

June 15, 2000

MEMORANDUM

SUBJECT: Flagging and Valid PM_{2.5} Data

FROM: Richard D. Scheffe, Leader (Original signed by Rich Scheffe)
Monitoring and Quality Assurance Group (MD-14)

TO: Regional Monitoring Contacts

I would like to reiterate some information in the memo from David Mobley of March 27, 2000 (Attachment 1) which described the use of flags. Attachment C of the memo states "Flags would be placed only on data which the State/local was uncertain of its quality, not on data it considers to be invalid, which should not be entered." There has been some misconception among some agencies that EPA wants to see all the data. This is not true. State and local agencies have developed QAPP's and quality systems to determine data validity, and we do not want data that agencies truly feel is invalid to enter into AIRS.

Our current thinking is that flagged data have the potential to be validated, or be of benefit to a secondary use, such as network design. However, due to existing regulations/ guidance, there are cases where potentially valid data are labeled invalid. An example might be the violation of the 96-hour filter retrieval requirement which we hope to demonstrate has negligible impact on data quality. Another example is the lack of an approved QAPP prior to data collection. On the other hand, obviously poor quality data corroborated by a number of QC check failures should not be entered, despite the lack of explicit requirements. In short, we are asking QA managers who have developed their quality system to utilize their technical expertise and available quality control information during the data validation process.

The PM_{2.5} flags were generated for data that either did not meet a CFR criteria for which the State felt the quality of the data were acceptable, or for data that they were unsure of its quality. Based on conversations and my knowledge of the past, there were two ways an agency would address this issue: 1) not enter the data, or 2) enter the data as valid. Neither of these decisions is optimal because,

in the first case, data of adequate quality for either NAAQS comparisons or other uses is not available or, in the second case, inappropriate data are used for the NAAQS or other evaluations.

Flags provide a way for the data generators to appropriately qualify data for the data users and will allow us to determine what acceptance criteria do not significantly effect quality and, therefore, remove it from the reference method. Flags also allow us the option to revise our requirements (regulations and guidance) over the next 2 years and salvage potentially useful data that have been collected prior to such change.

We recognize the potential burden placed on data analysts as well as confusion generated by adding flags, and expect that issues raised by flags to be resolved prior to utilizing the data for designation purposes. Based on comments raised by participants at the recent PM_{2.5} Workshop, clearly, more work is required among all of us on developing an effective flag policy. We do not intend to extend these flagging procedures to other criteria pollutants.

Attachment

cc: John Bachmann
Eric Ginsburg
Mike Hamlin
Ed Lillis
Dave Mobley
Joe Paisie
Jake Summers
Regional AIRS Contacts
Regional Office Air Program Managers
Regional Office Air Division Directors
SAMWG
MQAG
AQTAG

Use of Data Flags for PM_{2.5} Data

OAQPS is emphasizing the need to accumulate as much PM_{2.5} data into AIRS as possible in order to perform various data analysis and data quality assessments. Since EPA and the States have gone to the effort to collect this information, it is important that we use it to gain as much knowledge as possible about preliminary concentrations, trends, and ways to improve data quality. OAQPS has developed a set of generic data qualifiers (flags) in order to allow data to be entered in AIRS that the State/locals believe have value, but are unsure of its quality. The approach tries to provide a balance of ease of use and specificity. Due to limitations in the current AIRS network, the only place for flags is in the exceptional event area where most letters are already in use. There are 4 flags already associated with PM_{2.5}. The flags T, W, X and Y are the flags associated with the sampler acceptance criteria identified in Table L-1 of 40 CFR Part 50. The 6 flags listed below can also be used. Applicability of other flags in AIRS pertaining to PM₁₀ or other pollutants has not been determined.

If you have any questions on this information, please contact Michael Papp (919-541-2408) or Rich Scheffe (919-541-4650).

Flag Comments

1. **Deviation from a CFR requirement-** Data collected did not or may not meet all of the critical criteria for sampling and analysis as specified in CFR and the Validation Template critical criteria table (Table 1). As stated in the Validation Template: "*Criteria that were deemed critical to maintaining the integrity of a sample or group of samples were placed in the **Critical Criteria Table** (see Table 1). Observations that do not meet each and every criterion on the Critical Criteria Table should be invalidated unless there are compelling reason and justification for not doing so. Basically, the sample or group of samples for which one or more of these criteria are not met is invalid until proven otherwise.*" The State/local may use this flag when it is unclear of the effect of the deviation on data quality. This flag should be rarely used, but there may be instances where other QA/QC information tend to validate the sample or changes/updates to the critical criteria table may allow utilization of the data for some purposes.
2. **Operational Deviations-** Data quality may be impacted by sampling and analysis procedures which did not or may not comply with acceptable range or threshold values from either the Validation Template operational evaluations table (see Table 2) or a State/local defined acceptance criteria.
3. **Field Issue-** Data that may have been effected by events occurring in the field that could potentially have compromised the integrity of the sample (oil crystallization, excessive dust etc.)
4. **Lab Issue-** Data that may have been effected by events occurring in the lab that could potentially have compromised the integrity of the sample (cassette off gassing, etc.)
5. **Outlier-** Data value that appears to be invalid either because it is outside the normal/expected range of concentrations or fails various statistical or comparison tests. However, there is no additional information available that would provide a reason to invalidate the value(s).

6. **QAPP Issue** - Data collection prior to QAPP approval per 01/21/99 memo from Bill Hunt

Flags would be placed only on data for which the State/local was uncertain of its quality, not on data it considers to be invalid, which should not be entered. Since these flags are generic and AIRS does not have a free form comment field at the individual sampler level, State and locals would have to document, at the local level, the actual problem that occurred with each sample that is flagged. Tables 1 and 2 provide examples of more specific flags that could be associated with the generic flag. For example, each “1” flag could be associated with another flag (1_) that would distinguish the actual CFR criteria violated. This way, the State and locals would not have to generate much in the way of free form notes on the flagged data. In addition, there are some acceptance criteria in the Validation Template that would not require a flag. These are designated by “N/A”. State and local agencies would have to develop any additional flags not identified in Tables 1 and 2.

Use of flags would allow more data into the system, affording better data analysis and data quality assessments (prior to any official NAAQS assessment) to determine whether or not the flagged data could be used for attainment decisions. These assessments would also help effect changes in acceptance criteria in our regulation and guidance documents. OAQPS plans on using the Data Validation Workgroup, made up of EPA Regions and State and local monitoring representatives who helped develop the PM2.5 Data Validation Template, to assist in evaluation of the usefulness of flagged data.

Table 1. Critical Criteria Table

CRITICAL CRITERIA TABLE				
^a S- Single Filter, G- Group of filters (i.e. batch), G1-Group of filters from 1 instrument				
Criteria	Acceptable Range	Frequency	AIRS FLAG	Local FLAG
<i>Filter Holding Times</i>				
Sample Recovery	# 4 days from sample end date	all filters	1	SR
Post-sampling Weighing	# 10 days at 25E C from sample end date, or # 30 days at 4E C from sample end date <i>See 1/20/00 memo on filter cassette transport</i> http://www.epa.gov/ttn/amtic/pmpolgud.html	all filters	1	FT
<i>Sampling Period</i> (including multiple power failures)	1380-1500 minutes, or value if < 1380 and exceedance of NAAQS ^{1/} midnight to midnight	all filters	Y	
<i>Sampling Instrument</i>				
Average Flow Rate	average within 5% of 16.67 liters/minute	24 hours of op	1	AF
Variability in Flow Rate	CV # 2%	24 hours of op	1	VF
<i>Filter</i>				
Visual Defect Check (unexposed)	see reference	all filters	NA	
Filter Conditioning Environment				
Equilibration	24 hours minimum	all filters	1	EQ
Temp. Range	24-hr mean 20-23E C	all filters	1	TR
Temp.Control	± 2E C SD* over 24 hr	all filters	1	TC

CRITICAL CRITERIA TABLE				
^a S- Single Filter, G- Group of filters (i.e. batch), G1-Group of filters from 1 instrument				
Criteria	Acceptable Range	Frequency	AIRS FLAG	Local FLAG
Humidity Range	24-hr mean 30% - 40% RH or # 5% sampling RH but > 20% RH	all filters	1	HR
Humidity Control	± 5% SD* over 24 hr.	all filters	1	HC
Pre/post Sampling RH	difference in 24-hr means # ± 5% RH	all filters	1	RH
Balance	located in filter conditioning environment	all filters	NA	
Calibration/Verification				
One-point FR Check	± 4% of transfer standard	1/4 weeks	1	FR

1/ value must be flagged

*= variability estimate not defined in CFR

SD= standard deviation

CV= coefficient of variation

NA- Not applicable for a flag in AIRS

Table 2. Operational Evaluations Table

OPERATIONAL EVALUATIONS TABLE					
^a S- Single Filter, G- Group of filters (i.e. batch), G1-Group of filters from 1 instrument					
Criteria	Acceptance Range	Frequency	Samples Impacted ^a	AIRS FLAG	Local FLAG
Filter Checks					
Lot Blanks	less than 15 Fg change between weighings	9 filters per lot	G	NA	
Exposure Lot Blanks	less than 15 Fg change between weighings	3 filters per lot	G	NA	
Filter Integrity (exposed)	no visual defects	each filter	S	NA	
Filter Holding Times					
Pre-sampling	< 30 days before sampling	all filters	S	2	HT
Lab QC Checks					
Field Filter Blank	± 30 Fg change between weighings	10% or 1 per weighing session	G/G1	2	FB
Lab Filter Blank	± 15 Fg change between weighings	10% or 1 per weighing session	G	2	LB
Balance Check	#3 Fg	beginning, 10th sample, end	G	NA	
Duplicate Filter Weighing	± 15 Fg change between weighings	1 per weighing session	G	NA	
Sampling Instrument					
Individual Flow Rates	no flow rate excursions > ±5% for > 5 min. ^{1/}	every 24 hours of op	S	W ₂ or T	
Filter Temp Sensor	no excursions of > 5E C lasting longer than 30 min ^{1/}	every 24 hours of op	S	X or T ^{2/}	
Calibration/Verification					
External Leak Check	< 80 mL/min	every 5 sampling events*	G1	2	EL
Internal Leak Check	< 80 mL/min	every 5 sampling events	G1	2	IL

OPERATIONAL EVALUATIONS TABLE					
^aS- Single Filter, G- Group of filters (i.e. batch), G1-Group of filters from 1 instrument					
Criteria	Acceptance Range	Frequency	Samples Impacted ^a	AIRS FLAG	Local FLAG
Temperature Calibration	± 2EC of standard	if multi-point failure	G1	NA	
Temp M-point Verification	± 2EC of standard	on installation, then 1/yr	G1	NA	
One-point Temp Check	± 4EC of standard	1/4 weeks	G1	2	TP
Pressure Calibration	± 10 mm Hg	on installation, then 1/yr	G1	NA	
Pressure Verification	± 10 mm Hg	1/4 weeks	G1	2	BP
Other Monitor Calibrations	per manufacturers' operating manual	per manufacturers' op manual	G	2	?
Lab Temperature	± 2EC	1/6 months	G	2	LT
Lab Humidity	± 2%	1/6 months	G	2	LH
Flow Rate (FR) Calibration	± 2% of transfer standard	if multi-point failure	G1	NA	
FR Multi-point Verification	± 2% of transfer standard	1/yr	G1	NA	
Design Flow Rate Adjustment	± 2% of design flow rate	at one-point or multi-point	G1	2	DF
Mirobalance Calibration	Manufacturer's specification	1/yr	G	NA	
Precision					
Collocated Samples	CV ≤ 10% of samples > 6 Fg/m ³	every 6 days for 25% of sites	G	NA	
Accuracy					
Temperature Audit	± 2EC	4/yr	G1	NA	
Pressure Audit	±10 mm Hg	4/yr	G1	NA	
Balance Audit	± 0.050 mg or manufacturers specs, whichever is tighter	1/yr	G	NA	
Flow Rate Audit	± 4% of audit standard ± 5% of design flow rate	1/2wk (automated) 4/yr (manual)	G1	2	FA
Calibration & Check Standards (working standards)					
Field Thermometer	± 0.1E C resolution, ± 0.5E C accuracy	1/yr	G/G1	NA	
Field Barometer	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1/yr	G/G1	NA	
Working Mass Stds. (compare to primary standards)	0.025 mg	1/3 mo.	G	NA	
Monitor Maintenance					
Impactor	cleaned/changed	every 5 sampling events	G1	NA	
Inlet/downtube Cleaning	cleaned	every 15 sampling event	G1	NA	
Filter Chamber Cleaning	cleaned	monthly	G1	NA	
Leak Check [®]	see <i>Calibration/Verification</i>				

OPERATIONAL EVALUATIONS TABLE					
^a S- Single Filter, G- Group of filters (i.e. batch), G1-Group of filters from 1 instrument					
Criteria	Acceptance Range	Frequency	Samples Impacted ^a	AIRS FLAG	Local FLAG
Circulating Fan Filter Cleaning	cleaned/changed	monthly	G1	NA	
Manufacturer-Recommended Maintenance	per manufacturers' SOP	per manufacturers' SOP	G1	NA	

1/ value must be flagged

2/ These are sampler defined flags. If only one sampler defined flag is generated the first flag is used , if there are multiples the "T" is used

***= variability estimate not defined in CFR**

@= Scheduled to occur immediately after impactor cleaned/changed.

SD= standard deviation

CV= coefficient of variation

NA- Not applicable for a flag in AIRS