



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

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OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

## MEMORANDUM

**SUBJECT:** Use of Make-up PM Samples to Replace Scheduled PM Samples

**FROM:** William F. Hunt, Jr. /s/ William F. Hunt, Jr.  
Director, Emissions, Monitoring,  
and Analysis Division (MD-14)

**TO:** Deputy Director, Office of Ecosystem Protection, Region I  
Director, Environmental Planning and Protection Division, Region II  
Director, Air Protection Division, Region III  
Director, Air, Pesticides, & Toxics Management Division, Region IV  
Acting Director, Air and Radiation Division, Region V  
Acting Director, Multimedia Planning & Permitting Division, Region VI  
Director, Air, RCRA, and Toxics Division, Region VII  
Director, Air and Radiation Program, Region VIII  
Director, Air Division, Region IX  
Director, Office of Air, Region X

This memorandum provides some important procedures that may be followed by State and local monitoring agencies to improve data capture for particulate matter monitoring. Another memorandum may be forthcoming to address those situations where required data capture is still not achieved.

### **Background**

As you know, scheduled PM samples may be missed due to a variety of situations including: (1) sampler malfunction, (2) power outage, and (3) filter problems. These situations are particularly relevant during the start-up of the fine particle monitoring program. Obviously, adequate numbers of PM measurements are important to maintain high data capture, in accordance with Interpretation of the PM standards (40 CFR part 50, Appendix N). In particular, 75% of scheduled samples per quarter are required to show that a site meets the standard, unless special approval is granted by the Regional Administrator (RA); and 11 observations per quarter in a year with high values are sufficient to show that a site does not meet the standard. Although this appendix also says that situations may arise in which there are compelling reasons to retain years containing quarters which do not meet the minimum number

of samples, and the use of less than complete data is subject to the approval of the RA, it is still extremely important to try to achieve 75 percent data capture. Therefore, the allowed use of “replacement samples” will help achieve desirable data capture goals and avoid the necessity for special RA approval.

For the previous PM<sub>10</sub> monitoring program, replacement sampling was utilized. Missing PM<sub>10</sub> samples could be replaced by another sample before next scheduled sampling day (e.g., during the next 5 days with 1 in 6 day sampling). A similar procedure will be described for the new PM monitoring program. In general, the scheme for replacement of scheduled days is designed to not introduce bias into the derivation of quarterly and annual summary statistics, or design values for regulatory use.

### **Terminology**

Scheduled sampling days. The EPA scheduled sampling days are specified in advance to ensure systematic selection of sampling days to establish unbiased estimates of air quality summary statistics. Schedules are published for each calendar year to identify every sixth day and every third day for SLAMS and other particulate matter sampling.

Non-scheduled vs. Replacement (Make-up) sampling days. A “make-up” day becomes a replacement for a scheduled day. Like scheduled days, these 24-hour periods (midnight to midnight) are selected without prior knowledge of pollution potential and may be used without prejudice in making comparisons to the National Ambient Air Quality Standards. These are different than “non-scheduled” days. The latter are 24-hour periods which supplement scheduled days. These may be produced during episodes or special studies, and may be subject to separate treatment in accordance with EPA data handling guidelines.

### **Data Reporting**

Both make-up and non-scheduled days should be clearly identified in the data record. Until notified otherwise, all make-up days should be treated the same as scheduled samples and reported under the same pollutant occurrence code (POC) as scheduled samples. Other non-scheduled samples (e.g., extra samples during episodes) should be reported under a different POC for the monitoring site. This will facilitate data handling conventions and subsequent analysis.

### **Make-Up Samples - Allowed, Required, Encouraged?**

Make-up samples are optional and should be encouraged whenever the achievement of minimum data capture goals are not likely. Although the use of make-up sampling will enhance overall data capture, they are not required. The EPA recognizes that make-up sampling causes additional work for the site operator or network manager, and may or may not be possible,

depending on the time when the missing or invalidated sample is discovered (see recommendations below).

Make-up samples are subject to Regional Office review to ensure that they are produced in an unbiased fashion in accordance with EPA guidance and are consistent with the data validation procedures in the State's Quality Assurance Project Plan (QAPP). In some cases, the QAPP must be modified to add this feature. The State or local agency should provide the Region with the reason why the original sample was invalidated. States should not selectively make-up some samples (e.g., during period of predicted pollution potential) and not make-up others. When the QAPP does not specify a process to make-up all missed samples (when practicable), then the EPA Regional Office may not want to approve particular make-ups that are not representative of scheduled days (e.g., after a severe stagnation or brief period of extreme emissions). Such make-up samples would be treated as special study data and stored under a separate pollutant occurrence code on AIRS.

The number of make-up samples permitted in any calendar quarter should be limited to no more than 5 samples. Normally, monitoring agencies should only rarely have make-up samples. If a monitoring agency is consistently having to use make-up samples, this should trigger the Regional Offices to investigate the situation.

### **Recommendations for Make-up PM<sub>2.5</sub> Sampling**

- (1) Make-up sampling days (as replacement for missed or invalidated scheduled samples) are allowed but not required. States should be encouraged to make up samples if the overall data capture rate is expected to fall below 75% of scheduled samples (reflecting both field and laboratory performance). In general, the preferred approach is to attempt to make up all samples which are missed or invalidated in the field (i.e., after retrieval from sampler) in accordance with allowed time frames. This will reduce the chance for any biases to be introduced into the final PM data set. In general, proper make-up sampling will increase overall data capture and, therefore, reduce the chance for introducing bias into summary statistics such as 98<sup>th</sup> percentile and annual averages.
- (2) Quality Assurance Project Plans should discuss the use of make-up sampling as part of the process to achieve representative data and to satisfy required data capture objectives. Appropriate oversight by the EPA Regional Office is needed to ensure that samples are not intentionally invalidated and that replacement samples do not inadvertently introduce bias into summary statistics.
- (3) There are several options for the selection of a make-up sampling day. The approach utilized should be chosen in accordance with the following priorities. In all cases, a make-up sampling day must be no later than 1 week from the missed sampling day.

- ▶ Preferred choice for make up sampling day: before the next scheduled sampling day
    - (a) For monitoring sites sampling every sixth day (in a network with other sites sampling every third day), the preferred replacement day is the next scheduled every third day sample. This provides the benefit of additional spatial resolution of network measurements and is likely to be most convenient for site operators. Otherwise, a day closest to the missed sampling day is suggested.
    - (b) For monitoring sites sampling every third day, the earliest possible day before the next scheduled sample at the monitoring site is suggested. Although there are only two possible make-up days with 1 in 3 day sampling, selection of a replacement day as close as possible to the missing day increases the chances of a replacement day with similar meteorological conditions.
  - ▶ Alternative approach: Sample one week later, on the same calendar day. This provides a replacement day on the same day of the week, thereby helping with temporal balance for the quarterly data set to reduce any potential day of the week effect of emissions.
- (4) A discussion of the allowed use of make-up days should be included in the PM data handling guideline. This will facilitate communication to State and local monitoring agencies.
  - (5) The internal State data base should maintain information regarding the reasons for missing scheduled samples and the need for replacement samples.

If you have any questions about this policy, you can call Neil Frank of my staff at (919) 541-5560.

cc: Acting Director, Office of Environmental Measurement & Evaluation, Region I  
 Director, Environmental Science and Assessment Division, Region II  
 Director, Environmental Services Division, Region III  
 Director, Science & Ecosystems Support Division, Region IV  
 Director, Environmental Services Division, Region VII  
 Director, Office of Environmental Assessment, Region X  
 T. Curran  
 T. Fitz-Simons  
 D. Guinnup  
 D. Mobley

J. Paisie  
T. Rosendahl  
R. Scheffe  
J. Summers  
M. Wayland  
L. Wegman  
MQAG Staff  
Regional Office PM Monitoring Contacts