

STATE OF CALIFORNIA
AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME V

AUDIT PROCEDURES
FOR
AIR QUALITY MONITORING

MONITORING AND LABORATORY DIVISION

FEBRUARY 2011

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5.0.0 OBJECTIVE

The objective of Volume V of the Air Resources Board (ARB) Quality Assurance Manual is to define the responsibilities for conducting system and performance audits and to also provide standardized documented audit procedures and reporting formats. The objective of the audit program is to assure all published air quality data are from approved sites, gathered by trained personnel using approved methods in accordance with well documented procedures, traceable to recognized standards and reported with assessments of their precision and accuracy. The audit program thus assures that air quality data are comparable and can be used with confidence by air pollution control officials, the medical community and others.

5.0.0.1 DEFINITION OF SYSTEM AND PERFORMANCE AUDITS

A system audit is an on-site inspection and review of a monitoring organization's entire program in which the total measurement system is reviewed (sample collection, sample analysis, data processing, etc.). The audit includes a review of staff, standard operating procedures, facilities, and documentation to assure compliance with federal and state air quality monitoring, quality assurance, siting and data reporting regulations (40 CFR Part 58).

A performance audit is an on-site test aimed at challenging the integrity of the air monitoring site's or laboratory's ability to generate data of acceptable quality. Variations in the audit procedures correspond to the type of performance audit being conducted. Performance audit categories are as follows:

- A. Through-the-probe audits (Gaseous Criteria and Gaseous Toxic). Known concentrations of gases (National Institute of Standards Technology (NIST) traceable) are used to challenge the analyzers. The sampler's measured results are then compared to the actual results.
- B. Sampler flow audits (High and low volume particulate matter of 10 microns or less (PM10), particulate matter of 2.5 microns or less (PM2.5), high and low volume total suspended particulate (TSP), Tapered Element Oscillating Microbalance (TEOM), PM10 and PM2.5 Beta Attenuated Monitor (BAM)): Flow measurement instruments (NIST traceable) are used to compare the sampler's measured and actual flow rate.
- C. Laboratory Audits (PM2.5 and PM10 Mass), wet acid deposition, toxic air contaminants, toxic metals (Pb), PM10 ions, Non-Methane Organic Compound (NMOC), Volatile Organic Compound (VOC), motor vehicle, and pesticides): Measured results are compared to actual results using

known quantities of compounds and NIST traceable instrumentation where available.

- D. Meteorological Audits (wind speed, wind direction, temperature and barometric pressure): Sensors are checked for accuracy using NIST traceable instruments. The measured results are then compared to the actual results.

In addition, a performance audit includes a review of the site, the primary data recording device and the procedures used to record and report data.

5.0.0.2 AUDIT SCHEDULES

System audits are conducted periodically at the ARB and local district facilities. Performance audits are conducted quarterly on at least 25 percent of the State and Local Air Monitoring Stations (SLAMS) for each criteria pollutant. Special Purpose Monitors (SPM from which data are to be used for State Implementation Plans (SIPS) and non-criteria pollutant instrumentation are also audited on a regular basis.

Performance audits are scheduled so that they meet the U.S. Environmental Protection Agency's (EPA) regulations set forth in 40 CFR Part 58. Since some sites are seasonal or have a limited operational window, performance audits are also scheduled to accommodate these factors. Whenever possible, calibrations and audits shall be scheduled at alternating six-month intervals to provide a semi-annual multi-point performance check of each station.

5.0.1 SYSTEM AUDIT PROCEDURES

5.0.1.1 RESPONSIBILITY

System audits of monitoring organizations operating National Air Monitoring Stations (NAMS) are the responsibility of the U.S. EPA. The U.S. EPA may negotiate with private contractors or the ARB to conduct NAMS system audits. In addition to NAMS system audits, the Quality Assurance Section (QAS) of the ARB's Monitoring and Laboratory Division (MLD) also conducts field as well as laboratory system audits of PM10 and PM2.5. The QAS also conducts routine system audits of SLAMS without a subset of NAMS sites as well as other selected private contractors.

5.0.1.2 POLICY

System audit procedures used by the QAS are in accordance with those stipulated in U.S. EPA's Quality Assurance Handbook (EPA-600/4-77-022a, Section 2.0.11). Questionnaires and check sheets are formulated from U.S. EPA's regulations and guidelines for the type of system audit being conducted. These audit questionnaires and check sheets are mailed to the audited organization in advance of the actual on-site visit. The monitoring organization is to complete the questionnaires and check sheets and return them to the auditors at least one week prior to the on-site visit.

Each system audit will be documented in a preliminary system audit report which will be sent to the audited organization for review. The report will include the findings of the auditors and, whenever necessary, suggested corrective actions. After the audited organization has reviewed the preliminary system audit report, it will be returned to the QAS where the final system audit report will be drafted. It is the responsibility of the audited organization to correct all deficiencies and report such corrections to the QAS and U.S. EPA Region IX quality assurance coordinators. Some deficiencies may be reviewed during the next performance audit.

5.0.1.3 COMPONENTS OF A SYSTEM AUDIT

- A. Assessment of the staff:
 - 1. Background and education.
 - 2. Chain of command regarding description of assignments and specific duties.
 - 3. Continued training for staff.
 - 4. Level of staffing.

- B. Assessment of facilities:
1. Review questionnaires and check sheets with staff at site.
 2. Review laboratory practices.
 3. Review field activities.
 4. Inspect laboratory and support facilities.
 5. Review monitoring sites with respect to stated siting criteria and representativeness requirements.
 6. Audit controlled environment (temp, RH etc.) as required by U.S. EPA guidelines.
- C. Assessment of data and document control:
1. Review chain-of-custody forms.
 2. Review laboratory daily operational records.
 3. Review field documentation and records.
 4. Review the reporting format including the process used to upload data.
 5. Review the process and how long the data will be archived.
- D. Assessment of the quality control programs:
1. Review the Standard Operating Procedures.
 2. Review adequacy and adherence to procedures.

5.0.2 PERFORMANCE AUDIT PROCEDURES

5.0.2.1 RESPONSIBILITY

The Quality Assurance Section (QAS) of the Air Resources Board's (ARB) Monitoring and Laboratory Division is responsible for preparing and implementing these audit procedures. The auditors shall be QAS staff and work independently of the operator/analyst functions of the ARB's air quality surveillance program.

5.0.2.2 POLICY

- A. Whenever possible, audits shall be conducted with a staff member of the monitoring organization present.
- B. Monitoring personnel shall provide the auditor with the instrument's make, model, identification number, equivalency certification number, operating parameters, and responses of the audits as read from the primary data recording device. Variations in the audit procedures correspond with the type of performance audit being conducted.
- C. The operating agency is responsible for correcting deficiencies found during the audit.
- D. The QAS shall calculate and report data accuracy estimates for reference and equivalent method analyzers operated as SLAMS within the ARB reporting organization. Procedures for calculating and reporting data accuracy estimates are presented in Volume I of this manual.
- E. The auditors will not make instrument adjustments (e.g. adjustments to potentiometer, replacement of parts, etc.). However, after the initial audit points are taken, the attending monitoring personnel may perform maintenance and make repairs. If such repairs are made at the time of the audit and schedules permit, the auditors will perform a series of post audit checks to verify accurate analyzer or sampler performance. If the nature of the adjustments and/or repairs are such as would normally require a recalibration of the instrument, the audit shall not suffice as a recalibration. However, the data taken between time of the post audit checks and the recalibration, shall be validated and reported if the instrument's "as is" performance at the time of the recalibration is within acceptable accuracy limits.
- F. All audit standards shall be certified and traceable to either NIST standards or other authoritative standards.

5.0.2.3 PREAUDIT CONTACTS

- A. The auditor will contact the organization to be audited one or two weeks prior to audit date. During the contact, the auditor will verify and confirm the following:
1. Date and time that each site will be audited.
 2. Samplers and instruments operating at the site and if all equipment are in working order.
 3. Calibration dates, serial numbers, and other pertinent information available at the time of the audit.
 4. Any special situations such as parking, locks/codes, directions, etc.
 5. Develop cooperation so that those instruments found operating outside the ARB's control limits will be remedied quickly.
- B. An email will be sent to the organization to be audited confirming the above information.

5.0.2.4 EQUIPMENT REQUIREMENTS

Specific equipment requirements for each audit procedure are listed in each Appendix.

5.0.2.5 AUDIT DOCUMENTATION AND FORMS

- A. The vehicle inspection list (Figure 5.0.2.1) is checked off before each audit trip to ensure that all the required audit equipment is present. All pertinent site information such as site topography, site dossier, and site location are printed out and reviewed before an audit trip.
- B. The QAS audit program contains preliminary audit results as well as the Site Survey Report (Figure 5.0.2.2). Data such as longitude, latitude, station temperature, siting report, cleaning schedule, calibrations, in-line filter changes, etc., are inputted in the above report. Photos of the site and probe are taken and uploaded to the program.
- C. Audit data are entered on the Audit Worksheets (Figure 5.0.2.3) to report preliminary audit results. This audit data is then transferred into the QAS audit program where audit calculations are processed using certified standards.

- D. Audit results from the QAS audit program are printed at the end of the audit and reviewed with the site operator.

5.0.2.6 AUDIT REPORTS

- A. Quarterly and annually, audit results for criteria pollutants are reported to the EPA showing individual and polled data accuracy estimates. These results are calculated using EPA's data analysis and reporting methods (40 CFR Part 58, Appendix A). See Volume I of this manual for procedures and formats for calculating these estimates.

5.0.2.7 CORRECTIVE ACTIONS

Whenever an audit indicates an exceedance of the accuracy limits, an Air Quality Data Action (AQDA) request (Figure 5.0.2.4) will be initiated. The AQDA withholds data from entering the ARB's data files until investigation and necessary corrective actions are taken and reported. If necessary, the data are corrected. If data corrections cannot be made, the data shall be invalidated back to the initial occurrence of the malfunction. If the date and time of the malfunction cannot be verified, data shall be invalidated back to the last successful calibration, span, check, or audit.

Variations in the accuracy limits correspond with the type of analyzers or instruments being audited. Accuracy limits are listed below:

- A. Gaseous analyzers (except Ozone):
- $\pm 15\%$ from true.
 - $\pm 10\%$ from true, results in warning.

Ozone analyzers:

- $\pm 10\%$ from true.
- $\pm 7\%$ from true, results in warning.

- B. Flow samplers

1. PM10, TEOM, PM10 BAM, Xontech 920/924:
 - $\pm 10\%$ from true.
 - $\pm 10\%$ from design.
 - $\pm 7\%$ from true, results in warning.
2. PM2.5, PM2.5 BAM:
 - $\pm 4\%$ from true.
 - $\pm 5\%$ from design.
3. Total Suspended Particulates (TSP).
 - $\pm 15\%$ from true
 - $\pm 10\%$ from true , results in warning

C. Laboratory instrumentation

1. PM10 Ions:
 - Accuracy limits based on approved standard's control limits.
2. Mass:
 - See U.S. EPA's Quality Assurance Document 2.11 (PM10)
 - See U.S. EPA's Quality Assurance Document 2.12 (PM2.5)
3. Lead (EPA audit):
 - $\pm 16\%$ based on 90th percentile control limits. See EPA's Quality Assurance handbook (Volume II, Section 2.8).
4. Toxic Metals (Lead only):
 - $\pm 20\%$ from true.
5. VOC instrumentation:
 - $\pm 20\%$ from true.
6. Motor vehicle instrumentation:
 - $\pm 20\%$ from true.

D. Meteorological instrumentation

1. Horizontal or vertical wind speed:
 - ± 25 m/s of true at speeds < 5 m/s.
 - $\pm 5\%$ of true at speeds above 5 m/s.
 - Starting threshold – Less than or equal to 0.5m/s
2. Wind direction:
 - Less than or equal to 5° combined accuracy and orientation error.
 - Starting threshold – Less than or equal to 0.5m/s
 -
3. Ambient temperature:
 - $\pm 0.5^\circ$ Celsius
4. Barometric pressure:
 - ± 7.50 mm of Hg.

Van Inventory

Auditors: _____ / _____ Date: _____ Van: _____

- Lap Top
- Nav. GPS
- Cellular Phone
- Camera
- Location GPS
- Site Folders
- Standard Files
- Audit Forms
- PM Mass Weights
- Digital Thermometer

- Drinking water
- Glass "T"
- 0-10L Rotometer
- Tape, 60 Meter
- Tubing, Misc.
- Wire/Zip Ties
- Walkie Talkies
- Thermos Bottles
- Extension Cords
- Rope

- Compass & Tripod
- O3 Transfer Standard
- Tools/Tool Box
- Leatherman Tool (2)
- Binoculars
- Torque Watches
- Safety Bag
- Leather gloves
- Disposable gloves
- Ice (recoverable)

Stationery Supplies

- Printer Paper
- Printer Ink: Color/B&W
- Clipboards
- 2-hole Punch
- Stapler

- Pencils
- Staples
- Paper Clips
- Post-Its

- Duct tape
- Masking tape
- Electrical tape
- Teflon tape

- 9 Volt batteries
- D Cell batteries
- "AA" batteries

Vehicle

- Battery Charger
- Spare Oil
- Jumper Cables
- Flares
- Traffic Cones
- Wheel Chocks

- Water Hose
- Sewer Hose (10 ft)
- Fire Extinguisher - charged
- First Aid Kit
- Toilet Chemical
- Safety Highway Kit

- Propane Level _____
- Grey/Black H₂O _____
- Fresh H₂O _____
- Check Engine/Gen Oil
- Start Truck Engine

TEOM Accessory Box

- Flow Adapter
- Wrenches
- Caps, Plugs, Tubing
- XonTech Adapter
- XonTech Cartridge

PM10 Audit Box

- Dickson Charts
- PM10/TSP Filters
- Filter Cover
- BGI Variable Orifice

- RM Young MET Bag
- MET Audit Box

Delta Cal Bag

- Delta Cal
- PM2.5 Filter Holders
- Spare PM2.5 Filters
- Philips Screwdriver (sm)
- Leak Test Cap

TetraCal Bag

- TetraCal
- PM2.5 Filter Holders
- Spare PM2.5 Filters
- Philips Screwdriver (sm)
- Leak Test Cap

Cylinder Pressures (psi)

SB1: _____
 HiCO: _____
 LoCO: _____
 Ultra Pure: _____
 H2S: _____

* Optional

Checkout completed by: _____ and/or _____

State of California Air Resources Board

Revised May 18, 2010

Figure 5.0.2.1
 Vehicle Inspection List

California Air Resources Board Final Performance Audit Report by Quality Assurance Section Monitoring and Laboratory Division

Manager: Merrin Wright

Phone: (916) 324-6191



AIRS Number: 060790005

ARB Number: 40850

Site Name:
Paso Robles

Audit Date:
2008-11-24

Auditors:
Harnek Nijjar
Alvin Danque

Station Operator:
Phil Wagner

Report Contents:
Executive Summaries
Technical Appendices
Audit Calculations
Site Survey Report

Figure 5.0.2.2
QAS Audit Program

Executive Summary - Gaseous Criteria

Site Name: Paso Robles

Audit Date: 2008-11-24

| Parameter | Audit Level | Station Percent Difference | Pass/Fail |
|-----------|-------------|----------------------------|-----------|
| Ozone | Low | -2.5 | Pass |
| | Mid | -2.7 | Pass |
| | High | -2.8 | Pass |

Figure 5.0.2.2
QAS Audit Program (cont'd)

Executive Summary - Samplers (Flow Rate)

Site Name: Paso Robles

Audit Date: 2002-04-08

| Parameter | Station Percent Difference | Station Percent Difference From Design | Percent Difference Pass/Fail | Design Difference Pass/Fail |
|-----------|----------------------------|----------------------------------------|------------------------------|-----------------------------|
| PM10 | 0.7 | 0.5 | Pass | Pass |

Figure 5.0.2.2
QAS Audit Program (cont'd)

Executive Summary - Meterological Sensors

Site Name: Paso Robles

Audit Date: 2002-04-08

| Audit Parameter & Level | Station Ind. | Van Act. | Diff. or % Diff | Pass/Fail |
|---------------------------------|--------------|----------|--------------------|-----------|
| Horizontal Wind Speed Threshold | | | 0.3 (m/s) | Pass |
| Horizontal Wind Speed (Level 1) | 0.00 | 0.00 | 0.00 m/s | Pass |
| Horizontal Wind Speed (Level 2) | 8.27 | 8.27 | 0.00 m/s | Pass |
| Horizontal Wind Speed (Level 3) | 16.27 | 16.26 | 0.01 m/s | Pass |
| Horizontal Wind Speed (Level 4) | 24.26 | 24.26 | 0.00 m/s | Pass |
| Horizontal Wind Speed (Level 5) | 32.24 | 32.25 | -0.01 m/s | Pass |
| Ambient Temperature (Hot) | 0.2 | 0.0 | 0.2 °C | Pass |
| Ambient Temperature (Warm) | 25.3 | 25.0 | 0.3 °C | Pass |
| Ambient Temperature (Cold) | 46.6 | 46.3 | 0.3 °C | Pass |
| Wind Direction Threshold | | | 0.31 (m/s) | Pass |
| Orientation Error | | | -0.5 ° | |
| Wind Direction | 86.5 | 90 | -3.5° | Pass |
| Wind Direction | 178.5 | 180 | -1.5° | Pass |
| Wind Direction | 269.5 | 270 | -0.5° | Pass |
| Wind Direction | 359.5 | 360 | -0.5° | Pass |
| Wind Direction | 446.5 | 450 | -3.5° | Pass |

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Technical Appendix - Ozone

Audit Information

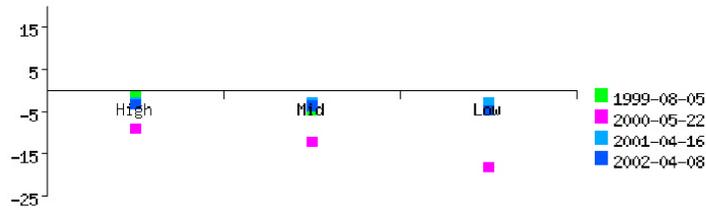
| Audit Point | Audit Indicated | Audit Actual | Station Indicated | Station Actual | Percent Difference |
|-------------|-----------------|--------------------|-------------------|---------------------|---------------------|
| Pre Zero | -0.001 | - | 0.000 | - | - |
| High | 0.412 | 0.409 | 0.396 | 0.396 | -3.2 |
| Mid | 0.176 | 0.175 | 0.169 | 0.169 | -3.4 |
| Low | 0.067 | 0.067 | 0.064 | 0.064 | -4.5 |
| Post Zero | -0.001 | - | 0.000 | - | - |
| Av % Diff | Zero Ave | Standard Deviation | Corr | Upper 95 Prob Limit | Lower 95 Prob Limit |
| -3.7 | -0.001 | 0.7 | 1.00000 | -2.3 | -5.0 |

Failures and Warnings

All audit parameters are within specified limits!

Audit Data Comparison

Station 03 Monitor Response



Instrument/AIRS Information

| | | | |
|------------|------------|----------------------|------------|
| ARB Number | 40850 | AIRS Number | 060790005 |
| Audit Date | 2002-04-08 | Inst. Make and Model | API 400 |
| Van | B | Serial Number | 20003837 |
| Quarter | 2 | Last Cal Date | 2002-02-07 |

Comments

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Technical Appendix - ARB PM10

Audit Information

| Audit Pressure Drop (inches H2O) | Audit Flow (CFM) | Station Magnehelic Reading | Station Flow (CFM) | Audit Average | Percent Difference | Percent Difference from Design |
|----------------------------------|------------------|----------------------------|--------------------|---------------|--------------------|--------------------------------|
| 3.06 | 40.1 | - | | | | |
| 3.07 | 40.2 | - | | | | |
| 3.07 | 40.2 | 20.0 | 40.5 | 40.2 | 0.7 | 0.5 |
| | | Temperature | 19.2 | | | |
| | | Ambient Pressure (mmhg) | 741 | | | |

Design flow rate limits are 36 to 44 CFM for PM10 SSI samplers.

Failures and Warnings

All audit parameters are within specified limits!

Instrument/AIRS Information

| | | | |
|------------|------------|----------------------|-------------------------|
| ARB Number | 40850 | AIRS Number | 060790005 |
| Audit Date | 2002-04-08 | Inst. Make and Model | Sierra Andersen SA 1200 |
| Van | B | Serial Number | 20004187 |
| Quarter | 2 | Last Cal Date | 2002-03-25 |

Comments

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Technical Appendix - Outdoor Temperature

Audit Information

| Audit Display Reading | Audit Temperature (C) | Station Indicated Temperature (C) | Station Actual Temperature (C) | Degree Difference |
|-----------------------|-----------------------|-----------------------------------|--------------------------------|-------------------|
| 0.0 | 0.0 | 0.2 | 0.2 | 0.2 |
| 25.0 | 25.0 | 25.3 | 25.3 | 0.3 |
| 46.3 | 46.3 | 46.6 | 46.6 | 0.3 |

Failures and Warnings

All audit parameters are within specified limits!

Instrument/AIRS Information

| | | | |
|------------|------------|----------------------|----------------|
| ARB Number | 40850 | AIRS Number | 060790005 |
| Audit Date | 2002-04-08 | Inst. Make and Model | MET ONE 060A-2 |
| Van | B | Serial Number | N/A |
| Quarter | 2 | Last Cal Date | 2002-02-07 |

Comments

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Technical Appendix - Wind Direction

Audit Information

| Station Direction | Audit Direction | Degree Difference | Boom Orientation |
|-------------------|-----------------|-------------------|----------------------|
| 87 | 90 | -3.5 | Compass Reading 346 |
| 179 | 180 | -1.5 | Sensor Alignment 360 |
| 270 | 270 | -0.5 | Declination 14.5 |
| 360 | 360 | -0.5 | True Alignment 360.5 |
| 447 | 450 | -3.5 | Alignment Error -0.5 |

Torque Measurements

| | |
|--------------------------|------|
| Measured Torque | 3.6 |
| Starting Threshold | 0.31 |
| K Factor | 38 |
| Highest Allowable Torque | 9.5 |

Failures and Warnings

Based on PAMS Criteria for wind direction alignment, the sensor passes the audit.
 Based on PAMS Criteria for starting threshold, the sensor passes the audit.

Instrument/AIRS Information

| | | | |
|------------|------------|----------------------|---------------|
| ARB Number | 40850 | AIRS Number | 060790005 |
| Audit Date | 2002-04-08 | Inst. Make and Model | MET ONE 020-C |
| Van | B | Serial Number | W1488 |
| Quarter | 2 | Last Cal Date | 2002-02-07 |

Comments

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Technical Appendix - Horizontal Wind Speed

Audit Information

| Audit Reference (RPM) | Audit Actual Speed (m/s) | Station Speed (Knots) | Station Speed (m/s) | PAMS Failure Limits | Actual Differences |
|-----------------------|--------------------------|-----------------------|---------------------|---------------------|--------------------|
| 0 | 0.00 | 0.54 | 0.00 | +/- 0.2 m/s | 0.00 m/s |
| 300 | 8.27 | 16.08 | 8.27 | +/- 0.6 m/s | 0.00 m/s |
| 600 | 16.26 | 31.63 | 16.27 | +/- 1.0 m/s | 0.01 m/s |
| 900 | 24.26 | 47.17 | 24.26 | +/- 1.4 m/s | 0.00 m/s |
| 1200 | 32.25 | 62.68 | 32.24 | +/- 1.8 m/s | -0.01 m/s |

Torque Measurements

| | |
|---------------------------------|------------|
| Measured Torque | 0.1 |
| Starting Threshold | 0.3 |
| K Factor | 1.4 |
| Highest Allowable Torque | 0.4 |

Failures and Warnings

All audit parameters are within specified limits!

Instrument/AIRS Information

| | | | |
|------------|------------|----------------------|---------------|
| ARB Number | 40850 | AIRS Number | 060790005 |
| Audit Date | 2002-04-08 | Inst. Make and Model | MET ONE 010-C |
| Van | B | Serial Number | 20003671 |
| Quarter | 2 | Last Cal Date | 2002-02-07 |

Comments

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Audit Calculations

Site Name: Paso Robles

Audit Date: 2002-04-08

Ozone Analyzer Certification Equation

$$\text{Audit Actual} = (((\text{Audit Indicated} - \text{Zero Ave}) * \text{Slope} + \text{Intercept}) * (1 - \text{Line Loss}/100))$$

| Slope | Intercept | Line Loss | Zero Ave |
|---------|-----------|-----------|----------|
| 0.99160 | 0.00000 | 0.24% | -0.001 |

ARB PM10

$$\text{Audit Flow} = \text{BGI Slope} * ((\text{Audit Pressure Drop} * (\text{Temperature} + 273.15)) / \text{Pressure})^{1/2} + \text{Intercept}$$

| Audit Slope | Audit Intercept |
|-------------|-----------------|
| 35.6000 | 0.9790 |

Outdoor Temperature

$$\text{Audit Temperature} = (\text{Audit Display Reading}) * \text{Slope} + \text{Intercept}$$

| Slope | Intercept |
|---------|-----------|
| 1.00000 | 0.00000 |

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Audit Calculations

Site Name: Paso Robles

Audit Date: 2002-04-08

Wind Direction

Starting Threshold = (Measured Torque/K Factor)^{1/2}
 Highest Allowable Torque = K Factor * 0.25
 True Alignment = Declination + Compass Reading
 Alignment Error = True Alignment - Sensor Alignment
 Degree Difference = Station Direction - Audit Direction + Alignment Error

K Factor

38.00

Horizontal Wind Speed

Starting Threshold = (Measured Torque/K Factor)^{1/2}
 Highest Allowable Torque = K Factor * 0.25
 Audit Actual Speed = Audit Reference * Slope + Intercept
 Station Speed (m/s) = Station Speed * Conversion Factor

| Slope | Intercept | K Factor | Conversion Factor |
|----------|-----------|----------|-------------------|
| 0.026651 | 0.270000 | 1.40 | 0.5144 |

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Site Survey Report

Siting Information

| | | | |
|---------------------------------------------------|-----------------------------------------|------------------------------|----------------------------|
| Site Name: Paso Robles | Audit Date: 2008-11-24 | ARB Number: 40850 | AIRS Number: 060790005 |
| Address: 235 Santa Fe Av Paso Robles, CA 93446 | Latitude: N 35° 36' 53" | Longitude: W 120° 39' 18" | Elevation (m): 248 |
| | Auditors: Harnek Nijjar Alvin Danque | Site Technician: Phil Wagner | Site Phone: (805) 237-9614 |
| Operating Agency: California Air Resources Board | | Site Report: Yes | Site Photos: Yes |

General Siting Conditions

| | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Station Temperature Controlled: Yes Recorded: Yes Inside Temp: 25 Degrees Celsius | Traffic Description: Arterial Distance: 92 meters Count (Veh/Day): 11800 | Topography Site: Level | Predominant Wind Direction: South |
| | | Region: Hilly | Arc Air Flow (Deg): 360 Degrees |
| | | QA Manual Approved: Yes Agency: CARB Urbanization: City Center Ground Cover: Gravel | Probe Clean: Yes |
| Manifold Clean: Yes | | | |
| Cleaning Schedule: Annually | | | |
| Autocalibrator Type: EnviroNics 6103 | | | |
| Meteorology Located With Instruments: Yes Shadowing: No Boom Orientation (Deg): 344 Temp(Motor/Natural): Motor | Non-vehicular Local Sources Description: None Distance: NA Direction: NA | Site Survey Complete: Yes | |
| | | Logbook Up To Date: Yes | |

Action Items

Comments

* Transfer standard audit was performed through-the-probe (TTP).

Figure 5.0.2.2
 QAS Audit Program (cont'd)

Site Survey Report (Cont.)

| Monitor Type | Ozone | PM10-SSI | Outdoor Temperature | Wind Direction |
|---------------------------------|------------------------------|------------------------------|---------------------|----------------|
| Manufacturer/Model | API 400 | Sierra Andersen SA 1200 | MET ONE 060A-2 | MET ONE 020-C |
| Serial Number | 20003837 | 20004187 | N/A | W1488 |
| POC | 1 | 1 | 1 | 1 |
| Data For Record? | Yes | Yes | Yes | Yes |
| Purpose | SLAMS | SLAMS | Other | Other |
| Objective | Representative Concentration | Representative Concentration | | |
| Scale | Neighborhood | Neighborhood | | |
| Height Above Ground | 6.6 | 5.1 | 3.5 | 10.0 |
| Height Above Platform | 3.0 | 1.5 | 1.0 | |
| Sampler Spacing | | | | |
| Current Manual (SOP) Available? | Yes | Yes | Yes | Yes |
| Instrument Log Up-to-date? | Yes | Yes | Yes | Yes |
| In-line Filter Change Date | 2002-04-05 | | | |
| Cal. Gas Cert. Date | | | | |
| Calibration Current? | Yes | Yes | Yes | Yes |
| Calibration Date | 2002-02-07 | 2002-03-25 | 2002-02-07 | 2002-02-07 |
| Cal. Equipment Cert. Date | 2002-02-07 | 2001-07-16 | 2000-07-01 | Not Available |
| Obstacle Description | None | None | None | None |
| Distance to Obstacle | - | - | - | - |
| Height Above Inlet | - | - | - | - |
| Distance to Walls, etc. | - | - | - | - |
| Distance to Dripline | - | - | - | - |
| Dominant Influence | Vehicular | Vehicular | | |
| Residence Time (sec) | 9.3 | | | |

| Monitor Type | Horizontal Wind Speed |
|---------------------------------|-----------------------|
| Manufacturer/Model | MET ONE 010-C |
| Serial Number | 20003671 |
| POC | 1 |
| Data For Record? | Yes |
| Purpose | Other |
| Objective | |
| Scale | |
| Height Above Ground | 10.0 |
| Height Above Platform | |
| Sampler Spacing | |
| Current Manual (SOP) Available? | Yes |
| Instrument Log Up-to-date? | Yes |
| In-line Filter Change Date | |
| Cal. Gas Cert. Date | |
| Calibration Current? | Yes |
| Calibration Date | 2002-02-07 |
| Cal. Equipment Cert. Date | Not Available |
| Obstacle Description | None |
| Distance to Obstacle | - |
| Height Above Inlet | - |
| Distance to Walls, etc. | |
| Distance to Dripline | |
| Dominant Influence | |
| Residence Time (sec) | |

Figure 5.0.2.2
 QAS Audit Program (cont'd)

QA AUDIT WORKSHEET - GASEOUS

Site Name: _____

Operator: _____

Auditors: _____

Date: _____

Van: _____

GPS Coordinates

| | |
|------------|---------|
| Previous | Current |
| Lat: _____ | _____ |
| Long _____ | _____ |
| Alt _____ | _____ |

| Ozone | | | CO Calibration | | CO | | | SO ₂ | H ₂ S | NO ₂ | | | | |
|-----------------------------|-----------------------------|------------------|--------------------------|---------------------------|-----------------|-----------------|------------------|------------------|------------------|------------------|------------------|-----------------------------|------------------|------------------|
| Target O ₃ (ppm) | Actual O ₃ (ppm) | Station Response | Pre-Audit CO Van Reading | Post-Audit CO Van Reading | Target CO (ppm) | Actual CO (ppm) | Station Response | Station Response | Station Response | Ozone Off | | Ozone On (Titration) | | |
| | | | | | | | | | | NO | NO _x | O ₃ | NO | NO _x |
| | | | | | | | | | | Station Response | Station Response | Target O ₃ (ppm) | Station Response | Station Response |
| Zero | | | ZERO | <i>Zero</i> | ZERO | | | | | | | | | |
| | | | HI CO | HI CO | 43.8 | | | | | | | | | |
| 0.250 | | | Low CO | Low CO | (39)(17) | | | | | | | | | |
| 0.150 | | | U.P. | U.P. | 21 | | | | | | | 0.350 | | |
| | | | | | 11 | | | | | | | 0.130 | | |
| 0.080 | | | | | (9) (6) | | | | | | | 0.060 | | |
| | | | | | 3.8 | | | | | | | | | |
| Zero | | | | | <i>Zero</i> | | | | | | | | | |

| | Ozone | CO | SO ₂ | H ₂ S | NO _x | Cal. Gas | Gas Calibrator Standard | Ozone Calibrator Standard | Auto Calibrator Daily Zero/Span |
|------------------------|-------|----|-----------------|------------------|-------------------|----------|-------------------------|---------------------------|---------------------------------|
| Manufacturer: | | | | | | Cylinder | | | |
| Model Number: | | | | | | | | | |
| Serial Number: | | | | | | | | | |
| Instrument Range: | | | | | | | | | |
| Last Calibrated: | | | | | | | | | |
| Slope / Coeff.: | | | | | NO: | | | | |
| Intercept / Offset: | | | | | NO _x : | | | | |
| Flow: | | | | | NO: | | | | |
| In-Line Filter Change: | | | | | NO _x : | | | | |

Data recorded and verified by: _____

Figure 5.0.2.3
 Audit Worksheet

QA AUDIT WORKSHEET PM 10 and TSP SAMPLERS

Site Name: _____ Date: _____
 Operator: _____ Inlet Cleaning Schedule: _____
 Auditors: _____ Inlet Last Cleaned: _____

Collocated Yes [] No [] Primary Yes [] No [] Secondary Yes [] No []

Model: _____

ID #: _____

| Audit Orifice Delta P | | |
|-----------------------|-------|-------|
| Run 1 | Run 2 | Run 3 |
| | | |

| Station Instrument Flow Rate | | |
|------------------------------|-------|-------|
| Run 1 | Run 2 | Run 3 |
| | | |

Cal. Date: _____ Magnehelic Reading: _____ Passed FCT Yes [] No []

Cal. Equip. Cert Date: _____ Slope: _____ Intercept: _____ Baro: _____ Temp: _____ °C

Collocated Yes [] No [] Primary Yes [] No [] Secondary Yes [] No []

Model: _____

ID #: _____

| Audit Orifice Delta P | | |
|-----------------------|-------|-------|
| Run 1 | Run 2 | Run 3 |
| | | |

| Station Instrument Flow Rate | | |
|------------------------------|-------|-------|
| Run 1 | Run 2 | Run 3 |
| | | |

Cal. Date: _____ Magnehelic Reading: _____ Passed FCT Yes [] No []

Cal. Equip. Cert Date: _____ Slope: _____ Intercept: _____ Baro: _____ Temp: _____ °C

Collocated Yes [] No [] Primary Yes [] No [] Secondary Yes [] No []

Model: _____

ID #: _____

| Audit Orifice Delta P | | |
|-----------------------|-------|-------|
| Run 1 | Run 2 | Run 3 |
| | | |

| Station Instrument Flow Rate | | |
|------------------------------|-------|-------|
| Run 1 | Run 2 | Run 3 |
| | | |

Cal. Date: _____ Magnehelic Reading: _____ Passed FCT Yes [] No []

Cal. Equip. Cert Date: _____ Slope: _____ Intercept: _____ Baro: _____ Temp: _____ °C

Data recorded and verified by: _____

State of California Air Resources Board

MLD/QAS-029 (Rev. 8/2008)

Figure 5.0.2.3
 Audit Worksheet (cont'd)

QA AUDIT WORKSHEET
 METEOROLOGICAL SENSORS

Site Name: _____

Operator: _____

Date: _____

Auditors: _____

| WIND SPEED | | | | WIND DIRECTION | | | |
|-----------------------|--------------------|----------------------|-----------|---------------------|-------------------------|----------------------|----------------|
| Audit Point | Motor Speed (RPM) | Station Sensor Value | Units | Audit Point | Audit Fixture Direction | Station Sensor Value | Alignment |
| 1 | 0 | | M/S [] | 1 | 90 | | Boom (compass) |
| 2 | | | MPH [] | 2 | 180 | | |
| 3 | | | KNOTS [] | 3 | 270 | | |
| 4 | | | FT/S [] | 4 | 360 | | Vane |
| 5 | | | KPH [] | 5 | 450 | | |
| Torque - gm/cm: | | | CM/S [] | Torque - gm/cm: | | | |
| Manufacturer: | | | | | | | |
| Model Number: | | | | | | | |
| Serial Number: | | | | | | | |
| Operating Range: | | | | | | | |
| Site Destination: N/A | | | | | | | |
| Last Calibrated: | | | | | | | |
| Cal Equip Cert Date: | | | | N/A | | | |
| OUTSIDE TEMPERATURE | | | | BAROMETRIC PRESSURE | | | |
| Audit Point | Audit Sensor Value | Station Sensor Value | Units | Audit Point | Audit Sensor Value | Station Sensor Value | Units |
| Cold | | | °F [] | 1 | | | mmHg [] |
| Ambient | | | °C [] | 2 | | | inHg [] |
| Hot | | | | 3 | | | Millibars [] |
| Manufacturer: | | | | | | | |
| Model Number: | | | | | | | |
| Serial Number: | | | | | | | |
| Operating Range: | | | | | | | |
| Last Calibrated: | | | | | | | |
| Cal Equip Cert Date: | | | | | | | |

Data recorded and verified by: _____

State of California Air Resources Board

MLD/QAS-039 (Rev. 1/5/2010)

Figure 5.0.2.3
 Audit Worksheet (cont'd)

AIR QUALITY DATA ACTION REQUEST

(For ARB Use Only)

SITE NAME: _____ **REQUEST LOG #:** _____
SITE NUMBER: _____ **AIRS#:** _____ **REQUEST DATE:** _____

To: _____, Air Monitoring/APCD. Please investigate the potential inaccuracies listed below * and recommend appropriate action/s. If no response to this action is received by _____ QA staff shall review and recommend appropriate action/s.

To: Dwight Oda, Air Quality Data Review. Please withhold the following air quality data from processing until potential data inaccuracies

FROM: _____, Quality Assurance Section.

* Potential Data Inaccuracies

| POLLUTANT | EST. TIME PERIOD * | | | REASON FOR ACTION |
|-------------------|--------------------|-----|------|-------------------|
| | FROM: | | | |
| CODE | Month | Day | Year | |
| | To: | | | |
| See Attached List | Month | Day | Year | |
| | | | | |

Air Monitoring/APCD to complete the following block from their quality control records, sign, and return to Quality Assurance Section. * Exact interval to be determined by district.

| RECOMMENDED DATA ACTION | TIME PERIOD (INCLUSIVE) | | | | ‡CORRECTION FACTOR |
|-------------------------|-------------------------|------|-------|-----|--------------------|
| RELEASE: | BEGIN: | | | | |
| CORRECT†: | END: | | | | *NULL CODE |
| INVALIDATE ‡: | | Hour | Month | Day | Year |

JUSTIFICATION

| |
|--|
| |
| |
| |
| |
| |
| |

REVIEWED BY: 1. _____ DATE: _____
 2. _____ DATE: _____
 3. _____ DATE: _____
 4. _____ DATE: _____

The recommended data actions were applied and the air quality data were updated on the AIRS/ADAM Database by _____ on _____.

MLD-40/10/00

Figure 5.0.2.4
 Air Quality Data Action (AQDA)

VOLUME V – APPENDICES

| <u>APPENDIX</u> | | <u>PAGES</u> | <u>REVISION</u> | <u>DATE</u> |
|-----------------|-----------------------------------------------------------------------------------------------------|--------------|-----------------|-------------|
| A | Performance Audit Procedures Using Ambient Level Cylinders (Used only for special circumstances) | 6 | 1 | 08/01/83 |
| B | Performance Audit Procedures Using Dilution Techniques (Used only for special circumstances) | 6 | 1 | 08/01/83 |
| C | Performance Audit Procedures for Ozone Analyzers Using a Portable Ozone Transfer Standard | 12 | 5 | 09/01/08 |
| D | Performance Audit Procedures for High-Volume Samplers | 17 | 3 | 02/14/08 |
| E | Performance Audit Procedures for Thru-the Probe Criteria Pollutant Audits | 36 | 7 | 08/20/08 |
| J | Performance Audit Procedures for Thru-the-Probe Toxic Audits | 13 | 3 | 08/05/02 |
| K | Performance Audit Procedures for PM10 Ions Lab Audits | 10 | 3 | 04/01/08 |
| L | Performance Audit Procedures for Toxic Air Sampler (Xontech 920) | 24 | 6 | 08/02/04 |
| M | Performance Audit Procedures for Toxic Air Contaminants – Lab Audits | 10 | 2 | 09/27/02 |
| O | Operating Procedures for Global Positioning System | 6 | 3 | 09/04/07 |
| P | Performance Audit Procedures for PM10 Dichotomous Samplers | 18 | 4 | 09/18/02 |
| Q | Performance Audit Procedures for Lead (Pb) Analysis TSP – Lab Audits | 12 | 2 | 08/01/07 |

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| S | Performance Audit Procedures for Meteorological Parameters | 95 | 2 | 08/23/02 |
| U | System Audit Procedures for PM10 Mass Analysis | 28 | 1 | 01/15/03 |
| V | Performance Audit Procedures For Continuous PM10 Monitors | 30 | 4 | 12/24/09 |
| X | Performance Audit Procedures for Light-End & Mid-range Non-Methane Hydrocarbon Pollutants in Automotive Exhaust - Lab Audits | 13 | 1 | 05/07/02 |
| Y | Quality Assurance Project Plan For the PM2.5 – Ambient Air Monitoring Program at State and Local Air Monitoring Stations (SLAMS) | 181 | 1 | 10/30/01 |
| Z | Performance Audit Procedures For PM2.5 Samplers | 58 | 6 | 01/01/08 |
| AA | System Audit Procedures for PM2.5 Mass Analysis | 27 | 0 | 01/15/99 |
| AB | System Audit Procedures for Dichotomous PM10 Sampling and Analysis Program | 21 | 0 | 05/01/99 |
| AC | Ambient Air Comparison Check Procedures for Non-Methane Hydrocarbon Compounds | 17 | 1 | 09/03/02 |
| AE | Site Survey Programs for Ambient Air Monitoring Stations | 31 | 3 | 09/10/07 |
| AG | System Audit Procedures for Pesticide Monitoring Programs | 16 | 0 | 07/31/01 |
| AH | System Audit Procedures for Ambient Air Monitoring Programs | 64 | 0 | 08/06/02 |

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| <u>APPENDIX</u> | | <u>PAGES</u> | <u>REVISION</u> | <u>DATE</u> |
|-----------------|--------------------------------------------------------------------------------|--------------|-----------------|-------------|
| AI | Laboratory Audit Procedures for Dioxins, Furans, and Polychlorinated Biphenyls | 11 | 1 | 10/27/03 |
| AJ | Dioxin Flow Audits | 15 | 0 | 04/01/03 |
| AK | Audit Information System Users Manual | 109 | 1 | 11/28/05 |
| AL | Maintenance Procedures for Audit Van Instruments | 17 | 0 | 01/11/10 |