UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1201 ELM STREET, SUITE 500
DALLAS, TEXAS 75270

December 5, 2024

Ms. Demetria Kimbrough
Associate Director
Office of Air Quality
Arkansas Energy & Environment - Environmental Quality
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317

Dear Ms. Kimbrough:

The Quality Assurance Project Plan (QAPP) for the Arkansas Department Energy & Environment/Division of Environmental Quality (ADE&E/DiEQ) Ambient Air Quality Monitoring Program, Q-Trak No. 25-076. I am pleased to inform you that the QAPP has been reviewed and approved by Brenton Gildner, R6 Air QA Officer, Region 6, EPA. The QAPP has an expiration date of December 2, 2026.

Please send all QAPP's **sixty days (October 2) prior to** the expiration of the recipient's approved QAPP. The recipient shall submit to the Project Officer a revised QAPP or certification that the QAPP is current and include a signed copy of the new approval page(s) for the QAPP.

Digitally signed copy of the QAPP signature page(s) are attached for your record. Should you have any questions, please call me at (214) 665-8453.

Sincerely,

TERRIE WRIGHT
Digitally signed by TERRIE WRIGHT
Date: 2024.12.05 06:38:33 -06'00'

Terrie Wright
Project Officer
Air Grants Section

DIVISION OF
ENVIRONMENTAL QUALITY

Sarah Huckabee Sanders
GOVERNOR
Shane E. Khoury
SECRETARY

October 28, 2024

Terrie Wright
Environmental Protection Specialist (6AR-PM) Air and Radiation Division
Air Permits, Monitoring & Grants Branch
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270-2102

RE: Arkansas Department of Energy and Environment, Division of Environmental Quality (DEQ), Office of Air Quality Fiscal Year 2025 Quality Assurance Project Plan (QAPP) for the Ambient Air Monitoring Program

Dear Ms. Wright:

Enclosed are revisions to the QAPP for the DEQ Ambient Air Monitoring Network (Q-Trak No. 22-013). The revisions include the following:

- Revised dates;
- Revised document format for consistency with EPA QA/R-5 and EPA's QA Project Plan Template;
- Added additional detail to conform with the DEQ Quality Management Plan and EPA Guidance; and
- Updated Organization Chart for the Office of Air Quality.

If additional revisions are made, the QAPP will be updated to reflect those changes and submitted to Region VI. We request the QAPP be approved for a two-year period.

Upon review of this request, please provide AR DEQ with documentation of your approval or denial. If you have any questions, please do not hesitate to contact Robert Graddy at 501-682-0965, or via e-mail at Robert.Graddy@arkansas.gov.

Sincerely,

Stacie Wassell
AR DEQ Interim QA Manager

Robert Graddy
AR DEQ Project Manager

A1 Title Page

QUALITY ASSURANCE PROJECT PLAN

Ambient Air Quality Monitoring Program

Prepared by
Arkansas Department of Energy and Environment
5301 Northshore Drive
North Little Rock, AR 72118
Date Prepared: February 27, 2024
Period of Applicability: 2023-2025
Revision 5

Prepared for
United States Environmental Protection Agency Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270

A2 Approval Page

This Quality Assurance Project Plan (QAPP) for the Ambient Air Quality Monitoring Program, to be implemented beginning upon approval by the United States Environmental Protection Agency (EPA) Region 6 (R6), is hereby recommended for approval and commits the Arkansas Department of Energy and Environment (E&E) to follow the elements described within.

E&E

1) Signature Robert Graddy
Date: 3/12/2024
Robert Graddy, Project Manager
Email: Robert.Graddy@arkansas.gov
Office of Air Quality
Phone: (501) 682-0756

2)Signature
Date: 3/12/2024
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3)Signature Rhonda Moore
Date: 10/22/24
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4)Signature
Date: 23 October 2024
Stacie Wassell, Interim Quality Assurance Manager, Office of Water Quality
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5)Signature Demetria Kimbrough
Date: 3/12/2024
Demetria Kimbrough, Associate Director
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EPA R6

MICHAEL GILDNER Digitally signed by MICHAEL GILDNER Date: 2024.12.02 11:15:56 -06'00'
Division Quality Assurance Officer

TERRIE WRIGHT Digitally signed by TERRIE WRIGHT Date: 2024.12.02 13:25:35 -06'00'
Project Officer

A3 Table of Contents, Document Format and Control

A3.1 List of Contents

A3.2 List of Tables and Figures

A3.3 List of Acronyms and Abbreviations

AMTIC - Ambient Monitoring Technology Information Center
ANR – Annual Network Review
AQI - Air Quality Index
AQS- Air Quality System
CFR - Code of Federal Regulations
CO - carbon monoxide
CSN - chemical speciation network
DQO - data quality objective
DQI – data quality indicator
DFA – Arkansas Department of Finance and Administration
E&E – Arkansas Department of Energy and Environment
EPA – United States Environmental Protection Agency
FEM - federal equivalent method
FRM - federal reference method
Hi-Vol - high-volume
IMPROVE - Interagency Monitoring of Protected Visual Environments
m^3 - cubic meter
MQO - measurement quality objective
MSA - metropolitan statistical area
NAAQS - National Ambient Air Quality Standards
NCore - National Core (multipollutant monitoring stations)
NIST - National Institute of Standards and Technology
NO - nitrogen oxide
NO2 - nitrogen dioxide
NOx - oxides of nitrogen; the sum of the concentrations of NO and NO2
NOy - sum of all total reactive nitrogen oxides
NPAP - National Performance Audit Program
O3 - Ozone
OAQPS - EPA Office of Air Quality Planning and Standards
OEI - EPA Office of Environmental Information
ORD - EPA Office of Research and Development
PEP - Performance Evaluation Program
PM - particulate matter
PM_{10} - particles with an average aerodynamic diameter of 10 μm or less as measured by a reference method based on appendix J of 40 CFR Part 50
$PM_{10-2.5}$ - particles with an average aerodynamic diameter ≤ a nominal 10 μm and > 2.5 μm as measured by a reference method based on appendix O of 40 CFR Part 50
$PM_{2.5}$ - particles with an average aerodynamic diameter of 2.5 μm or less as measured by a reference method based on appendix L of 40 CFR Part 50
PQAO - primary quality assurance organization
PSD - prevention of significant deterioration
QA - quality assurance
QA Handbook, Vol. II - Quality Assurance Handbook for Air Pollution Measurement Systems,

Volume II: Ambient Air Quality Monitoring Program
QA Handbook, Vol. IV - Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements
QAC – Quality Assurance Coordinator
QAM – Quality Assurance Manager
QAPP - quality assurance project plan
QC - quality control
QMP - quality management plan
SIP - State Implementation Plan
SLAMS - state or local air monitoring stations
SO_2 - sulfur dioxide
SOP - standard operating procedure
SPM - special purpose monitor
TEI – Thermo Environmental Instruments
TSA - technical systems audit
TTN - Technology Transfer Network
µm – micrometer
URG – URG Corporation

A4 Project Purpose, Problem Definition, and Background

E&E has the primary responsibility of protecting the health and welfare of Arkansans from the harmful effects of air pollution. To that end, the E&E ensures that the ambient air quality in Arkansas is monitored in accordance with the levels of the state and National Ambient Air Quality Standards (NAAQS Table A4.1) and the Prevention of Significant Deterioration of Air Quality (PSD) Rules.

The NAAQS are established by the EPA in response to the requirements of the Clean Air Act (last amended in 1990) in order to protect public health and the environment. Arkansas is charged with implementing a program in order to assure that the NAAQS continue to be met.

The Clean Air Act, which was last amended in 1990, requires EPA to set NAAQS (40 CFR part 50) for pollutants considered harmful to public health and the environment. The Clean Air Act identifies two types of NAAQS. ***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

The EPA has set NAAQS for six principal pollutants, which are called "criteria" air pollutants. Periodically, the standards are reviewed and may be revised. The current standards are listed below. Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$). Three years of criteria pollutant data is required to compare with the NAAQS.

The table on the following page was taken from the TTN website: https://www.epa.gov/criteria-air-pollutants/naaqs-table

In pursuit of the goal of attaining the NAAQS, a network of ambient air quality monitors is maintained throughout the state (Figure A5.4 in Section 5.4 of this QAPP to evaluate current ambient air quality conditions. All data collected through these sites is subject to QA and QC processes in order to assure best representativeness of actual conditions. The QAPP. outlines how these processes should be implemented and followed.

The QAPP. has undergone several revisions since it was first developed in 2017. This document is the latest and includes the most current procedures applied by the program to assure continued adherence to appropriate QA and QC. This QAPP is reviewed annually along with accompanying SOPs.

Table A4.1 National Ambient Air Quality Standards (NAAQS)

Pollutant [links to historical tables of NAAQS reviews]	**Primary/ Secondary**	**Averaging Time**	**Level**	**Form**
Carbon Monoxide (CO)	primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Lead (Pb)	primary and secondary	Rolling 3-month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)	primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O_3)	primary and secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
$PM_{2.5}$	primary	1 year	12.0 µg/m^3	annual mean, averaged over 3 years

Pollutant [links to historical tables of NAAQS reviews]		**Primary/ Secondary**	**Averaging Time**	**Level**	**Form**
Particle Pollution (PM)		secondary	1 year	15.0 $\mu g/m^3$	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 $\mu g/m^3$ as a calendar quarter average) also remain in effect.
(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.
(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.
(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2)any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required NAAQS.

A5 Project Task Description

A5.1 Summary

The task to be completed is to collect data of sufficient quantity and quality to determine if the concentrations of criteria pollutants in the ambient air in the State of Arkansas exceed the levels established in the NAAQS. To accomplish this E&E Air Lab operates and maintains a network of fifteen ambient air quality monitoring sites throughout the state of Arkansas. These sites include seven O_3, eleven $PM_{2.5}$, two PM_{10}, two NO_2, one Trace SO_2, and one Trace CO. Thirteen sites are classified as population exposure sites, one is a background pollutant level site, and one is a long-range transport site. The process of selecting these sites is described in Section A5.3 of this QAPP All pollutants and parameters measured are listed is Section A5.4 of this QAPP. All air monitoring site locations and criteria pollutants measured are shown in Figure A5.4.

All ambient air monitoring data will be collected by monitors that have been designated as a federal reference method (FRM) or federal equivalent method (FEM), in accordance with 40 CFR Part 58, Appendix C, Section 2.1. The types of data collected by E&E Air Lab will include:

- Continuous hourly-averaged pollutant concentration data collected by FRMs or FEMs;
- Continuous five-minute averaged pollutant concentration data collected by FRMs or FEMs;
- Twenty-four-hour particulate mass concentrations collected by FRMs;
- Continuous shelter temperature measurements for ensuring conformity to environmental requirements of the air monitoring equipment; and,
- QA/QC measurements.

All data will be reported to AQS in accordance with the requirements stated in 40 CFR 58.16.

The work required to collect, document, and report this data includes, but is not limited to, the following:

- Establishing a monitoring network that has:
    - Appropriate location, and sampling frequency;
    - Accurate and reliable monitors, data recording equipment, and data management software;
- Developing encompassing documentation for:
    - All data collection activities;
    - Quality objectives and criteria;
- Establishing standard operating procedures, which provide activities and schedules for:
    - Equipment operation and preventative maintenance;
    - Instrument calibrations, precision checks, and accuracy evaluations;
    - Lab operations and sample custody procedures;

- Establishing assessment criteria and schedules; and
- Verifying and validating the data produced by network monitors in accordance with the criteria and schedules established herein.

A5.2 Monitoring Objectives

In accordance with 40 CFR Part 58, Appendix D, Section 1.1, E&E's monitoring objectives are the following:

- Provide air pollution data to the general public in a timely manner. Data can be presented to the public in a number of ways, including through air quality maps, newspapers, internet sites, and as part of weather forecasts and public advisories.
- Support compliance with ambient air quality standards and emissions strategy development. Data from FRM, FEM, and approved Regional Method (ARM) monitors for NAAQS pollutants will be used for comparing an area's air pollution levels against the NAAQS. Data from monitors of various types can be used in the development of attainment and maintenance plans. State and Local Air Monitoring Sites (SLAMS), and especially NCore station data, will be used to evaluate the regional air quality models used in developing emission strategies, and to track trends in air pollution abatement control measures' impact on improving air quality.
- Support for air pollution research studies. Air pollution data from the NCore network can be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development work.

In addition to the three monitoring objectives listed above, E&E's monitoring program has the following specific goals:

- Determining the highest concentrations expected to occur in the area covered by the network.
- Determining the typical concentrations in areas of high population density.
- Determining the impact of significant sources or source categories on air quality.
- Determining general background concentration levels.
- Determining the extent of regional pollutant transport among populated areas and in support of secondary standards.
- Determining air pollution impacts on visibility, vegetation damage, or other welfare based impacts.

A5.3 Site Selection Criteria

The selection of a specific monitoring site includes the following activities:

- Developing and understanding the monitoring objective and appropriate data quality objectives,
- Identifying the spatial scale most appropriate for the monitoring objective of the site,

- Identifying potential locations where the monitoring site could be placed,
- Identifying the specific monitoring site, and
- Following the site selection criteria specified in 40 CFR Part 58, Appendix E.

The sampling site selection process also involves consideration of the following factors:

- Economics – The quantity of resources required to accomplish all data collection activities, operations, including instrumentation, installation, maintenance, data retrieval, data analysis, QA, and data interpretation, must be established.
- Security – In some cases, a preferred location may have associated problems that compromise the security of monitoring equipment (i.e., high risk of theft, vandalism, etc.). If such problems cannot be remedied using standard measures—such as additional lighting, fencing, etc.— then an attempt to locate the site as near to the preferred location as possible shall be made.
- Logistics – This process includes procurement, maintenance, and transportation of material and personnel for the monitoring operation. The logistics process requires full knowledge of all aspects of the data collection operation: planning, reconnaissance, training, scheduling, safety, staffing, procuring of goods and services, communications, and inventory management.
- Atmospheric Considerations – These considerations may include spatial and temporal variability of pollutants and their transport. Effects of buildings, terrain, and heat sources or sinks on air trajectories can produce localized anomalies of pollutant concentrations. Meteorology must be considered in determining the geographic location of a site as well as the height, direction, and extension of sampling probes. Evaluation of winds is essential to properly locate many monitoring sites (e.g., siting either to detect or avoid emissions from specific sources).
- Topography – Evaluation of the local topography based upon land use maps, U.S. Geological Survey topographic maps, and other available resources must be completed. Minor and major topological features that affect both the transport and diffusion of air pollutants must be identified and evaluated. Minor features may consist of an adjacent tree lined stream or tall structures upwind or downwind of a point source, each of which may exert small influences on pollutant dispersion patterns.

A5.4 Site Locations and Monitoring Parameters

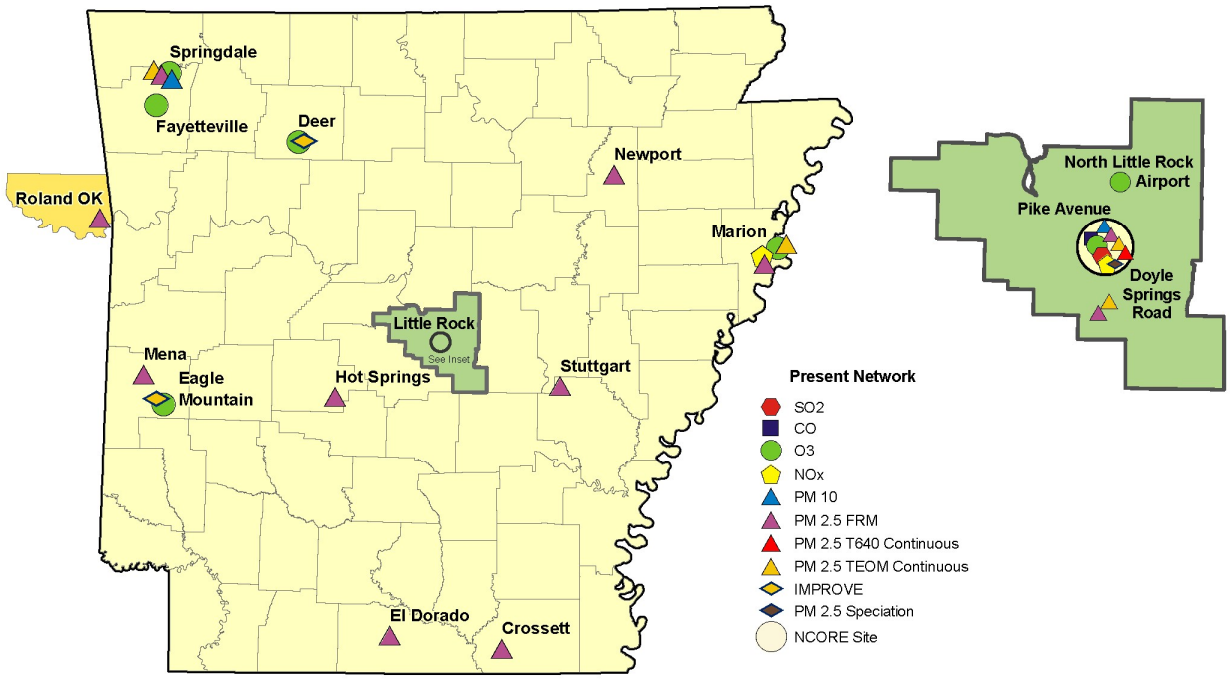
Site locations are reviewed annually for their ability to meet the program's current year monitoring objectives. This is accomplished by annual review and approval of an Annual Network Plan. For the location of the monitoring sites and the parameters monitored, see Figure A5.4. Pollutants and parameters currently monitored include:

- Particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10})*
- Particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$)*
- Particulate matter with an aerodynamic diameter between 2.5 and 10 micrometers ($PM_{10\text{-}2.5}$)
- Trace Sulfur dioxide (SO_2)*
- Nitrogen dioxide (NO_2)*
- Nitric oxide (NO)
- Total reactive nitrogen (NOy)
- Ozone (O_3)*
- Trace Carbon monoxide (CO)*
- Wind speed (WS)
- Wind direction (WD)
- Solar radiation (SR)
- Temperature (T)
- Delta temperature (ΔT)
- Barometric pressure (BP)
- Relative humidity (RH)

Pollutants listed above that are marked with an * are defined as criteria pollutants under the Clean Air Act and are subject to applicable NAAQS.

All gaseous ambient air parameters and particulate TEOMs and T640s are monitored continuously (hourly sampling frequency). Some sites may also include manual PM_{10} and $PM_{2.5}$ samplers operating on collection schedules that include 24-hour sampling every third or sixth day. The NCore site has daily sampling for $PM_{2.5}$.

Figure A5.4 E&E Ambient Air Monitoring Map



A5.5 Monitoring Site Designation

The Air Monitoring network is designed to allow for adequate NAAQS comparison. All sites in the network are designated as SLAMS unless the site is specifically designated a Special Purpose Monitor (SPM—there are none at the present in Arkansas). SLAMS sites are used in criteria pollutant monitoring for making NAAQS compliance decisions. A SPM site is established for a specified time period not to exceed 24 months and collects data used to support a variety of air program objectives including source emissions investigations. The network includes one NCore multi-pollutant monitoring network site. The NCore network was established by EPA nationwide to provide data on multiple pollutants at lower detection limits and data on pollutant precursors. The monitoring site located in North Little Rock, Arkansas is currently the designated NCore station in the state.

A5.6 Field Activities

All Air Lab personnel will perform those activities that support the continued successful operation of the statewide ambient air quality monitoring network. Personnel will perform field activities that include, but are not necessarily limited to, conducting periodic preventative maintenance and servicing equipment at SLAMS monitoring stations located within the State of Arkansas. Operational servicing activities may include, but are not limited to, collecting data, recording pertinent field data, and restocking consumables, such as calibration gases, at the monitoring sites. Performance audits, calibrations, verifications, precision checks, field equipment certifications, and annual siting evaluations, which includes visiting and assessing monitoring stations in the field, will also be performed. Additional field activities include relocating sites and/or locating

suitable monitoring sites for possible expansion of the network.

A5.7 Laboratory Activities

Continuous monitoring requires little laboratory activity, because these pollutants are measured continuously in the field. However, certain activities necessitate the use of laboratory activities. These include certification of calibration and audit transfer standards, as well as general maintenance. Laboratory activities for manual particulate monitoring include filter weighing, certification of calibration and audit transfer standards, and general maintenance. The EPA and E&E work together in the operation of the Chemical Speciation Network (CSN). EPA provides samplers to the state for the CSN. The state is responsible for operating the samplers and reviewing the data. The EPA contract laboratory is responsible for analysis of those samples collected for the CSN and managing the data. The CSN QAPP for NCore and Supplemental Sites and supporting materials are available online via the EPA Technology Transfer Network (TTN) found on the Ambient Monitoring Technology Information Center (AMTIC). https://www.epa.gov/amtic/chemical-speciation-network-csn

A6 Information/Data Quality Objectives and Performance/ Acceptance Criteria

A6.1 Data Quality Objectives (DQOs)

DQOs provide a goal on which to build the E&E's Air Quality Monitoring Program. DQOs are qualitative and quantitative statements derived from the DQO Planning Process that:

- Clarify the intended use of the data,
- Define the appropriate type of data to collect, and
- Specify tolerable levels of potential decision errors.

A6.1.1 Intended Use of Data

Data collected in the E&E network will be used to:

- Evaluate compliance with the NAAQS,
- Establish a historical baseline concentration of natural and anthropogenic air pollutants,
- Monitor the current dynamic concentrations of these air pollutants,
- Monitor progress made toward meeting ambient air quality standards,
- Provide data upon which long term control strategies can be reliably developed,
- Observe pollution trends throughout the region, and
- Provide a database for researching and evaluating effects.

A6.1.2 Appropriate Types of Data

The type of data needed is determined by its intended use. Because the primary use of E&E's

monitoring data is for comparison to the NAAQS, data must be collected in accordance with 40 CFR Parts 50, 53, and 58 requirements, and be of such quality that decision makers can make comparisons to the NAAQS with confidence and certainty.

Gaseous criteria pollutant data will be collected for comparison to the NAAQS using hourly concentration data by the five-minute data that is averaged (also 5-minute data for SO_2). Particulate FRM data will be collected for a 24-hour period for comparison with the NAAQS. For all criteria pollutants the quarterly data capture must achieve ≥75% completeness. Precision and Bias data are data quality indicators that are calculated utilizing appropriate quality control analyses. In addition to these requirements, the data generated will meet following principal quality objectives:

- All data should be traceable to a National Institute of Standards and Technology (NIST) primary standard.
- All data shall be of a known and documented quality. As noted above, two key quantitative indicators for assessing data quality are precision and bias.
- All data shall be comparable. This means all data shall be produced in a similar and scientific manner.
- All data shall be representative of the parameters being measured with respect to time, location, and the conditions from which the data are obtained. Use of standard methodologies will ensure that data generated is comparable. Following the site location criteria will ensure that the data are representative.
- This QAPP and its associated SOPs must be dynamic to continue to achieve its stated goals as techniques, systems, concepts, and technology change.

A6.1.3 Tolerable Levels of Decision Errors

DQIs define what is acceptable quality and quantity for decision making. QC procedures and the MQOs reduce errors. EPA established the tolerable error limits for ambient air monitoring precision and bias data to reduce the probability of decision errors. 40 CFR 58, Appendix A Section 2.3.1, defines the acceptable measurement uncertainty for O_3, NO_2, SO_2, and $PM_{2.5}$. The E&E Air Lab also follows the precision and bias requirements for all parameters including CO and PM_{10} outlined in Table A6.2.1 through A6.2.9 of this QAPP and referenced 40 CFR Part 58 Appendix A section 4. The MQOs are listed in the pink and yellow tables. The DQIs are listed in the blue tables.

A6.2 Data Quality Indicators (DQIs)

Once a DQO is established, the quality of the data must be maintained within the established acceptance criteria. Measurement quality objectives are designed to evaluate and control various phases of the measurement process so that total measurement uncertainty meets the DQOs. DQIs can be defined in terms of the following data quality indicators:

- **Precision** is a measure of agreement between two replicate measurements of the same property, under prescribed similar conditions. This agreement is calculated as the percent difference and the standard deviation. This calculation represents the random component

of error. This random component is what changes randomly high or low, and which cannot be controlled with the equipment and the procedures used. Precision is estimated by various statistical techniques using the standard deviation or, if you only have two measurements, the percent difference. In the E&E Air Monitoring Program, manual and automated quality control (QC) is completed at least every fourteen days for gaseous pollutants, and monthly for particulate pollutants (See Section B5 of this QAPP This will be the major estimate of precision on an ongoing basis. For manual (gravimetric) and continuous $PM_{2.5}$ and $PM_{10,}$ precision assessments are calculated during monthly flow verifications on all samplers as follows:

Equation 1.

$$cv = \sqrt{\frac{\left(n * \sum_{i=1}^{n} d_i^2 -\right)(\sum_{i=1}^{n} d_i)^2}{n(n-1)}} * \sqrt{\frac{n-1}{x^2_{0.1,n-1}}}$$

where *X* is the flow rate of the verification standard and *Y* is the sampler's measured flow rate. For gaseous analyzers, precision assessments are calculated with Equation 1 above where *Y* is the analyzer response value and *X* is the precision gas known value;

- **Bias** is a statistical calculation on the data set using equations 3-9 in 40 CFR Part 58 Appendix A 4.1.3. Bias is determined by estimating the positive and negative deviation from the true value as a percentage of the true value. In the E&E Air Monitoring Program, performance audits on all analyzers/samplers will be conducted quarterly to provide an estimate of bias. Performance audits will be performed with personnel and equipment/standards completely independent from the standards used to calibrate the monitoring equipment and the personnel responsible for site operations. For manual (gravimetric) and continuous $PM_{2.5}$ and PM_{10} bias assessments are calculated during quarterly flow audits on all samplers using Equation 1 above where *X* is the flow rate of the audit standard and *Y* is the sampler's measured flow rate. For gaseous analyzers bias assessments are calculated using Equation 1 above where *Y* is the analyzer response value and *X* is the audit gas known value. Audits are completed by challenging the monitor with audit gas standards of known concentration from at least three audit levels. One point must be within two to three times the method detection limit of the instruments within the PQAOs network, the second point will be less than or equal to the 99th percentile of the data at the site or the network of sites in the PQAO or the next highest audit concentration level. The third point can be around the primary NAAQS or the highest 3-year concentration at the site or the network of sites in the PQAO;
- **Representativeness** is a measure of the degree to which data accurately and precisely represent a characteristic of a population parameter at a sampling point or for a process condition or environmental condition. Representativeness is a qualitative term that should be evaluated to determine whether in situ or other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied. The representativeness of measurements made in the E&E Air Monitoring Network is ensured by following EPA siting guidelines and is fully explained in Section A6 of this QAPP. The goal is to measure the pollutant

concentrations representative of what most people breathe throughout the State of Arkansas.

- **Data Comparability** is a measure of how much confidence there is in the ability to accurately compare individual data sets to one another. Comparability must be carefully evaluated to establish whether two data sets can be considered equivalent with respect to the measurement of a specific variable or groups of variables. Comparability is important so that data sets within one part of the country can be compared with another area or data from another year. Data comparability is accomplished with the use of FRM and FEM methods.
- **Data Completeness** is the number of valid data points actually collected as compared to the expected number. Completeness can be expressed as a ratio or a percentage. Data completeness requirements are included in the appendices of 40 CFR Part 50 and 40 CFR Part 58 appendix A; and
- **Detectability (Sensitivity)** is defined as the lowest value that a method procedure can reliably discern a measured response above background noise. In other words, detectability is the level below which the instrument cannot reliably discriminate from zero. Because there is always variation in any measurement process (precision uncertainty), the level of detectability depends on how much precision error is in the process. Detection limits for all E&E air monitoring instruments are consistent with the requirements listed in 40 CFR 53. For Federal Reference Methods (FRM) and Federal Equivalent Methods (FEM), the detection limits are specified with the respective EPA FRM/FEM designation.

Table A6.2.1 Ozone Validation Template

1) Requirement (O_3)	2) Frequency	3) Acceptance Criteria	Information /Action
CRITICAL CRITERIA-OZONE			
Monitor	NA	***Meets requirements listed in FRM/FEM designation***	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
One Point QC Check Single analyzer	***Every 14 days***	< ±7.1% (percent difference) or < ±1.5 ppb difference whichever is greater	1 and 2) 40 CFR Part 58 App. A Sec. 3.1 3) Recommendation based on DQO in 40 CFR Part 58 App. A Sec. 2.3.1.2. QC Check Conc range 0.005 - 0.08 ppm and 05/05/2016 Technical Note on AMTIC
Zero/span check	Every 14 days	Zero drift < ± 3.1 ppb (24 hr) < ± 5.1 ppb (>24hr-14 day) Span drift < ± 7.1 %	1 and 2) QA Handbook Volume 2 Sec. 12.3 3) Recommendation and related to DQO
OPERATIONAL CRITERIA -OZONE			
Shelter Temperature Range	Daily (hourly values)	20.0 to 30.0º C. (Hourly avg)or per manufacturers specifications if designatedto a wider temperature range	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2 Generally, the 20-30.0º C range will apply but the most restrictive operable range of the instruments in the shelter may also be used as guidance. FRM/FEM list found on AMTIC provides temp. range for given instrument. FRM/FEM monitor testing is required at 20-30º C range per 40 CFR Part 53.32
Shelter Temperature Control	Daily (hourly values)	< 2.1º C SD over 24 hours	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Shelter Temperature Device Check	Every 182 days and 2/ calendar year	<± 2.1º C of standard	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Annual Performance Evaluation Single analyzer	***Every site every 365 days and 1/ calendar year within period of monitor operation***	Percent difference of audit levels 3-10 < ±15.1% Audit levels 1&2 < ± 1.5 ppb difference or <± 15.1%	1 and 2) 40 CFR Part 58 App. A Sec. 3.1.2 3) Recommendation- 3 audit concentrations not including zero. AMTIC guidance 2/17/2011 AMTIC Technical Memo
Federal Audits (NPAP)	***20% of sites audited in calendar year***	Audit levels 1&2 < ± 1.5 ppb difference all other levels percent difference < ± 10.1%	1 and 2) 40 CFR Part 58 App. A Sec. 3.1.3 3) NPAP QAPP
Verification/Calibration	Upon receipt/adjustment/repair/ installation/moving and repair and recalibration of standard of higher level Every 182 day and 2/ calendar year if manual zero/span performed biweekly Every 365 day and 1/ calendar year if continuous zero/span performed daily	All points < ± 2.1 % or < ±1.5 ppb differenceof best-fit straight line whichever is greater and Slope 1 ± .05	1) 40 CFR Part 50 App. D 2) Recommendation 3) 40 CFR Part 50 App. D Sec 4.5.5.6 Multi-point calibration (0 and 4 upscale points) Slope criteria is a recommendation
Zero Air/Zero Air Check	Every 365 days and 1/calendar year	Concentrations below LDL	1) 40 CFR Part 50 App. D Sec. 4.1 2 and 3) Recommendation
Ozone Level 2 Standard			

1) Requirement (O_3)	2) Frequency	3) Acceptance Criteria	Information /Action
Certification/recertification to Standard Reference Photometer (Level 1)	Every 365 days and 1/calendar year	single point difference < ± 3.1%	1) 40 CFR Part 50 App. D Sec. 5.4 2 and 3) Transfer Standard Guidance EPA-454/B-10-001 Level 2 standard (formerly called primary standard) usually transported to EPA Regions SRP for comparison
Level 2 and Greater Transfer Standard Precision	Every 365 days and 1/calendar year	***Standard Deviation less than 0.005 ppm or 3.0% whichever is greater***	1) 40 CFR Part 50 Appendix D Sec. 3.1 2) Recommendation, part of reverification 3) 40 CFR Part 50 Appendix D Sec. 3.1
(if recertified via a transfer standard)	Every 365 days and 1/calendar year	Regression slopes = 1.00 ± 0.03 and two intercepts are 0 ± 3 ppb	1, 2 and 3) Transfer Standard Guidance EPA-545/B-10-001
Ozone Transfer standard(Level 3 and greater)			
Qualification	Upon receipt of transfer standard	< ±4.1% or < ±4 ppb (whichever greater)	1, 2 and 3) Transfer Standard Guidance EPA-545/B-10-001
Certification	After qualification and upon receipt/adjustment/repair	RSD of six slopes ≤ 3.7% Std. Dev. of 6 intercepts ≤ 1.5	1, 2 and 3) Transfer Standard Guidance EPA-545/B-10-001
Recertification to higher level standard	Beginning and end of O3 season or every 182 days and 2/calendar year whichever less	New slope = ± 0.05 of previous and RSD of six slopes ≤3.7% Std. Dev. of 6 intercepts ≤ 1.5	1, 2 and 3) Transfer Standard Guidance EPA-545/B-10-001 recertification test that then gets added to most recent 5 tests. If does not meet acceptability certification fails
Detection (FEM/FRMs) Noise and Lower Detectable Limits (LDL) are part of the FEM/FRM requirements. It is recommended that monitoring organizations perform the LDL test tominimally confirm and establish the LDL of their monitor. Performing the LDL test will provide the noise information.			
Noise	Every 365 days and 1/ calendar year	***≤ 0.0025 ppm (standard range)*** ***≤ 0.001 ppm (lower range)***	1) 40 CFR Part 53.23 (b) (definition & procedure) 2) Recommendation- info can be obtained from LDL 3) 40 CFR Part 53.20 Table B-1
Lower detectable limit	Every 365 days and 1/calendar year	***≤ 0.005 ppm (standard range)*** ***≤ 0.002 ppm (lower range)***	1) 40 CFR Part 53.23 (b) (definition & procedure) 2) Recommendation 3) 40 CFR Part 53.20 Table B-1
SYSTEMATIC CRITERIA-OZONE			
Standard Reporting Units	***All data***	***ppm (final units in AQS)***	1, 2 and 3) 40 CFR Part 50 App. U Sec. 3(a)
Rounding convention for designvalue calculation	***All routine concentration data***	***3 places after decimal with digits to right truncated***	1, 2 and 3) 40 CFR Part 50 App. U Sec. 3(a) The roundingconvention is for averaging values for comparison to NAAQS not for reporting individual hourly values.
Completeness (seasonal)	***3-Year Comparison***	***≥ 90% (avg) daily max available in ozone season with min of 75% in any one year.***	1,2,3) 40 CFR Part 50 App. U Sec 4(b)
	8- hour average	***≥ if at least 6 of the hourly concentrations for the 8-hour period are available***	1) 40 CFR Part 50 App. U 2 and 3) 40 CFR Part 50 App. U Sec. 3(b)
	Valid Daily Max	***≥ if valid 8-hour averages are available for at least 13 of the 17 consecutive 8-hour periods starting from 7:00 a.m. to 11:00 p.m.***	1) 40 CFR Part 50 App. U 2,3) 40 CFR Part 50 App. U Sec. 3(d)

Sample Residence Time Verification	Every 365 days and 1/calendar year	***≤ 20 Seconds***	1) 40 CFR Part 58 App. E, Sec. 9 (c) 2) Recommendation

1) Requirement (O_3)	2) Frequency	3) Acceptance Criteria	Information /Action
			3) 40 CFR Part 58 App. E, Sec. 9 (c)
Sample Probe, Inlet, Sampling train	***All sites***	***Borosilicate glass (e.g., Pyrex®) or Teflon®***	1) 40 CFR Part 58 App. E, Sec. Sec. 9 (a) 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. Sec. 9 (a) FEP and PFA have been accepted as an equivalent material to Teflon. Replacement or cleaning is suggested as 1/year and more frequent if pollutant load or contamination dictate
Siting	Every 365 days and 1/calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Sec. 2-6 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 2-6
EPA Standard Ozone Reference Photometer (SRP) Recertification (Level 1)	Every 365 days and 1/calendar year	Regression slope = 1.00 ± 0.01 and intercept < 3 ppb	1, 2 and 3) Transfer Standard Guidance EPA-454/B-10-001 This is usually at a Regional Office and is compared against the traveling SRP
Precision (using 1-point QC checks)	***Calculated annually and as Appropriate for design value estimates***	**90% CL CV < 7.1%**	1) 40 CFR Part 58 App. A 2.3.1.2 & 3.1.1 2) 40 CFR Part 58 App. A Sec. 4 (b) 3) 40 CFR Part 58 App. A Sec. 4.1.2
Bias (using 1-point QC checks)	***Calculated annually and as Appropriate for design value estimates***	**95% CL < ± 7.1%**	1) 40 CFR Part 58 App. A 2.3.1.2 & 3.1.1 2) 40 CFR Part 58 App. A Sec. 4 (b) 3) 40 CFR Part 58 App. A Sec. 4.1.3

Table A6.2.2 CO Validation Template

1) Requirement (CO)	2) Frequency	3) Acceptance Criteria	Information /Action
CRITICAL CRITERIA-CO			
Sampler/Monitor	NA	***Meets requirements listed in FRM/FEM designation***	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
One Point QC Check Single analyzer	***Every 14 days***	< ±10.1% (percent difference)	1 and 2) 40 CFR Part 58 App. A Sec. 3.1.1 3) Recommendation based on DQO in 40 CFR Part 58 App. A Sec. 2.3.1. QC Check Conc range 0.5 – 5 ppm
Zero/span check	Every 14 days	Zero drift < ± 0.41 ppm (24 hr) < ± 0.61 ppm (>24hr-14 day) Span drift < ± 10.1 %	1 and 2) QA Handbook Volume 2 Sec. 12.3 3) Recommendation
OPERATIONAL CRITERIA-CO			
Shelter Temperature range	Daily (hourly values)	20.0 to 30.0º C. (Hourly avg) or per manufacturers specifications if designated to a wider temperature range	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2 Generally, the 20-30.0 º C range will apply but the most restrictive operable range of the instruments in the shelter may also be used as guidance. FRM/FEM list found on AMTIC provides temp. range for given instrument. FRM/FEM monitor testing is required at 20-30 º C range per 40 CFR Part 53.32
Shelter Temperature Control	Daily (hourly values)	< 2.1º C SD over 24 hours	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Shelter Temperature Device Check	Every 182 days and 2/ calendar year	< ± 2.1º C of standard	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Annual Performance Evaluation Single Analyzer	***Every site every 365 days and 1/ calendar year***	Percent difference of audit levels 3-10 < ±15.1% Audit levels 1&2 < ± 0.031 ppm difference or < ±15.1%	1 and 2) 40 CFR Part 58 App. A Sec. 3.1.2 3) Recommendation- 3 audit concentrations not including zero. AMTIC Technical Memo
Federal Audits (NPAP)	***20% of sites audited in a calendar year***	Audit levels 1&2 < ± 0.031 ppm difference all other levels percent difference < ± 15.1%	1 and 2) 40 CFR Part 58 App. A Sec. 3.1.3 3) NPAP QAPP
Verification/Calibration	Upon receipt/adjustment/repair/ installation/moving Every 182 day and 2/ calendar year if manual zero/span performed biweekly Every 365 days and 1/ calendar year if continuous zero/span performed daily	All points < ± 2.1 % or < ± 0.03 ppm difference of best-fit straight line. whichever is greater and Slope 1 ± .05	1) 40 CFR Part 50 Appendix C Sec. 4 2 and 3) Recommendation See details about CO2 sensitive instruments Multi-point calibration (0 and 4 upscale points) Slope criteria is a recommendation

1) Requirement (CO)	2) Frequency	3) Acceptance Criteria	Information /Action
Gaseous Standards	All gas cylinders	**NIST Traceable** (e.g., EPA Protocol Gas)	1) 40 CFR Part 50 Appendix C Sec. 4.3.1 2) NA Green Book 3) 40 CFR Part 50 Appendix C Sec. 4.3.1 See details about CO2 sensitive instruments Gas producer used must participate in EPA Ambient Air Protocol Gas Verification Program 40 CFR Part 58 App. A Sec. 2.6.1
Zero Air/Zero Air Check	Every 365 days and 1/ calendar year	***< 0.1 ppm CO***	1) 40 CFR Part 50 App. C Sec. 4.3.2 2) Recommendation 3) 40 CFR Part 50 App. C Sec. 4.3.2
Gas Dilution Systems	Every 365 days and 1/ calendar year or after failure of 1 point QC check or performance evaluation	Accuracy < ± 2.1 %	1, 2 and 3) Recommendation based on SO2 requirement in 40 CFR Part 50 App. A-1 Sec. 4.1.2
Detection (FEM/FRMs) Noise and Lower Detectable Limits (LDL) are part of the FEM/FRM requirements. It is recommended that monitoring organizations perform the LDL test tominimally confirm and establish the LDL of their monitor. Performing the LDL test will provide the noise information.			
Noise	Every 365 days and 1/ calendar year	***≤ 0.2 ppm (standard range)*** ***≤ 0.1 ppm (lower range)***	1) 40 CFR Part 53.23 (b) (definition & procedure) 2) Recommendation- info can be obtained from LDL 3) 40 CFR Part 53.20 Table B-1
Lower detectable level	Every 365 days and 1/ calendar year	***≤ 0.4 ppm (standard range)*** ***≤ 0.2 ppm (lower range)***	1) 40 CFR Part 53.23 (c) (definition & procedure) 2) Recommendation 3) 40 CFR Part 53.20 Table B-1
SYSTEMATIC CRITERIA-CO			
Standard Reporting Units	***All data***	***ppm (final units in AQS)***	1, 2 and 3) 40 CFR Part 50.8 (a)
Rounding convention for design value calculation	***All routine concentration data***	***1 decimal place***	1, 2 and 3) 40 CFR Part 50.8 (d) The rounding convention is for averaging values for comparison to NAAQS not for reporting individual hourly values.
Completeness	***8-hour standard***	***75% of hourly averages for the 8-hour period***	1) 40 CFR Part 50.8(c) 2) 40 CFR Part 50.8(a-2) 3) 40 CFR Part 50.8(c)
Sample Residence Time Verification	Every 365 days and 1/ calendar year	≤ 20 Seconds	1, 2, and 3) Recommendation. CO not a reactive gas but suggest following same methods other gaseous criteria pollutants.
Sample Probe, Inlet, Sampling train	All Sites	Borosilicate glass (e.g., Pyrex®) or Teflon®	1, 2, and 3) Recommendation. CO not a reactive gas but suggest following same methods other gaseous criteria pollutants. FEP and PFA have been accepted as a equivalent material to Teflon. Replacement/cleaning is suggested as 1/year and more frequent if pollutant load dictate.

Siting	Every 365 days and 1/ calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Sec. 2-6 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 2-6
1) Requirement (CO)	**2) Frequency**	**3) Acceptance Criteria**	**Information /Action**
Precision (using 1-point QC checks)	***Calculated annually and as Appropriate for design valueestimates***	***90% CL CV < 10.1%***	1) 40 CFR part 58 App. A Sec. 3.1.1 2) 40 CFR Part 58 App. A Sec. 4 (b) 3) 40 CFR Part 58 App. A Sec. 4.1.2
Bias (using 1-point QC checks)	***Calculated annually and as Appropriate for design valueestimates***	***95% CL < ± 10.1%***	1) 40 CFR Part 58 App. A Sec. 3.1.1 2) 40 CFR Part 58 App. A Sec. 4 (b) **4)** 40 CFR Part 58 App. A Sec. 4.1.3

Table A6.2.3 NO_2, NOx, NO Validation Template

1) Requirement (NO_2)	2) Frequency	3) Acceptance Criteria	Information /Action
CRITICAL CRITERIA- NO_2			
Sampler/Monitor	***NA***	***Meets requirements listed in FRM/FEM designation***	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
One Point QC Check Single analyzer	***Every 14 days***	< ±15.1% (percent difference) or < ± 1.5 ppb difference whichever is greater	1 and 2) 40 CFR Part 58 App. A Sec. 3.1.1 3) Recommendation based on DQO in 40 CFR Part 58 App. A Sec. 2.3.1.5 QC Check Conc range 0.005 - 0.08 ppm and 05/05/2016 Technical Note on AMTIC
Zero/span check	Every 14 days	Zero drift < ± 3.1 ppb (24 hr) < ± 5.1 ppb (>24hr-14 day) Span drift < + 10.1 %	1 and 2) QA Handbook Volume 2 Sec. 12.3 3) Recommendation and related to DQO
Converter Efficiency	During multi-point calibrations, span and audit Every 14 days	***(≥96%)*** 96% – 104.1%	1) 40 CFR Part 50 App. F Sec. 1.5.10 and 2.4.10 2) Recommendation 3) 40 CFR Part 50 App. F Sec. 1.5.10 and 2.4.10 Regulation states ≥ 96%, 96 – 104.1% is a recommendation.
OPERATIONAL CRITERIA- NO_2			
Shelter Temperature Range	Daily (hourly values)	20.0 to 30.0° C. (Hourly avg) or per manufacturers specifications if designated to a wider temperature range	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2 Generally, the 20-30.0 ° C range will apply but the most restrictive operable range of the instruments in the shelter may also be used as guidance. FRM/FEM list found on AMTIC provides temp. range for given instrument. FRM/FEM monitor testing is required at 20-30 ° C range per 40 CFR Part 53.32
Shelter Temperature Control	Daily (hourly values)	< 2.1° C SD over 24 hours	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Shelter Temperature Device Check	every 182 days and 2/calendar year	< ± 2.1° C of standard	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Annual Performance Evaluation Single Analyzer	***Every site every 365 days and 1/ calendar year***	Percent difference of audit levels 3-10 < ±15.1% Audit levels 1&2 < ± 1.5 ppb difference or < ±15.1%	1) 40 CFR Part 58 App. A Sec. 3.1.2 2) 40 CFR Part 58 App. A Sec. 3.1.2 3) Recommendation - 3 audit concentrations not including zero. AMTIC Technical Memo
Federal Audits (NPAP)	20% of sites audited in calendar year	Audit levels 1&2 < ± 1.5 ppb difference all other levels percent difference < ± 15.1%	1 & 2) 40 CFR Part 58 App. A Sec. 3.1.3 3) NPAP QAPP

1) Requirement (NO_2)	2) Frequency	3) Acceptance Criteria	Information /Action
Verification/Calibration	Upon receipt/adjustment/repair/ installation/moving Every 182 day and 2/ calendar year if manual zero/span performed biweekly Every 365 day and 1/ calendar year if continuous zero/span performed daily	Instrument residence time ≤ 2 min Dynamic parameter ≥ 2.75 ppm-min All points <± 2.1 % or ≤ ± 1.5 ppb difference of best-fit straight line whichever is greater and Slope 1 ± .05	1) 40 CFR Part 50 App. F 2 and 3) Recommendation Multi-point calibration (0 and 4 upscale points) Slope criteria is a recommendation
Gaseous Standards	All gas cylinders	**NIST Traceable** (e.g., EPA Protocol Gas) 50-100 ppm of NO in Nitrogen with < 1 ppm NO_2	1) 40 CFR Part 50 App. F Sec. 1.3.1 2) NA Green Book 3) 40 CFR Part 50 App. F Sec. 1.3.1. A technical memo may change the concentration requirement. Gas producer used must participate in EPA Ambient Air Protocol Gas Verification Program 40 CFR Part 58 App. A Sec. 2.6.1
Zero Air/ Zero Air Check	Every 365 days and 1/ calendar year	Concentrations below LDL	1) 40 CFR Part 50 App. F Sec. 1.3.2 2 and 3) Recommendation
Gas Dilution Systems	Every 365 days and 1/ calendar year or after failure of 1 point QC check or performance evaluation	Accuracy < ± 2.1 %	1, 2 and 3) Recommendation based on SO2 requirement in 40 CFR Part 50 App. A-1 Sec. 4.1.2
Detection (FEM/FRMs) Noise and Lower Detectable Limits (LDL) are part of the FEM/FRM requirements. It is recommended that monitoring organizations perform the LDL test tominimally confirm and establish the LDL of their monitor. Performing the LDL test will provide the noise information.			
Noise	Every 365 days and 1/ calendar year	***≤ 0.005 ppm***	1) 40 CFR Part 53.23 (b) (definition & procedure) 2) Recommendation- info can be obtained from LDL 3) 40 CFR Part 53.20 Table B-1
Lower detectable level	Every 365 days and 1/ calendar year	***≤ 0.01 ppm***	1) 40 CFR Part 53.23 (c) (definition & procedure) 2) Recommendation 3) 40 CFR Part 53.20 Table B-1
SYSTEMATIC CRITERIA- NO_2			
Standard Reporting Units	***All data***	***ppb (final units in AQS)***	1, 2 and 3) 40 CFR Part 50 App. S Sec. 2 (c)
Rounding convention for data reported to AQ S	***All routine concentration data***	***1 place after decimal with digits to right truncated***	1, 2 and 3) 40 CFR Part 50 App. S Sec. 4.2 (a) The rounding convention is for averaging values for comparison to NAAQS not for reporting individual hourly values.
	Annual Standard	***≥ 75% hours in year***	1) 40 CFR Part 50 App. S Sec. 3.1(b) 2) 40 CFR Part 50 App. S Sec. 3.1(a) 3) 40 CFR Part 50 App. S Sec. 3.1(b)

Completeness	***1-hour standard***	***1) 3consecutive calendars years of complete data 2) 4 quarters complete in each year 3) ≥75% sampling days in quarter 4) ≥ 75% of hours in a day***	1) 40 CFR Part 50 App. S Sec. 3.2(b) 2) 40 CFR Part 50 App. S Sec. 3.2(a) 3) 40 CFR Part 50 App. S Sec. 3.2(b) More details in 40 CFR Part 50 App. S
Sample Residence Time Verification	Every 365 days and 1/ calendar year	***≤ 20 Seconds***	1) 40 CFR Part 58 App. E, Sec. 9 (c) 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 9 (c)
Sample Probe, Inlet, Sampling train	***All sites***	***Borosilicate glass (e.g., Pyrex®) or Teflon®***	1, 2 and 3) 40 CFR Part 58 App. E Sec. 9 (a) FEP and PFA have been accepted as equivalent material to Teflon. Replacement or cleaning is suggested as 1/year and more frequent if pollutant load or contamination dictate
Siting	Every 365 days and 1/ calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Secs 2-6 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 2-6
Precision (using 1-point QC checks)	***Calculated annually and as Appropriatefor design value estimates***	***90% CL CV < 15.1%***	1) 40 CFR Part 58 App. A Sec. 2.3.1.5 & 3.1.1 2) 40 CFR Part 58 App. A Sec. 4 (b) 3) 40 CFR Part 58 App. A Sec. 4.1.2
Bias (using 1-point QC checks)	***Calculated annually and as Appropriatefor design value estimates***	***95% CL < ± 15.1%***	1) 40 CFR Part 58 App. A Sec. 2.3.1.5 & 3.1.1 2) 40 CFR Part 58 App. A Sec. 4 (b) 3) 40 CFR Part 58 App. A Sec. 4.1.3

Table A6.2.4 SO_2 Validation Template

1) Requirement (SO_2)	2) Frequency	3) Acceptance Criteria	Information /Action
CRITICAL CRITERIA- SO_2			
Sampler/Monitor	NA	***Meets requirements listed in FRM/FEM designation***	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
One Point QC Check Single analyzer	***Every 14 days***	< ±10.1% (percent difference) or < ± 1.5 ppb difference whichever is greater	1 and 2) 40 CFR Part 58 App. A Sec. 3.1.1 3) Recommendation based on DQO in 40 CFR Part 58 App. A Sec. 2.3.1.2 QC Check Conc range 0.005 - 0.08 ppm and 05/05/2016 Technical Note on AMTIC
Zero/span check	Every 14 days	Zero drift < ± 3.1 ppb (24 hr) < ± 5.1 ppb (>24hr-14 day) Span drift < ± 10.1 %	1 and 2) QA Handbook Volume 2 Sec. 12.3 3) Recommendation and related to DQO
OPERATIONAL CRITERIA- SO_2			
Shelter Temperature Range	Daily (hourly values)	20.0 to 30.0° C. (Hourly avg) or per manufacturers specifications if designated to a wider temperature range	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2 Generally, the 20-30.0 ° C range will apply but the most restrictive operable range of the instruments in the shelter may also be used as guidance. FRM/FEM list found on AMTIC provides temp. range for given instrument. FRM/FEM monitor testing is required at 20-30 ° C range per 40 CFR Part 53.32
Shelter Temperature Control	Daily (hourly values)	< 2.1° C SD over 24 hours	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Shelter Temperature Device Check	every 180 days and 2/calendar year	< ± 2.1° C of standard	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Annual Performance Evaluation Single Analyzer	***Every site every 365 days and 1/ calendar year***	Percent difference of audit levels 3-10 < ±15.1% Audit levels 1&2 < ± 1.5 ppb difference or < ±15.1%	1 and 2) 40 CFR Part 58 App. A Sec. 3.1.2 3) Recommendation - 3 audit concentrations not including zero. AMTIC Technical Memo
Federal Audits (NPAP)	20% of sites audited in calendar year	Audit levels 1&2 < ± 1.5 ppb difference all other levels percent difference < ± 15.1%	1&2) 40 CFR Part 58 App. A Sec. 3.1.3 3) NPAP QAPP
Verification/Calibration	Upon receipt/adjustment/repair/ installation/moving Every 182 day and 2/ calendar year if manual zero/span performed biweekly Every 365 day and 1/ calendar year if continuous zero/span performed daily	All points < ± 2.1 % or < ± 1.5 ppb difference of best-fit straight line whichever is greater and Slope 1 ± .05	1) 40 CFR Part 50 App. A-1 Sec. 42 and 3) Recommendation Multi-point calibration (0 and 4 upscale points) Slope criteria is a recommendation
Gaseous Standards	***All gas cylinders***	***NIST Traceable (e.g., EPA Protocol Gas)***	1) 40 CFR Part 50 App. A-1 Sec. 4.1.6.1 2) NA Green Book 3) 40 CFR Part 50 App. F Sec. 1.3.1 Producers must participate in Ambient Air Protocol Gas

1) Requirement (SO_2)	2) Frequency	3) Acceptance Criteria	Information /Action
			Verification Program 40 CFR Part 58 App. A Sec. 2.6.1
Zero Air/ Zero Air Check	Every 365 days and 1/ calendar year	Concentrations below LDL < 0.1 ppm aromatic hydrocarbons	1) 40 CFR Part 50 App. A-1 Sec. 4.1.6.2 2) Recommendation 3) Recommendation and 40 CFR Part 50 App. A-1 Sec.4.1.6.2
Gas Dilution Systems	Every 365 days and 1/ calendar year or after failure of 1point QC check or performance evaluation	***Accuracy < ± 2.1 %***	1) 40 CFR Part 50 App. A-1Sec. 4.1.2 2) Recommendation 3) 40 CFR Part 50 App. A-1 Sec. 4.1.2
Detection (FEM/FRMs) Noise and Lower Detectable Limits (LDL) are part of the FEM/FRM requirements. It is recommended that monitoring organizations perform the LDL test tominimally confirm and establish the LDL of their monitor. Performing the LDL test will provide the noise information.			
Noise	Every 365 days and 1/ calendar year	***≤ 0.001 ppm (standard range)*** ***≤ 0.0005 ppm (lower range)***	1) 40 CFR Part 53.23 (b) (definition & procedure) 2) Recommendation- info can be obtained from LDL 3) 40 CFR Part 53.20 Table B-1
Lower detectable level	Every 365 days and 1/ calendar year	***≤ 0.002 ppm (standard range)*** ***≤ 0.001 ppm (lower range)***	1) 40 CFR Part 53.23 (c) (definition & procedure) 2) Recommendation 3) 40 CFR Part 53.20 Table B-1
SYSTEMATIC CRITERIA- SO_2			
Standard Reporting Units	***All data***	***ppb (final units in AQS)***	1, 2 and 3) 40 CFR Part 50 App. T Sec. 2 (c)
Rounding convention for design value calculation	***All routine concentration data***	***1 place after decimal with digits to right truncated***	1, 2 and 3) 40 CFR Part 50 App. T Sec. 2 (c) The rounding convention is for averaging values for comparison to NAAQS not for reporting individual hourly values.
Completeness	***1 hour standard***	Hour – 75% of hour ***Day- 75% hourly Conc*** ***Quarter- 75% complete days*** ***Years- 4 complete quarters*** ***5-min value reported only for valid hours***	1, 2 and 3) 40 CFR Part 50 App. T Sec. 3 (b), (c) More details in CFR on acceptable completeness. 5-min values or 5-min max value (40 CFR part 58.16(g)) only reported for the valid portion of the hour reported. If the hour is incomplete no 5-min or 5-min max reported.
Sample Residence Time Verification	Every 365 days and 1/ calendar year	***≤ 20 Seconds***	1) 40 CFR Part 58 App. E, Sec. 9 (c) 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 9 (c)
Sample Probe, Inlet, Sampling train	***All sites***	***Borosilicate glass (e.g., Pyrex®) or Teflon®***	1, 2 and 3) 40 CFR Part 58 App. E Sec. 9 (a) FEP and PFA have been accepted as equivalent material to Teflon. Replacement or cleaning is suggested as 1/year and more frequent if pollutant load or contamination dictate
Siting	Every 365 days and 1/ calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Sec. 2-6 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 2-6
Precision (using 1-point QC checks)	***Calculated annually and as Appropriatefor design value estimates***	***90% CL CV < 10.1%***	1) 40 CFR Part 58 App. A Sec. 2.3.1.6 & 3.1.1 2) 40 CFR Part 58 App. A Sec. 4 (b) 3) 40 CFR Part 58 App. A Sec. 4.1.2

1) Requirement (SO_2)	2) Frequency	3) Acceptance Criteria	Information /Action
Bias (using 1-point QC checks)	***Calculated annually and as Appropriatefor design value estimates***	***95% CL < ± 10.1%***	1) 40 CFR Part 58 App. A Sec. 2.3.1.6 & 3.1.1 2) 40 CFR Part 58 App. A Sec. 4 (b) 3) 40 CFR Part 58 App. A Sec. 4.1.3

Table A6.2.5 $PM_{2.5}$ Filter Based Local Conditions Validation Template

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- $PM_{2.5}$ Filter Based Local Conditions			
Field Activities			
Sampler/Monitor	NA	***Meets requirements listed in FRM/FEM/ARM designation***	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Filter Holding Times			
Pre-sampling	***all filters***	***≤ 30 days before sampling***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.5
Sample Recovery	***all filters***	***≤ 7 days 9 hours from sample end date***	1, 2 and 3) 40 CFR Part 50, App. L 10.10
Sampling Period (including multiple power failures)	***all filters***	***1380-1500 minutes, or if value < 1380 and exceedance of NAAQS*** [1/] ***midnight to midnight local standard time***	1, 2 and 3) 40 CFR Part 50 App. L Sec. 3.3 and 40 CFR Part 50 App. N Sec. 1 for the midnight to midnight local standard time requirement See details if less than 1380 min sampled
Sampling Instrument			
Average Flow Rate	***every 24 hours of op***	***average within 5% of 16.67 liters/minute***	1, 2 and 3) Part 50 App. L Sec. 7.4.3.1
Variability in Flow Rate	***every 24 hours of op***	***CV ≤ 2%***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.2
One-point Flow Rate Verification	***every 30 days each separated by 14 days***	***< ± 4.1% of transfer standard*** < ± 5.1% of flow rate design value	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.5 and 7.4.3.1 and 40 CFR Part 58, App. A Sec. 3.2.1
Design Flow Rate Adjustment	***After multi-point calibration or verification***	***< ± 2.1% of design flow rate***	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.6
Individual Flow Rates	***every 24 hours of op***	***no flow rate excursions > ±5% for > 5 min.*** [1/]	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.1
Filter Temp Sensor	***every 24 hours of op***	***no excursions of > 5º C lasting longer than 30 min*** [1/]	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.11.4
External Leak Check	***Before each flow rate verification/calibration*** and before and after $PM_{2.5}$ separator maintenance	***< 80.1 mL/min*** (see comment #1)	1) 40 CFR Part 50 App. L, Sec. 7.4.6.1 2) 40 CFR Part 50 App. L Sec. 9.2.3 and Method 2-12Sec. 7.4.3 3) 40 CFR Part 50, App. L, Sec. 7.4.6.1
Internal Leak Check	If failure of external leak check	***< 80.1 mL/min***	1) 40 CFR Part 50, App. L, Sec. 7.4.6.2 2) Method 2-12, Sec. 7.4.4 3) 40 CFR Part 50, App. L, Sec. 7.4.6.2

Laboratory Activities			
1) Criteria (PM2.5 LC)	**2) Frequency**	**3) Acceptable Range**	**Information /Action**
Post-sampling Weighing	***all filters***	***Protected from exposure to temperatures above 25C from sample retrieval to conditioning*** ***≤10 days from sample end date if shipped at ambient temp, or*** ***≤ 30 days if shipped below avg ambient (or 4º C or below for avg sampling temps < 4º C) from sample end date***	1, 2 and 3) 40 CFR Part 50 App. L Sec. 8.3.6 and L Sec. 10.13. See technical note on holding time requirements at : https://www3.epa.gov/ttn/amtic/pmpolgud.html
Filter Visual Defect Check (unexposed)	***all filters***	***Correct type & size and for pinholes, particles or imperfections***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 10.2
Filter Conditioning Environment			
Equilibration	***all filters***	***24 hours minimum***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.5
Temp. Range	***all filters***	***24-hr mean 20.0-23.0º C***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.1
Temp. Control	***all filters***	***< 2.1º C SD* over 24 hr.***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.2 SD use is a recommendation
Humidity Range	***all filters***	***24-hr mean 30.0% - 40.0% RH or Within ±5.0 % sampling RH but ≥ 20.0%RH***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.3
Humidity Control	***all filters***	***< 5.1 % SD* over 24 hr.***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.4 SD use is recommendation
Pre/post Sampling RH	***all filters***	***difference in 24-hr means < ± 5.1% RH***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.3
Balance	***all filters***	***located in filter conditioning environment***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.2
Microbalance Auto-Calibration	***Prior to each weighing session***	Manufacturer's specification	1) 40 CFR Part 50, App. L, Sec. 8.1 2) 40 CFR Part 50, App. L, Sec. 8.1 and Method 2.12 Sec. 10.6 3) NA
OPERATIONAL EVALUATIONS TABLE $PM_{2.5}$ Filter Based Local Conditions			
Field Activities			
One-point Temp Verification	every 30 days	< ± 2.1ºC	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.5 and Table 6-1 3) Recommendation
Pressure Verification	every 30 days	< ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.6 and Table 6-1 3) Recommendation
Annual Multi-point Verifications/Calibrations			
Temperature multi-point Verification/Calibration	on installation, then every 365 days and once a calendar year	< ± 2.1ºC	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.4.4 Table 6-1

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Pressure Verification/Calibration	on installation, and on one-point verification failure	< ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.5 Sampler BP verified against independent standard verified against a lab primary standard that is certified as NIST traceable 1/year
Flow Rate Multi-point Verification/ Calibration	***Electromechanical maintenance or transport*** or every 365 days and once a calendar year	< ± 2.1% of transfer standard	1) 40 CFR Part 50, App. L, Sec. 9.2. 2) 40 CFR Part 50, App. L, Sec. 9.1.3, Method 2.12 Sec. 6.3 & Table 6-1 3) Recommendation
Other Monitor Calibrations	per manufacturers' op manual	per manufacturers' operating manual	1, 2 and 3) Recommendation
Precision			
Collocated Samples	***every 12 days for 15% of sites by method designation***	CV < 10.1% of samples ≥ 3.0 µg/m^3	1) and 2) Part 58 App. A Sec. 3.2.3 3 Recommendation based on DQO in 40 CFR Part 58 App. A Sec. 2.3.1.1
Accuracy			
Temperature Audit	every 180 days and at time of flow rate audit	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	< ±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit	***Twice a calendar year and between 5-7 months apart***	< ± 4.1% of audit standard < ± 5.1% of design flow rate	1 and 2) Part 58, App. A, Sec. 3.2.2 3) Method 2.12 Sec. 11.2.1
Monitor Maintenance			
$PM_{2.5}$ Separator (WINs)	every 5 sampling events	cleaned/changed	1, 2, and 3) Method 2.12 Sec. 8.2.2
$PM_{2.5}$ Separator (VSCC)	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3.3
Inlet Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Downtube Cleaning	every 90 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.4
Filter Housing Assembly Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Circulating Fan Filter Cleaning	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3
Manufacturer-Recommended Maintenance	per manufacturers' guidelines	per manufacturers' guidelines	
Laboratory Activities			
Filter Checks			
Lot Blanks	9 filters per lot	< ±15.1 µg change between weighings	1, 2, 3) Recommendation and used to determine filter stability of the lot of filters received from EPA or vendor. Method 2.12 Sec. 10.5
Exposure Lot Blanks	3 filters per lot	< ±15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.5 Used for preparing a subset of filters for equilibration
Filter Integrity (exposed)	each filter	no visual defects	1, 2 and 3) Method 2.12 Sec. 10.7 and 10.3
Lab QC Checks			

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Field Filter Blank	10% or 1 per weighing session	<± 30.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.1 2 and 3) Method 2.12 Table 7-1 & Sec.10.5
Lab Filter Blank	10% or 1 per weighing session	<± 15.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.2 2 and 3) Method 2.12 Sec. 10.5
Balance Check (working standards)	beginning, 10th sample, end	< ±3.1 µg from certified value	1, 2 and 3) Method 2.12 Sec. 10.6 Standards used should meet specifications in Method 2.12, Sec. 4.3.7
Routine Filter re-weighing	1 per weighing session	<± 15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.8
Microbalance Audit	every 365 days and once a calendar year	<± 0.003 mg or manufacturers specs, whichever is tighter	1, 2 and 3) Method 2.12 Sec. 11.2.7
Lab Temp Check	Every 90 days	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 10.10
Lab Humidity Check	Every 90 days	< ± 2.1%	1, 2 and 3) Method 2.12 Sec. 10.10
Verification/Calibration			
Microbalance Calibration	***At installation*** every 365 days and once a calendar year	Manufacturer's specification	1) 40 CFR Part 50, App. L, Sec. 8.1 2) 40 CFR Part 50, App. L, Sec. 8.1 and Method 2.12 Sec. 10.11 3) NA
Lab Temperature Certification	every 365 days and once a year	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Lab Humidity Certification	every 365 days and once a year	< ± 2.1%	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Calibration & Check Standards -			
Working Mass Stds. Verification Compared to primary standards	Every 90 days	< ± 2.1 ug	1, 2 and 3) Method 2.12 Sec. 9.7
Primary standards certification	every 365 days and once a calendar year	0.025 mg tolerance (Class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7
SYSTEMATIC CRITERIA -$PM_{2.5}$ Filter Based Local Conditions			
Siting	every 365 days and once a calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Sec. 2-5 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 2-5
Data Completeness	***Annual Standard***	***≥ 75% scheduled sampling days in each quarter***	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.1 (b) 4.2 (a)
	24- Hour Standard	***≥ 75% scheduled sampling days in each quarter***	1, 2 and 3) 40 CFR Part 50, App. N, Sec. 4.1 (b) 4.2 (a)
Reporting Units	***all filters***	***µg/m^3 at ambient temp/pressure ($PM_{2.5}$)***	1, 2 and 3) 40 CFR Part 50 App. N Sec. 3.0 (b)
Rounding convention for designvalue calculation	***all filters***	***to one decimal place, with additional digits to the right being truncated***	1, 2 and 3) 40 CFR Part 50 App. N Sec. 3.0 (b) The rounding convention is for averaging values for comparison to NAAQS not for reporting individual values.

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Annual 3-yr average	***all concentrations***	***nearest 0.1 µg/m³*** (≥ 0.05 round up)	1, 2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
24-hour, 3-year average	***all concentrations***	***nearest 1 µg/m³*** (≥ 0.5 round up)	1, 2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
Detection Limit			
Lower DL	***all filters***	***≤ 2 µg/m³***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 3.1
Upper Conc. Limit	***all filters***	***≥ 200 µg/m³***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 3.2
Precision			
Single analyzer (collocated monitors)	every 90 days	Coefficient of variation (CV) < 10.1% for values ≥ 3.0 µg/m³	1, 2 and 3) Recommendation in order to provide early (quarterly) evaluation of achievement of DQOs.
Primary Quality Assurance Org.	***Annual and 3 year estimates***	***90% CL of CV < 10.1 % for values ≥ 3.0 µg/m³***	1, 2 and 3) 40 CFR Part 58, App. A, Sec. 4.2.1 and 2.3.1.1
Bias			
Performance Evaluation Program (PEP)	***5 audits for PQAOs with ≤ 5 sites 8 audits for PQAOs with > 5 sites***	***< ± 10.1% for values ≥ 3.0 µg/m³***	1, 2 and 3) 40 CFR Part 58, App. A, Sec. 3.2.4, 4.2.5 and 2.3.1.1
Field Activities			
Verification/Calibration Standards Recertifications – All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	***< ± 2.1% of NIST Traceable Std.***	1) 40 CFR Part 50, App. L Sec. 9.1 & 9.2 2) Method 2-12 Sec. 4.2.2 & 6.4.3 3) 40 CFR Part 50, App. L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Clock/timer Verification	Every 30 days	***1 min/mo***	1 and 2) Method 2.12 Sec. 4.2.1 3) 40 CFR Part 50, App. L Sec. 7.4.12
Laboratory Activities			
Microbalance Readability	***At purchase***	***1 µg***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.1
Microbalance Repeatability	At purchase	1 µg	1) Method 2.12 Sec. 4.3.6 2) Recommendation 3) Method 2.12 Sec. 4.3.6
Primary Mass/Working mass Verification/Calibration Standards	At purchase	0.025 mg tolerance (Class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7

1) Criteria (PM2.5 LC)	2) Frequency	3) Acceptable Range	Information /Action
Comment #1 The associated leak test procedure shall require that for successful passage of this test, the difference between the two pressure measurements shall not be greater than the number of mm of Hg specified for the sampler by the manufacturer, based on the actual internal volume of the sampler, that indicates a leak of less than 80 mL/min.			

1 / value must be flagged SD * = standard deviation CV= coefficient of variation

Table A6.2.6 Continuous PM2.5 Local Conditions Validation Template

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- $PM_{2.5}$ Continuous, Local Conditions			
Sampler/Monitor Designation	NA	***Meets requirements listed in FRM/FEM/ARM designation*** Confirm method designation on front panel or just inside instrument.	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Firmware of monitor	At setup	1. Must be the firmware (or later version) as identified in the published method designation summary. ***2. Firmware settings must be set for flowrate to operate and report at "local conditions" (i.e., not STP).***	40 CFR Part 50 App. N. sec. 1 (c)
Data Reporting Period	Report every hour	1. The calculation of an hour of data is dependent on the design of the method. *2. **A 24-hour period is calculated in AQS if 18 or more valid hours are reported for a day*** [1/].	See operator's manual. Hourly data are always reported as the start of the hour on local standard time 40 CFR Part 50 App. N. Sec 3 (c)

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
Sampling Instrument			
PM10 Inlet (if Applicable to method designated)	At Setup	Must be a Louvered PM10 size selective inlet as specified in 40 CFR 50 Appendix L, Figures L-2 through L-19	
PM2.5 second stage separator (if Applicable to method designated)	At Setup	Must be a BGI Inc. Very Sharp Cut Cyclone (VSCC^{TM}) or equivalent second stage separator Approved for the method.	The other approved second stage separator option for select FEMs is the Dichot. Only the Teledyne T640 and T640X are known tonot have a second stage separator as part of the method.
Average Flow Rate	***every 24 hours of operation; alternatively, each hour can be checked***	***average within 5% of 16.67 liters/minute at local conditions***	1, 2 and 3) Part 50 App. L Sec. 7.4.3.1
Variability in Flow Rate	***every 24 hours of op***	***CV < 2%***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.2
One-point Flow Rate Verification	***every 30 days each separated by 14 days***	***< ± 4.1% of transfer standard*** < ± 5.1% of flow rate design value	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.5, 40 CFR Part 58, Appendix A Sec. 3.2.3 & 3.3.2
Design Flow Rate Adjustment	***After multi-point calibration or verification***	***< ± 2.1% of design flow rate***	1,2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.6
External Leak Check	***Before each flow rate verification/calibration*** and before and after $PM_{2.5}$ separator maintenance	Method specific. See operator's manual.	1) 40 CFR Part 50 App. L, Sec. 7.4.6.1 2) 40 CFR Part 50 App. L Sec.t 9.2.3 and Method2-12 Sec. 7.4.3 3) 40 CFR Part 50, App. L, Sec. 7.4.6.1
Internal Leak Check	If failure of external leak check	Method specific. See operator's manual.	1) 40 CFR Part 50, App. L, Sec. 7.4.6.2 2) Method 2-12 7.4.4 3) 40 CFR Part 50, App. L, Sec. 7.4.6.2
Annual Multi-point Verifications/Calibrations			
Leak Check	every 30 days	± 0.15 lpm TEOM	1) 40 CFR Part 50 App. L, Sec. 7.4.6.1 2) Recommendation 3) TEOM Manufacturer Guidelines Sec. 10.1.6
Temperature multi-point Verification/Calibration	on installation, then Every 365 days and 1/ calendar year	< ± 2.1ºC	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.4.4
One-point Temp Verification	every 30 days	< ± 2.1ºC	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.5 and Table 6-1 3) Recommendation
Pressure Verification/Calibration	on installation, then Every 365 days and 1/ calendar year	< ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.32 and 3) Method 2.12 Sec. 6.5 BP verified against independent standard verified against a lab primary standard that is certified NIST traceable 1/year

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
Flow Rate Multi-point Verification/ Calibration	***Electromechanical maintenance or transport or*** Every 365 days and 1/ calendar year	< ± 2.1% of transfer standard	1) 40 CFR Part 50, App. L, Sec. 9.2. 2) 40 CFR Part 50, App. L, Sec. 9.1.3, Method 2.12Sec. 6.3 & Table 6-1 3) Recommendation
Collocated Samples	***every 12 days for 15% of sites by method designation***	CV < 10.1% of samples ≥ 3 µg/m^3	1) and 2) Part 58 App. A Sec. 3.2.3 3 Recommendation based on DQO in 40 CFR Part 58 App. A Sec. 2.3.1.1
Accuracy			
Temperature Audit	every 180 days and at time of flow rate audit	< ± 2.1ºC	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	< ±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit	***Twice a calendar year and 5-7 months apart***	< ± 4.1% of audit standard < + 5.1% of design flow rate	1 and 2) Part 58, App. A, Sec. 3.3.3 3) Method 2.12 Sec. 11.2.1
Shelter Temperature			
Temperature range	At setup	per operator manual	
Temperature Control	Daily (hourly values)	< 2.1º C SD over 24 hours	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Temperature Device Check	every 180 days and twice a calendar year	< ± 2.1º C	1, 2 and 3) QA Handbook Volume 2 Sec. 7.2.2
Monitor Maintenance			
$PM_{2.5}$ Separator (WINS)	every 5 sampling events	cleaned/changed	1, 2,and 3) Method 2.12 Sec. 8.2.2
$PM_{2.5}$ Separator (VSCC)	every 30 days	cleaned/changed	1,2 and 3) Method 2.12 Sec. 8.3.3
Inlet Cleaning	every 30 days	cleaned	1,2 and 3) Method 2.12 Sec. 8.3
Downtube Cleaning	every 90 days	cleaned	1,2 and 3) Method 2.12 Sec. 8.4
Filter Housing Assembly Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Circulating Fan Filter Cleaning	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3
Manufacturer-Recommended Maintenance	per manufacturers' guidelines	per manufacturers' guidelines	
TEOM-FDMS Specific Operational Criteria			
Total Flow Verification	every 30 days	Sum of flow rates from 3 paths equal design flow rate < + 5.1%	1,2 and 3) TEOM Manufacturer Guidelines Sec. 10.1.2
Bypass leak check (TEOM)	every 30 days	± 0.60 lpm	1,2 and 3) TEOM Manufacturer Guidelines Sec. 10.1.6 or TEOM Operating Manual Sec. 5-4
Replace TEOM filters	as needed	Change TEOM filter as filter loading approaches 90%, but must be changed before reaching 100%.	1,2 and 3) TEOM Manufacturer Guidelines Sec. 10.1.8
1) Criteria (PM2.5 Cont)	**2) Frequency**	**3) Acceptable Range**	**Information /Action**
Replace the 47-mm FDMS (Purge) filters	every 30 days or any time TEOM filters are replaced	replaced	1,2 and 3) TEOM Manufacturer Guidelines Sec. 10.1.10

Internal/External Data Logger Data	Every 30 days 10 randomly selected values	agree exactly (digital) and ± 1 µg/m^3 (analog). Note: digital is expected and should be used unless there is no capacity to utilize digital in the monitoring agencies' data system.	1, 2 and 3) TEOM Manufacturer Guidelines Sec. 10.1.24
Replace In-line filters	every 180 days and twice a calendar year	replaced	1, 2 and 3) TEOM Manufacturer Guidelines Sec. 10.2
Clean cooler assembly	every 365 days and once a calendar year	cleaned	1, 2 and 3) TEOM Manufacturer Guidelines Sec. 10.3.1
Clean/Maintain switching valve	every 365 days and once a calendar year	cleaned	1, 2 and 3) TEOM Manufacturer Guidelines Sec. 10.3.2
Clean air inlet system of mass transducer enclosure	every 365 days and once a calendar year	cleaned	1, 2 and 3) TEOM Manufacturer Guidelines Sec. 10.3.3
Replace the dryers	1/yr or due to poor performance	Review dryer dew point data to determine acceptable performance of dryer	1, 2 and 3) TEOM Manufacturer Guidelines Sec. 10.3.4
Calibration (KO) constant verification	every 365 days and once a calendar year	Pass or Fail (≤ 2.5%)	1, 2 TEOM Manufacturer Guidelines Sec. 10.3.6 3) 1405-DF operating guide. Verification software either passes or fails the verification. Acceptance criteria is < 2.5 %
Rebuild sampling pump	18 months	< 66% of local pressure	1, 2 and 3) TEOM Manufacturer Guidelines Sec. 10.4
Teledyne T640 Specific Operational Criteria			
Check for leaks with zero filter	Monthly	Acceptance criteria is 0.0 – 0.3 µg/m^3 Action level is 0.1 to 0.3 µg/m^3 (for each PM metric)	1-6 T640 Manufacturer Guidelines Sec. 9.1
Check/Adjust PMT with SpanDust™ (measured peak, limit value displayed on bottle +/- 0.5)	Quarterly. Avoid over performing this procedure. If problems persist, wait 10 minutes and retry.	Stated value on SpanDust™ bottle +/- 0.5 (e.g., 11.3 with a tolerance of 10.8 to 11.8)	1-12 T640 Manufacturer Guidelines Sec. 9.5
Ambient Pressure	Monthly	+/- 10 mm Hg	1-4 T640 Manufacturer Guidelines Sec 10.1
Ambient Temperature	Monthly	+/- 2°C	1-6 T640 Manufacturer Guidelines Sec. 9.3
Check Pump Performance	Weekly to Monthly	PWM[1] value < 80% PID[1] value < 85%	T640 Manufacturer Guidelines Sec. 11.4

[1] Pulse width modulation (PWM); proportional, integral, differential (PID) loop

Clean Inlet	Quarterly	NA	1-12 T640 Manufacturer Guidelines Sec. 11.1
Clean PM_{10} Well	Monthly	NA	1-14 T640 Manufacturer Guidelines 1-14
Inspect and clean optical chamber and relative humidity/temperature (RH/T) sensors	Every six months or as needed, e.g., high dust load	NA	1-21 T640 Manufacturer Guidelines Sec. 11.5
Change Disposable Filter Unit (DFU) for 5-lpm sample flow and 11.67 lpm bypass flow	Annually or when Pump PWM value approaches 80% or valve PWM approaches 85%.	NA	1-14 T640 Manufacturer Guidelines Sec. 11.3
Inspect inner and outer sample tubes	Monthly or as needed	NA	T640 Manufacturer Guidelines Sec.11.6
Flow rate verifications (see below)			
Sample flow: 5.0 lpm	Monthly	+/- 5% of standard compared to current reading on T640x; (e.g., 4.75 – 5.25 lpm if T640x reads 5.00).	T640 Manufacturer Guidelines Sec. 10.2
Bypass Flow: 11.67 lpm	As needed if total or sample flow does not meet criteria. Use same tolerance as total and sample flow.	+/- 5% of standard compared to reading on T640x; (e.g., 11.12 – 12.29 lpm if T640x reads 11.7).	T640 Manufacturer Guidelines Sec. 10.2
Total Flow: 16.67 1pm	Monthly	+/- 5% of standard compared to current reading on T640x. (e.g., 15.87 – 17.54 lpm if T640x reads 16.7).	T640 Manufacturer Guidelines Sec. 10.2

SYSTEMATIC CRITERIA- $PM_{2.5}$ Continuous, Local Conditions			
Siting	every 365 days and once a calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Sec. 2-5 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 2-5
Data Completeness	***Annual Standard***	***≥ 75% scheduled sampling days in each quarter***	1, 2 and 3) 40 CFR Part 50, App. N Sec. 4.1 (b) 4.2 (a)
	24- Hour Standard	***≥ 75% scheduled sampling days in each quarter***	1, 2 and 3) 40 CFR Part 50, App. N Sec. 4.1 (b) 4.2 (a)
Reporting Units	***all filters***	***µg/m³ at ambient temp/pressure ($PM_{2.5}$)***	1. 2 and 3) 40 CFR Part 50 App. N Sec. 3.0 (b)
Rounding convention for data reported to AQS	***all filters***	***to one decimal place or as reported by instrument***	1. 2 and 3) 40 CFR Part 50 App. N Sec. 3.0 (b)
Annual 3-yr average	***all concentrations***	***nearest 0.1 µg/m³*** (≥ 0.05 round up)	1,2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
24-hour, 3-year average	***all concentrations***	***nearest 1 µg/m³*** (≥ 0.5 round up)	1,2 and 3) 40 CFR Part 50, App. N Sec. 3 and 4 Rounding convention for data reported to AQS is a recommendation
Verification/Calibration Standards Recertification's - All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	***< ± 2.1% of NIST Traceable Std.***	1) 40 CFR Part 50, App. L Sec. 9.1 & 9.22) Method 2-12 Sec. 4.2.2 & 6.4.3 3) 40 CFR Part 50, App. L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2

1) Criteria (PM2.5 Cont)	2) Frequency	3) Acceptable Range	Information /Action
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Clock/timer Verification	Every 30 days	***1 min/mo****	1 and 2) Method 2.12 Sec. 4.2.1 3) 40 CFR Part 50, App. L Sec. 7.4.12
Precision			
Single analyzer (collocated monitors)	every 90 days	Coefficient of variation (CV) < 10.1% for values ≥ 3.0 µg/m^3	1,2 and 3) Recommendation in order to provide early (quarterly) evaluation of achievement of DQOs.
Primary Quality Assurance Org.	***Annual and 3 year estimates***	***90% CL of CV < 10.1 % for values ≥ 3.0 µg/m^3***	1,2 and 3) 40 CFR Part 58, App. A, Sec. 4.2.1 and 2.3.1.1
Bias			
Performance Evaluation Program (PEP)	***5 audits for PQAOs with ≤ 5 sites*** ***8 audits for PQAOs with > 5 sites***	***< ±10.1% for value > 3 µg/m^3***	1,2 and 3) 40 CFR Part 58, App. A, Sec. 3.2.7, 4.3.2 and 2.3.1.1

1/ 24-hour average value must be flagged if not meeting criteria
SD= standard deviation, CV= coefficient of variation
**** = need to ensure data system stamps Appropriate time period with reported sample value**

Table A6.2.7 PM10c for $PM_{10-2.5}$ Low –Volume, Filter-Based Local Conditions Validation Template

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- PM10c Filter Based Local Conditions			
Field Activities			
Sampler/Monitor	NA	***Meets requirements listed in FRM/FEM/ARM designation***	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Filter Holding Times			
Pre-sampling	***all filters***	***≤ 30 days before sampling***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.5
Sample Recovery	***all filters***	***≤7 days 9 hours from sample end date***	1, 2 and 3) 40 CFR Part 50 App. L Sec. 10.10
Sampling Period (including multiple power failures)	***all filters***	***1380-1500 minutes, or value if < 1380 and exceedance of NAAQS*** [1/] ***midnight to midnight local standard time***	1, 2 and 3) 40 CFR Part 50 App. L Sec. 3.3 See details if less than 1380 min sampled
Sampling Instrument			
Average Flow Rate	***every 24 hours of op***	***average within 5% of 16.67 liters/minute***	1, 2 and 3) Part 50 App. L Sec. 7.4.3.1
Variability in Flow Rate	***every 24 hours of op***	***CV ≤ 2%***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.2
One-point Flow Rate Verification	***every 30 days each separated by 14 days***	***± 4% of transfer standard*** ± 5% of flow rate design value	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.5, 40 CFR Part 58 App. A Sec. 3.3.1
Design Flow Rate Adjustment	***After multi-point calibration or verification***	***< ± 2.1% of design flow rate***	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.6
Individual Flow Rates	***every 24 hours of op***	***no flow rate excursions > ±5% for > 5 min.*** [1/]	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.1
Filter Temp Sensor	***every 24 hours of op***	***no excursions of > 5º C lasting longer than 30 min*** [1/]	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.11.4
External Leak Check	***Before each flow rate verification/calibration*** and before and after $PM_{2.5}$ separator maintenance	***< 80.1 mL/min*** (see comment #1)	1) 40 CFR Part 50 App. L, Sec. 7.4.6.1 2) 40 CFR Part 50 App. L Sec.t 9.2.3 and Method 2-12Sec. 7.4.3 3) 40 CFR Part 50, App. L, Sec. 7.4.6.1

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
Internal Leak Check	If failure of external leak check	***< 80.1 mL/min***	1) 40 CFR Part 50, App. L, Sec. 7.4.6.2 2) Method 2-12, Sec. 7.4.4 3) 40 CFR Part 50, App. L, Sec. 7.4.6.2
Laboratory Activities			
Post-sampling Weighing	***all filters***	***Protected from exposure to temperatures above 25C from sample retrieval to conditioning*** ***≤10 days from sample end date if shipped at ambient temp, or*** ***≤30 days if shipped below avg ambient (or 4º C or below for avg sampling temps < 4º C) from sample end date***	1, 2 and 3) 40 CFR Part 50 App. L Sec. 8.3.6
Filter Visual Defect Check (unexposed)	***all filters***	***Correct type & size and for pinholes, particles or imperfections***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 10.2
Filter Conditioning Environment			
Equilibration	***all filters***	***24 hours minimum***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.5
Temp. Range	***all filters***	***24-hr mean 20.0-23.0º C***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.1
Temp. Control	***all filters***	***< 2.1º C SD* over 24 hr***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.2 SD use is a recommendation
Humidity Range	***all filters***	***24-hr mean 30.0% - 40.0% RH or within ±5.0% sampling RH but > 20.0%RH***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.3
Humidity Control	***all filters***	***< 5.1% SD* over 24 hr.***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.4 SD use is recommendation
Pre/post Sampling RH	***all filters***	***difference in 24-hr means ≤ ± 5.1% RH***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.3
Balance	***all filters***	***located in filter conditioning environment***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.2
OPERATIONAL EVALUATIONS TABLE- PM10c Filter Based Local Conditions			
Field Activities			
Sampling Instrument			
Routine Verifications			
One-point Temp Verification	every 30 days	≤± 2.1ºC	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.5 and Table 6-1 3) Recommendation
Pressure Verification	every 30 days	< ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.6 and Table 6-1 3) Recommendation
Annual Multi-point Verifications/Calibrations			
Temperature multi-point Verification/Calibration	on installation, then every 365 days and once a calendar year	≤± 2.1ºC	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.4.4 Table 6-1

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
Pressure Verification/Calibration	on installation, then every 365 days and once a calendar year	<± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.5 Sampler BP verified against independent standard verified against a lab primary standard that is certified as NIST traceable 1/year
Flow Rate Multi-point Verification/ Calibration	***Electromechanical maintenance or transport or*** every 365 days and once a calendar year	<± 2.1% of transfer standard	1) 40 CFR Part 50, App. L, Sec. 9.2. 2) 40 CFR Part 50, App. L, Sec. 9.1.3, Method 2.12 Sec. 6.3 & Table 6-1 3) Recommendation
Other Monitor Calibrations	per manufacturers' op manual	per manufacturers' operating manual	1, 2 and 3) Recommendation
Precision			
Collocated Samples	***every 12 days for 15% of sites by method designation***	CV < 10.1% of samples ≥ 3.0 µg/m^3	1) and 2) Part 58 App. A Sec. 3.2.3 3 Recommendation based on DQO in 40 CFR Part 58 App. A Sec. 2.3.1.1
Accuracy			
Temperature Audit	every 180 days and at time of flow rate audit	<± 2.1ºC	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	<±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit	***Twice a calendar year and 5-7 months apart***	<± 4.1% of audit standard <± 5.1% of design flow rate	1 and 2) Part 58, App. A, Sec. 3.2.2 3) Method 2.12 Sec. 11.2.1
Monitor Maintenance			
$PM_{2.5}$ Separator (WINs)	every 5 sampling events	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.2.2
$PM_{2.5}$ Separator (VSCC)	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3.3
Inlet Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Downtube Cleaning	every 90 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.4
Filter Housing Assembly Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Circulating Fan Filter Cleaning	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3
Manufacturer-Recommended Maintenance	per manufacturers' guidelines	per manufacturers' guidelines	
Laboratory Activities			
Filter Checks			
Lot Blanks	9 filters per lot	< ±15.1 µg change between weighings	1, 2, 3) Recommendation and used to determine filter stability of the lot of filters received from EPA or vendor. Method 2.12 Sec. 10.5
Exposure Lot Blanks	3 filters per lot	< ±15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.5 Used for preparing a subset of filters for equilibration
Filter Integrity (exposed)	each filter	no visual defects	1, 2 and 3) Method 2.12 Sec. 10.7 and 10.3
Lab QC Checks			

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
Field Filter Blank	10% or 1 per weighing session	<± 30.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.1 2 and 3) Method 2.12 Table 7-1 & Sec.10.5
Lab Filter Blank	10% or 1 per weighing session	<± 15.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.2 2 and 3) Method 2.12 Sec. 10.5
Balance Check (working standards)	beginning, 10th sample, end	< ±3.1 µg from certified value	1, 2 and 3) Method 2.12 Sec. 10.6 Standards used should meet specifications in Method 2.12, Sec. 4.3.7
Routine Filter re-weighing	1 per weighing session	<± 15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.8
Microbalance Audit	every 365 days and once a calendar year	<± 0.003 mg or manufacturers specs, whichever is tighter	1, 2 and 3) Method 2.12 Sec. 11.2.7
Lab Temp Check	Every 90 days	< + 2.1°C	1, 2 and 3) Method 2.12 Sec. 10.10
Lab Humidity Check	Every 90 days	< + 2.1%	1, 2 and 3) Method 2.12 Sec. 10.10
Verification/Calibration			
Microbalance Calibration	***At installation*** every 365 days and once a calendar year	Manufacturer's specification	1) 40 CFR Part 50, App. L, Sec. 8.1 2) 40 CFR Part 50, App. L, Sec. 8.1 and Method 2.12 Sec. 10.11 3) NA
Lab Temperature Certification	every 365 days and once a year	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Lab Humidity Certification	every 365 days and once a year	< ± 2.1%	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Calibration & Check Standards -			
Working Mass Stds. Verification Compared to primary standards	Every 90 days	< ± 2.1 ug	1, 2 and 3) Method 2.12 Sec. 9.7
Primary standards certification	every 365 days and once a calendar year	0.025 mg tolerance (Class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7
SYSTEMATIC CRITERIA - PM10c Filter Based Local Conditions			
Siting	Every 365 days and 1/ calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Sec. 2-5 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 2-5
Data Completeness	NA	≥ 75% scheduled sampling days in each quarter	1, 2 and 3) Recommendation based on PM2.5 requirements in 40 CFR Part 50, App. N, Sec. 4.1 (b) 4.2 (a)
Reporting Units	***all filters***	***µg/m³ at ambient temp/pressure ($PM_{2.5}$)***	1, 2 and 3) 40 CFR Part 50 App. N
Rounding convention for designvalue calculation	***all filters***	***to one decimal place, with additional digits to the right being truncated***	1, 2 and 3) 40 CFR Part 50 App. N Sec. 3.0 (b) The rounding convention is for averaging values for comparison to NAAQS not for reporting individual values.
Lower DL	***all filters***	***≤ 3 µg/m³***	1, 2 and 3) 40 CFR Part 50, App. O Sec. 3.1
Upper Conc. Limit	***all filters***	***≥200 µg/m³***	1, 2 and 3) 40 CFR Part 50, App. O Sec. 3.2

1) Criteria (PM10c)	2) Frequency	3) Acceptable Range	Information /Action
Precision			
Single analyzer (collocated monitors)	every 90 days and 4 times a calendar year.	Coefficient of variation (CV) < 10.1% for values ≥ 3 µg/m^3	1, 2 and 3) Recommendation in order to provide early evaluation of achievement of DQOs.
Primary Quality Assurance Org.	***Annual and 3 year estimates***	***90% CL of CV < 10.1% for values ≥ 3 µg/m^3***	1, 2 and 3) Recommendation in order to provide early evaluation of achievement of DQOs.
Bias			
Performance Evaluation Program (PEP)	Once every 6-7 years	***< ±10.1% for values ≥ 3 µg/m^3***	1, 2 and 3) Recommendation based on pending guidance.
Field Activities			
Verification/Calibration Standards Recertifications – All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	***< ± 2.1% of NIST-traceable Std.***	1) 40 CFR Part 50, App. L Sec. 9.1 & 9.2 2) Method 2-12 Sec. 6.3.3 and Table 3-1 3) 40 CFR Part 50, App. L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Verification/Calibration Clock/timer Verification	every 30 days	***1 min/mo***	1 and 2) Method 2.12 Sec 4.2.1 3) 40 CFR Part 50, App. L, Sec. 7.4.12
Laboratory Activities			
Microbalance Readability	***at purchase***	***1 µg***	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 8.1
Microbalance Repeatability	at purchase	1 µg	1) Method 2.12 Sec. 4.3.6 2) Recommendation 3) Method 2.12 Sec. 4.3.6
Primary Mass. Verification/Calibration Standards	at purchase	0.025 mg tolerance (class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7
Comment #1 The associated leak test procedure shall require that for successful passage of this test, the difference between the two pressure measurements shall not be greater than the number of mmof Hg specified for the sampler by the manufacturer, based on the actual internal volume of the sampler, that indicates a leak of less than 80 mL/min.			

1/ value must be flagged, SD= standard deviation, CV= coefficient of variation

Table A6.2.8 Continuous PM10 STP Conditions Validation Template

1) Criteria (PM_{10} Cont)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- PM_{10} Continuous			
Sampler/Monitor	NA	***Meets requirements listed in FRM/FEM/ARM designation***	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Sampling Period	**all filters**	**1440 minutes ± 60 minutes midnight to midnight local standard time**	1, 2 and 3) 40 CFR Part 50 App. J Sec. 7.1.5
Average Flow Rate	every 24 hours of op	Average within < ± 5.1% of design	recommendation
Verification/Calibration			
One-point Flow Rate Verification	***every 30 days each separated by 14 days***	< ± 7.1% of transfer standard	1 and 2) 40 CFR Part 58, App. A, Sec. 3.3 3) Method 2.10 Table 3-1
OPERATIONAL EVALUATIONS TABLE PM_{10} Continuous			
Verification/Calibration			
System Leak Check	During pre-calibration check	Auditory inspection with faceplate blocked	1, 2 and 3) Method 2.11 Sec. 2.3.2
FR Multi-point Verification/Calibration	every 365 days and once a calendar year	3 of 4 cal points within < ± 10.1% of design	1) 40 CFR Part 50 App. J Sec. 8.0 2 and 3) Method 2.10 Sec. 2.2.4
Audits			
Semi Annual Flow Rate Audit	***Twice a calendar year and 5-7 months apart***	< ± 10.1% of audit standard	1, 2) Part 58, App. A, Sec. 3.3.3 3) Method 2.10 Sec. 7.1.5
Monitor Maintenance			
Inlet/downtube Cleaning	every 90 days and 4 times a calendar year	cleaned	1, 2 and 3) Method 2.10 Sec. 6.1.2
Manufacturer-Recommended Maintenance	per manufacturers' guidelines	per manufacturers' guidelines	
SYSTEMATIC CRITERIA - PM_{10} Continuous			
Siting	Every 365 days and 1/ calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Sections 2-5 2) Recommendation 3) 40 CFR Part 58 App. E, Sections 2-5
Data Completeness	24-hour quarterly	≥ 75%	1, 2 and 3) 40 CFR Part 50 App. K, Sec. 2.3b & c

1) Criteria (PM_{10} Cont)	2) Frequency	3) Acceptable Range	Information /Action
Reporting Units	all filters	µg/m^3 at standard temperature and pressure (STP)	40 CFR Part 50 App. K
Rounding convention for designvalue calculation			
24-hour, 3-year average	***quarterly***	***nearest 10 µg/m^3 (≥ 5 round up)***	1, 2 and 3) 40 CFR Part 50 App. K Sec. 1 The rounding convention is for averaging values for comparison to NAAQS not for reporting individual values.
Verification/Calibration Standards and Recertifications - All standards should have multi-point certifications against NIST Traceable standards			
Flow Rate Transfer Std.	every 365 days and once a calendar year	***< ± 2.1% of NIST-traceable Std.***	1) 40 CFR Part 50, App. J Sec. 7.32) Method 2.11 Sec. 1.1.3 3) 40 CFR Part 50, App. J Sec. 7.3
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.1° C accuracy	1, 2 and 3) Method 2.10 Sec. 1.1.2
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.10 Sec. 1.1.2
Clock/timer Verification	every 180 days and twice a calendar year	***15 min/day***	1) 40 CFR Part 50, App. .J Sec. 7.1.5 2) Recommendation 3) 40 CFR Part 50, App. .J Sec. 7.1.5

Table A6.2.9 PM_{10} Low Volume STP Filter-Based Local Conditions Validation Template

1) Criteria (PM10 Lo-Vol STP)	2) Frequency	3) Acceptable Range	Information /Action
CRITICAL CRITERIA- PM_{10} Lo-Vol Filter Based STP			
Field Activities			
Sampler/Monitor	NA	***Meets requirements listed in FRM/FEM/ARM designation***	1) 40 CFR Part 58 App. C Sec. 2.1 2) NA 3) 40 CFR Part 53 & FRM/FEM method list
Sample Recovery	***all filters***	***≤7 days 9 hours from sample end date***	1, 2 and 3) 40 CFR Part 50 App. L Sec. 10.10
Pre-sampling	***all filters***	***≤ 30 days before sampling***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.5
Sampling Instrument			
Average Flow Rate	***every 24 hours of op***	***average within < 5.1% of 16.67 liters/minute***	1, 2 and 3) Part 50 App. L Sec. 7.4.3.1
Variability in Flow Rate	***every 24 hours of op***	***CV < 2.1%***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.2
One-point Flow Rate Verification	***every 30 days each separated by 14 days***	***< ± 4.1% of transfer standard*** < ± 5.1% of flow rate design value	1) 40 CFR Part 50, App. L, Sec. 9.2.5, 40 CFR Part 58, App. A Sec. 3.3.1 2) Part 58, App. A, Sec. 3.3.1 3) 40 CFR Part 50, App. L, Sec. 9.2.5 & 7.4.3.1
Design Flow Rate Adjustment	***at one-point or multi-point verification/calibration***	***< ± 2.1% of design flow rate***	1, 2 and 3) 40 CFR Part 50, App. L, Sec. 9.2.6
Individual Flow Rates	***every 24 hours of op***	***no flow rate excursions > ±5.1% for > 5 min.*** [1/]	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.3.1
Filter Temp Sensor	***every 24 hours of op***	***no excursions of > 5º C lasting longer than 30 min*** [1/]	1, 2 and 3) 40 CFR Part 50, App. L Sec. 7.4.11.4
External Leak Check	***Before each flow rate verification/calibration*** and before and after maintenance	***< 80.1 mL/min*** (see comment #1)	1) 40 CFR Part 50 App. L, Sec. 7.4.6.1 2) 40 CFR Part 50, App. L Sec. 9.2.3 Method 2-12 Sec. Table 8-1 3) 40 CFR Part 50, App. L, Sec. 7.4.6.1
Internal Leak Check	every 5 sampling events	***< 80.1 mL/min***	1) 40 CFR Part 50, App. L, Sec. 7.4.6.2 2) Method 2-12 Table 8-1 3) 40 CFR Part 50, App. L, Sec. 7.4.6.2
Laboratory Activities			

1) Criteria (PM10 Lo-Vol STP)	2) Frequency	3) Acceptable Range	Information /Action
Post-sampling Weighing	***all filters***	***Protected from exposure to temperature ≤10 days from sample end date if shipped at ambient temp, or ≤30 days if shipped below avg ambient (or 4° C or below for avg sampling temps < 4° C) from sample end date***	1, 2 and 3) 40 CFR Part 50 App. L Sec. 8.3.6
Filter Visual Defect Check (unexposed)	***all filters***	***Correct type & size and for pinholes, particles or imperfections***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 10.2
Filter Conditioning Environment			
Equilibration	***all filters***	***24 hours minimum***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.5
Temp. Range	***all filters***	***24-hr mean 20.0-23.0° C***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.1
Temp. Control	***all filters***	***< 2.1° C SD* over 24 hr***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.2 SD use is recommendation
Humidity Range	***all filters***	***24-hr mean 30.0% - 40.0% RH or <5.1% sampling RH but ≥ 20.0%RH***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.3
Humidity Control	***all filters***	***< 5.1% SD* over 24 hr.***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.2.4 SD use is recommendation
Pre/post Sampling RH	***all filters***	***difference in 24-hr means < ± 5.1% RH***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.3
Balance	***all filters***	***located in filter conditioning environment***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.3.2
OPERATIONAL EVALUATIONS TABLE PM_{10} Lo-Vol Filter Based STP			
Field Activities			
Sampling Instrument			
Routine Verifications			
One-point Temp Verification	every 30 days	< ± 2.1°C	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec. 7.4.5 and Table 6-1 3) Recommendation
Pressure Verification	every 30 days	< ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2) Method 2.12 Sec 7.4.6 and Table 6-1 3) Recommendation
Annual Multi-point Verifications/Calibrations			
Temperature multi-point Verification/Calibration	on installation, then every 365 days and once a calendar year	< ± 2.1°C	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.4.4 and Table 6-1
Pressure Verification/Calibration	on installation, then every 365 days and once a calendar year	< ± 10.1 mm Hg	1) 40 CFR Part 50, App. L, Sec. 9.3 2 and 3) Method 2.12 Sec. 6.5 Sampler BP verified against independent standard verified against a lab primary standard that is certified as NIST traceable 1/year

1) Criteria (PM10 Lo-Vol STP)	2) Frequency	3) Acceptable Range	Information /Action
Flow Rate Multi-point Verification/ Calibration	***Electromechanical maintenance or transport or*** every 365 days and once a calendar year	< ± 2.1% of transfer standard	1) 40 CFR Part 50, App. L, Sec. 9.2. 2) 40 CFR Part 50, App. L, Sec. 9.1.3, Method 2.12 Sec. 6.3 Table 6-1 3) Recommendation
Other Monitor Calibrations	per manufacturers' op manual	per manufacturers' operating manual	1, 2 and 3) Recommendation
Precision			
Collocated Samples	***every 12 days for 15% of sites***	CV < 10.1% of samples ≥ 3.0 µg/m^3	1) and 2) 40 CFR Part 58 App. A Sec. 3.3.4 3) Recommendation
Accuracy			
Temperature Audit	every 180 days and at time of flow rate audit	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 11.2.2
Pressure Audit	every 180 days and at time of flow rate audit	< ±10.1 mm Hg	1, 2 and 3) Method 2.12 Sec. 11.2.3
Semi Annual Flow Rate Audit	***Twice a calendar year and 5-7 months apart***	< ± 4.1% of audit standard < ± 5.1% of design flow rate	1 and 2) Part 58, App. A, Sec. 3.3.3 3) Method 2.12 Sec. 11.2.1
Monitor Maintenance			
Inlet Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Downtube Cleaning	every 90 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.4
Filter Chamber Cleaning	every 30 days	cleaned	1, 2 and 3) Method 2.12 Sec. 8.3
Circulating Fan Filter Cleaning	every 30 days	cleaned/changed	1, 2 and 3) Method 2.12 Sec. 8.3
Manufacturer-Recommended Maintenance	per manufacturers' guidelines	per manufacturers' guidelines	
Laboratory Activities			
Filter Checks			
Lot Blanks	9 filters per lot	< ±15.1 µg change between weighings	1, 2, 3) Recommendation and used to determine filter stability of the lot of filters received from EPA or vendor. Method 2.12 Sec. 10.5
Exposure Lot Blanks	3 filters per lot	< ± 15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.5 Used for preparing a subset of filters for equilibration
Filter Integrity (exposed)	each filter	no visual defects	1, 2 and 3) Method 2.12 Sec. 10.3 and 10.7
Lab QC Checks			
Field Filter Blank	10% or 1 per weighing session	< ± 30.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.1 2 and 3) Method 2.12 Table 7-1 & Sec. 10.5
Lab Filter Blank	10% or 1 per weighing session	< ± 15.1 µg change between weighings	1) 40 CFR Part 50, App. L Sec. 8.3.7.2 2 and 3) Method 2.12 Sec. 10.5
Balance Check (working standards)	beginning, 10th sample, end	< ± 3.1 µg from certified value	1, 2 and 3) Method 2.12 Sec. 10.6 Standards used should meet specifications in Method 2.12, Sec. 4.3.7
Routine Filter re-weighing	1 per weighing session	< ± 15.1 µg change between weighings	1, 2 and 3) Method 2.12 Sec. 10.8

1) Criteria (PM10 Lo-Vol STP)	2) Frequency	3) Acceptable Range	Information /Action
Microbalance Audit	every 365 days and once a calendar year	< ± 0.003 mg or manufacturers specs, whichever is tighter	1, 2 and 3) Method 2.12 Sec. 11.2.7
Lab Temp Check	Every 90 days	< + 2.1°C	1, 2 and 3) Method 2.12 Sec. 10.10
Lab Humidity Check	Every 90 days	< + 2.1%	1, 2 and 3) Method 2.12 Sec. 10.10
Verification/Calibration			
Microbalance Calibration	***At installation*** every 365 days and once a calendar year	Manufacturer's specification	1) 40 CFR Part 50, App. L, Sec. 8.1 2) 40 CFR Part 50, App. L, Sec. 8.1 and Method 2.12 Sec. 10.11 3) NA
Lab Temperature Certification	every 365 days and once a year	< ± 2.1°C	1, 2 and 3) Method 2.12 Sec. 4.3.8 and 9.4
Lab Humidity Certification	every 365 days and once a year	< ± 2.1%	1, 2 and 3) Method 2.12 Sec.4.3.8 and 9.4
Calibration & Check Standards -			
Working Mass Stds. Verification Compared to primary standards	Every 90 days	< ± 2.1 ug	1, 2 and 3) Method 2.12 Sec. 9.7
Primary standards certification	every 365 days and once a calendar year	0.025 mg tolerance (Class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7
SYSTEMATIC CRITERIA - PM_{10} Lo-Vol Filter Based STP			
Siting	Every 365 days and 1/ calendar year	***Meets siting criteria or waiver documented***	1) 40 CFR Part 58 App. E, Sec. 2-5 2) Recommendation 3) 40 CFR Part 58 App. E, Sec. 2-5
Data Completeness	***24- Hour Standard***	***> 75% scheduled sampling days in each quarter***	1, 2 and 3) 40 CFR Part 50 App. K, Sec. 2.3b
Reporting Units	all filters	µg/m³ at standard temperature and pressure	1, 2 and 3) 40 CFR Part 50 App. K Sec. 1
Rounding convention for design value calculation	***Each routine concentration***	***nearest 10 µg/m³ (≥ 5 round up)***	1, 2 and 3) 40 CFR Part 50 App. K Sec. 1 The roundingconvention is for averaging values for comparison to NAAQS not for reporting individual values.
Detection Limit			
Lower DL	***all filters***	***≤ 2 µg/m³***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 3.1
Upper Conc. Limit	***all filters***	***≥200 µg/m³***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 3.2
Precision			
Single analyzer	every 90 days and 4 times a calendar year.	Coefficient of variation (CV) < 10.1% ≥ 3.0 µg/m³	1, 2 and 3) Recommendation
Single analyzer	1/ yr	CV < 10.1% ≥ 3.0 µg/m³	1, 2 and 3) Recommendation
Primary Quality Assurance Org.	Annual and 3 year estimates	90% CL of CV < 10.1% ≥ 3 µg/m³	1, 2 and 3) Recommendation
Field Activities			
Verification/Calibration Standards Recertification's – All standards should have multi-point certifications against NIST Traceable standards			

1) Criteria (PM10 Lo-Vol STP)	2) Frequency	3) Acceptable Range	Information /Action
Flow Rate Transfer Std.	**every 365 days and once a calendar year**	***< ± 2.1% of NIST Traceable Std.***	1) 40 CFR Part 50, App. L Sec. 9.1 & 9.2 2) Method 2.12 Sec.4.2.2 & 6.4.3 3) 40 CFR Part 50, App. L Sec. 9.1 & 9.2
Field Thermometer	every 365 days and once a calendar year	± 0.1° C resolution, ± 0.5° C accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Field Barometer	every 365 days and once a calendar year	± 1 mm Hg resolution, ± 5 mm Hg accuracy	1, 2 and 3) Method 2.12 Sec. 4.2.2
Clock/timer Verification	every 30 days	***1 min/mo***	1and 2) Method 2.12 Sec. 4.2.1 3) 40 CFR Part 50, App. L Sec. 7.4.12
Laboratory Activities			
Microbalance Readability	***at purchase***	***1 µg***	1, 2 and 3) 40 CFR Part 50, App. L Sec. 8.1
Microbalance Repeatability	at purchase	1 µg	1) Method 2.12 Sec. 4.3.6 2) Recommendation 3) Method 2.12 Sec. 4.3.6
Primary Mass. Verification/Calibration Standards Recertification's	at purchase	0.025 mg tolerance (Class 2)	1, 2 and 3) Method 2.12 Sec. 4.3.7
Comment #1 The associated leak test procedure shall require that for successful passage of this test, the difference between the two pressure measurements shall not be greater than the number of mmof Hg specified for the sampler by the manufacturer, based on the actual internal volume of the sampler, that indicates a leak of less than 80 mL/min.			

A7 Distribution List

An electronic copy of this QAPP has been made available to the individuals in Table A7 below.

Table A7 E&EQAPP Distribution List

Name	Title	Contact Information
Demetria Kimbrough	Associate Director, Office of Air Quality	demetria.kimbrough@arkansas.gov 501-682-0927
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Michael Rosewaren-Mose	Chemist	Michael.rosewaren-mose@arkansas.gov (501) 682-0924
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*The Chemist Supervisor is the designated Project Manager for the Ambient Air Quality Monitoring Program.

EPA R6:

An electronic copy of the QAPP was emailed to EPA contact:

Terrie Wright - EPA R6

A8 Project Organization

A8.1 Purpose

The Arkansas Department of Energy and Environment, Division of Environmental Quality (E&E, DEQ), Air Lab has the overall responsibility for administering the ambient air quality monitoring program in the state. As a part of this program, the Air Lab is responsible for, and applies, quality assurance and quality control practices to all phases of ambient air quality monitoring

By applying these practices, the ambient air quality monitoring program aims to provide data that meet user requirements for completeness, precision, accuracy, representativeness, comparability, and sensitivity such that the data can be used to make decisions related to Arkansas' air environment.

The practices described above, and the strategies on how to implement these practices, comprise the program's Quality Assurance Project Plan (QAPP). The development of a QAPP is a core component of the Quality System of the U.S. Environmental Protection Agency (EPA). Following an approved QAPP is a requirement for organizations that collect and/or process environmental data on behalf of EPA. This document describes the QAPP and the quality assurance (QA) and quality control (QC) practices that will be used while operating the monitoring program in Arkansas.

The QAPP has gone through several revisions since initially developed. This revision replaces the version that was approved on October 12, 2021.

A8.2 Organization

The EPA is responsible for developing National Ambient Air Quality Standards (NAAQS), defining the quality of the data necessary to make comparisons to the NAAQS, and identifying a minimum set of quality assurance /quality control (QA/QC) samples from which to evaluate data quality.

The State of Arkansas through the E&E is responsible for developing and implementing a system that will meet the data quality requirements of the EPA. It is the responsibility of both EPA and E&E to assess the quality of the data and take corrective action when appropriate.

The State of Arkansas forbids political subdivisions below state level from regulating air pollution. Therefore, E&E has sole responsibility for measuring and reporting state air quality to the EPA.

This gives E&E the responsibility of developing and implementing a QAPP for monitoring criteria pollutants in the Air Quality Monitoring Program that covers all phases of the environmental data operation. Although not considered contractors, some particulate matter (PM) sites are maintained by cooperators that are state employees. No other contractors are anticipated.

The Quality Assurance Manager (QAM) is responsible for ensuring that all E&E Division of

Environmental Quality (DEQ) quality assurance (QA) programs at DEQ are being appropriately administered and QA procedures are being followed. QAM responsibilities for this QAPP include without limitation:

- Providing technical assistance to the project;
- Generating reports, memos, or other formal communications on Department QA activities, which may include details concerning audits, performance evaluations, management and peer reviews, inspections, surveillances, readiness reviews, peer consultations, and product reviews such as data inspection and software testing;
- Coordinating communication between E&E and EPA R6 Office of Quality Assurance; and
- Reviewing and approving this QAPP.

The Quality Assurance Coordinator (QAC) is responsible for the overall direction of QA program activities within the Office of Air Quality (OAQ). QAC responsibilities for this QAPP include without limitation:

- Providing reports, memos, or other formal communications on QA activities, which may include details concerning audits, performance evaluations, management and peer reviews, inspections, surveillances, readiness reviews, peer consultations, and product reviews such as data inspection and software testing, to the QAM;
- Reporting any QA failures on project-related problems to the QAM;
- Providing technical assistance, such as technical review, to the project;
- Reviewing and approving this QAPP.

The Chemist Supervisor in the Office of Air Quality fills the Project Manager role, which is responsible for the oversight of the Air Lab, including routine QA activities associated with the day-to-day operation of the air monitoring program. Responsibilities include without limitation:

- Preparing, updating, and revising the QAPP for the Ambient Air Quality Monitoring Program;
- Overseeing all training, hiring, and assignments of activities under this QAPP to the appropriate personnel;
- Supervising Chemists and Field Cooperators;
- Ensuring that all relevant procedures suggested in the EPA guidance are implemented;
- Preparing and updating standard operating procedures;
- Ordering the installation, replacement, and discontinuance of ambient air monitors within the primary quality assurance organization (PQAO);
- Communicating with the Deputy Associate Director and Associate Director on work accomplished in this QAPP;
- Distributing information to project staff;
- Entering data into AQS and certifying AQS data;
- Managing Airvision data software;
- Performing Level 2 and Level 3 data validation activities;
- Certifying level 3 ozone transfer standards;
- Tracking and verifying all standards;
- Overseeing document management plans;
- Serving as a point of contact for EPA R6 regarding project data;

- Ensuring adherence to the QA procedures included in this QAPP;
- Reporting any QA problems or deviations that need to be resolved to the QAC; and
- Developing corrective action reports.
- The Project Manager is responsible for preparing, updating, and revising SOP's.

The Chemists ensure that all equipment is operated and all data is collected and managed in accordance with the QA procedures established pursuant to this QAPP Chemist responsibilities for this QAPP include without limitation:

- Performing sampler calibrations and audits on PM monitors. Audits are performed independent of the unit generating data and performing routine QC;
- Performing routine maintenance on samplers;
- Providing other services as described below for Field Cooperators;
- Facilitating the finding and hiring of field cooperators for operating samplers;
- Designing and installing platforms and other structures/equipment for use in sampling;
- Transferring filters and other consumables to and from cooperators;
- Analyzing particulate filters and maintaining the particulate analysis environment;
- Tracking and storing QC-related documents for particulate sampling;
- Performing continuous ambient air sampler audits.
- Maintaining and managing all sites/buildings.
- Calibrating, maintaining, servicing, and repairing all PM and continuous ambient air monitors;
- Verifying the function of all the continuous ambient air monitors in the network;
- Training personnel on continuous monitors;
- Providing other services as described below for Field Cooperators;
- Data entry into AQS;
- Maintaining spare parts and consumable inventory;
- Certifying level 3 ozone transfer standards; and
- Performing Level 1 data validation activities.
- Reviewing sampler logs to ensure proper use by cooperators.

The Field Cooperators are part-time state employees who assist with PM sampling. Field Cooperator responsibilities for this QAPP include without limitation:

- Assisting in operating samplers;
- Repairing samplers;
- Performing verifications/service on samplers;
- Facilitating the delivery/storage of data from samplers on central computer; and

The Project Manager, Chemists, and Field Cooperators are collectively referred to as "Air Lab staff" or "Air Lab personnel."

The Associate Director is responsible for directing all Office of Air Quality operations, including the Ambient Air Quality Monitoring Project. Associate Director responsibilities for this QAPP include without limitation:

- Approving Annual Network Plans and 5-Year Network Plans;
- Approving personnel changes in the Air Monitoring Program (the program);
- Reviewing and approving all budgets/grants associated with the program;
- Reviewing and approving this QAPP;
- Has "stop work authority" and will make final decisions regarding monitoring issues, including resuming work after a stoppage.

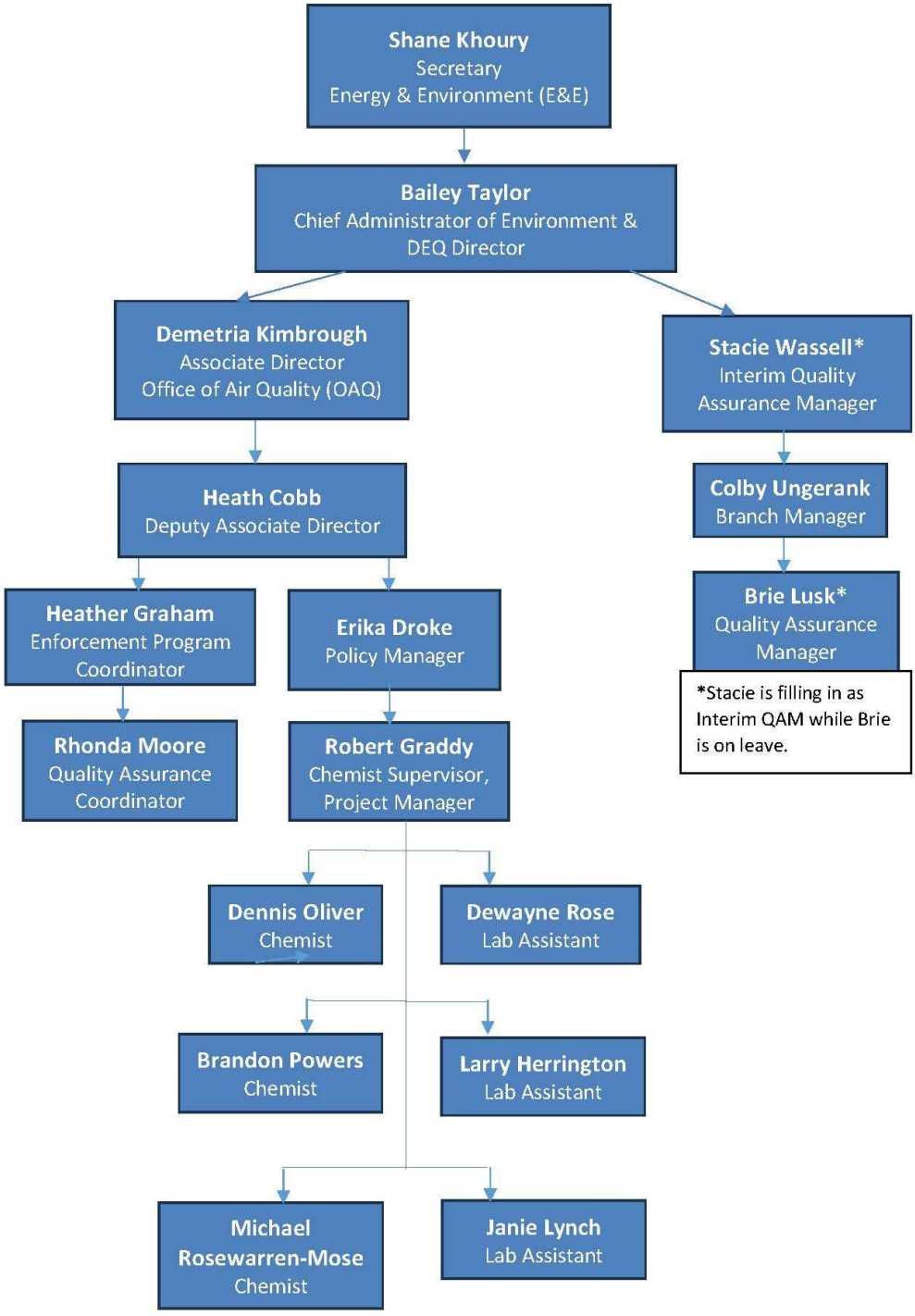
The Deputy Associate Director is responsible for direction of Policy and Planning Branch operations, including the Ambient Air Quality Monitoring Project. Deputy Associate Director responsibilities for this QAPP include without limitation:

- Hiring and supervising the Chemist Supervisor;
- Coordinating communication between Air Lab personnel and other Office of Air Quality staff;
- Reviewing and approving this QAPP.

A9 Project Quality Assurance Manager Independence

The QAM is responsible for the oversite of the QA program and is independent of the environmental information operations associated with this QAPP.

A10 Organization Chart and Communications



A11 Personnel Training/Certification

Adequate education and training are essential to any monitoring program that strives for reliable data. All new and current staff in the Air Lab is trained in the specific functions of their job. The primary method of training is a combination of required E&E training, EPA-sponsored courses, and required reading.

Required E&E training includes E&E orientation training, cross-training amongst staff, and annual ethics training. E&E orientation training introduces new staff to the agency and state government operations. Cross-training amongst staff is centered around QA/QC and monitoring equipment operation to ensure all staff has thorough knowledge of all aspects of the monitoring program. Required EPA sponsored training includes the Quality Project and Program Management course and the following online courses from Air Pollution Training Institute (APTI):

- Introduction to Ambient Air Monitoring
- Quality Assurance for Air Pollution Measurement Systems
- What are Criteria Pollutants
- Introduction to NAAQS

To ensure all staff has a complete understanding of the entire E&E ambient air monitoring program the following reading and activities are required:

- Reading and understanding this Ambient Air Monitoring QAPP.
- Reading and understanding all Ambient Air Monitoring SOPs.
- Reading and understanding of the EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II.
- Reading and understanding of Best Practices for Review and Validation of Ambient Air Monitoring Data 2021.

Each staff member shall have a signed training plan that outlines completion of each required training and reading. The signed training plan shall be managed and filed by the Project Manager. Proficiency assessments on quality assurance and data validation policies and procedures shall be conducted by the QAM. Proficiency assessments on QA/QC field activities will also be conducted through peer/manager review of all activities to assure accuracy and completeness.

Continued training and education is encouraged for all staff through new workshops, meetings, and training courses. This is a good way of keeping current on new monitoring & technological information and methodologies. All required training and continuing education records will be maintained by each employee as well as a staff file maintained by the Project Manager. Additionally, E&E keeps track of special training and continuing education through the annual job evaluation database.

On-the-job training for Field Cooperators is completed to ensure they are trained in basic sampler operation. They are provided with a SOP and a list of duties outlining the service required.

A12 Documentation and Records

This section includes information concerning the management of documentation and records for the ambient air monitoring program. See Table A12.1.6 for a summary of the E&E Ambient Air Quality Records Management Plan.

All E&E Air Lab staff has access and maintains all electronic documents, paper documents, and logbooks for all sampling data, QA/QC, and maintenance activities in the air monitoring program. All QA/QC documents, logbook entries, and chain of custody (COC) forms are initialed and dated by the site operator upon completion of the activity. All paper documents and binders are secured in a lockable storage. Electronic data are password protected. This QAPP and associated SOPs are published with the date and revision information clearly noted, generally in a document header. Corrections or changes made to any record shall be done by inserting a single line through the incorrect entry, initialing and dating with the date the correction was made. The correct information should then be written beside the incorrect entry. All written entries shall be done in ink. All corrections will be reviewed by the Project Manager.

This QAPP and associated SOPs are reviewed annually and the latest versions are distributed to all Air Lab staff through email. All records will be retained for a period of seven years unless stated otherwise. The records will then be destroyed.

A12.1 Air Quality Monitoring Program Records to Create and Retain

The majority of documentation and records produced by E&E's ambient air monitoring program consist of data collection activities and QA/QC documents. Documentation and records include:

- Sample and Laboratory, General and Site Specific Records
- Field Sampling Operation Records
- Particulate Filter Weighing Operation Records
- QA/QC Records
- Electronic Records

A12.1.1 Sample and Laboratory, General and Site Specific Records

Documentation for siting and maintenance of samplers/analyzers shall be kept on file. These documents shall include the following:

- Photographs of the site in four cardinal directions plus one photograph of the site in general, a site sketch, a USGS topographical map of the area, a copy of site documentation records that were submitted to the AQS database, and any updates all of which will be stored in the E&E Air Lab;
- A site logbook that contains dated entries for site maintenance at each gaseous sampling site;

- A sampler/analyzer logbook that contains QA/QC documentation as well as maintenance, which will be kept with the analyzer at all times;
- All records of manufacturer-supplied calibration and traceability for devices used to maintain samplers/analyzers will be kept in the central office. This includes certification records of gas standards, flow standards, O_3 transfer standards, and temperature standards, which will be on file in the E&E Air Lab;
- Microbalance records and records of other equipment necessary for maintaining the microbalance environment will be kept in the air section of the laboratory at E&E. These records include maintaining anti-static devices and certification records of weight standards and balances, and weigh room temperature/relative humidity checks, all of which will be filed in the E&E Air Lab; and
- All Air Lab applicable SOPs shall be maintained, updated as needed, and stored on the E&E Tech Services Network Drive in the AIRSOP subfolder of the AirLab folder.
- A missing data logbook shall be maintained to keep record of all missing data and appropriate missing data flags, which will be kept in the E&E Air Lab.
- An AQS logbook is maintained to keep a record of all AQS entries and activity which will be kept in the E&E Air Lab.

A12.1.2 Field Sampling Operation Records

- All COC forms for individual $PM_{2.5}$/PM_{10} samples are forwarded, along with the samples, to the central laboratory. After processing each filter, the COC forms are filed by site and date. All of these forms are stored in bins in the Air Lab by year.
- All five-minute and hourly raw data from continuous analyzers and samplers will be stored in the E&E Airvision Database.

A12.1.3 Particulate Filter Weighing Operation Records

- Computer records of five-minute and hourly averages for relative humidity and temperature for the laboratory and weighing room will be electronically stored on the Office of Air Quality Planning Network Drive.
- Microbalance certifications and servicing records will be maintained and filed in the E&E Air Lab.
- A filter weigh room logbook shall be maintained, which will include the following records: routine cleaning activities, lot blank weights, temperature and relative humidity checks, and weight checks. The logbook will be stored in the filter weighing room.
- A filter spreadsheet for each sample shall be on file on the Office of Air Quality Planning Network Drive in the PM25 subfolder of the AirLab folder, which contains filter numbers, filter weights, and balance checks.
- Filters will be archived in cold storage for a period of not less than one year (stored by run date and identified by filter number and site) in the E&E Air Lab. After one year, due to space limitations, the filters may be placed in an unrefrigerated storage area for up to seven years.

A12.1.4 QA/QC Records

- All QA/QC forms for the $PM_{2.5}/PM_{10}$ network will be stored on the Office of Air Quality Planning Network Drive in the "Verifications and Audits" subfolder of the PM25 subfolder of the AirLab folder and filed in site folders in a file cabinet in the Air Lab.
- All QA/QC forms for the gas network will be stored by site on the Office of Air Quality Planning Network Drive in the Gas QC subfolder of the AirLab folder. A copy of each QA/QC form will also be kept at each gas site and in a QC binder in the Air Lab.
- The E&E air monitoring QAPP shall be maintained and stored on the Office of Air Quality Planning Network Drive in the AIRSOP subfolder of the AirLab folder.

A12.1.5 Electronic Records

In lieu of paper forms in the field, some operators will use electronic tablets for QA/QC activities. The data will be entered on QA/QC spreadsheets and saved. Upon arrival to the Air Lab, the spreadsheets will be printed, initialed, and dated. Particulate data spreadsheets will be filed in site files in a file cabinet in the Air Lab. Gas QA/QC data will be placed in a QC binder in the Air Lab and a copy will also be taken back to each site for reference. All QA/QC data is stored on the Air Quality planning network drive. All electronic records on the Office of Air Quality Planning Network Drive are backed up nightly. The E&E Air Lab strives to adhere to all guidance in Appendix J of the QA Handbook regarding electronic logbooks.

A12.1.6 Data Reporting Requirements

The following shall be maintained for AQS reporting and other purposes:

- Siting documentation and changes to site configuration.
- Pollutant concentration data and relevant measurements for calculating concentration data; and
- Data transcribed from screens to COCs.

Table A12.1.6 Ambient Air Quality Records Management Plan

Data Type	Location	Retention Time
Ambient monitoring data reports	Online web access (AQS)	Permanent
Raw/edited air monitoring data	E&E database	Minimum of three years for continuous data, minimum of seven years for manual particulate data. Data backup stored offsite.
$PM_{2.5}/PM_{10}$ COC Forms	Filed by year in Air Lab bins	Seven years
Gas calibration forms, zero/span/precision checks forms, audit forms	Electronic copies stored on Office of Air Quality Planning Network Drive in the Gas QC subfolder of the AirLab folder. Hard copies filed in QC binder and at each site.	At least seven years.

$PM_{2.5}/PM_{10}$ Verifications/Audits	Electronic copies stored on Office of Air Quality Planning Network Drive at in the Verifications and Audits subfolder of the PM25 subfolder of the AirLab folder. Hard copies filed in site files in a file cabinet in the Air Lab.	Seven years
Field documentation including instruments and site logs	Each instrument has a logbook that remains with the instrument. Site logbooks are at each site.	Updated as needed. In use until the instrument is disposed of. The site log is a binder that tracks the maintenance and history of the site and is permanent.
Certification records for gas standards, flow standards, temperature standards, O_3 transfer standards, weight standards, and balances.	Filed in the Air Lab	Seven years
QAPP/SOPs	Office of Air Quality Planning Network Drive at in the AIRSOP subfolder of the Airlab folder	Permanent
Training Records	Filed in Air Lab by Project Manager	Permanent
Corrective Action Reports	Filed in Air Lab by Project Manager	Permanent

B1 Identification of Project Environmental Information Operations

E&E maintains its ambient air monitoring network in accordance with the quality assurance requirements of 40 CFR Part 58, App. A, designs its network in accordance with App. D, and locates its sites to meet all requirements of App. A, D, and E. The operation of each monitor meets the requirements of 40 CFR Part 58 Appendices B and C, where applicable. E&E operates numerous air monitors at various monitoring sites throughout the State of Arkansas. (See Figure A6.4 and Tables B1.3 in this QAPP). Monitors operated by E&E are currently maintained by the Air Lab in the Policy and Planning Branch of the Office of Air Quality. Data from these monitoring sites are entered into the national AQS database and made available to the public within ninety days following the end of each calendar quarter. The Arkansas Air Monitoring Annual Network Review (ANR) discusses the network design and specifics on each individual monitoring site.

B1.1 Monitoring Objectives

To fulfill the three basic monitoring objectives in Section A5.2 of this QAPP, E&E begins the process of selecting a monitoring site by identifying a monitoring objective listed below. Appendix D of 40 CFR Part 58 defines the six basic monitoring objectives used to choose the locations of sites in a monitoring program to determine:

- Highest ***pollutant concentrations*** expected to occur in an area covered by the network;
- Representative concentrations in areas of high ***population density;***
- Impact on ambient pollution levels by a ***significant source*** or source categories;
- ***General/background*** concentration levels;
- Impact on air quality by ***regional transport***; and
- ***Welfare-related*** impacts (such as on visibility and vegetation).

B1.2 Spatial Scale

Once an objective for a site has been identified, a spatial scale is chosen. A set of spatial scales is defined, and scales are based on physical dimensions that, given a particular objective, would be likely to have similar pollutant concentrations throughout. These are:

- **Micro-scale**—Dimensions ranging from several meters up to about 100 meters;
- **Middle Scale**—Areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer (km);
- **Neighborhood Scale**—City areas of relatively uniform land use with dimensions of 0.5 to 4.0 km;
- **Urban Scale**—Overall, city-wide dimensions on the order of 4 to 50 km (usually requires more than one site for definition);
- **Regional Scale**—Rural areas of reasonably homogeneous geography covering from 50 km to hundreds of km; and
- **National or Global Scale**—The entire nation or greater.

The relationships between monitoring objectives and spatial scales are as follows:

Monitoring Objective	Appropriate Siting Scales
Highest Concentration	Micro, middle, neighborhood, (sometimes urban or regional for secondarily formed pollutants)
Population Oriented	Neighborhood, urban
Source Impact	Micro, middle, neighborhood
General/Background	Urban, regional
Regional Transport	Urban, regional
Welfare-related Impacts	Urban, regional

Spatial scales appropriate to the criteria pollutants monitored in Arkansas are shown below:

Criteria Pollutant	Spatial Scales
Inhalable Particulate	micro, middle, neighborhood, urban, regional
Sulfur Dioxide	middle, neighborhood, urban, regional
Ozone	middle, neighborhood, urban, regional
Nitrogen Dioxide	middle, neighborhood, urban
Carbon Monoxide	middle, neighborhood, urban

B1.3 Site Selection

A good understanding of the appropriate monitoring objective and spatial scale allows a site location to be chosen. Using these criteria to locate sites allows for an objective approach, ensures compatibility among sites, and provides a common basis for data interpretation and application. The annual review process involves assessing each site and associated monitors to confirm that all still meet their intended purpose. Sites and/or monitors that no longer satisfy the intended purpose are either terminated or modified accordingly.

Each air pollutant has certain characteristics that must be considered when establishing a monitoring site. These characteristics may result from variations in the number and types of sources and emissions, reactivity of a particular pollutant with other constituents in the air, local site influences—such as terrain and land use—and climatology. The E&E Air Monitoring Network is designed to monitor air quality data for five basic conditions: (1) monitoring of criteria pollutant

background concentrations; (2) quantifying population exposure to pollutants; (3) monitoring significant sources of pollutants or class category; (4) long-range transport of pollutants; and (5) regional haze. Table B1.3 below shows all E&E SLAMS Monitor information. All listed monitors have a neighborhood spatial scale.

Table B1.3 E&E Operated SLAMS Monitor Information

AQS ID #	Site Name	Address/Location	Pollutants Measured	Method Code	Sampling Method	Operating Schedule	Monitoring Objective	NAAQS Comp.	MSA
05-001-0011	Stuttgart	1703 N. Beurkle	$PM_{2.5}$	143	Thermo 2000i FRM Teledyne T640	Daily 1 in 3	Population Exposure	Yes	Not in an MSA
05-003-0005	Crossett	201 Unity Rd.	$PM_{2.5}$	143	Thermo 2000i FRM Teledyne T640	Daily 1 in 3	Population Exposure	Yes	Not in an MSA
05-035-0005	Marion	Polk & Colonial Dr.	$PM_{2.5}$ $PM_{2.5}$ O_3 NO_2	143 701 019 035	Thermo 2000i FRM R&P TEOM UV Photometric Chemiluminescence	Daily 1 in 3 Continuous Continuous Continuous	Population Exposure Population Exposure Population Exposure Population Exposure	Yes No Yes Yes	Memphis
05-051-0003	Hot Springs	300 Werner	$PM_{2.5}$[1]	143	Thermo 2000i FRM Teledyne T640	Daily 1 in 3	Population Exposure	Yes	Hot Springs
05-067-0001	Newport	7648 Victory Blvd.	$PM_{2.5}$	143	Thermo 2000i FRM Teledyne T640	Daily 1 in 3	Population Exposure	Yes	Not in an MSA
05-101-0002	Deer	Hwy 16	O_3	019	UV Photometric	Continuous	Background	Yes	Not in an MSA
05-113-0002	Mena	Hornbeck Rd	$PM_{2.5}$	143	Thermo 2000i FRM Teledyne T640	Daily 1 in 3	Regional Background	Yes	Not in an MSA
05-113-0003	Eagle Mtn	463 Polk 631	O_3	019	UV Photometric	Continuous	Regional Transport	Yes	Not in an MSA

05-119-0007	PARR (NCore)	Pike Ave at River Road	$PM_{2.5}$[1] $PM_{2.5}$[1] PM_{10}[1] PM_{10}[1] $PM_{10-2.5}$[1] $PM_{10-2.5}$[1] O_3 NO_x NO_y Speciation Trace SO_2 Trace CO	145 238 127 239 176 240 019 074 574 810 560 554	Thermo 2025i FRM Teledyne T640X Gravimetric Teledyne T640X Gravimetric/FRM Teledyne T640X UV Photometric Chemiluminescence Chemiluminescence Low Volume Infrared Infrared	Daily 1 in 1 Continuous Daily 1 in 3 Continuous Daily 1 in 3 Continuous Continuous Continuous Continuous Daily 1 in 3 Continuous Continuous	Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure	Yes Yes Yes Yes Yes Yes Yes Yes No No Yes Yes	Little Rock
05-119-1002	NLRAP	Remount Rd	O_3	019	UV Photometric	Continuous	Population Exposure	Yes	Little Rock
05-119-1008	DSR	Doyle Springs Rd	$PM_{2.5}$ $PM_{2.5}$	143 701	Thermo 2000i FRM R&P TEOM Teledyne T640	Daily 1 in 3 Continuous	Population Exposure Population Exposure	Yes No	Little Rock
05-139-0006	El Dorado	Union Memorial Hospital	$PM_{2.5}$	143	Thermo 2000i FRM	Daily 1 in 3	Population Exposure	Yes	Not in an MSA
05-143-0005	Springdale	600 S. Old Missouri Rd	$PM_{2.5}$ $PM_{2.5}$ PM_{10} O_3	145 701 127 019	Thermo 2025i FRM R&P TEOM Gravimetric UV Photometric	Continuous Daily 1 in 3 Daily 1 in 6 Continuous	Population Exposure Population Exposure Population Exposure Population Exposure	No Yes Yes Yes	Fayetteville
05-143-0006	Fayettevill e	429 Ernest Lancaster Dr.	O_3	019	UV Photometric	Continuous	Population Exposure	Yes	Fayetteville
40-135-9021	Roland, OK	207 Cherokee Blvd	$PM_{2.5}$	145	Thermo 2025i FRM	Daily 1 in 3	Population Exposure	Yes	Fort Smith

[1]Collocated Monitors

B2 Methods for Environmental Acquisition

All monitors are sited as per 40 CFR Part 58, Appendix E. Monitoring for criteria pollutants is accomplished using EPA reference or equivalent methods. Table B1.3 in Section B1.3 of this QAPP includes a list of sampling methods and AQS method codes operated by the E&E Air Lab. Their respective EPA FRM or FEM designation numbers are found in Table B4 in Section B4 of this QAPP. All monitors are installed and operated consistent with 40 CFR Parts 53 & 58, EPA QA Handbook, Volume II, and manufacturer's operation manuals.

B2.1 Continuous Gas Analyzers

All gas analyzers are operated in temperature-controlled shelters. They are connected by ¼" Teflon (or equivalent) with an inline Teflon filter to a common borosilicate glass manifold. At each site, a glass inlet tube is positioned approximately a meter above the shelter roof and is connected with leak free fittings to the glass manifold inside the shelter. A blower fan is connected to the manifold exhaust drawing ~12 CFM of ambient air through the manifold. The glass sampling manifold is cleaned annually or as needed.

Each monitoring shelter for SO_2, NO_2, and CO includes a dilution calibrator and zero air system used to perform calibrations and precision checks. Each monitoring shelter for O_3 includes an O_3 primary standard calibrator that performs a zero, span, and precision each night. All calibrators for SO_2, CO, and NO_2 analyzers are connected to a T in each sampling line. O_3 calibrators are connected to each O_3 analyzers through an electronic solenoid valve. All gas analyzers operate continuously providing "instantaneous" output which is used to generate 5-minute and 1-hour averages.

Each monitoring shelter includes an Agilaire 8832 data logger. Each station data logger is automatically polled each hour by the central server at the North Little Rock E&E headquarters (running AirVision software) for 5-minute and 1-hour average data. This data is automatically stored in a dedicated SQL database.

B2.2 PM2.5, PM10, and PM10-2.5 FRM Samplers

PM FRM samplers are installed at sites around the state using factory supplied stands. Each stand is anchored using screws, metal stakes, or concrete blocks.

Teflon filters provided by EPA are sent to the E&E Air Lab for each calendar year. The Air Lab inspects filters according to the EPA criteria (40 CFR Part 58 and EPA Guidance 2.12) and Appendix K of the Air Lab SOPs. Filters that do not meet the criteria are rejected for sampling. Filters are then placed in filter weigh room for 24 hours of conditioning. Filters are then tare weighed, placed in filter cassettes, and a COC is generated for each filter.

Filters are taken to each FRM site and setup to run as shown in the Appendix J SOP. Each FRM is configured to collect 24-hour samples from midnight to midnight on an EPA published 1-in-1 day (NCore site), 1-in-3 day, 1-in-6 day, or 1-in-12 day schedule. Filter samples must be recovered

and refrigerated within 7 days, 9 hours of the sample date.

All filter data from each sampling run is recorded on a filter data sheet which is stored in the AirLab drive under PM2.5 filter data. Sampled filters returned from the field are removed from the filter cassettes, placed in labeled filter slides, and stored in refrigerated storage at < 4°C. Filters must be weighed within 30 days of sample collection. After all filters are collected from a sample run day they are removed from refrigerated storage and placed in the weighing room for a 24-hour conditioning period. After filters are conditioned for 24 hours they are weighed to obtain final weights and PM concentrations. $PM_{10-2.5}$ values are calculated from the difference of validated PM_{10} and $PM_{2.5}$ FRM results.

B2.3 Continuous PM2.5 Monitors

Continuous $PM_{2.5}$ monitors are located inside gas monitoring shelters or in portable shelters with the inlet approximately one meter above the roof. These monitors operate continuously providing "instantaneous" output which is used to generate 1-minute and hourly averages. Two of these continuous $PM_{2.5}$ samplers in the E&E network have the EPA-approved FEM designation (Teledyne T640X EQPM-0516-238). These are located with an FRM at our PARR, Crossett, DSR, Hot Springs, Mena, Newport, Stuttgart, El Dorado, and Marion sites. Three other continuous $PM_{2.5}$ sites are non-NAAQS comparable TEOMs used for AQI forecasting. All Teledyne T640 and TEOM data is reported to AQS.

B2.4 Data Acquisition Requirements for Non-Direct Measurements

Non-direct measurement data utilized by the Air Monitoring Network includes existing meteorological and geographical data, which may be used in the process of siting new monitoring stations.

Non-direct measurements will be clearly identified in reports and data summaries and will include verification of collection location, collection method, and data source.

B3 Integrity of Environmental

Samples for inhalable particulate ($PM_{2.5}$, PM_{10}, $PM_{10-2.5}$, and speciation) shall be subject to consistent handling procedures to protect the integrity of both the samples and the data. Guidelines for $PM_{2.5}$ filter preparation, shipping, sample analysis, and filter storage are found in Appendix K for PM filters and Appendix M for CSN. Sample handling and chain of custody for particulate and speciation samples are specified in Appendix J and Appendix M for sample retrieval/handling.

B4 Quality Control

E&E Air Lab staff follow all guidance in QA Handbook Volume II, Appendix D when completing all quality control requirements. Quality control of instrumentation is dependent on the following key components:

- **Calibration**: Defines a range over which a given instrument operates that has been determined to adequately reflect expected results in comparison with a standard and adjustment of the instrument to fall within this range. Calibrations are completed when monitor response exceeds defined warning limit or after repairs. Limits are defined in table A6.2. Calibrations are followed by a multipoint verification. Calibrations include identifying and adjusting monitor response at:
    - **Zero Point**: Measure zero concentration using a zero-air generator or standard; and
    - **Span Point**: Measure a known subject concentration between eighty and ninety percent of the full-scale range of the analyze.
- **Zero/Span/Precision Checks**: How well repeated measurements of the same factor under identical conditions agree with one another. Zero/Span/Precision checks are the critical criteria for the method performance. Explained further in section B5.1.2.
- **Accuracy or Bias Checks**: Identification of systematic deviation from the true value. Accuracy and Bias are calculated for the data set based on the precision checks above, co-located samples and flow rate checks.
- **Corrective Actions**: Actions (either mechanical adjustment or procedural) taken to bring a given instrument back into calibration range.
- **Verifications:** Verifications are performed on particulate FRM and FEM samplers monthly. Verifications for FRM samplers consist of ambient/filter temperature, barometric pressure, and flow rate checks using annually certified thermometers, barometers, and chinooks. Certifications are kept electronically.

Specific procedures for each analyzer or monitor type can be found in the applicable section of the Air Lab's SOPs. Below is a summary of QC activities in the E&E Air Lab network. Table B5 below shows the E&E Air Lab QC schedule for criteria pollutants.

EPA has developed a set of pollutant specific MQOs which are available in Volume II, Appendix D of EPA's Quality Assurance Handbook (QAH). The Air Lab uses these DQIs for evaluating analyzer operation and accepting data, which is in Tables A6.2.1 through A6.2.9 of this QAPP. Additionally, meteorological instrumentation DQIs are taken from the Volume IV, Appendix C of the QAH.

In addition to adopting the EPA DQIs, the E&E Air Lab has also established some warning limit criteria for all parameters. Warning limits are defined as the level of allowable imprecision before an analyzer/sampler calibration or other corrective action is warranted. These limits will be set lower than the DQIs to reduce imprecision and bias and enhance data recovery. E&E Air Lab warning limits are listed in Table B4 below.

B4.1.1 Zero/Span/Precision Checks

Zero/Span/Precision checks are performed every two weeks on all SO_2, CO, and NO_2 analyzers. O_3 precision checks are completed by an automatic zero, span, and precision (0.400 and 0.040 ppm) performed nightly at each O_3 site. The automatic zero, span, and precision is completed using a site level 3 O_3 bench standard that is certified quarterly against a level 2 lab standard. Every two

weeks Air Lab staff will pull an O_3 calibration report from our polling computer and print the file. The file will be reviewed and placed into our QC binder for entry into AQS.

NO_x, SO_2, and CO precision checks are performed manually by taking a span and precision point from the most recent calibration along with a zero, sending it to a T in the sample line and measuring the response of the site analyzer. O_3 precision checks are performed automatically each night by sending a span and precision point form the O_3 calibrator to the O_3 analyzer utilizing an electronic solenoid valve. This is done using the same dilution calibrator, zero air source, and EPA protocol gas from the calibration. Every two weeks, using ¼" Teflon tubing, the output of the site dilution calibrator is connected to a "T" in each analyzer sampling line to see how each gas analyzer responds to each point. SO_2 precisions consist of a zero, span, and precision point (0.090 and 0.015 ppm). CO precisions consist of a zero, span, and precision point (4.0 and 1.5 ppm). NO_2 precisions consist of a zero, span, and precision point (0.350 and 0.040 ppm). Converter efficiency is also checked every 14 days on NO_2 analyzers.

Table B4 Data Quality Action Levels

Parameter	Warning Limit	MQO
Ozone (O_3)	≥ ± 5%	< ± 7.1%
Carbon Monoxide (CO)	≥ ± 7%	< ± 10.1%
Sulfur Dioxide (SO_2)	≥ ± 7%	< ± 10.1%
Nitrogen Dioxide (NO_2)	≥ ± 10%	< ± 15.1%
Particulate ($PM_{2.5}$)	≥ ± 3%	< ± 4.1%
Particulate (PM_{10})	≥ ± 4%	< ± 7.1%

B5 Instrument/Equipment Calibration, Testing, Inspection, and Maintenance

B5.1 Continuous Analyzers

B5.1.1 Calibrations/Verifications

Calibrations are performed on gas analyzers quarterly or following installation, repair, or precision/span exceeds action level noted in Table B5 of this QAPP.

O_3 analyzer calibrations are performed using a zero air source and a Level 3 O_3 transfer standard that has been certified with a Level 2 lab O_3 standard. The O_3 analyzer at each site is connected using ¼" Teflon tubing to the output of the level 3 transfer standard to measure the response of a zero and a span point. The site analyzer zero and span are adjusted to match the level 3 transfer standard. After the adjustment on the analyzer is made, verification is then performed by comparing a zero and six upscale points (0.480, 0.400, 0.300, 0.225, 0.150, and 0.040 ppm) to check the linearity of the analyzer. (The EPA Data Assessment Statistical Calculator [DASC] is used for multipoint verifications.)

NO_x, SO_2, and CO calibrations are done using a site dilution calibrator, zero air source, and EPA

protocol gas standard. Gas flows and air flows are measured on the dilution calibrator using a certified flow meter. The output concentration is then calculated using these measured flows and the gas concentration of the gas standard. Using ¼" Teflon tubing, the output of the calibrator is then connected to a "T" in each analyzer sampling line to see how each gas analyzer responds to each point. For NO_x analyzers, a gas phase titration is done using NO and O_3 to measure the response for NO_2. During calibrations each site analyzer zero and span is adjusted to match the calculated output concentrations. After the adjustment is made verifications are performed on each analyzer to check the linearity. SO_2 verifications consist of a zero and 6 upscale points (0.090, 0.080, 0.060, 0.030, 0.015, and 0.008 ppm). CO verifications consist of a zero and 6 upscale points (4.8, 4.0, 2.5, 1.5, 0.5, and 0.1 ppm). NO_x verifications consist of a zero and 6 upscale points for NO-NO_x response (0.450, 0.400, 0.300, 0.200, 0.100, and 0.040 ppm) and a zero and 2 upscale points for NO_2 response (0.350 and 0.040 ppm). If the analyzer response is at or greater than MQO action limit listed in table B5, a calibration is performed.

B5.2 Continuous and FRM Particulate Samplers

Certified flow transfer standards, temperature transfer standards, and pressure transfer standards are used to perform all QC activities in the E&E particulate network.

B5.2.1 Calibrations

Calibrations are performed on particulate FRM samplers annually. Calibrations on FRM samplers consist of thorough cleaning, ambient/filter temperature response at 0, 20, and 45°C, pressure check, flow calibration, and leak check. Flow calibrations are performed on continuous particulate samplers and FRM particulate samplers following installation, repair, or when the flow is greater than ±3.1% of the flow transfer standard for $PM_{2.5}$ and greater than ±4.1% for PM_{10}. Temperature calibrations are performed when the sampler temperature is greater than ±2°C from the certified transfer standard. Pressure calibrations are performed when the sampler pressure is ±10mm from the pressure transfer standard. If the monitor response is at or greater than MQO action limit listed in table B5, a calibration is performed.

B5.3 Inspection/Acceptance of Air Quality Instrumentation

All air quality analyzers, monitors, and samplers used within the monitoring network for criteria pollutants are selected from the list of EPA-designated reference or equivalent methods (FRMs or FEMs, respectively). All monitoring equipment (criteria, non-criteria, and meteorological) is selected for compatibility with existing equipment to facilitate familiarity with the operation and maintenance of the equipment and consistency in spare parts and supplies.

B5.4 Acceptance checks

Acceptance checks must be performed on all new equipment or equipment returned from factory repair. Acceptance checks consist of the following items:

1. Unpacking and assembly;
2. Start-up procedures (found in the instrument specific manual);
3. Calibration (if applicable);
4. If unit is an analyzer or monitor: zero, precision, and span check. Verify zero drift, span drift, zero noise, and response time are within specifications guaranteed by the manufacturer; and
5. If steps 1 through 4 are deemed satisfactory, prepare the equipment for deployment. Otherwise, perform troubleshooting and repair, and if necessary, return the equipment to the vendor for repair or replacement.

B5.5 Inspection, Testing, and Maintenance

Maintenance and testing are performed as needed and at a minimum of every other week during on-site visits. All repairs or adjustments are recorded in instrument and/or site logs. Maintenance performed at gaseous monitoring sites includes but not limited to replacing inline filters, replacing desiccant, replacing dirty sampling lines, cleaning sampling manifolds, and HVAC maintenance. Maintenance performed at particulate monitoring sites includes but not limited to changing fan filters, cleaning filter compartment, and replacing PM_{10} inlet or very sharp cut cyclone.

Inspection includes visual and auditory review of each instrument. Periodic replacement of consumables and cleaning are performed according to the applicable manufacturer's recommendations or as needed. Testing follows manufacturer's recommendations. Zero, precision, and span checks, and scheduled required calibrations are reviewed for indications of malfunction. Daily data review can also indicate faulty operation.

An inventory of consumables and frequently replaced parts is maintained by field staff in vehicles along with test instruments and field repair tools. Additional less frequently needed parts are stored in the main office Air Lab along with surplus equipment that can be used for replacement parts. Parts supplies are replenished on an as-needed basis.

The Air Lab has a goal to keep in inventory a minimum of one complete replacement analyzer of each type in ready-to-deploy status. In the event that a field unit needs to be replaced or brought back for repairs, this replacement unit can take its place minimizing data loss due to analyzer down time.

B5.6 Continuous Analyzers

All continuous analyzers will be calibrated in accordance with the manufacturer's recommended procedures and the recommendations in EPA's QA Handbook Volume II; the specific procedures are contained in the appropriate portion of the Air Lab's SOP, Section B5.1.1 of this QAPP, and the E&E QC schedule is found in Table B5.2.3 in Section B5.2.3 of this QAPP. All calibrations frequency and MQOs are listed in table B5. A calibration is performed at initial installation at a site, and a recalibration is performed as follows:

- No later than three months after the most recent calibration or performance audit that indicated an acceptable analyzer response;
- Following any adjustments, repairs, or moving of the unit;
- Following any indication of possible significant inaccuracy of the analyzer, including excessive zero or span drift; and
- At any other time deemed necessary

O_3 analyzer calibrations are performed using a zero air source and a Level 3 O_3 transfer standard that has been certified with a Level 2 lab O_3 standard. NO_x, SO_2, and CO analyzer calibrations are performed by using an EPA Protocol Gas Standard, site dilution calibrator, and site zero air source. NO_2 is generated using gas phase titration of NO with O_3 to achieve the desired concentration. All calibrations consist of adjusting analyzer response to a zero and a span point. Following the adjustment, a multipoint verification is performed consisting of a zero and at least four upscale points.

In addition to multi-point calibrations, a zero, span, and precision check shall be performed manually (automated nightly for O_3 using site level 3 bench standard) on all SO_2, NO_2, and CO analyzers at least once every two weeks in accordance with the procedures contained in the appropriate section of EPA's QA Handbook Volume II. Zero and span checks shall be performed to provide:

- Data from which a decision can be made on when to calibrate an analyzer; and
- A decision point for data validation.

The limits established for these checks are found in QAH Volume II.

Calibration and span gases used for continuous analyzers for SO_2, CO, and NO/NO_2/NOx shall be EPA protocol gases traceable to National Institute of Standards and Technology (NIST), Standard Reference Materials (SRM) as specified in QAH Volume II. Gases for trace level analyzers (SO_2 and CO) will be selected to fit the specific full-scale range for each analyzer.

Calibration/span gases for O_3 shall be traceable to an authoritative ultraviolet photometric device via transfer standards certified according to requirements and procedures specified in EPA's QA Handbook Volume II.

B5.7 Manual/Continuous Particulate Methods

FRM particulate samplers will be calibrated annually and verified monthly. Continuous particulate samplers will be verified monthly. Calibration and verifications will include checks on flow, temperature, and barometric pressure. The specific procedures are contained in the appropriate Air Lab SOPs, Section B5.2.1 of this QAPP, and the criteria set forth in EPA's QA Handbook Volume II. (See Appendix G of E&E SOP handbook). All flows shall be traceable to an NIST reference flow standard.

B5.8 Gravimetric Operations

Calibrations of all microbalances and weight standards will be performed annually by Aldinger Corporation. Calibration checks using a 200 and 500 mg certified weight are performed at the start of each weighing batch and after every 10 sample filters are weighed. Weigh room temperature and relative humidity calibrations are performed quarterly using certified temperature standard and MgCl/NaCl solution standards for relative humidity.

Table B5 E&E QC Schedule

(Zero/Span/Precision and Converter Efficiency are Critical Criteria, Verification/Calibrations are Operational Criteria)

Pollutant	QC Performed	Frequency	Action Limit	MQOs	Appendix
O_3	Zero/Span/Precision	Every 14 days	≥ ± 5%	< ±7.1% (percent difference) or < ±1.5 ppb difference, whichever is greater Zero drift < ± 3.1 ppb (24 hr) < ± 5.1 ppb (>24hr-14 day) Span drift < ± 7.1%	Appendix B
	Calibration/ Multipoint Verification	Quarterly, when greater than action limit, relocation, or repairs performed		All points < ± 2.1 % or < ±1.5 ppb difference of best-fit straight line whichever is greater and Slope 1 ± .05	Appendix B
CO	Zero/Span/Precision	Every 14 days	≥ ± 7%	< ±10.1% (percent difference) Zero drift < ± 0.41 ppm (24 hr) < ± 0.61 ppm (>24hr-14 day) Span drift < ± 10.1%	Appendix E & F

	Calibration/ Multipoint Verification	Quarterly, when greater than action limit, relocation, or repairs performed		All points < ± 2.1 % or < ± 0.03 ppm difference of best-fit straight line. whichever is greater and Slope 1 ± .05	Appendix E & F
SO_2	Zero/Span/Precision	Every 14 days	≥ ± 7%	< ±10.1% (percent difference) or < ± 1.5 ppb difference, whichever is greater Zero drift < ± 3.1 ppb (24 hr) < ± 5.1 ppb (>24hr-14 day) Span drift < ± 10.1%	Appendix C & F
	Calibration/ Multipoint Verification	Quarterly, when greater than action limit, relocation, or repairs performed		All points < ± 2.1 % or < ± 1.5 ppb difference of best-fit straight line whichever is greater and Slope 1 ± .05	Appendix C & F
NO_2	Zero/Span/Precision	Every 14 days	≥ ± 10%	< ±15.1% (percent difference) or < ± 1.5 ppb difference, whichever is greater Zero drift < ± 3.1 ppb (24 hr) < ± 5.1 ppb (>24hr-14 day) Span drift < ± 10.1%	Appendix D & F

	Calibration/ Multipoint Verification	Quarterly, when greater than action limit, relocation, or repairs performed		All points <+ 2.1 % or < ± 1.5 ppb difference of best-fit straight line whichever is greater and Slope 1 + .05	Appendix D & F
	Converter Efficiency	Every 14 days		***(≥96%)*** 96% – 104.1%	Appendix D & F
$PM_{2.5}$	One-point Flow Rate Verification	Every 30 days	≥ ± 3%	< ±4.1% of transfer standard < ±5.1% of flow rate design value	Appendix H
	Calibration/ Multipoint Verification	Annually, or when greater than action limit, or repairs performed		< ±2.1% of transfer flow standard < ±2.1°C Temperature ±10 mm Hg Pressure	Appendix G
PM_{10}	One-point Flow Rate Verification	Every 30 days	≥ ± 4%	< ±7.1% of transfer standard < ±5% of flow rate design value	Appendix H
	Calibration/ Multipoint Verification	Annually, or when greater than action limit or repairs performed		< ±2.1% of transfer flow standard < ±2.1°C Temperature ±10 mm Hg Pressure	Appendix G
PM Continuous	One-point Flow Rate Verification	Every 30 days	≥ ± 3%	< ± 4.1% of transfer standard < ±5.1% of flow rate design value	Appendix O & U

	Flow Calibration	When greater than action limit, relocation, or repairs performed		< ± 4.1% of transfer standard < ±5.1% of flow rate design value	Appendix O & U

B6 Inspection/Acceptance Requirements for Supplies and Consumables

Supplies and consumables used in the air monitoring program fall into three general categories: filters used in PM analysis; compressed calibration and span gases used in gas sample analysis; and general supplies including in-line filters, sample lines, desiccants, O-rings, and gaskets, etc.

Particulate filter materials are obtained from the EPA as part of the $PM_{2.5}$ program and must meet the specifications outlined in 40 CFR Part 50 Appendix L Section 6.0.

Gases must be EPA protocol gas-certified and obtained from a vendor who participates in the Protocol Gas Verification Program. Gasses are to be traceable to an appropriate standard reference material (NIST).

General supplies are typically original equipment manufacturer replacement parts and are handled according to the applicable SOP and/or manufacturer's documentation. If general supplies are not available from the original equipment manufacturer, every effort is made to procure from a reputable vendor, ideally one under current state government contract.

All consumables are inspected prior to use to assure that they meet all appropriate QA requirements. Additionally, supplies and consumables are checked for the general physical condition of the material/packaging to identify potential damage or contamination. If the integrity of the material is in question, it is replaced with an acceptable substitute.

Supplies and consumables inventories are tracked by all Air Lab staff. When inventory is low and replacements needed the Project Manager is responsible for generating a purchase requisition to replace the inventory. Purchase requisitions must be approved by upper management.

B6.1 Calibration Standards

Standards used for calibration will either be certified to local primary standards or sent out for certification. Standards requiring periodic calibration and the associated calibration method are listed in Table B6.6 below.

Table B6.6 E&E Calibration Standards Certification Schedule

Standard	Calibration/Certification Method
O_3 Level 2 Lab Standard	Sent to EPA R6 Houston Laboratory annually for certification with Level 1 Standard
O_3 Level 3 Transfer Standards	Certified Quarterly by using local Level 2 lab standard RSD of six slopes ≤ 3.7% Std. Dev. of six intercepts ≤ 1.5
O_3 Level 3 Site Bench Standards	Certified Quarterly by using local Level 2 lab standard RSD of six slopes ≤ 3.7% Std. Dev. of six intercepts ≤ 1.5
Bios Flow Meters	Sent to manufacturer annually for certification
EPA Protocol Compressed Gas Standards	Recertification will be by the supplier per EPA traceability protocol, EPA-600/R-12/531
Chinook Flow Transfer Standards	Certified annually using certified Bios Flow Meters
Weight Standards	Certified annually by Aldinger Corporation
Microbalances	Certified annually by Aldinger Corporation
Temperature Standard	Certified annually by Aldinger Corporation
Temperature Transfer Standards	Certified annually by using certified temperature standard

B6.2 Inspection/Acceptance Requirements for Supplies and Consumables

Supplies and consumables used in the air monitoring program fall into three general categories: filters used in PM analysis; compressed calibration and span gases used in gas sample analysis; and general supplies including in-line filters, sample lines, desiccants, O-rings, and gaskets, etc.

Particulate filter materials are obtained from the EPA as part of the $PM_{2.5}$ program and must meet the specifications outlined in 40 CFR Part 50 Appendix L Section 6.0.

Gases must be EPA protocol gas-certified and obtained from a vendor who participates in the Protocol Gas Verification Program. Gasses are to be traceable to an appropriate standards reference material (NIST).

General supplies are typically original equipment manufacturer replacement parts and are handled according to the applicable SOP and/or manufacturer's documentation. If general supplies are not available from the original equipment manufacturer, every effort is made to procure from a reputable vendor, ideally one under current state government contract.

All consumables are inspected prior to use to assure that they meet all appropriate QA requirements. Additionally, supplies and consumables are checked for the general physical condition of the material/packaging to identify potential damage or contamination. If the integrity of the material is in question, it is replaced with an acceptable substitute.

Supplies and consumables inventories are tracked by all Air Lab staff. When inventory is low and replacements needed the Project Manager is responsible for generating a purchase requisition to replace the inventory. Purchase requisitions must be approved by upper management.

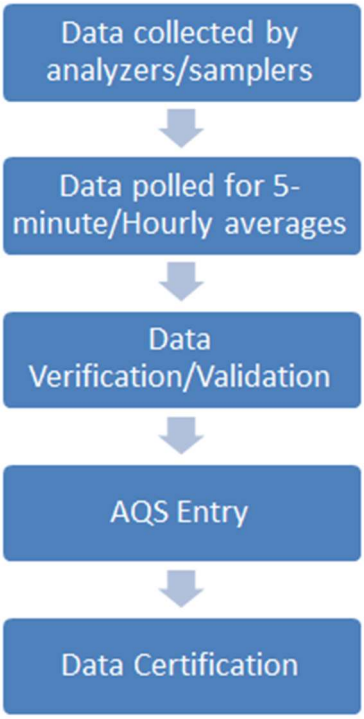
B7 Environmental Information Management

The success of E&E's ambient air quality program relies heavily on the data and data interpretation. It is critical that the data available to users be reliable, of known and discernible quality, and aggregated in a manner that is acceptable for its primary use. To accomplish this activity, data must be collected and handled in a consistent manner that protects and ensures its integrity.

B7.1 Continuous Data

Continuous monitoring data are generated at each site for each analyzer and stored on an Agilaire 8832 data logger. The data (5-minute and hourly averages) are collected on an hourly basis using polling software (Airvision) at a central computer in the Air Lab. The software polls each 8832 data logger at each site via a cellular modem. Each 8832 data logger can store up to 33 days of hourly data and fourteen days of 5-minute data. Once the data are in the Airvision database the data are verified and validated quarterly. Once the data is validated, it is formatted into an AQS file and submitted into AQS. Missing data flags are then entered into AQS for any missing data. Data are then certified annually.

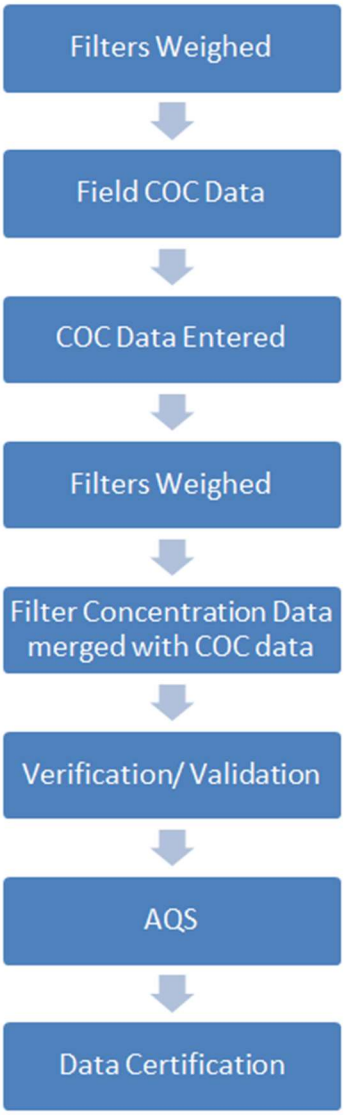
Figure B7.1 Continuous Data Flow



B7.2 Particulate FRM Data

Manual FRM particulate sample data are collected on a COC form for each filter run during setup and collection of each sample. The data from the COC are then entered into a filter spreadsheet on the Air Lab network. After filters are weighed, the data from COC filter spreadsheets are merged with filter concentration spreadsheets to calculate the filter mass concentration data. These files are then merged into a quarterly master file that contains site name, run date, filter number, temperatures, pressures, run time, volume, coefficient of variation, and concentrations. These quarterly filter files are verified, validated, and submitted into AQS quarterly. Missing data flags are then entered into AQS for any missing data. Data are certified annually. All new filters are pre-weighed. All samplers are weighed after sampling.

Figure B7.2 PM FRM Data Flow



B7.3 Data Storage

Raw continuous data are retained for at least three years on the Airvision database. FRM filter samples and COCs are retained for seven years. All electronic data and QA/QC data reside and are preserved on the E&E network. All data is secured by E&E Information Technology Services and only Air Lab staff has access to the data.

All paper QA/QC forms are stored at each site and in QC binder for continuous data. Paper QA/QC forms for PM FRM samplers are in site files in a file cabinet in the Air Lab. All PM COC forms are stored in bins in the Air Lab by year. All forms and electronic are secured. All paper forms are retained for seven years.

C1 Assessments and Response Actions

Assessments are designed to determine whether the ambient air quality monitoring program is being implemented in conformance with its approved QAPP Table C1 below provides a summary of assessments performed in the E&E ambient air monitoring network. To ensure the adequate performance of the quality system, E&E Air Lab performs and/or participates in the following assessments:

- Annual Network Review
- 5-Year Network Review
- National Performance Audit Program (NPAP) Audits
- Performance Evaluation Program (PEP) Audits
- Technical Systems Audits
- Performance Audits
- Data Certifications

The Annual Network Review shall provide for the documentation of the establishment and maintenance of an ambient air monitoring network. The review shall include a statement of whether the operation of each monitor meets the requirements of 40 CFR Part 58 Appendices A through E. Any changes to the network are noted in the network review. The 5-year network assessment is a more extensive evaluation of the air monitoring network. The assessment determines if the network meets the monitoring objectives defined in 40 CFR Part 58, Appendix D, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network.

E&E Air Lab participates in the NPAP for performance audits of gaseous monitoring equipment. E&E Air Lab also participates in the EPA PEP for performance audits of FRM $PM_{2.5}$ samplers. NPAP and PEP are performance evaluations during which quantitative data are collected independently to evaluate the accuracy of the monitoring equipment.

The Technical Systems Audit (TSA) is a thorough, independent, and systematic on-site qualitative assessment, during which facilities, equipment, personnel, training procedures, protocols, and recordkeeping are examined for conformance with regulatory requirements and this QAPP. The TSA is completed every three years by EPA Region 6 staff. Upon completion of the TSA, EPA reports all findings, concerns, and other observations. A corrective action plan addressing each finding and concern is then completed and submitted by E&E Air Lab staff.

Performance audits are completed quarterly on all monitors. The Air Lab staff conduct ambient air quality and meteorological monitoring equipment performance audits at the state-operated monitoring stations. This is to assure that by meeting all QA objectives, the dataset developed through monitoring activities is a representation of actual air quality. Audits are performed in adherence to the guidelines specified in the EPA QA Handbook Volume II with respect to type and frequency. Each member of the field operations staff is assigned one or more monitoring stations as his or her primary responsibility. Staff members visit their assigned stations at a

minimum once every two weeks. To complete the required performance audit duties, each field operator audits the equipment at a colleague's station, thereby assuring that an operator never audits his own equipment.

E&E Air Lab performs data certifications annually. In accordance with 40 CFR 58.15, an annual air monitoring data certification letter is required to certify that the data collected by the FRM and FEM monitors at SLAMS within the E&E Air Quality Monitoring Network meet criteria in 40 CFR Part 58, Appendix A from January 1 to December 31 of the previous year. Along with the certification letter, E&E must submit to EPA two AQS files, AMP600 Certification Evaluation and AMP45NC Quicklook All Parameters.

Table C1 E&E Assessments

Assessment Type	Assessment Agency	Frequency
Technical Systems Audit	EPA Regional Office	Every 3 years
Annual Network Review	EPA Regional Office/E&E Office of Air Quality	Annually
5 Year Network Review	EPA Regional Office/E&E Office of Air Quality	Every 5 years
NPAP Audits	EPA Regional Office Contractor	Annually
PEP Audits	EPA Regional Office Contractor	Annually
Performance Audits	E&E Air Laboratory	Quarterly
Semi-Annual Flow Rate Audit for Particulate Samplers	E&E Air Laboratory	Quarterly
Data Certification	E&E Air Laboratory	Annually

C2 Oversight and Reports to Management

This section describes the quality-related reports and communications to management necessary to support the E&E SLAMS Air Quality Monitoring Network. Unless otherwise indicated, data pertaining to all monitored pollutants is included in reports.

Reports to management alerts the management of possible problems in the ambient air monitoring network, proposes viable solutions to problems, and prepares necessary additional resources. Quality assessment, including technical systems evaluation, performance measurement, and data assessment, is conducted to ensure that measurement results meet program objectives. It ensures that necessary corrective actions are taken early, when they will be most effective.

Reports produced include:

- The **Annual Monitoring Network Plan** describes an annual review of the monitoring network conducted to determine if all federal monitoring requirements, as set forth in 40 CFR part 58, are being met and to outline any changes that will be made to the network.

- **Annual Data Certification:** As the PQAO for the SLAMS in Arkansas, each year the E&E Air Lab certifies that the air monitoring data that has been collected is accurate to the highest level possible via a letter and the required EPA Reports (AMP600, AMP450NC & AMP430).
- **E&E Weekly Ozone Report:** Hourly ozone concentrations with design value analysis are emailed to Office of Air Quality management weekly.
- **Technical Systems Audit Corrective Action Report:** TSA corrective action report is sent to Office of Air Quality management within 30 days of receiving initial report from EPA.
- **NPAP Audit Reports:** All NPAP audit reports are forwarded to Office of Air Quality management following completion of audit.
- **Daily Parameter Summary Report:** Sent to Project Manager daily for review.
- **Daily Ozone Calibration Report:** Sent to Project Manager daily for review.
- **Corrective Action Reports:** Corrective action reports are prepared by the Project Manager when a problem occurs in the E&E ambient monitoring network. The purpose of the corrective action report is to identify the problem, identify why the problem occurred, identify a process in which it can be prevented from recurring, and follow up after the process has been put into place. Corrective action reports are submitted to EPA R6.

SLAMS data reporting requirements to EPA; bias and accuracy calculation procedures are outlined in 40 CFR Part 58. These reporting requirements consist of quarterly reports of SLAMS data along with the respective QC results. Any changes/deletions to data in the AQS Database are submitted along with new data in the next scheduled report to EPA. Data collected by industry are reported to the state quarterly and, as a courtesy to the regulated community, submitted by the state to AQS on their behalf. Reports can be generated by AQS on demand to provide various summary reports on these data.

D1 Environmental Information Review

Data review is the examination of data; a multi-step, multi layered process to ensure data has been recorded, transmitted, and processed correctly and ultimately meets the needs of data users. Data review incorporates various verification and validation techniques which are used to accept, reject, or qualify data in an objective and consistent manner.

Data verification is a process of comparing how the data were gathered to the data collection plan (QAPP/SOPs). It is a data review technique that evaluates the completeness, correctness, and conformance of data against method, procedural, and/or contractual specifications. It can be further defined as confirmation, through the provision of objective evidence, that specific requirements have been fulfilled. Verification usually consists of checking that SOPs were followed and QC activities were performed.

Data validation is a data review technique designed to ensure that reported values meet the quality goals of the environmental data operation, in this case ambient air monitoring operations. It can be further defined as the examination, through the provision of objective evidence, that the particular requirements for a specified intended use (i.e., monitoring objectives) are fulfilled. Validation includes the evaluation of data for compliance with specified QC requirements, such as whether

the acceptance limits for various performance specifications were achieved. This is done in the assessment phase for the data set and ten reconciliations with regulatory DQOs to determine the suitability of use in decision making.

D1.1 Data Verification/Validation

Data verification and validation is a combination of checking and reviewing data processing operations and of monitoring the quality of field operations. This process can identify problems in either of these areas. Once problems are identified, the data can be corrected or invalidated, and corrective actions can be taken. All data, even if flagged, is preserved. For all data verification and validation activities, the E&E Air Lab will follow all guidance in **Best Practices for Review and Validation of Ambient Air Monitoring Data, August 2021.**

Data review is the in-house examination to ensure that the data has been recorded, transmitted, and processed correctly. It includes completeness checks to determine if there are any deficiencies such as missing data or lost integrity. The data under evaluation should be compared to actual events. In addition, it is expected that some of the QC checks will indicate that the data fail to meet the acceptance criteria. Data identified as suspect, or does not meet the acceptance criteria, shall be flagged with AQS codes prior to upload into AQS. The review of the routine data and the associated QC data will be verified and validated on a monthly basis. Gaseous data is downloaded to the data acquisition system (AirVision) daily and examined daily to ensure the data is acquired according to requirements. Continuous data is later reviewed in batches during the data validation process. Corrective action is taken if errors or anomalies are found. In cases when data does not meet quality goals, it may be flagged or invalidated.

Data verification is the process for evaluating the completeness, correctness, and conformance/compliance of the dataset against method, procedural, and contractual specifications. Verification can be further defined as a confirmation, through provision of objective evidence, that specified requirements have been fulfilled. The Project Manager verifies the gaseous and particulate data collected when reviewing and documenting data reports and filter summary reports, as well as by verifying or updating the flags applied to data by the site data loggers for continuous data. Any missing data (gaps) are reviewed and accounted for, and unacceptable or questionable data will be flagged by the Chemists and Field Cooperators during the daily and/or monthly data review process. At that time, all flagged data will be re-verified by the Project Manager.

Data validation is a routine process designed to ensure that reported values meet the quality goals of the environmental data operations. Data validation is further defined as examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. The primary intended use for E&E's Air Lab dataset is NAAQS compliance. A progressive, systematic approach to data validation must be used to ensure and assess the quality of data. Data validation includes the review of the Air Lab datasets against the individual pollutant MQOs (see Table B5), which is completed by the Project Manager and QAM. It also includes the review of data against the QA/QC results, as well as the comparison of the data against basic

statistics (such as completeness). Reviewing data long-term (over a monthly or quarterly timeframe) provides information about the structure of the data and may identify patterns, relationships, or potential anomalies. Invalidated data are replaced with AQS Null Data codes prior to upload to AQS (See Table B7.4 for a list of Null Data codes). The Project Manager and QAM spot-checks these data prior to AQS upload. Further details on data review, verification, and validations methods are in Section D2 of this QAPP.

Table D1.1 Missing Data Codes

Null Code	Null Code Description
AA	Sample Pressure out of Limits.
AB	Technician Unavailable.
AC	Construction/Repairs in Area.
AD	Shelter Storm Damage.
AE	Shelter Temperature Outside Limits.
AF	Scheduled but not Collected.
AG	Sample Time out of Limits.
AH	Sample Flow Rate or CV out of Limits.
AI	Insufficient Data (cannot calculate).
AJ	Filter Damage.
AK	Filter Leak.
AL	Voided by Operator.
AM	Miscellaneous Void.
AN	Machine Malfunction.
AO	Bad Weather.
AP	Vandalism.
AQ	Collection Error.
AR	Lab Error.
AS	Poor Quality Assurance Results.
AT	Calibration.
AU	Monitoring Waived.
AV	Power Failure.
AW	Wildlife Damage.
AX	Precision Check.
AY	Q C Control Points (zero/span).
AZ	Q C Audit.
BA	Maintenance/Routine Repairs.
BB	Unable to Reach Site.
BC	Multi-point Calibration.
BD	Auto Calibration.
BE	Building/Site Repair.
BF	Precision/Zero/Span.
BG	Missing ozone data not likely to exceed level of standard.

BH	Interference/co-elution/misidentification.
BI	Lost or damaged in transit.
BJ	Operator Error.
BK	Site computer/data logger down.
BL	QA Audit.
BM	Accuracy check.
BN	Sample Value Exceeds Media Limit.
BR	Sample Value Below Acceptable Range.
CS	Laboratory Calibration Standard.
DA	Aberrant Data (Corrupt Files, Aberrant Chromatography, Spikes, Shifts).
DL	Detection Limit Analyses.
EC	Exceeds Critical Criteria.
FI	Filter Inspection Flag.
MB	Method Blank (Analytical).
MC	Module End Cap Missing.
QV	Quality Control Multi-point Verification.
SA	Storm Approaching.
SC	Sampler Contamination.
ST	Calibration Verification Standard.
SV	Sample Volume out of limits.
TC	Component Check & Retention Time Standard.
TS	Holding Time Or Transport Temperature Is Out Of Specs.
XX	Experimental Data.

D2 Usability Determination Method

As stated in Section A2 of this QAPP, E&E has adopted the EPA data validation templates in the EPA QA Handbook and also Tables A6.2.1 through A6.2.9 of this QAPP. The data validation templates are sorted and classified into three main criteria categories as described in the QA Handbook: critical criteria (pink), operational criteria (yellow), and systematic criteria (blue). E&E will use these three categories, described below, when validating data:

- **Critical Criteria:** Deemed critical to maintaining the integrity of a sample (or ambient air concentration value) or group of samples. Observations that do not meet each and every criterion on the critical table should be invalidated unless there are compelling reasons 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. In most cases the requirement, the implementation frequency of the criteria, and the acceptance criteria are found in CFR and are therefore regulatory in nature.
- **Operational Criteria:** Violation of a criterion or a number of criteria may be cause for invalidation. The data validator should consider other quality control information that may

or may not indicate the data are acceptable for the parameter being controlled. Therefore, the sample or group of samples for which one or more of these criteria are not met is suspect unless other quality control information demonstrates otherwise and is documented. The reason for not meeting the criteria should be investigated, mitigated, or justified.

- **Systematic Criteria:** Include those criteria that are important for the correct interpretation of the data, but do not usually impact the validity of a sample or group of samples. An example criterion is that at least 75% of the scheduled samples for each quarter should be successfully collected and validated. The DQOs are also included in this table. If the data quality objectives are not met, this does not invalidate any of the samples, but it may impact the confidence in the attainment/non-attainment decision.

There are multiple layers of processing as data travels from the time it is initially collected until it is reported to AQS, all of which can have an impact on the final product. Therefore, E&E will follow the tiered data review method, as described in the EPA guidance document **Best Practices for Review and Validation of Ambient Air Monitoring Data, August 2021,** when verifying and validating data.

- **Level 0 (All Staff):** Data acquisition systems display continuous/near real-time concentrations from air monitoring instruments. The first, or Level 0 phase, of data review utilizes automated systems and occurs as the monitoring data are originally acquired. It includes automatic flagging of data by an instrument, data logger, and/or management system, which has been pre-programmed with specific acceptance criteria. This is a continuous, daily process. The Level 0 data review can help distinguish valid measurements from measurement errors, as well as distinguish actual measurements from automated QC activities, such as nightly zero/span/precision checks. For example, if automated nightly QC checks are scheduled, the data associated with those checks can be automatically flagged by the automated system with a user-defined flag that alerts the data reviewer of the specific check. Similarly, some monitoring equipment, such as particulate samplers, have this ability to flag data as they are acquired. Other management systems, such as AirNow-Tech, screen data prior to reporting real-time to a public interface. System codes for flow rate, filter loading, or any out-of-range parameters can be pre-programmed in the automated system/software and are very useful in diagnosing problems.

- **Level 1 (Chemists/Project Manager):** Level 1 data review should occur on a daily basis, with the data reviewer verifying the previous 24-hour's worth of data. If problems are readily identified during this review stage, they can be fixed more quickly, documented, and the system can resume gathering valid data sooner, minimizing data loss. Timely review also ensures that data quality issues, including any local impacts near the site/monitor, are consistently and accurately documented. The goals of Level 1 data review include:

    - To distinguish measurements from measurement errors, interferences, or contamination; and
    - To document events that impact data quality clearly when they first occur, so they don't have to be reconstructed weeks or months later.

To accomplish these two goals of Level 1 data, review the E&E Air Lab completes the following steps:

- Flag data results of values when monitoring instruments fail specified validation criteria with null codes for invalidation;
- Verifying computer file entries against data sheets/logbooks, where appropriate;
- Replacement of data from a backup data acquisition system in the event of failure of the primary system;
- Identification and flagging of data that are beyond reasonable values, significantly deviate from measurement assumptions, or that may be deemed unrepresentative; and
- Identification of data collected during periods of maintenance or malfunction.

- **Level 2 (Project Manager):** Level 2 review typically begins the validation stage of the review process, as more QA/QC data is available to the data reviewer; verification is also performed during Level 2 review. Ideally, Level 2 reviews should be conducted monthly and quarterly. The goals of Level 2 data review include:

  - Verifying the Level 1 review occurred properly and there is sufficient documentation to support decision making; and,
  - Ensuring data meets QA/QC requirements and the objectives of their intended use (validation).

  In addition to a Level 1 review of the data, the Level 2 review includes the Project Manager verifying the chemist's and field cooperator's logbooks and data forms for completeness and accuracy and ensures the data results meet the MQOs found in Tables A6.2.1 through A6.2.9. Data that do not meet the requirements of the critical criteria elements will be invalidated, unless compelling evidence and justification exists for not doing so. In case of the latter, the reason(s) for not invalidating the data will be documented. Qualifier flags may be applied to data that are found to not meet operational or systematic criteria. If multiple operational criteria flags are applied to the data, the Project Manager may deem that the data should be invalidated instead of qualified.

- **Level 3 (Project Manager/QAC)** The Level 3 review concludes the validation phase of the data review process. The goals of Level 3 data review include:

  - Verifying the Level 1 and 2 reviews and supporting documentation;
  - Ensuring data are accurate, complete, comparable, representative, and defensible, given the supporting documentation (validation); and
  - Approving data suitability for release to AQS.

  During Level 3 data review data is prepared for AQS submission and text files are created. The QAC and Project Manager will perform a cursory review of statewide data prior to upload to AQS. Once submitted successfully, AQS AMP reports will be reviewed by the QAC and Project Manager to verify data upload (transfer) was successful. These reports

are retained electronically in the Air Lab database. Furthermore, the data will also be spot-checked for accuracy by the QAC.

Figures D2.1 and D2.2 below illustrate the E&E Air Lab Data Review Flow for continuous data and FRM data.

Figure D2.1 E&E Continuous Data Review Process

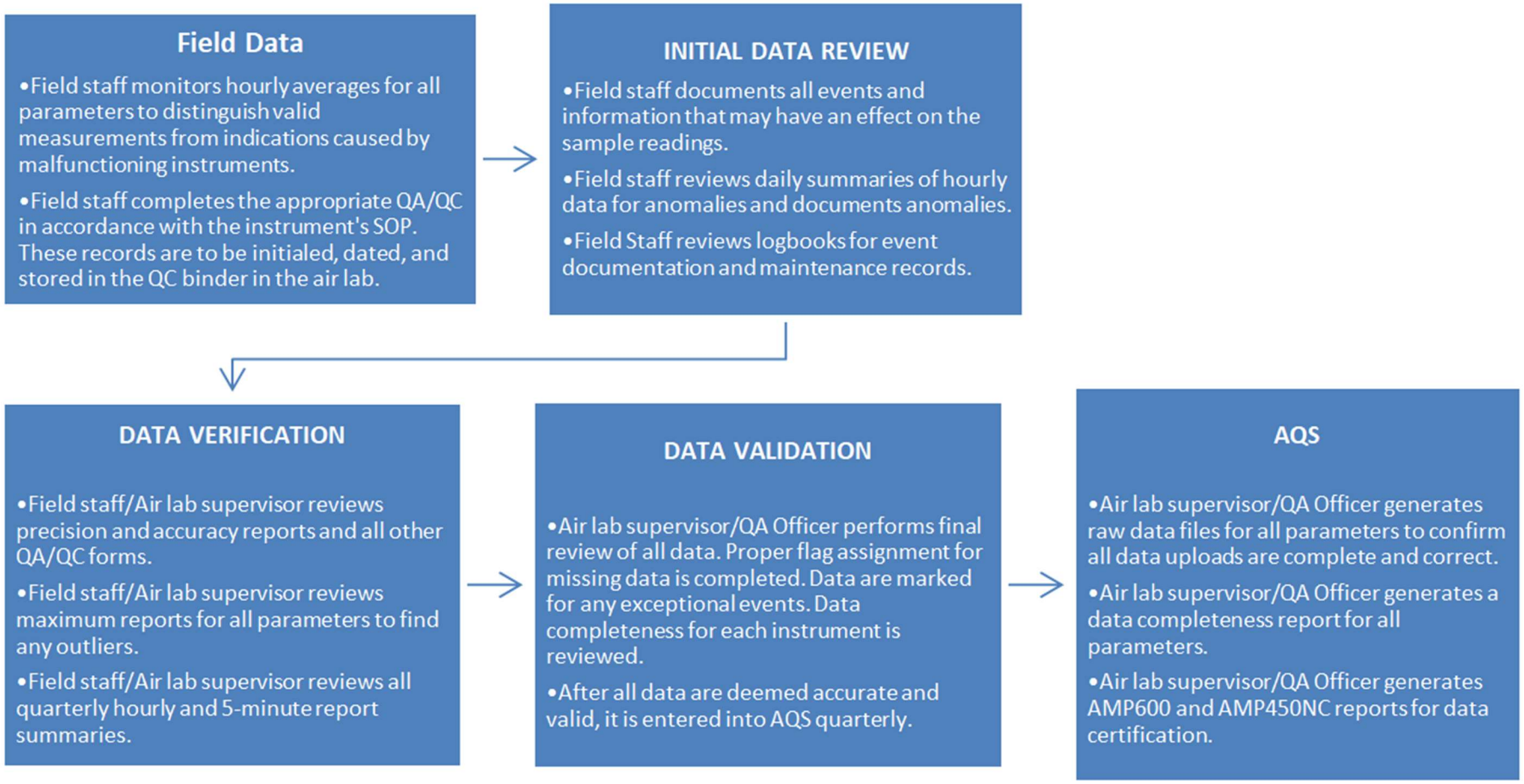
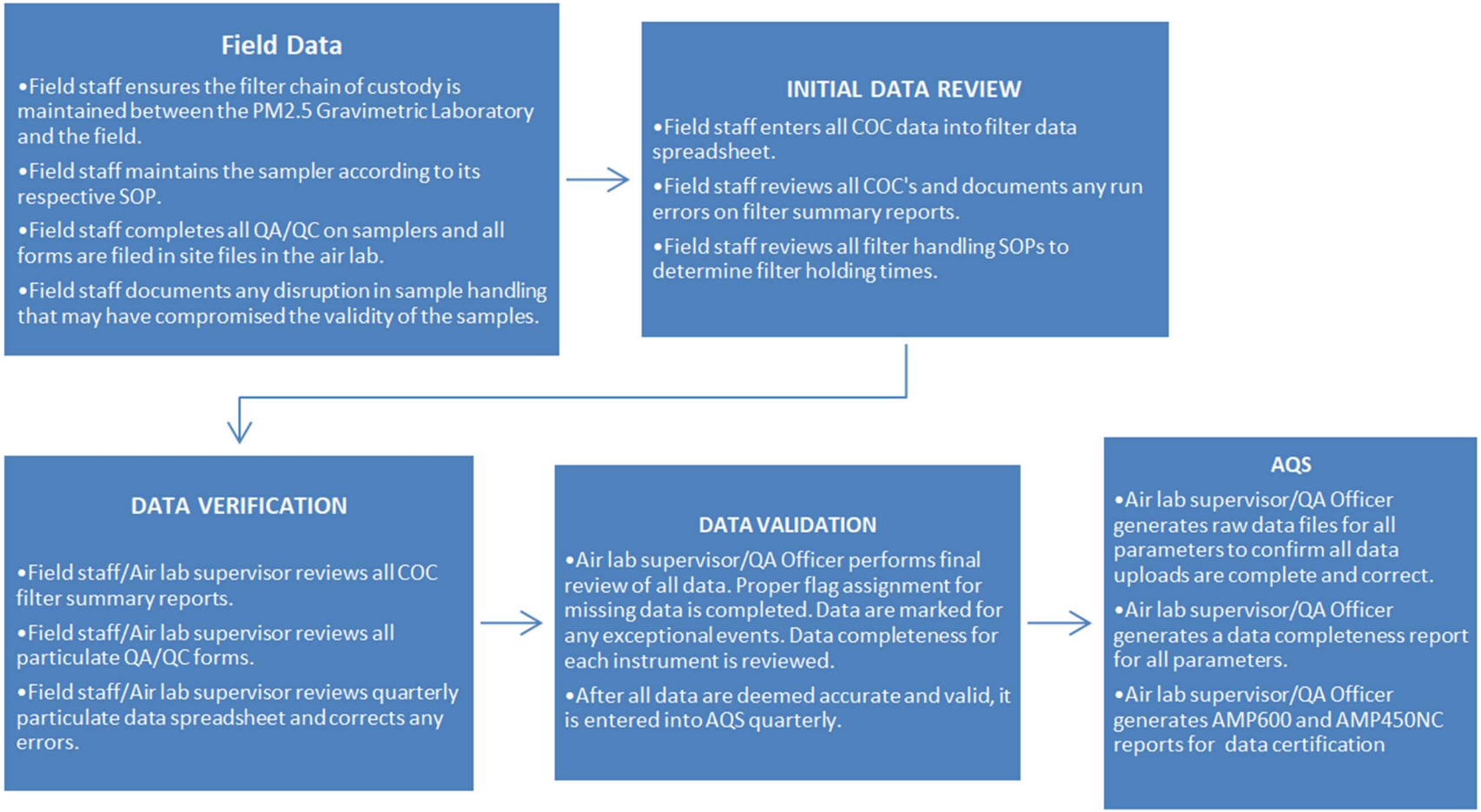


Figure D2.2 E&E Particulate FRM Data Review Process



D2.1 High Values

All exceedances measured by the state monitoring system are examined to determine if they occurred as the result of some natural event, as defined in the EPA Exceptional Events Rule and associated guidance. Documentation and reporting will be in accordance with this rule. All documentation pertaining to the event will be retained by the Project Manager and will be available for public review. Copies of the documentation will be forwarded to EPA, Region 6 for concurrence/non-concurrence as to the appropriateness of the exceptional event designation.

D2.2 Reconciliation with Data Quality Objectives

Criteria gas and particulate data are reconciled with DQOs identified in Section A6 of this QAPP through quarterly level 0-3 validation review procedures performed by Air Lab staff and the QA Coordinator In addition, further reconciliation of calendar year data is performed as part of the annual data certification process required by 40 CFR Part 58.15. E&E Air Lab must certify the previous year's criteria gas and particulate data submitted to AQS by May 1. This process involves generating the following AQS reports for applicable data parameters: AMP 600 Certification Report and AMP 450 NC Quicklook Report which include summaries of the data with associated DQO values.

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