**40 CFR Parts 53 and 58**

**[EPA–HQ–OAR–2004–0018; FRL–8227–2] RIN 2060–AJ25**

**Revisions to Ambient Air Monitoring Regulations**

*E. Appendix D—Network Design Criteria for Ambient Air Quality Monitoring*

1. Requirements for Operation of Multipollutant NCore Stations

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The NCore stations are to be deployed at sites representing as large an area of relatively uniform land use and ambient air concentrations as possible (i.e., out of the area of influence of specific local sources, unless exposure to the local source(s) is typical of exposures across the urban area). Neighborhood-scale sites may be appropriate for NCore multipollutant monitoring stations in cases where the site is expected to be similar to many other neighborhood scale locations throughout the area.

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2. Requirements for Operation of

PM10-2.5 Stations

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We proposed to retain the current siting criteria for PM2.5, which have an emphasis on population-oriented sites at neighborhood scale and larger. See 71 FR 2741. In the proposal, EPA stated that these current design criteria appeared to remain appropriate for implementation of the proposed primary PM2.5 NAAQS. See 71 FR 2742. The proposal stated that the existing minimum requirements effectively ensure that monitors are placed in locations that appropriately reflect the community-oriented area-wide concentrations levels used in the epidemiological studies that support the proposed (and now final) lowering of the 24-hour NAAQS.

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Accordingly, the PM2.5 network design provisions in that final rule (62 FR 38833, July 18, 1997) and EPA’s subsequent negotiations with State/local monitoring agencies over monitoring plans were largely but not solely directed at obtaining air quality data reflecting community-wide exposures by placing monitors in neighborhood and larger scales of representation. Section 2.8 of appendix D of 40 CFR part 58 as promulgated in 1997 had only a few definite requirements regarding the siting of PM2.5 monitors. Section 2.8.1.3 specified how many ‘‘core’’ monitors representing community-wide air quality were required based on MSA population. For areas with populations of 500,000 or more, section 2.8.1.3.1(a) required that at least one core monitoring station must be placed in a ‘‘population-oriented’’ area of expected maximum concentration and (unless waived under section 2.8.1.3.4) at least one core station in an area of poor air quality. Areas with populations between 200,000 and 500,000 were required to operate at least one core monitor. Section 2.8.1.3.4 strongly encouraged any State with an MSA with only one required monitor (due to being fewer than 500,000 in population or due to a waiver) to site it so it represented community-oriented concentrations in areas of high average PM2.5 concentrations. Section 2.8.1.3.7 required core monitoring sites to represent neighborhood or larger spatial scales. States could at their initiative place additional monitors anywhere, but monitors in relatively unique microscale, localized hot spot, or unique middle-scale locations cannot be compared to the annual NAAQS, and any monitoring site must be population oriented to be compared to either NAAQS. Part 58 App. D section 2.8.1.2.3. In practice, the majority of PM2.5 monitors are deployed at neighborhood scale and larger, meaning that they are located far enough from large emission sources that they represent the fairly uniform air quality across an area with dimensions of at least a few kilometers and thus can be considered community oriented. The existing PM2.5 monitoring network continues to mostly be made up of these population-oriented, community-oriented, neighborhood scale monitoring sites.

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In this final rule, section 4.6 (Particulate Matter (PM10) Design Criteria) addresses this subject matter for PM10, while section 4.7 (Fine Particulate Matter (PM2.5) Design Criteria) does so for PM2.5. In the proposed rule, for the purpose of providing context, EPA included paragraphs on microscale, middle scale, neighborhood scale, urban scale, and regional monitoring scales in both section 4.6 and 4.7. However, EPA upon closer consideration has determined that omitting the paragraphs on urban scale and regional scale from section 4.6 is appropriate for PM10, in terms of clarifying and preserving the effective substance of the 1997 rule for PM10. The bases for reaching this conclusion include the following: (1) The paragraphs concerning these scales of representation in the 1997 appendix D (section 2.8.0.7 and 2.8.0.8) mention PM2.5 specifically but not PM10, (2) the paragraph which precedes the five paragraphs on the five scales (2.8.0.2) states that middle and neighborhood scales are the most important scales for PM10, (3) section 2.8 in the 1997 rule was titled as applying to SLAMS in particular but no SLAMS monitors were specifically required at any spatial scale or scales, (4) under section 3.7 (Particulate Matter Design Criteria for NAMS) specific numbers of PM10 monitors were required but without specification as to spatial scale, and (5) Table 6 of appendix D in the 1997 rule indicates that only the micro, middle, and neighborhood scales are ‘‘required for NAMS.’’ The EPA notes that in the final rule, the same numbers of PM10 monitors are required as in the 1997 rule, but they are not referred to as NAMS monitors. The EPA notes that urban scale and regional scale are of little, if any, relevance to PM10 monitoring, because of the short transport distances for PM10, especially when emitted near ground level. In contrast, because PM2.5 is a secondary pollutant, large spatial scales are relevant because monitors in such locations will reflect regional emissions trends and transport patterns.

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**Appendix D to Part 58—Network Design Criteria for Ambient Air Quality Monitoring**

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1.2 Spatial Scales.

(a) To clarify the nature of the link between general monitoring objectives, site types, and the physical location of a particular monitor, the concept of spatial scale of representativeness is defined. The goal in locating monitors is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring site type, air pollutant to be measured, and the monitoring objective. (b) Thus, spatial scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring site throughout which actual pollutant concentrations are reasonably similar. The scales of representativeness of most interest for the monitoring site types described above are as follows:

(1) *Microscale*—Defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

2) *Middle scale*—Defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer

(3) *Neighborhood scale*—Defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. The neighborhood and urban scales listed below have the potential to overlap in applications that concern secondarily formed or homogeneously distributed air pollutants.

(4) *Urban scale*—Defines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale.

(5) *Regional scale*—Defines usually a rural area of reasonably homogeneous geography without large sources, and extends from tens to hundreds of kilometers.

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**4. Pollutant-Specific Design Criteria for SLAMS Sites**

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4.7 Fine Particulate Matter (PM2.5) Design Criteria.

4.7.1 General Requirements.

(a) State, and where applicable local, agencies must operate the minimum number of required PM2.5 SLAMS sites listed in Table D–5 of this appendix. The NCore sites are expected to complement the PM2.5 data collection that takes place at non-NCore SLAMS sites, and both types of sites can be used to meet the minimum PM2.5 network requirements. Deviations from these PM2.5 monitoring requirements must be approved by the EPA Regional Administrator. (b) Specific Design Criteria for PM2.5. The required monitoring stations or sites must be sited to represent community-wide air quality. These sites can include sites collocated at PAMS. These monitoring stations will typically be at neighborhood or urban-scale; however, in certain instances where population-oriented micro-or middlescale PM2.5 monitoring are determined by the Regional Administrator to represent many such locations throughout a metropolitan area, these smaller scales can be considered to represent community-wide air quality. (1) At least one monitoring station is to be sited in a population-oriented area of expected maximum concentration. (2) For areas with more than one required SLAMS, a monitoring station is to be sited in an area of poor air quality. (3) Additional technical guidance for siting PM2.5 monitors is provided in references 6 and 7 of this appendix. (c) The most important spatial scale to effectively characterize the emissions of particulate matter from both mobile and stationary sources is the neighborhood scale for PM2.5. For purposes of establishing monitoring sites to represent large homogenous areas other than the above scales of representativeness and to characterize regional transport, urban or regional scale sites would also be needed. Most PM2.5 monitoring in urban areas should be representative of a neighborhood scale.

(1) *Microscale*—This scale would typify areas such as downtown street canyons and traffic corridors where the general public would be exposed to maximum concentrations from mobile sources. In some circumstances, the microscale is appropriate for particulate sites; community-oriented SLAMS sites measured at the microscale level should, however, be limited to urban sites that are representative of long-term human exposure and of many such microenvironments in the area. In general, microscale particulate matter sites should be located near inhabited buildings or locations where the general public can be expected to be exposed to the concentration measured. Emissions from stationary sources such as primary and secondary smelters, power plants, and other large industrial processes may, under certain plume conditions, likewise result in high ground level concentrations at the microscale. In the latter case, the microscale would represent an area impacted by the plume with dimensions extending up to approximately 100 meters. Data collected at microscale sites provide information for evaluating and developing hot spot control measures. Unless these sites are indicative of population-oriented monitoring, they may be more appropriately classified as SPM.

(2) *Middle scale*—People moving through downtown areas, or living near major roadways, encounter particle concentrations that would be adequately characterized by this spatial scale. Thus, measurements of this type would be appropriate for the evaluation of possible short-term exposure public health effects of particulate matter pollution. In many situations, monitoring sites that are representative of microscale or middle-scale impacts are not unique and are representative of many similar situations. This can occur along traffic corridors or other locations in a residential district. In this case, one location is representative of a number of small scale sites and is appropriate for evaluation of long-term or chronic effects. This scale also includes the characteristic concentrations for other areas with dimensions of a few hundred meters such as the parking lot and feeder streets associated with shopping centers, stadia, and office buildings.

(3) *Neighborhood scale*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban sub-region with dimensions of a few kilometers and of generally more regular shape than the middle scale. Homogeneity refers to the particulate matter concentrations, as well as the land use and land surface characteristics. Much of the PM2.5 exposures are expected to be associated with this scale of measurement. In some cases, a location carefully chosen to provide neighborhood scale data would represent the immediate neighborhood as well as neighborhoods of the same type in other parts of the city. PM2.5 sites of this kind provide good information about trends and compliance with standards because they often represent conditions in areas where people commonly live and work for periods comparable to those specified in the NAAQS. In general, most PM2.5 monitoring in urban areas should have this scale.

(4) *Urban scale*—This class of measurement would be used to characterize the particulate matter concentration over an entire metropolitan or rural area ranging in size from 4 to 50 kilometers. Such measurements would be useful for assessing trends in area-wide air quality, and hence, the effectiveness of large scale air pollution control strategies. Community-oriented PM2.5 sites may have this scale.

(5) *Regional scale*—These measurements would characterize conditions over areas with dimensions of as much as hundreds of kilometers. As noted earlier, using representative conditions for an area implies some degree of homogeneity in that area. For this reason, regional scale measurements would be most applicable to sparsely populated areas. Data characteristics of this scale would provide information about larger scale processes of particulate matter emissions, losses and transport. PM2.5 transport contributes to elevated particulate concentrations and may affect multiple urban and State entities with large populations such as in the eastern United States. Development of effective pollution control strategies requires an understanding at regional geographical scales of the emission sources and atmospheric processes that are responsible for elevated PM2.5 levels and may also be associated with elevated O3 and regional haze.