



Florida Department of Environmental Protection

EPA TSA & Data Handling and Data Validation SOP Highlights

April 26, 2017





EPA TSA Highlights

- ❑ Data Coding Inconsistencies
- ❑ Siting Criteria and SX Data Flags
- ❑ QC and QA reporting to AQS
- ❑ Record submittal to DEP
- ❑ Data Decimal Precision
- ❑ Negative Data Policy
- ❑ AQS Reports: AMP251





Data Coding Inconsistencies

PQAO SO₂ Data Flags

United States Environmental Protection Agency
Air Quality System

Report Date: Apr. 4, 2017

All Qualifiers Utilized:

Qualifier Code:	Qualifier Description:	Qualifier Count:
1	Deviation from a CFR/Critical Criteria Requirement	3100
6	QAPP Issue	9170
AD	Shelter Storm Damage	1622
AE	Shelter Temperature Outside Limits	12546
AI	Insufficient Data (cannot calculate)	3783
AL	Voided by Operator	4088
AM	Miscellaneous Void	1
AN	Machine Malfunction	2905
AO	Bad Weather	2145
AQ	Collection Error	4558
AS	Poor Quality Assurance Results	12778
AT	Calibration	29273
AV	Power Failure	11746
AX	Precision Check	1414
AY	Q C Control Points (zero/span)	468
AZ	Q C Audit	501
BA	Maintenance/Routine Repairs	8409
BC	Multi-point Calibration	4795
BD	Auto Calibration	3651
BE	Building/Site Repair	78
BF	Precision/Zero/Span	12302
BH	Interference/co-elution/misidentification	2
BJ	Operator Error	596
BK	Site computer/data logger down	12682
BL	QA Audit	985
DA	Aberrant Data (Corrupt Files, Aberrant Chromatography, Spikes,	589
SA	Storm Approaching	4749
SX	Does Not Meet Siting Criteria	331090
V	Validated Value	5683



Data Coding Inconsistencies

❑ Null Codes and Qualifier Flags:

- o Inconsistent use of null codes and QA flags in the PQAO.
- o The revised Data Handling and Data Validation SOP provides more guidance.

QA Qualifier	Code Description	When to Use
1	Deviation from a CFR/Critical Criteria Requirement	This code should only be used when instructed to do so by Florida DEP.
6	QAPP Issue	QC check is completed outside the required timeframe (ex. a precision check is due on the 14 th of the month, but it isn't performed until the 18 th of the month; data from the 15 th to the 18 th must be flagged).
SX	Does Not Meet Siting Criteria	Site does not meet siting criteria (ex. flag applied to all pollutants from the date the issue is identified, usually by the Florida DEP audit staff, until the issue is resolved).
V	Validated Value	Validates data when data integrity may be questioned (ex. a QC check fails but the issue is not the analyzer, and the data is believed to be valid).



Data Coding Inconsistencies

Null Code	Code Description	When to Use
AE	Shelter Temperature Outside Limits	Shelter temperature exceeds limits defined by the EPA's QA Handbook and approved Equivalency Reference Methods (ex: data is collected when shelter temperature is outside the 20°-30° range or approved ranges for Teledyne instruments; the concentration data associated with these out of range temperatures must be invalidated).
AF	Scheduled but not Collected	A manual sample is scheduled to occur, but it is not collected (ex: filter shuttle issues).
AG	Sample Time Out of Limits	Valid sample time total is outside of limits (ex: less than 1380 or greater than 1500 minutes).
AH	Sample Flow Rate Out of Limits	Sample flow rate exceeds control limits (ex: failed flow check).
AN	Machine Malfunction	Machine/equipment malfunctions (ex: pump fails).
AQ	Collection Error	Data collection issues with continuous instruments (ex: less than 45 valid minutes collected).
AS	Poor Quality Assurance Results	Failed QC checks (ex: failed flow check and data invalidated back to last good check).
AT	Calibration	Continuous particulate matter calibrations (ex: calibrations on a TEOM).
AV	Power Failure	Power failure (ex: site loses power).
AY	Q C Control Points (Zero/Span)	Only a zero and span checks are performed (ex: equipment verification or troubleshooting).
AZ	Q C Audit	Internal quality control audit by agency (ex: agency does an official analysis of their procedures).
AX	Precision Check	Continuous particulate QC check (ex: flow checks).

Null Code	Code Description	When to Use
BA	Maintenance/ Routine Repairs	Routine maintenance and repairs (ex: filter change).
BF	Precision/Zero/ Span	ZSP is performed (ex: prior to a filter change – to bracket the data).
BC	Multi-point Calibration	Gaseous calibrations (ex: multi-point calibrations are performed).
BK	Site computer/ datalogger down	Datalogger or internet connection issues (ex: data logger locks up).
BL	QA Audit	Florida DEP or EPA audits are performed (ex: annual performance evaluations).
BR	Sample Value Below Acceptable Range	Sample is below the CFR required limits (ex: PM _{2.5} sample is less than 2 µg/m ³)
DA	Aberrant Data (Corrupt Files, Aberrant Chromatography, Spikes, Shifts)	Anomalous data below acceptable data quality standards (ex: corrupt files, spikes, shifts).
SA	Storm Approaching	Hurricane or storm approaching (ex: when equipment must be taken offline in preparation for storm).
ST	Calibration Verification Standard	Verifications with a NIST (ex: checking the concentration of a new gas bottle).
XX	Experimental Data	Data collected prior to a passing calibration (ex: first calibration of a new monitor failed and a passing recalibration did not occur immediately afterwards).



Data Coding Inconsistencies

❑ PM_{2.5} Laboratory Codes:

- o DEP worked with the Florida DEP PM_{2.5} Gravimetric Laboratory to add more clarification to the codes noted on the PM_{2.5} Analysis Reports and how they should be handled.

Data Qualifier	Code Flag	Recommended Comments	Action
Sample Integrity Suspect	SIS	Filter damage observed (ex: spots, scuffs, pinhole, light spots or particles)	Investigate flows in P and I files; Compare sample concentration to surrounding samples and/or collocated sample (if applicable) ▪ If sample is deemed valid qualify data with V “Validated Value” and comments in FAMAS ▪ If sample is invalid null code data with AJ “Filter Damage” and comments in FAMAS
Sample Integrity Compromised	SIC	Destructive filter damage observed (ex: hole, tear, scratch, heavy spots or particles)	Null Code – AJ “Filter Damage” with comments in FAMAS.
Lab Accident	LAC	Laboratory accident or damage.	Null Code – AR “Lab Error” and comments in FAMAS
Holding Time Exceedance	HTE	Post-weighed more than 30 days after sampling.	Null Code – TS “Holding Time or Transport Temp Is Out of Spec” and comments in FAMAS
		Holding time in field exceeded 177 hours.	
		Sampled more than 30 days after pre-weight.	



Data Coding Inconsistencies

Data Qualifier	Code Flag	Recommended Comments	Action
Voided Filter	VOD	Filter voided by customer.	Null Code – AL “Voided by Operator” and comments in FAMAS
Voided Filter	VOD	Filter voided by laboratory.	Null Code – AM “Miscellaneous Void” and comments in FAMAS stating that the filter was voided by the lab
Lab Temperature criteria exceeded	FLT	Lab Temperature criteria exceeded.	Null Code – AR “Lab Error” and comments in FAMAS
Lab Humidity criteria exceeded	FLH	Lab Humidity criteria exceeded.	Null Code – AR “Lab Error” and comments in FAMAS
Sample Preservation Criteria Exceeded	FSP	Filter Magazine received above 25 °C.	Null Code – TS “Holding Time or Transport Temp Is Out of Spec” and comments in FAMAS
Improper Sample Preservation	ISP	Filter Magazine received above 4 °C.	Investigate – Compare received temperature to average ambient temperature on Run Data Sheet. ▪ If average ambient is above received temperature qualify the data with V “Validated Value” and comments in FAMAS ▪ If average ambient is below received temperature check hold time and confirm whether sample was weighed within 10 days of sampling: • If sample was weighed within 10 days: Add V “Validated Value” and comments in FAMAS. • If sample was not weighed within 10 days: Null code data with TS “Holding Time or Transport Temp Is Out of Spec” and comments in FAMAS



Siting Criteria and SX Data Flags

- ❑ All sites that do not meet 40 CFR 58, Appendix E must be qualified with the SX – “Does Not Meet Siting Criteria” QA qualifier code.
 - o This will apply for the audit period (2014-2016) and onwards.
- ❑ FAMAS cannot handle more than one QA qualifier at a time.
 - o If 2 qualifier codes are required then the data qualifier code should be applied in FAMAS and a separate file (from AirVision) with both QA codes should be sent to me and the Data Validation inbox.

Example: What if the ozone data for a site needs the V – “Validated Value” qualifier code and the site currently doesn’t meet siting criteria?

- The data in FAMAS will have the V qualifier code and the file (from AirVision) will have both the V and SX qualifier codes to ensure AQS has both codes.



QC and QA Reporting to AQS

- ☐ All QC checks and Audits should be entered into **FAMAS**.
- ☐ QC checks following maintenance and/or adjustments should not be sent to **AQS**.
 - o The “*Exclude from Export/Reports*” box should be checked in FAMAS.
- ☐ QC checks and Audits in the middle of invalid data are not associated with valid data and should not be sent to **AQS**.
 - o The “*Exclude from Export/Reports*” box should be checked in FAMAS.
- ☐ Failed Audits (levels 3-10 only) should not be sent to **AQS**.
 - o The “*Exclude from Export/Reports*” box should be checked in FAMAS.
 - o **All** boxes (including those without a audit value) must be checked.



Record Submittal to DEP

- ☐ All local agencies should submit an annual aggregate of their records to DEP by June 30th of the following year.
 - o An extension has been provided for the 2016 data records.
 - o Approximate date August 31, 2017.
- ☐ Records should be submitted via Florida DEP's FTP Server.
 - o Additional information regarding this procedure will be provided and the Data Handling and Data Validation SOP will be updated.
- ☐ Each agency should submit their file naming convention to facilitate an easy review of these records.





Data Decimal Precision

- ❑ Data decimal precision across the PQAO became consistent as of January 1, 2017.
- ❑ A decimal precision for both standard and trace-level instruments was agreed upon.
- ❑ Forms will be updated by July 1, 2017.

5,892,643

A diagram illustrating the place values for the number 5,892,643. Red arrows point from the number to labels below it: "millions" points to the 5, "hundred thousands" points to the 8, "ten thousands" points to the 9, "thousands" points to the 2, "hundreds" points to the 6, "tens" points to the 4, and "ones" points to the 3.



Data Decimal Precision

- ❑ All data is to be truncated to the appropriate decimal place.
- ❑ All data for standard instruments should be to 1 decimal place.
 - o Exceptions: Ozone – whole number in ppb and Lead – 3 decimal places.
- ❑ All trace-level data should be to 3 decimal places.

Pollutant	Units	Decimal Places	Example
PM _{2.5}	µg/m ³	1	10.2
PM ₁₀	µg/m ³	1	26.2
Lead (Pb) TSP and PB-PM ₁₀	µg/m ³	3	1.525
PM _{10-2.5}	µg/m ³	1	10.2
O ₃	ppb	0	70
SO ₂	ppb	1	35.1
CO	ppm	1	2.5
NO ₂	ppb	1	53.2
SO _{2_TL}	ppb	3	0.351
CO_TL	ppm	3	0.025
NO _{2_TL} & NO _{y_TL}	ppb	3	1.532



Negative Data Policy

- ❑ Negative SO₂ data for an extended period of time.
 - o Zero drift did not exceed the control limits
 - o Data did not exceed the minimum detectable limit.
 - o All QC checks passed
 - Result: Data was negatively biased for several months due to the analyzer malfunction.
- ❑ Negative SO₂ Policy:
 - o Persistent SO₂ concentrations greater than or less than 0 ppb that remain unchanged for 9 to 10 consecutive hours may indicate an analyzer malfunction.
 - At a minimum an evaluation of the instrument should be conducted.
 - The Data Handling and Data Validation SOP has been updated with this and several other data handling policies.



AQS Reports: AMP251

- ❑ PQAQO AQS Reports: AMP251, AMP430, AMP501 and AMP504.
 - o PQAQO will be running the AMP251 – QA Raw Assessment Report beginning 1st Quarter 2017.
- ❑ This report will be used to catch any failed Audits or QC checks that should not have been uploaded to AQS.
- ❑ Detailed instructions and pictures are provided in the Data Handling and Data Validation SOP.
 - o Please contact me directly, for additional training.





Data Handling and Data Validation SOP Highlights

- ❑ What hasn't been covered already...
 - o Clarified how to bracket data based on QA/QC results
 - o Clarified PM_{10} and lead data validation process





Bracketing Data

☐ Focuses on timeliness and control limits:

- o Was the check performed timely?
- o Was it within the control limits?
- o Did the last check pass or fail?
- o Did the current check pass or fail?

☐ Limits are defined in the:

- o QAPPs
- o Data Handling and Data Validation SOP
- o Equipment SOPs
- o EPA QA Handbook





Bracketing Data (Cont.)

☐ QC Checks

- o Every 14 days (data validation template)
- o Checks performed the 14-day period require a QA qualifier flag (6-QAPP issue) for those days in excess of the 14-day period if the next check passes.
- o But, if the subsequent QC check fails, apply a null code (AS-Poor Quality Assurance Results) back to the last passing QC check (AS-Poor Quality Assurance Results).

☐ Flow Rate Verification

- o Every 30 days each separated by 14 days (data validation template)
- o Verifications performed beyond the minimum frequency require a QA qualifier flag (6-QAPP issue) be applied in FAMAS to those days exceeding the frequency if the next check passes.
- o However, if the subsequent check fails, a null code back to the last passing check must be applied in FAMAS (AH-Sample Flow Rates Out of Limits).

☐ Zero/Span/Precision (Z/S/P)

- o Every 14 days (data validation template)
- o Checks performed beyond the minimum 14-day frequency require a QA qualifier flag (6- QAPP issue) to those days exceeding the frequency of the check if the next Z/S/P passes.
- o However, if the subsequent check fails, a null code back to the last passing Z/S/P must be applied in FAMAS.



Bracketing Data (Cont.)

- ☐ Prior to a filter change or routine maintenance, bracket data (Z/S/P).
- ☐ Following a failed performance audit (Z/S/P).
- ☐ Whenever the analyzer is going to be taken offline, perform a Z/S/P (i.e. hurricane or storm preparation).





PM₁₀ and Lead Data Validation Process

- ❑ Primary responsibilities associated with the PM₁₀ and lead data verification are summarized below. The responsible QA staff:
 - o Utilizes records from the sampler's digital timer, if applicable, or records from a certified transfer standard to validate the field run sheets. The average ambient temperature, barometric pressure, average flow rate, and elapsed time recorded on the field logbook is compared to the run sheet.
 - o Verifies the completed filter analysis performed by the laboratory on the lead and PM₁₀ filters.
 - o Inserts the concentrations from the lab datasheets, once confirmed, into AirVision (or permanent record retention system).





PM₁₀ and Lead Data Validation Process (cont.)

PM₁₀/Pb High-Volume QA/QC Schedule*

Parameter	Frequency	Acceptance Criteria
Average Flow Rate in standard conditions for PM ₁₀ Average Flow Rate in local conditions for Pb-TSP	Every sample run	±10 % diff from 1.13 m ³ /min for PM ₁₀ 1.1 – 1.7 m ³ /min for Pb-TSP
Sample Elapsed Time	Every sample run	1440 ± 60 minutes
Hi-VOL Sampler Timer	Every sample run	±30 mins of the pre-set on/off time (midnight to midnight)
Hi-VOL Sampler Timer	Every 90-days (Quarterly)	± 30 minutes of the NIST-traceable transfer standard

*Schedule is taken directly from the SOP.



PM₁₀ and Lead Data Validation Process (cont.)

Parameter	Frequency	Acceptance Criteria
1-pt. Flow Rate Verification for PM ₁₀ in standard conditions	Every 90-days (Quarterly)	± 10% diff from design (1.13 m ³ /min) ± 7% of the NIST-traceable standard
1-pt. Flow Rate Verification for Pb-TSP in local conditions	Every 90-days (Quarterly)	± 7% of the NIST-traceable standard
Operational Flow Rate Check	Every 90-days (Quarterly)	± 7% diff from 1.13 m ³ /min for PM ₁₀ 1.1 – 1.7 m ³ /min for Pb-TSP
Multi-point Flow Rate Verification for PM ₁₀ in standard conditions	Every 365-days (Annual)	± 4% diff of the NIST-traceable calibration orifice
Multi-point Flow Rate Verification for Pb-TSP in local conditions	Every 365-days (Annual)	± 5% of the best fit linear regression line
Elapsed Timer Verification	Every 365-days (Annual)	1440 ± 60 minutes; ± 2 mins per 24-hour verification



Summary

- ❑ Reliable data are critical to the regulatory process
 - o Data that do not meet regulatory requirements can compromise attainment decisions



Questions?



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