Clean Air Branch Air Monitoring Program
Quality Assurance Project Plan
April 2023
Supplemental Document

APPENDIX IX

CAB Quality Assurance Officer
Internal Systems Audit Checklist

CAB Internal Systems Audit Checklist[1]

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[1] Adapted from U.S. EPA Quality Assurance Handbook for Air Pollution Measurement Systems Volume II, Appendix H 5/13

A. Quality Assurance and Quality Control

1. Status of Quality Assurance Program

Question	Yes	No	Comment
Are QA activities performed with internal personnel? If no, go to Section 3.	❒	❒	
Have specific audit procedures separate from monitoring procedures been documented and implemented?	❒	❒	
Are there two levels of management separation between QA and QC operations? Please describe below:	❒	❒	
Are there identifiable auditing equipment and standards (specifically intended for sole use) for audits?	❒	❒	

2. Internal Performance Audits

Question	Yes	No	Comment
Are there separate facilities to support audits and calibrations?	❒	❒	
If there are contracts or similar agreements either with another agency or contractor to perform audits or calibrations, please name the organization and briefly describe the type of agreement.			
If the agency does not have a performance audit SOP (include as attachment), please describe performance audit procedure for each type of pollutant (attach separate sheet if needed).			
Does the agency maintain independence of audit standards and personnel?	❒	❒	
Please provide information on certification of audit standards currently being used. Include information on vendor and internal or external certification of standards.			
Is there a certified source of zero air for performance audits?	❒	❒	
Are there procedures for auditing and/or validating performance of meteorological monitoring?	❒	❒	

Question	Yes	No	Comment
Please provide a list of the audit equipment and age of audit equipment.			
Is audit equipment ever used to support routine calibration and QC checks required for monitoring network operations? If yes, please describe.			
Are standard operating procedures (SOPs) for air monitoring available to all field personnel?	❒	❒	
Has the agency established and has it documented criteria to define agency-acceptable audit results?	❒	❒	

Complete the table below		
Pollutant	**How is performance tracked (e.g. control charts)**	**Audit Result Acceptance Criteria**
CO		
O_3		
NO_2		
SO_2		
PM_{10}		
$PM_{2.5}$ continuous		
$PM_{2.5}$ FRM		
Pb		
Trace CO		
Trace SO_2		
NO/NOy		
Meteorology		

Question	Yes	No	Comment
Were these audit criteria based on, or derived from, the guidance found in Volume II of the QA Handbook for Air Pollution Measurement System, Section 10.3?	❒	❒	
If no, please explain:			
If yes, explain any changes or assumptions made in the derivation:			
What corrective action may be taken if criteria are exceeded? If possible, indicate two examples of corrective actions, taken within the period since the previous systems audit which are based directly on the criteria discussed above.			
Corrective Action #1:			
Corrective Action #2:			

3. Planning Documents (including QMP, QAPP, & SOPs)

QMP questions	Yes	No	Comment
Is there an EPA-approved quality management plan?	❒	❒	
If yes, have changes to the plan been approved by the EPA?	❒	❒	
Has the QMP been approved by EPA within the last five years?	❒	❒	
Please provide: Date of original approval: Date of last revision: Date of latest approval:			
QAPP questions	**Yes**	**No**	**Comment**
Is there an EPA-approved quality assurance project plan?	❒	❒	
If yes, have changes to the plan been approved by the EPA?	❒	❒	
Has the QAPP been reviewed by EPA annually?	❒	❒	
Please provide: Date of original approval: Date of last revision: Date of latest approval:			
Are there any revisions to the QA project plan still pending?	❒	❒	
How is it verified that the QA project plan is fully implemented?			
How are the updates distributed?			
What personnel regularly receive updates?			
SOP questions	**Yes**	**No**	**Comment**
Are SOPs prepared and implemented for all facets of operation?	❒	❒	
Do the SOPs adequately address ANSI/ASQC E-4 quality system required by 40 CFR 58, Appendix A?	❒	❒	
Are copies of the SOP or pertinent sections available to agency personnel?	❒	❒	
How is it verified that the SOPs are implemented as provided?			
How are the updates distributed?			

4. General Documentation Policies

Question	Yes	No	Comment
Is there a documented records management plan?	❒	❒	
Is there a list of files considered official records and their media type (i.e. paper, electronic)?	❒	❒	
Is there a schedule for retention and disposition of records?	❒	❒	
Are records retained for at least three years?	❒	❒	
Who is responsible for the storage and retrieval of records?			
What security measures are utilized to protect records?			
Where/when does the agency rely on electronic files as primary records?			
What is the system for the storage, retrieval and backup of these files?			

5. Training

Question	Yes	No	Comment
Is there a formal training program and training plan?	❒	❒	
Where is it documented?			
Does it make use of seminars, courses, EPA sponsored college level courses?	❒	❒	
Are personnel cross-trained for other ambient air monitoring duties?	❒	❒	
Are training funds specifically designated in the annual budget?	❒	❒	
Does the training plan include:			
Training requirements by position?	❒	❒	
Frequency of training?	❒	❒	
Training for contract personnel?	❒	❒	
A list of core QA related courses?	❒	❒	

Indicate below the three most recent events and identify the personnel participants.		
Event	**Date(s)**	**Participant(s)**

6. Oversight of Contractors and Suppliers

Questions about Contractors			
Question	**Yes**	**No**	**Comment**
Who is responsible for oversight of contract personnel?			
What steps are taken to ensure contract personnel meet training and experience criteria?			
How often are contracts reviewed and/or renewed?			
Questions about Suppliers			
Have criteria and specification been established for consumable supplies and for equipment?	❒	❒	
What supplies and equipment have established specifications?			
Is equipment from suppliers open for bid?	❒	❒	

7. Corrective Action

Question	Yes	No	Comment
Is there a comprehensive corrective action program in place and operational?	❒	❒	
Have the procedures been documented?	❒	❒	
As a part of the QAPP?	❒	❒	
As a separate SOP?	❒	❒	
Are there established and documented corrective limits for QA and QC activities?	❒	❒	
Are procedures implemented for corrective actions based on results of the following which fall outside the established limits:			
Performance evaluations?	❒	❒	
Precision goals?	❒	❒	
Bias goals?	❒	❒	
NPAP audits?	❒	❒	
Validations of one point QC check goals?	❒	❒	
Completeness goals?	❒	❒	
Data audits?	❒	❒	
Calibrations and zero span checks?	❒	❒	
Technical Systems Audit findings?	❒	❒	
Have the procedures been documented?	❒	❒	
How is responsibility for implementing corrective actions assigned? Briefly discuss.			

How does the agency follow up on implemented corrective actions?
Briefly describe recent examples of the ways in which the above corrective action system was employed to remove problems.

8. Quality Improvement

Question	Yes	No	Comment
What actions were taken to improve the quality system since the last TSA?			
Since the last TSA do the control charts indicate that the overall data quality for each pollutant is steady or improving?	❒	❒	
For areas where data quality appears to be declining has a cause been determined?	❒	❒	
Have all deficiencies indicated on the previous TSA been corrected?	❒	❒	
If not, explain.			
Are there pending plans for quality improvement such as purchase of new or improved equipment, standards, or instruments?	❒	❒	

9. External Performance Audits

Question	Yes	No	Comment
Does the agency participate in NPAP, PEP, Pb PEP, Pb Strip Audit, AA_PGVP and other performance audits performed by an external party and/or using external standards?	❒	❒	
If not, please explain:			
Are NPAP audits performed by QA staff, site operators, calibration staff and/or another group?	❒	❒	

NPAP and Additional Audits

Does the agency participate in the NPAP as required under 40 CFR 58 Appendix A? If so, identify the individual with primary responsibility for the required participation in the NPAP.

Name:_____ Program function: _____

List date and result of latest audit. Describe any additional audits conducted:

Parameter Audited	NPAP Audit		Additional Performance Audit	
	Date of last audit	Result	Date of last audit	Result
CO				
O_3				
SO_2				
NO_2				
PM_{10}				
$PM_{2.5}$				
Pb				
Trace CO				
Trace SO_2				
Trace NO				
Trace NOy				

B. Field Support

1. General

Question	Yes	No	Comment
On average, how often are most of the stations visited by a field operator?			
On average, how many stations does a single operator have responsibility for?			
How many of the stations in the SLAMS/NCORE network are equipped with sampling manifolds?			
Do the sample inlets and manifolds meet the requirements for through the probe audits?	❒	❒	
Briefly describe most common manifold type			
Are manifolds cleaned periodically?	❒	❒	How often?
What is used to perform the cleaning?			
Are manifold(s) equipped with a blower? (List the stations with a manifold and blower)			
Is there sufficient air flow through the manifold at all times?	❒	❒	Approximate air flow:
How is the air flow through the manifold monitored?			
Is there a conditioning period for the manifold after cleaning?	❒	❒	Length of time:
What is the residence time?			
Sampling lines: What material is used for instrument sampling lines?			
Are lines changed or cleaned once per year?	❒	❒	
Are there uninterruptable power supplies or backup power sources at the sites?	❒	❒	
What instruments or devices are protected?			

2. SOPs

Question	Yes	No	Comment
Is the documentation of monitoring SOPs complete?	❒	❒	
Are any new monitoring SOPs needed?	❒	❒	
Are such procedures available to all field operations personnel?	❒	❒	
Are SOPs that detail operations during episode monitoring prepared and available to field personnel?	❒	❒	
Are SOPs based on the framework contained in Guidance for Preparing Standard Operating Procedures EPA QA/G-6?	❒	❒	

Please complete the following table:

Pollutant Monitored	Date of Last SOP Review	Date of Last SOP Revision
SO_2		
NO_2		
CO		
O_3		
PM_{10}		
$PM_{2.5}$ FRM mass		
Pb		
$PM_{2.5}$ speciation		
$PM_{10\text{-}2.5}$ FRM mass		
Continuous $PM_{2.5}$ mass		
Trace CO		
Trace SO_2		
Trace NO		
Trace NOy		
Surface Met (WS, WD, T, RH)		
Other		

3. Instrument and Consumables Acceptance

Has the agency obtained necessary waiver provisions to operate equipment which does not meet the effective reference and equivalency requirements? List all waivers.

List the instruments in the agency's inventory:

Pollutant	Number	Make and Models	Reference or Equivalent Number
SO_2			
NO_2			
CO			
O_3			
PM_{10}			
$PM_{2.5}$			
Pb			
Multi gas calibrator			
$PM_{2.5}$ speciation			
$PM_{10\text{-}2.5}$ FRM mass			
Continuous $PM_{2.5}$			
Trace CO			
Trace SO_2			
Trace NO			
Trace NOy			
Surface Met (WS, WD, RH, T)			
Other			

Question	Yes	No	Comment
Are criteria established for acceptance of field QC equipment?	❒	❒	
Are criteria established for acceptance of field QC gas standards?	❒	❒	
Are formal acceptance testing documented?	❒	❒	
Where is this document kept?			
How are the expiration dates for calibration and span gases at the stations tracked?			
Are the selection criteria for support systems documented and available for inspection?	❒	❒	
Is documentation available to demonstrate that the support systems meet specified requirements?	❒	❒	
Are testing and acceptance dates and results for the data acquisition and management system documented and available for review?	❒	❒	

4. Calibration

Indicate the frequency of multi-point calibrations.

Pollutant	Frequency	Name of Calibration Method

Question	Yes	No	Comment
Are field calibration procedures included in the SOPs?	❒	❒	Location of SOP:
Are calibrations performed in keeping with the guidance in QA Handbook for Air Pollution Measurement Systems Vol. II?	❒	❒	If no, why not?
Are calibration procedures consistent with the operational requirements of Appendices to 40 CFR 50 or to analyzer operation/instruction manuals?	❒	❒	If no, why not?
Have changes been made to calibration methods based on manufacturer's suggestions for a particular instrument?	❒	❒	
Do standard materials used for calibrations meet the requirements of appendices to 40 CFR 50 (EPA reference methods) and Appendix A to 40 CFR 58 (traceability of materials to NIST-SRMs or CRMs?	❒	❒	
Are all flow-measurement devices checked and certified?	❒	❒	

Additional comments:

List the authoritative standards used for each type of flow measurement, indicate the certification frequency of standards to maintain field material/device credibility.

Flow Device	Primary Standard	Frequency of Certification
Hi-Volume orifice		
TriCal		
BIOS		
Delta Cal		
Gilibrators		
Other:		

Where do field operations personnel obtain gas standards?			
Standards are certified by:			
The agency's laboratory?	❒	❒	
EPA/NERL standards laboratory?	❒	❒	
The vendor?	❒	❒	
Other (describe)			

Question	Yes	No	Comment
How are the gas standards verified after receipt?			
How are flow measurement devices certified?			
Are certifications of all standards currently in use (chemical, ozone, flow and zero air standards) kept in a logbook or folder and available for inspection?	❒	❒	
What equipment is used to perform calibrations (e.g. dilution devices) and how is the performance of this equipment verified?			
Does the documentation include expiration date of certification?	❒	❒	
Reference to primary standard used?	❒	❒	
What traceability is used?			
Is calibration equipment maintained at each station?	❒	❒	
How is the functional integrity of this equipment documented?			
Who has responsibility for maintaining field calibration standards?			

List the authoritative standards and frequency of each type of dilution, permeation and ozone calibrator and indicate the certification frequency.

Calibrator	Primary Standard	Frequency of Certification
Permeation calibrator flow controller		
Permeation calibrator temperature		
Dilution calibrator air and gas flow controllers		
Field/working standard photometer		
Ozone generator		

Identify station standards for gaseous pollutants at representative air monitoring stations			
Parameter	**Station(s)**	**Identification of Standard(s)**	**Recertification Date(s)**
CO			
NO_2			
SO_2			
O_3			

5. Repair

Question	Yes	No	Comment
Who is responsible for performing preventive maintenance (PM)?			
Is special training provided for performing PM?	❒	❒	
Type of training and/or courses:			
Is this training routinely reinforced?	❒	❒	
If no, why not?			

List the PM schedule for each type of field instrument:

Instrument	PM Schedule

	Field Station	Main Lab	Manufacturer
If PM is MINOR, it is performed at:	❒	❒	❒
If PM is MAJOR, it is performed at:	❒	❒	❒
Are there service contracts or agreements in place with instrument manufacturers? List which instruments are covered.			
What is the adequacy and availability of the supply of spare parts, tools and manuals available to the field operator to perform any necessary maintenance activities and prevent significant data loss:			
Are there any recurring problem with equipment(s) or manufacturer(s)? Identify the equipment or manufacturer and steps taken to remedy the problem:			
In the last 2 years, was more than 24 hours of data lost due to repairs?		Y❒	N❒
In the last 2 years, was more than 48 hours of data lost due to repairs?		Y❒	N❒
In the last 2 years, was more than one week of data lost due to repairs?		Y❒	N❒
Explain any situations where instrument down time was due to lack of PM or unavailability of parts.			

6. Recordkeeping

Question	Yes	No	Comment
What type of station logbooks are maintained at each monitoring stations? (e.g., maintenance, calibration, personal, etc.)			
What information is included in the station logbooks?			
Who reviews and verifies the logbooks for adequacy of station performance?			
How is control of logbooks maintained?			
Where is the completed logbook archived?			
What other records are used?			
Zero span record?	❒	❒	
Gas usage log?	❒	❒	
Maintenance log?	❒	❒	
Log of precision checks?	❒	❒	
Control charts?	❒	❒	
A record of audits?	❒	❒	
Are calibration records or at least calibration constants available to field operators?	❒	❒	
Describe the use and storage of these documents.			

C. Data and Data Management

1. Data Handling

Question	Yes	No	Comment
Is there a procedure, description, or a chart which shows a complete data sequence from point of acquisition to point of submission of data to EPA?	❒	❒	
Provide a data flow diagram.			
Are data handling procedures (e.g., data reduction, review) documented?	❒	❒	

What media and formats do data arrive at the data processing location? List below.

Category of Data (by Pollutant)	Data Media and Formats

Question	Yes	No	Comment
Is there documentation accompanying the data regarding any media changes, transcriptions, or flags which have been placed into the data before released to data processing?	❒	❒	
Describe the type of documentation.			
How are data actually entered into the computer system? (e.g., copied from disk or data transfer device, manual entry, strip charts, or other)?			

2. Software Documentation

Question	Yes	No	Comment
Are AQS manuals used?	❒	❒	
Are AirNow manuals used?	❒	❒	
If yes, list the title of each manual used including the version number and date published.			
What are the origins of the software used to prepare air monitoring data for release into the AQS and AirNow database? List the documentation for the software currently in use for data processing, including the names of the software packages, vendor or author, revision numbers, and the revision dates of the software.			
What is the recovery capability in the event of a significant computer problem (how much time and data would be lost?)			
Has the data processing software been tested to ensure its performance of the intended function is consistent with the QA Handbook, Volume II and Section 14.0?	❒	❒	
Are software tests documented?	❒	❒	
If yes, describe the documentation.			

3. Data Validation and Correction

Question	Yes	No	Comment
Have the validation criteria been established and documented?	❒	❒	
Does documentation exist on the identification and applicability of flags (i.e., identification of suspect values) within the data as recorded in the computer files?	❒	❒	
Is the data validation criteria documented, including limits for values such as flow rates, calibration results and range tests for ambient measurements?	❒	❒	
If yes, describe what action is taken with the data if limits are exceeded (e.g., flagged, modified, invalidated, etc.)			
Provide examples to illustrate what actions are taken when validation criteria are exceeded.			
Describe how changes made to data and submitted to AQS and AirNow are documented.			
Who has signature authority for approving corrections? Name: Program function:			
Discuss the criteria used to determine if a data point is to be deleted.			
Discuss the criteria used to determine if a data point needs to be reprocessed.			
Are corrected data resubmitted to the issuing group for cross-checking prior to release?	❒	❒	

4. Data Processing

Question	Yes	No	Comment
Are data summary reports generated?	❒	❒	

List at least 3 reports routinely generated:

Report Title	Distribution	Period Covered

Question	Yes	No	Comment
How often are data submitted to AQS and AirNow?			
Briefly comment on difficulties (if any) encountered in coding and submitting data following the guidance of the AQS guidelines:			
Are hard copy printouts on submitted data routinely requested from AQS?	❒	❒	
Are records kept for at least 3 years in an orderly, accessible form?	❒	❒	
If yes, does this include: ❒Raw data ❒Calculations ❒QC data ❒Reports			
If no, why not?			
Is data submitted along with the appropriate calibration equations used to the data processor?	❒	❒	
Other than $PM_{2.5}$, are concentrations of pollutants corrected to standard temperature and pressure (i.e., 298K and 760mm Hg) before input to AQS?	❒	❒	
Are concentrations of $PM_{2.5}$ reported to AQS under actual (volumetric) conditions?	❒	❒	
Are data reduction procedures audited on a routine basis?	❒	❒	
If yes, at what frequency?			
Are precision and accuracy data checked each time they are calculated, recorded, or transcribed to ensure that incorrect values are not submitted to EPA?	❒	❒	

5. Internal Reporting

What internal reports are prepared and submitted as a result of the audits required under 40 CFR 58 Appendix A?	
Report Title	**Frequency**
What internal reports are prepared and submitted as a result of precision checks as required under 40 CFR 58 Appendix A?	

Question	Yes	No	Comment
Do the audit or precision check reports include a discussion of corrective actions initiated based on audit or precision check results?	❒	❒	

Who is responsible for the calculation and preparation of data summaries? Who are the recipients?

Name	Title	Type of Report	Recipient

6. External Reporting

For the current calendar year or portion thereof which ended at least 90 calendar days prior to this TSA, provide the following percentages for required data submitted on time.							
Percent submitted on time (within 90 calendar days after the end of the quarter in which the data were collected)							
Quarter	**SO_2**	**CO**	**O_3**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
1 (Jan 1 - March 31							
2 (Apr 1 – June 30)							
3 (July 1 – Sept 30)							
4 (Oct 1 – Dec 31)							

For the same period, what fraction of the stations (by pollutant) reported less than 75% of the data (adjusted for site start-ups and shut-downs)							
Percent of stations with <75% data recovery							
Quarter	**SO_2**	**CO**	**O_3**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
1 (Jan 1 - March 31							
2 (Apr 1 – June 30)							
3 (July 1 – Sept 30)							
4 (Oct 1 – Dec 31)							

Question	Yes	No	Comment
Is the Air Quality Index reported?	❒	❒	
Is the annual data summary report as required in 40 CFR 58.15(b) submitted?	❒	❒	