more effort to studying fugitive dust emissions from unpaved roads, agricultural operations, construction activities, and natural sources. These data will prove to be helpful in determining the relative contributions of these sources to ambient $PM_{2.5}$ levels. NSSGA believes that valid scientific study of geologic crustal particulate emissions from these sources will demonstrate that they dominate emissions of mineral particulate in general and that none of the stationary source geologic crustal particulate matter sources strongly affect ambient $PM_{2.5}$ levels.

Local and Long Range Transport Source Control Strategies

The discussion provided in Section III E "How Should the States and EPA Balance the Need to Address Long-Range Transport of Fine Particle Pollution with the Need for Local Emissions Reductions When Implementing the $PM_{2.5}$ Standards?" is inadequate. The preamble and the proposed regulation do not include any specific requirements that State and local agencies speciate ambient $PM_{2.5}$ filters to determine the major constituents present on filters for monitoring days having $PM_{2.5}$ concentrations approaching or exceeding the standards. Speciation is critical in determining the extent to which high concentrations of ambient $PM_{2.5}$ are due to local sources and $PM_{2.5}$ formed during long-range transport and chemical reactions of precursors. The methods to speciate filters have been adequately summarized in EPA documents. It is not clear why the proposed regulations are silent on this especially important topic.

In a similar manner, the information provided in Section III O of the preamble also does not treat speciation as an important issue in developing the emission inventories needed to evaluate control strategies. Even the document referenced in Section III O, "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, EPA-454/R-05-001" dated August 2005 does not provide sufficient information concerning speciation.

The lack of emphasis on the important issue of speciation with respect to $PM_{2.5}$ ambient monitoring and $PM_{2.5}$ emission factors is inconsistent with the variability in $PM_{2.5}$ compositions stated in Table 2 of the Preamble (FR 65993). It is not clear how EPA, State, and local agencies will determine the most appropriate means to control local and long-range transport sources without extensive speciation analyses. Sections §51.1002 and §51.1002 should be modified to state that control strategies being evaluated to attain the $PM_{2.5}$ NAAQS should be based on speciation to the maximum extent possible. Section §51.1008 should be modified to require State and local agencies to compile speciated emission factor data to the maximum extent possible.

Conclusion

For the foregoing reasons, in addition to those presented in the attached Legal Memorandum, EPA should exclude aggregate emissions from fine PM implementation plans and should take additional steps for improvement of the final regulations.

Respectfully submitted,

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