California Environmental Protection Agency
Air Resources Board

Quality Assurance Manual
Volume I

Quality Management Plan for Ambient Air Monitoring

July 2013

APPROVALS		
California Air Resources Board		
	Signature	**Date**
Alberto Ayala, Ph.D., M.S.E. Deputy Executive Officer		11/27/13
Dr. Michael T. Benjamin, Chief Monitoring and Laboratory Division		9/24/13
Kurt Karperos, Chief Planning and Technical Support Division		9/26/13
Cindy Castronovo, Chief Northern Laboratory Branch		9/24/13
Mike Miguel, Chief Quality Management Branch		9/24/13
Kenneth Stroud, Chief Air Quality Surveillance Branch		9-24-13
Sylvia Vanderspek, Chief Air Quality Planning Branch		9/26/13
United States Environmental Protection Agency		
Eugenia McNaughton, Ph.D., Manager Quality Assurance Office, Region 9		9/10/2013

Table of Contents

Appendices

List of Acronyms

AIS	Audit Information System
APCD	Air Pollution Control District
AQAS	Air Quality Analysis Section
AQDA	Air Quality Data Action
AQPB	Air Quality Planning Branch
AQMD	Air Quality Management District
AQS	Air Quality System
AQSB	Air Quality Surveillance Branch
ARB	California Air Resources Board
ASD	Administrative Services Division
BAAQMD	Bay Area Air Quality Management District
CAL/EPA	California Environmental Protection Agency
CAN	Corrective Action Notification
CFR	Code of Federal Regulations
DASPS	Data Analysis and Special Projects Section
DGS	Department of General Services
DMS	Data Management System
DQOs	Data Quality Objectives
LIMS	Laboratory Information Management Systems
MLD	Monitoring and Laboratory Division
NAMS	National Ambient Air Monitoring Stations
NIST	National Institute of Standards and Technology
NLB	Northern Laboratory Branch
NPAP	National Performance Audit Program
NPS	National Park Service
OER	Office of Emergency Response
OIS	Office of Information Services
PEP	Performance Evaluation Program
PM10	Particulate Matter (10 micrometers or less in diameter)
PM2.5	Particulate Matter (2.5 micrometers or less in diameter)
PQAO	Primary Quality Assurance Organization
PTSD	Planning and Technical Support Division
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QAS	Quality Assurance Section
QMB	Quality Management Branch
QMP	Quality Management Plan
QMS	Quality Management Section
SAN	Storage Area Network
SCAQMD	South Coast Air Quality Management District
SDCAPCD	San Diego County Air Pollution Control District
SLAMS	State and Local Air Monitoring Stations
SOP	Standard Operating Procedure
SOW	Scope-of-Work
TSA	Technical System Audit
TTP	Through-the-Probe
U.S. EPA	United States Environmental Protection Agency

PURPOSE

This Quality Management Plan (QMP) describes the quality management system used by the California Air Resources Board (ARB) and participating local air monitoring organizations (also referred to as "local air districts") that comprise ARB's Primary Quality Assurance Organization (PQAO). The purpose of this document is to ensure that data collected by ARB's PQAO meets all applicable requirements for which it is intended through effective implementation of the quality management system described herein.

INTRODUCTION

The U.S. Environmental Protection Agency (U.S. EPA) designated ARB as one of the five PQAOs responsible for monitoring air pollution in California. U.S. EPA also designated the Bay Area Air Quality Management District (BAAQMD), South Coast Air Quality Management District (SCAQMD), San Diego County Air Pollution Control District (SDCAPCD), and the National Parks Service (NPS) as their own PQAOs. A PQAO is responsible for managing its own air monitoring quality assurance programs and reporting its precision and accuracy data to U.S. EPA's Air Quality System (AQS) database.

ARB's PQAO consists of ARB and 32 local air monitoring organizations throughout California, of which 22 collect ambient air monitoring data. The program includes operation of the air monitoring network, laboratory analysis, data reporting, and quality assurance activities to ensure the quality of the data generated by ARB's PQAO. The data generated is utilized to define the nature and severity of pollution in California, determine attainment status with state standards, identify pollution trends, support agricultural burn forecasting, and develop air models and emission inventories.

ARB's quality assurance program is comprised of quality assessment and quality control activities. Quality assessment is a set of external tasks that are performed outside of normal routine operations to provide certainty that the quality assurance system is generating data of sufficient quantity, quality, and meets or exceeds all applicable requirements. Quality control activities are internal tasks that are performed during sample collection, handling, analysis, and data reporting to ensure data accuracy and precision.

This QMP is contained in Volume I of ARB's Quality Assurance Manual, which is available at http://www.arb.ca.gov/aaqm/qa/qa-manual/qa-manual.htm. The Quality Assurance Manual is comprised of the following six volumes:

Volume I	Quality Management Plan
Volume II	Standard Operating Procedures for Air Quality Monitoring
Volume III	Laboratory Methods and Operations
Volume IV	Monitoring Methods for the State Ambient Air Quality Standards

Volume V Audit Procedures Manual
Volume VI Standard Operating Procedures and Test Methods for Consumer Products, Fuels, and Stationary and Mobile Sources

This QMP is valid for a period of up to five years from the official date of publication, however, the Quality Management Branch (QMB) Chief or designee may review and revise sooner, based on program changes or whenever a significant change is required. Any significant or major revisions to the QMP must be approved by appropriate ARB and U.S. EPA management.

MISSION STATEMENT

ARB is committed to ensuring that air monitoring data collected by and on behalf of its PQAO is scientifically and legally valid and of sufficient quantity and quality to meet or exceed all applicable federal, state and local data reporting requirements. This QMP is intended to meet all applicable requirements and conforms to applicable quality system documentation requirements of a QMP, including U.S. EPA Order 5360.1, Title 40, Code of Federal Regulations (CFR), Sections 30, 31, 35, and any specific grant agreements.

POLICY STATEMENT

It is ARB's policy that all management and staff within its PQAO that are involved in any aspect of generating air monitoring data commit to this quality assurance program and continual quality improvement. ARB management is committed to providing the resources needed to successfully implement and maintain a quality assurance program that meets or exceeds all applicable requirements. All air monitoring measurement activities performed by staff within ARB, by participating monitoring organizations in ARB's PQAO, or performed on behalf of ARB shall comply with the quality assurance policies and procedures specified in this QMP. If a monitoring organization within ARB's PQAO chooses to utilize its own quality management documents, prior written approval shall be obtained concurrently and collaboratively from ARB and U.S. EPA.

SECTION 1 – MANAGEMENT AND ORGANIZATION

1.1 PQAO Structure

A PQAO is a federal term defined as a state or subordinate organization within a state which is solely responsible for a set of air monitoring stations which monitor the same pollutant(s) and for which data quality assessments can be logically pooled. Each criteria pollutant sampler/monitor at a monitoring station in the State and Local Air Monitoring Station (SLAMS) network must be associated with one, and only one, PQAO.

Precision and accuracy among all air monitoring stations within ARB's PQAO is expected to be reasonably homogeneous, to the extent possible, based on the following five factors:

1. Operation by a common team of field operators, or according to a common set of procedures.
2. Use of common quality assurance documents [e.g., QMP, Quality Assurance Project Plan (QAPP), standard operating procedures (SOP)].
3. Common calibration facilities and standards.
4. Oversight by a common quality assurance organization.
5. Support by a common management, laboratory, or headquarters.

U.S. EPA designated ARB, BAAQMD, SDCAPCD, SCAQMD, and NPS as PQAOs in California.

ARB and all monitoring organizations comprising ARB's PQAO (Appendix A) are expected to follow, to the extend practical, the five common factors listed above.

1.2 PQAO Responsibilities

ARB has the primary responsibility of overseeing quality assurance activities for all monitoring organizations within its PQAO. This is accomplished through a comprehensive quality assurance program that includes systematic planning, implementation, assessment, and on-going evaluation activities. These quality assurance activities are discussed in more detail throughout this document. Roles and responsibilities for conducting these activities are defined collaboratively between ARB and local air monitoring organizations.

Anyone who is either directly or indirectly involved with air monitoring data collection has some responsibility for ensuring data quality. This includes staff level personnel, managers, branch chiefs, division chiefs, and the Deputy and Executive Officer. Each monitoring organization within ARB's PQAO has responsibility for ensuring that operation of the air monitoring network and data collected are conducted in accordance with approved procedures and are of sufficient quantity and quality to meet intended objectives. ARB's goal is to work cooperatively and collaboratively with monitoring organizations within its PQAO to consistently produce high quality air monitoring data. The quality assurance system and procedures set forth in this document apply to ARB and all monitoring organizations within its PQAO, unless alternative quality management documents and procedures are approved by ARB and U.S. EPA.

To ensure uniformity and consistency, monitoring organizations within ARB's PQAO are encouraged to utilize ARB's quality management documents (QMP, QAPPs, SOPs, etc.) and laboratory services to the extent possible. If a monitoring organization

chooses to utilize its own quality management documents, prior written approval shall be obtained from ARB and U.S. EPA. A repository listing the quality management documents utilized by ARB and the local air monitoring organizations within ARB's PQAO is available at http://www.arb.ca.gov/aaqm/qa/pqao/repository/qm_docs.htm.

ARB's Standards Laboratory performs certification and verification services of calibration instruments, gaseous standards, and flow and meteorological devices for ARB's PQAO. The use of common calibration facilities and standards helps ensure the data generated by monitoring organizations within ARB's PQAO are of similar quality. Monitoring organizations within ARB's PQAO are encouraged to utilize these services, which are provided free of charge. Monitoring organizations that choose to utilize other laboratory services must comply with all applicable requirements and must notify ARB of alternate laboratory services utilized.

ARB assists monitoring organizations within its PQAO in upgrading their quality assurance programs by providing technical assistance and training. Technical assistance includes equipment purchase recommendations, analyzer evaluation and repair, analyzer calibrations, inter-laboratory comparisons, training, equipment loans, and formalized reviews of air monitoring programs in the form of performance and system audits. The goal is to develop and maintain air monitoring programs that consistently meet or exceed all applicable state and federal requirements. Monitoring organizations in ARB's PQAO are required to conform to all applicable quality assurance requirements.

Additionally and upon request, ARB may provide quality assurance oversight and support including performance audits, certification, and verification services to air monitoring organizations outside of ARB's PQAO.

1.3 Network Overview

California's air monitoring network is unique in that it is shared and operated by ARB, other PQAOs, local air monitoring organizations, private contractors, and tribal authorities. These combined entities operate more than 250 air monitoring stations and more than 700 air monitors in California.

California is divided geographically into 15 air basins encompassing 58 counties. An air basin generally has similar meteorological and geographic conditions and may include several different counties. Some counties lie in more than one basin (e.g., Kern, Los Angeles, Riverside, and San Bernardino). Several different local air districts or monitoring organizations may operate monitoring stations in a given air basin. The geographical jurisdictions of local air monitoring organizations in California range from a portion of a county to several counties or even an entire air basin. A map of California's air basins and counties is available at http://www.arb.ca.gov/ei/maps/statemap/abmap.htm.

ARB's PQAO operates monitoring stations in 12 of the 15 air basins in California (Appendix B). In some portions of the state, private contractors operate monitoring stations under contract with businesses that are required by permit conditions to conduct air monitoring. If ARB utilizes air monitoring data generated by any of the entities mentioned above, the data must meet all applicable U.S. EPA requirements and comply with the quality assurance policies and procedures specified in this QMP.

ARB's air monitoring network includes monitoring of gaseous criteria and non-criteria pollutants, particulate matter (PM), toxic air contaminants, pesticides, meteorological parameters, and greenhouse gases.

1.4 Network Plan Management and Design

ARB's Annual Monitoring Network Report for Small Districts in California (Annual Network Plan) provides information about ambient air quality monitoring sites in California and in Mexico, across the border from San Diego and Imperial counties. Air monitoring sites in the network measure ambient levels of gaseous and particulate air pollutants, and in some cases, meteorological parameters.

Primary responsibility for ARB's Annual Network Plan and network management resides with ARB's Air Quality Planning Branch (AQPB) in the Planning and Technical Support Division (PTSD). Responsibilities include plan development, assessment, and decision making regarding system modifications. Certain local air districts prepare their own Annual Network Plans (Appendix C). Air districts are queried to ensure that those that are not drafting their own network plan are included in ARB's. By July 1, AQPB submits ARB's Annual Network Plan to U.S. EPA. Districts that prepare their own plans are expected to submit a copy concurrently to ARB and U.S. EPA. ARB employs a statewide perspective by developing and providing to U.S. EPA summary tables demonstrating that all Annual Network Plans for California meet minimum requirements. ARB prepares the following reports regarding California's air monitoring network as required by federal regulations:

- Annual Monitoring Network Report for Small Districts in California

The geographical scope of this report consists of 28 counties or portions of counties with ambient monitoring sites for which the local air districts are not drafting a separate report. ARB's Annual Monitoring Network Report for Small Districts in California, which meets the requirements for an Annual Network Plan as required by 40 CFR, Part 58, Section 10, describes the network of ambient air quality monitors for these air monitoring districts. This report is available at http://www.arb.ca.gov/aqd/amnr/amnr.htm. Twelve local air districts that operate monitoring sites in California are reporting separately on the ambient monitors within their jurisdictions.

- Air Monitoring Network Assessment

The purpose of this assessment is to determine if the network achieves the monitoring objectives as defined in 40 CFR, Part 58, Appendix D. Additionally, this assessment determines if new monitoring sites are needed, if existing monitoring sites are no longer needed and can be terminated, and if new technologies are appropriate for incorporation into the ambient air monitoring network. This assessment evaluates ARB's monitoring network, as well as those for several local air monitoring districts in California, to determine if the network achieves the monitoring objectives specified in federal regulations for pollutants with federal ambient air quality standards. These pollutants include ozone, PM10, PM2.5, carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. Federal regulations require an assessment of whether existing air monitoring sites are sufficient. The assessment also provides an evaluation of key elements for implementing California ambient air quality standards and program requirements. This network assessment began in 2010 and is required every five years.

PTSD staff prepares the Annual Network Plan for Small Districts and also coordinates with other monitoring organizations in California that prepare their own network plan to address any issues or concerns and to determine air monitoring network adequacy on a statewide basis. In October (three months following the July 1 deadline for network plan submission), PTSD staff provides U.S. EPA with a summary of all network plans that documents how air monitoring requirements are being met.

ARB's air monitoring network design follows the requirements outlined in 40 CFR, Part 58, Appendix D, based on monitoring objectives and spatial scales. Monitoring site location requirements are specified in 40 CFR, Part 58, Appendices A, C, D, and E. Siting considerations include appropriate spatial scale representation, location, availability, economics, security, logistics, and atmospheric conditions. Monitor placement considerations include physical obstructions, activities in the immediate area, accessibility, and availability of utilities and other support facilities in correlation with the defined purpose of the specific monitor and design. California's air monitoring network design meets or exceeds the minimum federal requirements. The network also includes monitors to address attainment issues in key geographic areas.

Information about each air monitoring station in California is available at http://www.arb.ca.gov/qaweb/. The website includes maps of each site, latitude and longitude coordinates, site photos, and a detailed survey of the physical parameters and conditions at each site. Site surveys list detailed information such as traffic descriptions, calibration dates, distances to obstacles, and residence times for gaseous parameters.

1.5 ARB Organization

The organizational structure of ARB includes the Chairman's Office and the Executive Office. The Executive Office is comprised of the following eight divisions (Appendix D):

1. Administrative Services.
2. Enforcement.
3. Mobile Source Control.
4. Mobile Source Operations.
5. Monitoring and Laboratory (MLD).
6. Planning and Technical Support (PTSD).
7. Research.
8. Stationary Source.

As discussed below, MLD and PTSD are the two divisions within ARB that have primary responsibility for ARB's ambient air monitoring program.

MLD is comprised of the following six branches (Appendix E):

1. Quality Management (QMB).
2. Air Quality Surveillance (AQSB).
3. Northern Laboratory (NLB).
4. Southern Laboratory.
5. Engineering and Certification.
6. Evaporative Controls and Certification.

AQSB, NLB, and QMB are the branches within MLD that have ambient air monitoring responsibilities and functions, as described below.

AQSB conducts most of ARB's continuous ambient air monitoring activities at over 40 air monitoring stations throughout California, including seasonal and toxic air monitoring stations. All fixed stations are operated by qualified station operators who are responsible for station operation, quality assurance/quality control (QA/QC) activities, data management, preventive maintenance, and minor repairs of sampling equipment. In addition, AQSB staff is responsible for verification and validation of ambient air monitoring data.

AQSB's Special Purpose Monitoring Section conducts short term or special purpose monitoring programs using temporary and mobile air monitoring stations. Additionally, AQSB's Operations Support Section provides technical assistance to local air monitoring organizations by conducting instrument acceptance testing, repair, modifications, and retrofits.

Quality assurance and operational procedures for activities conducted by AQSB are covered in Volume II of ARB's Quality Assurance Manual.

NLB provides laboratory services for ambient air analyses. The Organic and Inorganic Laboratory Sections analyze media-based and whole air samples by atomic adsorption, x-ray fluorescence, inductively coupled plasma-mass spectrometry, gas and liquid chromatography, and ion chromatography. Mass determination of particulate filter media is also performed. Samples are analyzed for lead, total metals, hexavalent chromium, aldehydes, ions, elemental and organic carbon and toxic air contaminants (i.e., benzene, butadiene, chloroform, carbon tetrachloride, trichloroethylene, etc.). All analyses are performed by qualified personnel that are responsible for sample analyses, QA/QC activities, laboratory data verification and validation, and preventive maintenance and minor repairs of analytical equipment.

Quality control procedures and SOPs for NLB are located in Volume III of ARB's Quality Assurance Manual.

QMB consists of the following four sections that support monitoring and quality management activities: Office of Emergency Response (OER), Data Analysis and Special Projects Section (DASPS), Quality Assurance Section (QAS), and Quality Management Section (QMS).

OER coordinates with state and federal agencies on statewide training and response to major air releases resulting from fires, and other releases and emergencies.

DASPS is responsible for assessing the quality of air monitoring data collected throughout California's network, providing field and laboratory quality assurance services to ARB's monitoring and laboratory sections, and performing certification and verification services of calibration and monitoring instruments, gases, and devices for ARB and local air monitoring organizations. DASPS also conducts and supports various research-oriented special projects.

QAS has primary responsibility for conducting performance audits of the field monitoring instrumentation used in support of California's ambient air monitoring network. Audits of special monitoring programs may also be conducted to ensure that data quality meets the purpose and objectives of the monitoring program. QAS is responsible for issuing air quality data action requests and initiating appropriate corrective action responses for issues discovered during performance audits. Additionally, QAS assists QMS with Technical System Audits (TSAs) and training.

QMS has the responsibility of acting as liaison between ARB and monitoring organizations within ARB's PQAO. Additional responsibilities include coordination and

communication of QA/QC information; development and management of the air monitoring training program; conducting TSAs; and review of air monitoring programs. These activities are conducted to ensure compliance with state and federal requirements pertaining to sample collection and analysis, and validation and reporting of ambient air monitoring data. QMS also assists QMB's Chief with preparation and review of quality management documents to ensure that consistent practices are performed within ARB's PQAO.

PTSD is comprised of the following six branches (Appendix F):

1. Air Quality Planning Branch.
2. Air Quality and Transportation Planning Branch.
3. Area Sources and Emission Inventory Programs Branch.
4. Greenhouse Gas Emission Inventory Branch.
5. Mobile Source Analysis Branch.
6. Modeling and Meteorology Branch.

AQPB is the only branch within PTSD that has ambient air monitoring responsibilities and functions. AQDB processes, stores, reports, and certifies air monitoring data generated by ARB and certain air monitoring organizations within ARB's PQAO. AQPB also coordinates and prepares Annual Network Plans and Network Assessments.

An overview of primary quality assurance functions for ARB's QMB, AQSB, NLB, AQDB, and monitoring organizations within ARB's PQAO is summarized in Appendix G.

1.6 Quality Assurance Program Authority and Responsibility

QMB's Chief has overall responsibility for the quality assurance program for ARB's PQAO and reports directly to MLD's Chief who has oversight authority over the program. QMB's Chief functions independently from the day-to-day air monitoring activities and has primary responsibility for timely review, implementation, and assessment of quality management documents and systems throughout ARB's PQAO. QMB's Chief works collaboratively with staff within ARB, U.S. EPA, and monitoring organizations on PQAO related quality assurance issues. QMB's Chief, or designee, has authority to speak to any member of staff or management on matters related to data quality assurance, and can recommend corrective actions after discussion and joint review with the impacted division or monitoring organization regarding data quality issues. QMB's Chief may also work collaboratively with other entities within the California Environmental Protection Agency (Cal/EPA) on quality assurance issues associated with air monitoring activities or projects.

SECTION 2 – QUALITY SYSTEM COMPONENTS

2.1 General Quality Assurance Principles

ARB relies on air monitoring measurements to provide information that is utilized for public health and regulatory policy decisions. The purpose of ARB's quality system is to plan, implement, and assess air monitoring measurements or data produced within its PQAO. ARB is committed to the following in order to ensure the quality and reliability of air monitoring data produced within its PQAO:

- Consistently providing air monitoring data of sufficient quantity and quality that meet or exceed the accuracy, precision, data capture, and completeness requirements of the local, state, and federal air monitoring regulations.
- Minimizing loss of air monitoring data due to malfunctions.
- Promoting continual quality improvement in all areas of air monitoring.

The quality assurance approach is both proactive and reactive. It is proactive by developing a set of quality assurance activities and assessing the effectiveness of those activities, reporting findings to management and staff, making recommendations to modify procedures, and correcting practices, as appropriate. However, it does not limit itself to routine assessments to maintain and improve data quality. The approach encourages timely response to input from staff and interested stakeholders regarding issues encountered and ideas for improving processes. Staff input may initiate ad hoc assessments of specific parts of the quality system that may be in need of immediate corrective action to maintain data quality objectives (DQOs) and to avoid the loss of data. The implementation of the quality assurance system is approached in a collaborative and cooperative manner with the objective of promoting continuous quality improvement.

It is essential that management and staff conducting air monitoring measurements within ARB's PQAO commit to and comply with this overall quality system, which includes the following general quality assurance elements:

- The objectives of each environmental measurement project shall be clearly identified during the planning stages of the project in a manner that is consistent with the mission, goals, policies, and priorities of ARB's PQAO.
- All monitoring measurement activities supporting environmental decision making will have DQOs in accordance with applicable regulatory criteria.
- Acceptable limits of uncertainty shall be identified in the planning stages of each project, so that appropriate procedures and resources are incorporated and utilized.
- Appropriate QA/QC activities shall be integrated into all projects.

- A QAPP will be developed for each project identifying how stated objectives and data reliability requirements will be achieved.
- Supervisory staff shall routinely evaluate sample collection, chain of custody, and analysis; training; and data management activities to identify areas needing improvement or modification.
- Data validation audits, performance audits, system audits, corrective action notifications, and quality assessment reports will be utilized and documented to ensure that the quality of the air monitoring data meet or exceed all applicable requirements.

Additionally, ARB provides the following guidelines to monitoring organizations within its PQAO to assist in evaluating the quality and reliability of their own air monitoring programs and the data that is generated:

- When the monitoring objective is to collect data for regulatory use, instrumentation used to measure ambient air pollutants shall be designated a reference or equivalent method by U.S. EPA and/or ARB. Federally approved methods are not automatically deemed usable for state standard attainment purposes.
- Calibration and operating procedures must be documented and found acceptable to ARB's QMB. This includes zero, span, and precision checks; preventative and remedial maintenance of instrumentation and equipment; and documentation of quality control information.
- When the monitoring objective is to collect data for regulatory use, automated instrumentation shall be housed in temperature controlled shelters, as required by 40 CFR.

2.2 Data Review, Validation, Verification, and Reporting

ARB is committed to the review, verification, validation, and assessment of data generated or utilized within its PQAO. The data assessment process includes both internal and external quality control assessments of the accuracy, precision, data completeness, and criteria identified in associated QMP, QAPPs, and SOPs. Internal assessments are conducted by the producers of the data on a continuous basis to identify issues in real-time. ARB collaborates with air monitoring organizations within its PQAO and other data generating entities, as appropriate, to ensure that roles and responsibilities associated with data generation, verification, validation, reporting, and certification are clearly defined in the Roles and Responsibilities Document (Appendix H).

The following is a description of the major steps associated with data flow within ARB's PQAO:

- **Data Generation** - The collection, handling, and analysis of air samples. Generation of data is the responsibility of the site operator or laboratory analyst.
- **Data Verification** - The process of evaluating completeness, correctness, and compliance with specified requirements. The site operator is responsible for field data verification and the laboratory analyst is responsible for analytical data verification.
- **Data Validation** - A sample specific process that builds on data verification to determine the analytical quality of a specific data set. Data validation is typically conducted by the producers of the data. However, QMB plays a key role in the validation process by periodically assessing the effectiveness of data validation procedures and recommending corrective action, as necessary, when the error rate exceeds established DQOs.
- **Data Reporting** - Is the submission of data to AQS. Data reporting is typically carried out by the monitoring organization responsible for the generation of the data, but can also be reported to AQS by ARB or another air district.
- **Data Certification** - The evaluation of quality assurance findings and reports generated in AQS. Responsibility for data certification lies with the reporting organization. In accordance with 40 CFR, Part 58, Section 15, the reporting organization will submit an annual data certification letter to U.S. EPA by May 1 of each year. In this letter, the reporting organization shall certify that data, including any previously certified data that was modified for the previous year, are complete and accurate.

The general pathways for data generated within ARB's PQAO are summarized in Appendix I. The following is a summary of the major pathway routes of air monitoring data generated by ARB's PQAO:

- **ARB Only** - Generates, validates, reports, and certifies the data.
- **Air Monitoring District Only**- Generates, validates, reports, and certifies the data.
- **Air Monitoring District and ARB** - Generates and validates the data; ARB reports and certifies the data.
- **Multiple Air Monitoring Districts -** Multiple air monitoring organizations conduct the various activities describes above.

Data upload and certification responsibilities by monitoring organizations within ARB's PQAO are described in Appendix J.

Secondary or existing data are data that is originally collected for a certain purpose or project and are subsequently reanalyzed and utilized for a different project or purpose. They may be obtained from many sources, including literature, industry surveys,

compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. Secondary data utilized in projects that result in regulatory decision-making will have established acceptance criteria or DQOs, and the roles, responsibilities and authority of key personnel will be specified in the corresponding QAPP.

2.3 Quality System Documentation

This QMP documents the quality system of ARB's PQAO for ambient air monitoring measurements. It describes how data of sufficient quality and quantity, which meet or exceed all applicable requirements, will be generated on a consistent basis. Additionally, it describes the management structure and organization, objectives, policies, roles and responsibilities, and quality management tools utilized to implement all the required components of the quality system. All quality system documentation (QMP, QAPPs, SOPs, Roles and Responsibilities Document, etc.) for ARB and air monitoring organizations within its PQAO is available at http://www.arb.ca.gov/aaqm/qa/pqao/repository/qm_docs.htm.

QMB's Chief or designee will review and revise ARB's QMP as needed based on program changes or whenever a significant change is required. Any significant or major QMP revisions must be approved by appropriate ARB and U.S. EPA management. Minor QMP revisions will be summarized and forwarded to designated U.S. EPA staff.

2.4 Annual Reviews and Planning

ARB's quality system will be reviewed annually through various assessment processes described in this document to determine compliance with program objectives and to determine if modifications are needed to further improve the quality system.

The Annual Data Quality Report documents the quality of ambient data in quantifiable terms. The report provides an overview of QA/QC activities. Additionally, it summarizes statistical estimates of the precision, bias, and accuracy of monitors for criteria pollutants. It also summarized the completeness of monitor checks from which the statistical estimates are derived. More information on annual reviews is provided in Section 9, Assessment and Response.

2.5 Management Assessments

Assessments are conducted by management on an ongoing basis to evaluate the effectiveness of ARB's quality system. The Assessment and Response section of this document describes ARB's assessments and how they are utilized, documented, and distributed by management to maintain and improve data quality. The results of management assessments are documented and distributed to all affected parties.

2.6 Training

ARB recognizes that adequate training of all staff involved in any aspect of its air monitoring program is a critical component of maintaining continuity and an effective and efficient quality assurance program. Training needs are assessed on a continual basis by section managers. Training is encouraged and provided as needed or required to ensure staff maintain adequate skills and knowledge to successfully perform assigned duties and comply with all applicable quality assurance requirements. Section 3, Personnel Qualifications and Training, describes ARB's training program in more detail.

2.7 Systematic Planning of Projects

U.S. EPA requires that all ambient air monitoring projects supporting environmental decisions utilize established DQOs. ARB complies with these requirements and also utilizes a systematic planning process for special monitoring projects or other projects where DQOs and accompanying measurement quality objectives need to be established. Prior to implementation of such projects, the following elements will be determined and included in appropriate quality management documents:

- Description of project goals and objectives.
- Identification of all stakeholders.
- Identification of the type of data required to meet goals and objectives.
- Identification of potential constraints that might affect output.
- Identification of an implementation plan that includes milestones, timelines, resources, etc.
- Detailed sampling plan (e.g. instrument type, sampling location, frequency, etc.).
- Determination of the quantity and quality of data needed.
- Determination of data analysis method, evaluation, assessment, and quality performance criteria.
- Identification of required QA/QC activities.
- Identification of project management, organization, roles and responsibilities.

All appropriate staff will be involved in the planning process including project managers, stakeholders, and executive management in a collaborative effort to meet identified project objectives. Section 7.2 discusses in more detail DQOs and their development utilizing a systematic planning process and appropriate regulatory criteria for all sampling and analyses activities that support environmental decision making.

2.8 Project-Specific Quality Documentation

ARB utilizes this QMP and program or project specific QAPPs and SOPs to implement its quality assurance system. All of ARB's quality management documents, including QMPs, QAPPS, and SOPS utilized by monitoring organizations within ARB's PQAO are available at http://www.arb.ca.gov/aaqm/qa/pqao/repository/qm_docs.htm.

2.9 Quality Assurance Project Plans

A QAPP is required for each air monitoring project that is federally funded, however QAPPs or an equivalent quality assurance document may also be developed for projects that are not federally funded. QAPPs are typically prepared by the organization or section responsible for the program and may address plans for more than one project in one comprehensive plan.

A QAPP must comply with all applicable requirements, including U.S. EPA's Requirements for Quality Assurance Project Plans (EPA QA/R-5), and must be consistent with the objectives and requirements of ARB's QMP. A QAPP document includes the following elements:

- Mission, objectives, and policies.
- Purpose and background.
- Distribution and approval signatures.
- Roles and responsibilities.
- Resource requirements.
- Measurement, sampling, analysis, and chain of custody specifics.
- Instrument requirements.
- Data acquisition and management specifics.
- QA/QC activities.
- Assessment activities and responsibilities.
- Reports produced for management.
- Data validation and DQO reconciliation specifics.

U.S. EPA's Guidance for Quality Assurance Project Plans (EPA QA/G5) should be utilized by the program/project manager and staff as guidance during the planning and development of a QAPP.

ARB intends to develop and implement QAPPs for each major federally funded air monitoring project or pollutant classes (e.g. gaseous, toxics, particulate matter, and meteorological). ARB's QAPPs will focus on project-specific policies and will reference SOPs and any other technical material. All QAPPs developed by ARB must be reviewed and approved by the appropriate program manager, QMB Chief, other related staff and

management, and U.S. EPA management prior to distribution and implementation. If a monitoring organization within ARB's PQAO chooses to utilize an alternative QAPP or modify any portion of ARB's QAPPs, prior written approval shall be obtained from ARB and U.S. EPA.

QAPPs are valid for a period of up to five years, but may be reviewed and revised sooner, based on project or program changes.

2.10 Standard Operating Procedures

Pursuant to 40 CFR, Part 58, Appendix A, Section 3.1, all monitoring organizations within ARB's PQAO are required to adopt and follow ARB's SOPs for each air monitoring instrument they operate and for which ambient air quality data are reported. Air monitoring organizations may adopt and follow alternative SOPs that have been reviewed and approved by ARB's QMB.

SOPs are an integral part of a quality system. They provide staff with the information necessary to perform a specified task properly and facilitate consistency which helps ensure the quality and integrity of results. SOPs utilized by ARB and monitoring organizations within its PQAO describe the detailed procedures for air monitoring activities, including sample collection, instrument operation and maintenance, preparation and analysis of samples, and data management procedures. New or revised SOPs are developed by experienced staff and are reviewed by the appropriate program manager and other management and staff, as appropriate. They are forwarded for review, approval and implementation to QMB's Chief.
ARB developed an SOP Review Checklist derived from U.S. EPA's Guidance for Preparing Standard Operating Procedures (EPA QA/G-6), which identifies the elements of an effective SOP. When a monitoring organization submits an SOP for review, ARB will utilize the criteria in the checklist to evaluate their completeness. Monitoring organizations are encouraged to use the review checklist and U.S. EPA's guidance document when creating or revising SOPs. SOPs are valid for a period of up to three years, but may be reviewed and revised sooner based on procedural changes.

A table listing SOPs utilized by ARB's PQAO and by some of the other PQAOs in California is available on ARB's PQAO website at http://www.arb.ca.gov/aaqm/qa/pqao/repository/qm_docs.htm. Program wide SOPs utilized by ARB's air monitoring program are listed in the Reference Section of this document.

2.11 Laboratory Quality Control Requirements

The purpose of ARB's Laboratory Quality Control Manual (Volume III of the Quality Assurance Manual) is to detail the guidelines and procedures utilized by NLB's

Inorganics and Organics Laboratory Sections. These guidelines and procedures are utilized to ensure the accuracy, precision, and completeness of analytical results and supporting quality control measures, and the consistent validation of data generated. The manual includes information about program management and responsibilities, standards and reagents, media and equipment, QA/QC, data and sample management, and confidentiality procedures.

General quality control, data management, and corrective action procedures are consistent for all analytical methods supported by NLB, but specific quality control components and performance criteria vary by analytical method and are addressed in corresponding SOPs.

2.12 Quality Assurance Assessments

ARB's quality system includes activities to evaluate the implementation and effectiveness of QMPs, QAPPs, SOPs, and any other quality management documents. These assessments are performed by various sections within ARB.

QMB's Chief has the overall responsibility for these assessments which are conducted in accordance with associated quality management documents. These assessments are discussed in more detail in Section 9, Assessment and Response.

2.13 Data Quality Assessments

Data quality assessments are performed on an ongoing basis to compare data quality with established DQOs. Data quality assessments include the evaluation of data accuracy, precision, detection limits, acceptable operating range, representativeness, comparability, and adherence to approved QAPPs and SOPs. Independent traceable National Institute of Standards and Technology (NIST) audit standards or other approved standards are utilized for these assessments, as appropriate.

Upon request, ARB may provide external assistance with data quality assessment by evaluating existing assessment methodologies, assisting with the development of new assessment methodologies and review of QMPs, QAPPs, and SOPs to ensure that data quality assessments are appropriate, adequate, properly documented, and effective.

2.14 Project Implementation Assessments

Periodic project implementation assessments are conducted through TSAs or other assessments to determine the effectiveness of project implementation with respect to policies, procedures, methods, and associated QAPPs and SOPs. Training, sampling, analysis, documentation, siting criteria, and data verification and reporting procedures are evaluated in these assessments.

SECTION 3 – PERSONNEL QUALIFICATIONS AND TRAINING

The quality of the air monitoring program in ARB's PQAO is dependent on the level of staff training and education. It is ARB's policy that management in each program, section or monitoring organization, routinely assess and address training needs and requirements through the annual budgeting process and in coordination with management, human resources, and the Executive Office, as appropriate.

Training needs will be identified, documented, and addressed as they arise on an annual basis. To the extent possible, managers will provide opportunities for staff to participate in training and educational activities outside of their daily work routines (e.g., inter-program cross-training, seminars, etc.).

3.1 Personnel Qualifications

All employees, including managers and staff must satisfy class specifications for all positions, including those performing quality assurance or environmental measurement functions. Class specifications and duty statements identify job duties and the minimum education, experience, knowledge, skills and abilities required to perform job duties for each specific position. Classification specifications are reviewed periodically for relevance to applicable ambient air monitoring requirements, including current technology, instrumentation, and methodologies. A competitive interview process is required for all prospective staff to ensure that the most qualified candidates are considered by the hiring manager or authority.

3.2 Training Overview

ARB's Training Section provides a variety of training and consultative services to ARB and Cal/EPA staff. The Training Section is responsible for developing training policy; maintaining training resources and materials; assisting management teams in the development and review of their annual training plan and needs; assisting employees in the identification of appropriate courses; and preparing training plans and reports. Additional information about ARB's Training Section is available to ARB and Cal/EPA staff at http://inside.arb.ca.gov/as/train/train.htm. Additional information and training courses is available to other interested parties on ARB's website at https://ssl.arb.ca.gov/training/courselist.php.

3.3 New Employee Orientation and Training

New staff receives on-the-job training from senior program staff and management. Additionally, each new staff member will be evaluated at approximately four, eight, and twelve months after initial hire by the appropriate section manager. A plan for achieving performance objectives is included in an employee development plan. The manager or

designee of each section or monitoring organization is responsible for documenting and maintaining training records for all staff.

In addition to job specific training, new employees of ARB and monitoring organizations within ARB's PQAO are encouraged to participate in the Air Academy Training Program. The program includes a series of on-line training modules covering major elements of ARB's programs and functions, and the fundamentals of air pollution. Upon completion of the on-line portion of the program, employees may meet with management or other staff to discuss any aspect of the training program in more detail. Additionally, ARB encourages staff participation in available and relevant training provided by outside agencies such as equipment manufacturers and U.S. EPA.

3.4 Continuing Education and Training

ARB recognizes that continuing education and training are a critical component of maintaining continuity and an effective and efficient quality assurance program. Training needs are assessed on a continual basis by section managers. Training is offered as needed or required to maintain and improve the skills and knowledge of staff. All training is tracked and documented in individual personnel files by managers or their designee. Staff may be required to submit a memorandum to their supervisor or manager outlining training received or may be required to present a summary of training received at meetings, conventions, or symposia proceedings to relevant staff.

The Administrative Services Division (ASD) created a Training Plan and Guide to assist employees in assessing their training needs. The Training Plan and Guide identifies training opportunities, along with some specific course recommendations for job classifications at ARB. The Training Section in ASD is dedicated to providing ARB staff training that meets ARB's mandate for educational development, enhancing employee skills, providing opportunities for upward mobility, improving productivity, and the quality of work output.

3.5 National Performance Audit Program Training

U.S. EPA has evaluated and authorized ARB to conduct National Performance Audit Program (NPAP) audits of monitoring organizations within ARB's PQAO. ARB's QAS developed an extensive and well documented training program for all ARB staff conducting NPAP, Through-the-Probe (TTP) audits. This training program is a year-long on-the-job training which includes in-office coursework, laboratory experience, in-field shadowing by experienced auditors, in-field evaluations by section management, and an annual certification by U.S. EPA or authorized auditor. QAS performs an annual comparison of audit procedures and results with U.S. EPA and third party audit staff to ensure that ARB's NPAP and Performance Evaluation Program audit procedures meet

all requirements (40 CFR, Part 58, Section 3.2 and 40 CFR and Part 58, Appendix A, Section 2.4, respectively). This audit training program is reviewed and approved by U.S. EPA staff every three years as part of U.S EPA's TSA program.

3.6 Air Monitoring Training Modules

MLD developed training modules for ARB, local air monitoring staff, and management at all levels. The modules are designed to emphasize the fundamentals of key elements of ambient air monitoring. The training program is comprised of three distinct modules, and will be offered at different times and locations in California. Training will be conducted by subject-matter experts from ARB, U.S. EPA, air monitoring districts, and instrument manufacturers. The following is a summary of each training module:

Module 1: Fundamentals of Air Monitoring and Station Setup and Operation – This module introduces attendees to the history of air monitoring, including why monitoring is performed, air monitoring terminology, network design, and station setup and operation.

Module 2: Quality Assurance and Data Management – This module covers the basics of quality assurance, quality assessment, and quality control. Attendees receive instruction on the use of SOPs, quality control forms, calibration and routine checks, documentation, and data management procedures.

Module 3: Instrumentation Operation and Media-Based Sampling and Analysis – This module is instrument specific training which covers operation, maintenance, and troubleshooting of most commonly used ambient air monitoring instruments and methodologies.

Training materials and associated references (i.e., regulatory requirements, guidance documents, QA Manual, AQSB SOPs, etc.) will be provided to all attendees. Training material for all three modules will be available on ARB's PQAO website.

SECTION 4 – PROCUREMENT OF ITEMS AND SERVICES

4.1 Procurement Policy

It is ARB's policy that all ARB staff shall comply with ARB's procurement policies and procedures as specified in ARB's Procurement Services Guide which is available at http://www.arb.ca.gov/personnel/asl/attto97-12.htm. ARB encourages monitoring organizations within its PQAO, including independent contractors, to utilize ARB's procurement policy, however, if an alternative policy is utilized, performance and technical specifications shall be specified.

4.2 Procurement Overview

Item and service requirements are typically based on program or project needs, and are determined based on ARB's Procurement Services Guide. Procurement of items and services is performed through an agency or state approved vendor, sole source non-competitive bid process, or a competitive bid/contract process as described further below.

4.3 Initiating a Contract

A contract is a legal agreement between parties that defines the terms and conditions of goods or services provided. The elements of a contract include:

- Identification of parties entering into the agreement.
- Contract term, including dates for performance and completion of the agreement.
- Maximum amount to be paid.
- Scope of Work (SOW) - Provides a concise and specific description of the work, services, or product rendered or provided, including terms and conditions.
- Authorized signatures from all parties involved.

4.4 Solicitation of Contracts

Contracts involving ARB and an outside contractor are classified as a Standard Agreement. These agreements are solicited through a formal or informal competitive bidding process. Formal bids require advertising on Bidsync, which provides online procurement services and public bidding. Informal bids can be received either verbally or in writing at any time and do not require advertising on Bidsync. Whether the contract is formally or informally bid depends on its complexity and is determined by the Contract Analyst and Project Manager.

The Project Manager must prepare a document which states the time frames of the contract, advertisement period, SOW, and minimum qualifications of the bidder. The contract is awarded to the most qualified bidder at the lowest cost. Contracts involving ARB and another governmental agency are classified as Interagency Agreements and are exempt from the bidding process.

4.5 Acceptance Test Procedure

Acceptance testing is conducted to verify if equipment meets the specifications described in the contract. Acceptance testing must be performed on any new air monitoring equipment purchased by ARB prior to implementation or use. Testing procedures are performed by AQSB's Instrument Laboratory and include a physical inspection, operational, and performance checks (leak checks, flow checks, linearity

checks, and precision checks). Acceptance criteria for these procedures are defined in instrument Acceptance Test Procedures documents located in ARB's Air Monitoring Web Manual. It is the responsibility of monitoring organizations within ARB's PQAO to perform acceptance testing on their own equipment if they are not using equipment purchased by ARB. Upon request, ARB may perform acceptance testing for local air monitoring organizations.

Equipment returning from a vendor following repair undergoes a bench test procedure, an abbreviated acceptance test procedure, prior to deployment.

SECTION 5 – DOCUMENTS AND RECORDS

5.1 Documents and Records

ARB and monitoring organizations within its PQAO generate and maintain a variety of quality management related documents and records. Documents include QMPs, QAPPs, SOPs, quality control forms, technical bulletins, acceptance test procedures, audit and assessment reports, Air Quality Data Action (AQDA) requests, and network plans. Data records include ambient air monitoring data and laboratory analysis results, sample reports, strip charts, and maintenance records.

Effective document management includes a system for generating, updating, maintaining, and disseminating quality management related documents and records. All available documents and records for ARB and monitoring organizations within its PQAO are available at http://www.arb.ca.gov/aaqm/qa/pqao/repository/qm_docs.htm. The procedures described below are those followed by ARB and monitoring organizations within its PQAO for quality management related documents and records.

5.2 Responsibility for Documents and Records

The responsibility for identifying, preparing, and managing quality management documents and records lies with management of the group responsible for creation of the document or record. The responsible party shall work with QMB to incorporate a document into the document control system as a new document or as part of an existing document (i.e., QAPP, SOP, etc.). Previous versions of documents should be archived if no longer in use. Only authorized personnel are granted access to edit or modify documents.

QMB is responsible for maintaining a database of all current ARB quality management related documents as well as a list of those documents in use by monitoring organizations within ARB's PQAO. A quality management document database repository is available at http://www.arb.ca.gov/aaqm/qa/pqao/repository/qm_docs.htm. AQSB is responsible for maintaining a database of quality control documents related to the operation and

maintenance of the ambient air monitoring program (SOPs, field maintenance forms, technical bulletins, acceptance test procedures, ambient air quality data, etc.). NLB is responsible for maintaining a database of laboratory quality control documents. These documents are accessible through ARB's Quality Assurance website, at http://www.arb.ca.gov/aaqm/qa/qa.htm.

5.3 ARB Document Retention Policy

Records and documents created or received by ARB are retained for a period of time as specified in ARB's Records Management Program and the Department of General Service's (DGS) Records Retention Schedule. However, the most stringent retention criteria are always applied. As a general rule, ARB retains documents and records for a period of three years before transferring them to DGS for long term archiving.

Site operators should maintain copies of their station's monthly maintenance datasheets for the current and previous calendar year. They should also maintain copies of all calibration and audit reports for the previous three calendar years. These materials along with the current station logbooks should be available and maintained at the air monitoring station.

5.4 ARB Document Tracking

The documentation format utilized by ARB for tracking and controlling quality management documents is described below. The system incorporates a standardized indexing format and provides for revisions without reissuing the entire document.

Each document is formatted to include a 4-line indexing format that includes the following information:

Line 1 – Branch and Document Number
Line 2 – Title or Description of Document
Line 3 – Document Revision Number and Revision Date
Line 4 – Page X of Y

An example of an indexing label is as follows:

AQSB SOP 001
API 400A Ozone Analyzer
Second Revision, August 2007
Page 1 of 50

Sections within a document can be added, modified, or deleted. When a document is modified, the revision number and revision date are changed on the Title Page, Table of Contents, and in the indexing label at the top of each page.

The Title Page will include SOP number, title, effective date, approval date and version.

Monitoring organizations within ARB's PQAO may adopt this procedure or develop their own standardized procedure for tracking quality management documents.

5.5 Document Distribution

ARB's MLD is responsible for maintaining electronic files of ARB's quality management documents (i.e., QMP, QAPPs, SOPs, etc.). The documents are accessible on the Quality Assurance webpage, which is available to ARB personnel, PQAO contacts within each monitoring organization, and the general public. The contents of the webpage are reviewed on an annual basis, and notification of updates or additions are sent via ARB's PQAO List Serve, available at http://www.arb.ca.gov/listserv/listserv_ind.php?listname=pqao. ARB management and designated PQAO contacts are responsible for dissemination of information to the appropriate personnel within their monitoring organization. The quality management document repository database is updated routinely, as needed.

5.6 Archiving of ARB Document and Records

Archiving of quality management documents and records is the responsibility of the section, program, or monitoring organization generating the document or record. Documents that are created and shared by multiple sections, such as the QMP, are maintained and archived by QMB. The section responsible for the document should maintain it in a digital and/or hardcopy format. A current version of the document or record shall be maintained in a designated electronic directory. Versions no longer in use are archived. Documents and records related to ARB's air monitoring program are maintained and accessible in accordance with ARB and U.S. EPA record retention policies. Quality management documents are archived in digital format unless hardcopy originals are legally required to be kept by the program QAPP. Records and data that are originally captured in digital format should be archived in digital format, unless a hardcopy of the original record or data is also required to be archived by the program QAPP. Records and data that are originally captured in a hardcopy format should be archived in a hardcopy format. An archived document incorporates the word "Archive" in the title and it is transferred to an "Archived Document" directory.

Section managers or monitoring organizations have the responsibility to maintain updated documents and to archive those that are no longer in use. In order to properly manage current and archived documents, two document directories shall be

maintained. The “current document” directory is accessible to all staff. Current documents are defined as those currently in use by management and staff for programs in progress or approved for implementation. The “archived document” directory is for all versions of documents that were previously in use. These documents and records provide a timeline indicating when a specific version of a document was in effect. Archived documents should remain available to all ARB personnel and designated PQAO contacts.

Hardcopy documents and records are archived on-site at ARB facilities or at an off-site secure storage facility contracted by ARB.

SECTION 6 – COMPUTER HARDWARE AND SOFTWARE

6.1 Introduction

ARB utilizes a wide range of computer equipment including laptops, desktop computers, field data loggers, laboratory analytical equipment, databases, and servers. Hardware and software needs are program or project specific and are determined by the project manager and are identified in corresponding QAPPs or SOPs. The acquisition of all hardware and software equipment is subject to procurement policies, as discussed in Section 4.

A variety of databases are utilized for data recording, reduction, management, and storage of data. Databases are managed in-house by an appointed system administrator. The system administrator is given administrative rights with a higher level of access to the database, including software modification capabilities. Data files are backed up to on-site secured servers, which are managed by ARB’s Office of Information Services (OIS). Scheduled maintenance of servers occurs on a monthly basis to ensure they are performing as required.

6.2 Data Management System

The Data Management System (DMS) is comprised of instruments and computers (CARBLogger) that monitor ambient air quality throughout ARB’s air monitoring network. There are over 40 monitoring sites in the network. The CARBLogger queries monitor instruments digitally each minute to generate minute averages, which are transferred via broadband internet to the server in ARB’s data center hourly. The DMS server retrieves the minute data and inputs it into a Microsoft SQL database. Data are reviewed and edited on the server by site operators, support staff, and managers. Data security is controlled by requiring a user name and password. Data are continuously replicated and backed up to a synchronized replication server located in an adjacent building. Data are also backed up on a nightly basis to a Storage Area Network (SAN) in the ARB data center. ARB’s SAN is backed up every 16 days to tape and all tape

backups are stored at an off-site facility. Data are stored on the database server for up to two years.

Data gathered from air monitoring sites are reviewed for accuracy and completeness. The DMS server utilizes various techniques to check the reliability of the data. In the event of a database transcription error, Microsoft SQL software and DMS will generate a log of the error in the database server. If CARBLogger loses communication with the server, it will queue the data files for the missed hours and send the queue once communications are established. Station operators can also request a manual data inquiry via an automated web page.

DMS is tested through daily use by site operators. Site operators have the primary responsibility for distinguishing valid or invalid data. If issues are identified, the site operator must contact the system administrator and other appropriate personnel to assist in addressing the issue. It is the responsibility of the site operator to document the issue and the corrective taken, as appropriate.

DMS is built around DMS software developed by Sonoma Technology Incorporated in cooperation with the Bay Area Air Quality Management District, South Coast Air Quality Management District, Airnow, and ARB. Guidelines for implementation of this software are provided with system documentation.

6.3 Laboratory Information Systems

Data processed by NLB is managed by a Laboratory Information Management System (LIMS), which is password protected with controlled access to authorized users only. Data processed by LIMS is stored in a database and managed through front end LIMS software. Other software is utilized along with LIMS to aid in data reporting and electronic data transfer. The database automatically backs up data files onto the server on a weekly basis. In addition, the database is in ARCHIVELOG mode meaning that changes made within the database are archived, rather than overwritten. This ensures that all committed transactions can be recovered in the event of an operating system failure.

LIMS hardware and software are managed in-house by the system administrator. The database includes trace files, which are used to ensure acceptable performance as required. Trace files contain a log produced by the database debugger program. The log includes a record of errors found and corrective action taken. The log runs automatically and sends an email notification to the system administrator when errors occur. In addition, the system administrator manually checks trace files on a weekly basis.

6.4 Audit Information Systems

Performance audit data for monitoring sites and laboratory operations are recorded and maintained in ARB's Audit Information System (AIS). AIS is a password protected database developed by ARB, which resides on audit laptops and a secured server maintained by ARB's OIS. AIS is utilized to perform calculations necessary to determine the performance of audited parameters, verify compliance with 40 CFR, Part 58 requirements, generate Performance Audit Reports, and initiate AQDA requests, as appropriate. AIS is also capable of generating other audit and data accuracy reports.

A verification of audit values and accuracy of transcription to AIS is performed by a second auditor for all audit parameters. Audit information is further verified for completeness utilizing an AIS "Inconsistency Report", which identifies audit fields with missing or incomplete information. A Preliminary Performance Audit Report is generated for monitoring organizations and QAS records. Preliminary Audit Reports and AQDAs undergo a multi-level peer and management review prior to being finalized and disseminated to monitoring organizations. Audit worksheets, audit reports, and AQDAs are maintained either electronically and/or in hardcopy format in accordance with ARB's records management policy. The system administrator for AIS is responsible for maintaining the database and has access to all functions within the AIS database. Information in AIS is backed up nightly to a primary and secondary server, in accordance with OIS policy.

6.5 Technical System Audit and Data Assessment Reports

TSA and data assessment reports undergo a multi-level peer and management review process prior to finalization. Data and reports are maintained in electronic and/or hardcopy format. The electronic format is housed in a secured server maintained by OIS with password protection and limited access. The server is backed up nightly. The hardcopy format is maintained in a secured file cabinet with limited access. Electronic and hardcopy records are maintained in accordance with ARB's records management policy.

6.6 Air Quality System

PTSD's Air Quality Analysis Section (AQAS) is responsible for preparing, processing, and submitting ambient air quality data for several local air monitoring organizations into AQS; logging and archiving all received data; and correcting and deleting any data, as appropriate [e.g., resulting from AQDA or Corrective Action Notification (CAN)]. Detailed data management procedures and AQAS staff responsibilities are specified in the corresponding SOP for ambient air quality data management.

AQAS receives ambient air quality data files from air monitoring organizations via email and/or U.S. mail. It is AQAS policy that data files received are submitted into AQS as soon as possible. U.S. mail or paper data files, mainly PM10 data sheets, are first transcribed onto Excel templates and then submitted into AQS. All submitted data files are logged and archived for future reference. AQAS archives electronic data files onto DVDs once a year in December. One copy of DVDs are stored onsite at ARB while another copy is sent offsite for storage. The offsite storage facility is contracted to securely store data files sent from ARB. Paper data files are archived on-site at AQAS offices in accordance with AQPB's records management policy and then sent for off-site archival to the California State Archives.

AQAS staff modifies data values in AQS as needed based on a request by a monitoring organization or as a result of finalized AQDA. Monitoring organizations can request AQAS staff to modify data in AQS by email, U.S. mail, or phone. Data modification requests are initiated by monitoring organizations when errors are identified with data they previously provided to ARB. A phone request is followed-up with an email to the monitoring organization detailing the modification request. Data modification requests received by U.S. mail are scanned and archived. All data modification request documents are electronically stored onsite at ARB.

SECTION 7 – PLANNING

7.1 Planning Requirements

It is ARB's policy that all operations that generate air monitoring data within ARB's PQAO must be systematically planned and documented in accordance with this QMP and appropriate quality management documents that have been approved by ARB and U.S. EPA. Reports and assessments are evaluated on an ongoing basis to help address training needs, corrective actions, and other quality assurance activities.

In the process of developing QAPPs, input must be obtained from data users, as well as field, laboratory, data management, supervisory, and other staff involved with the project. Prior to implementation, each QAPP must be reviewed and approved by appropriate ARB and U.S EPA management for compliance with all relevant quality assurance requirements. U.S. EPA's DQOs (QA/G-4) may be utilized as guidance by the project manager during the process of QAPP planning and development. See Section 2, Quality System Components, for more information regarding QAPPs.

7.2 Data Quality Objectives

ARB is committed to the review, validation, and assessment of data produced within its PQAO to ensure that data quality and quantity meets or exceeds all applicable requirements, and to strive for continual data quality improvement. All sampling and

analyses activities supporting environmental decision making will have established DQOs by utilizing a systematic planning process and appropriate regulatory criteria. The process of establishing DQOs is outlined in U.S. EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, December 2008. DQOs will be included in appropriate quality management documents.

DQOs define specific parameters, including the type of data that will be collected and allowable decision errors that will be tolerated with regard to the quantity and quality of data collected to ensure objectives are met. U.S. EPA initially established DQOs based on the most stringent data quality requirements and established formal DQOs for many of the monitoring programs (i.e., PM2.5, ozone, National Core Monitoring Network, criteria pollutants, etc.). DQOs established for each of these programs are utilized to develop measurement and data quality indicators to define acceptable data quality and quantity.

It is the goal of ARB to generate data of the type, quantity, and quality to meet established DQOs. Federal, state, and local ambient air monitoring networks are designed to collect data to meet four basic objectives:

1. Provide air pollution data to the general public in a timely manner.
2. Determine compliance with air quality standards.
3. Support emission strategy development.
4. Support air pollution research.

These objectives could potentially require different DQOs based on program specific data quality requirements. State and local air monitoring organizations may develop additional quality objectives or other systematic planning processes for their monitoring networks for special purpose monitoring projects or any other monitoring project that does not have established DQOs or for which no regulatory criteria apply. In addition these types of projects may utilize instrument manufacturer manuals, and other recommendations, as appropriate.

SECTION 8 – IMPLEMENTATION OF WORK PROCESSES

All air monitoring work processes are conducted by qualified personnel in accordance with approved QAPPs and SOPs. An implementation schedule detailing objectives, timelines, and responsibilities are utilized. Any anomalies or deviations from approved procedures are documented and communicated to appropriate program management. Documentation will include a clear description of the issue or deviation and corrective action taken. Any modification or corrective action taken must be approved by a program manager and other staff, as appropriate. CAN and AQDA processes are described in Section 9 and must be utilized, as appropriate.

Finalized QMPs, QAPPs, and SOPs utilized by ARB's PQAO are available at http://www.arb.ca.gov/aaqm/qa/pqao/repository/qm_docs.htm. Monitoring organizations are responsible for notifying ARB of changes to approved QMPs, QAPPs, and SOPs, and providing ARB with updated versions for approval. ARB will disseminate updated ARB documents to monitoring organizations and other interested parties through ARB's PQAO List Serve, located at http://www.arb.ca.gov/listserv/listserv_ind.php?listname=pqao. ARB will archive previous or outdated versions of quality management documents, as appropriate.

QMB will manage the quality management document repository, conduct assessment activities, and review and approve QMPs, QAPPs, and SOPs to ensure that programs and projects are implemented in accordance with approved plans and this quality management system.

SECTION 9 – ASSESSMENT AND RESPONSE

9.1 Introduction

ARB performs a variety of quality assessments and surveillance activities to ensure the accuracy of ambient air monitoring data generated by monitoring organizations within its PQAO. Assessment activities include various audits, siting evaluations, review of precision and accuracy data, and preparation of data quality reports. Surveillance activities include internal quality control tasks for both field and laboratory monitoring activities. Due to the variety of operations and programs in ARB's ambient air monitoring network, all assessments may not be required for all programs. However, each type of quality assessment is described in this section.

9.2 Performance Audits of Gaseous, Particulate, and Meteorological Equipment

TTP audits of continuous gaseous analyzers are conducted annually by ARB's QAS. The audits verify the accuracy of monitoring equipment and ensure the integrity of the entire sampling system. TTP audits are conducted using NIST traceable gases that are introduced simultaneously to audit and monitoring station instrumentation. Gases are introduced at known concentrations and readings between audit equipment and station equipment are compared to ARB's control and warning limits. TTP audits are conducted for carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, and hydrogen sulfide.

TTP audits are conducted annually for all air monitoring sites within ARB's PQAO. TTP audits are also conducted at monitoring sites that are operated by other PQAOs, as resources permit. These audits meet the requirements of U.S. EPA's NPAP. A complete description of these audit procedures is available in a technical paper titled,

"Through the Probe Performance Audits of Continuous Ambient Air Analyzers" (http://www.arb.ca.gov/aaqm/qa/papers/ttpaudits.pdf), and in various SOPs which are available in Volume V of ARB's Quality Assurance Manual.

Flow audits are conducted twice annually by QAS staff in conjunction with local air districts to verify the accuracy of the particulate samplers. The audit compares the site's instrument flow rate to a certified orifice or mass flow meter, and to the design specifications for the sampler. The audits are performed by QAS personnel using NIST traceable flow devices. The audit device is connected in-line with the sampler's flow path. The audit is conducted while the sampler is operating under normal sampling conditions. Results of flow audits are compared to ARB's control and warning limits to ensure proper operation of particulate samplers.

QAS also conducts annual performance audits for meteorological sensor parameters such as horizontal wind speed, wind direction, ambient temperature, and barometric pressure. Audits are performed using NIST traceable audit equipment. Results are compared to the monitoring site's meteorological equipment and manufacturer design specifications. Results exceeding specified control limits will initiate corrective action, as appropriate.

If any audited parameter fails to meet ARB's audit acceptance criteria, the failure is reported (see description of AQDA and CAN process below) and a request is made to the monitoring organization to investigate the issue and implement corrective action, as appropriate. A re-audit is conducted by QAS to verify resolution of any issue identified.

9.3 Siting Assessments

Site information is reviewed and verified for each air monitoring station that is audited by ARB's QAS. The siting assessment is generally conducted as part of the annual performance audit, but may be assessed at other times if deemed necessary. Physical measurements and observations include; probe/sensor height above ground level, sampler spacing, distance to obstructions, gaseous residence time, obstructions to air flow, distance to local sources, topography, vehicle counts, predominant wind direction, and sampling probe material. These evaluations are conducted to determine compliance with 40 CFR, Part 58, Appendix E requirements. A description of site surveys is available in a technical paper titled, Comprehensive Quality Assurance Site Survey, which is available at http://www.arb.ca.gov/aaqm/qa/papers/site_survey.pdf.

If any audited parameter fails to meet ARB's audit acceptance criteria, the failure is reported (see description of AQDA and CAN process below) and a request is made to the monitoring organization to investigate the issue and implement corrective action, as appropriate. A re-audit is conducted by QAS to verify resolution of any issue identified, as resources permit.

Station information can be accessed through either the California Air Basin Map or Site List, which is an alphabetical listing of air monitoring stations. More sophisticated queries can be made from the search page. These site webpages which are updated as new information is obtained are listed below.

- Interactive Site Map (http://www.arb.ca.gov/qaweb/mapdemo/map_module.php).
- Specific Site Search (http://www.arb.ca.gov/qaweb/mapdemo/siteinfo.php).
- Site List (http://www.arb.ca.gov/qaweb/site.php).
- Search Site Information Data Base (http://www.arb.ca.gov/qaweb/sitelist_create.php).
- Agency Monitoring Information (http://www.arb.ca.gov/qaweb/district_sitelist.php).

9.4 Laboratory Performance Audits

Laboratory performance audits assess the accuracy of analytical methods and instrumentation used in laboratories. Laboratory performance audits are typically conducted by ARB's QMB on an annual basis, but may also be conducted by U.S. EPA. These audits may be done at a greater frequency for certain programs (i.e., lead analysis). Laboratory performance audits are conducted for both gaseous and media-based audit materials.

Laboratory performance audits for toxic compounds are conducted by supplying the laboratory with a NIST certified gaseous sample containing a mixture of target compounds. Audit samples are analyzed in accordance with laboratory SOPs and results are reported to QMB.

Media-based laboratory audits are conducted for methods which employ a solid sample collection media. Audit samples for PM10 ions, hexavalent chromium, carbonyls, and lead are prepared by accredited vendors using traceable standard materials, if available. Audits are conducted by supplying the laboratory with a spiked filter or cartridge media for analysis in accordance with corresponding SOPs.
Analytical results for each laboratory audit are reported to QMB and compared to certified concentrations. Laboratory audit results must be within ARB's established control limits of the true or certified value. If results exceed established control limits, the laboratory must investigate the cause, report findings to QMB, and implement appropriate corrective action (see description of AQDA and CAN process below). A re-audit may be conducted to verify resolution of any issue identified.

9.5 Mass Analysis Audits

Annual mass analyses performance audits are conducted for all PM10 and PM2.5 laboratory operations within ARB's PQAO, as well as those operated by BAAQMD,

SCAQMD, and SDCAPCD. Mass analyses audits are conducted by ARB's QAS and include an on-site evaluation of filter weighing balances, relative humidity and temperature sensors, and a review of documentation records. The audit is conducted to ensure compliance with all applicable requirements (40 CFR, Part 50, Appendices J and L) and to assess if data generated is of sufficient quantity and quality to be considered data-for-record. If any audited parameter fails to meet ARB's audit acceptance criteria, the failure is reported (see description of AQDA and CAN process below) and a request is made to the monitoring organization to investigate the issue and implement corrective action, as appropriate. A re-audit may be conducted to verify resolution of any issue identified.

9.6 Technical System Audits

A TSA is an on-site inspection and review of a monitoring organization's entire ambient air monitoring program. The entire measurement system is reviewed which includes sample collection, sample analysis, and data processing. TSAs include a review of staff records, procedures, instrumentation, facilities, and documentation to assure compliance with all applicable requirements.

U.S. EPA is responsible for conducting TSAs of a monitoring organization's national ambient air monitoring stations (NAMS). U.S. EPA may negotiate with private contractors or ARB to conduct a portion or all of these NAMS system audits. QMB conducts audits of monitoring organizations operating SLAMS. TSA procedures utilized by QMB auditors are located in U.S. EPA's Quality Assurance Handbook, Volume II.

TSAs are conducted in three phases. The first phase consists of a questionnaire derived from U.S. EPA's, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Appendix H, which is designed to gather information regarding program areas including network management, field operations, laboratory operations, data management, quality assurance, and data reporting. The completed questionnaire undergoes a thorough review by QMB and is used as a tool to determine areas requiring further clarification and discussion during the on-site assessment phase. The second phase is an on-site assessment of a monitoring organization's field, laboratory, and data management operations, as appropriate. The evaluation includes a follow-up to questionnaire responses, and a review of procedures, practices, and records in all related program areas.

The third phase is an in-depth evaluation of the information gathered from the questionnaire, performance audit reports, precision and accuracy reports, data audit, and on-site assessment. Following evaluation of available information, a draft written report is prepared which includes a summary of the audit process, and a summary of findings and recommendations to correct any issues identified. A TSA report is provided to the audited monitoring organization for review and response.

If any audited parameter fails to meet State or federal requirements, the failure is reported (see description of AQDA and CAN process below) and the monitoring organization is directed to investigate the issue and implement corrective action, as appropriate.

U.S. EPA conducts a TSA of ARB, at a minimum every three years. Monitoring organizations within ARB's PQAO may also be included as part of a TSA.

9.7 Data Audits

Data audits are performed by ARB's QMB as part of TSAs. Data audits involve statistical analysis of air monitoring data. An auditor reviews data generated by the audited monitoring organization and performs statistical tests to identify trends and anomalies. Data findings that are inconsistent with historical trends will be identified in a TSA Report or other reports, as appropriate. The monitoring organization is required to address findings and implement appropriate corrective action (see description of AQDA and CAN process below).

9.8 Laboratory Quality Control Reports

Air monitoring data generated by NLB is submitted to AQS. NLB staff is responsible for creating and reviewing monthly data reports that include quality control information associated with sample analyses (i.e., calibration, controls, spikes, blanks, etc.). These reports are reviewed and approved by management prior to AQS submission. Information contained in these reports includes control charts, precision data for duplicates, replicates, and collocated samples, sample anomalies and corrective actions, and any departures from corresponding method SOPs. This information is also compiled in an annual quality control report, which is analyzed statistically and reported to ARB management.

9.9 Year-End AQS Data Submittal and Summary Report

At the end of each calendar year, AQSB produces a Year-End AQS Data Submittal and Summary Report for ARB management. The report summarizes continuous monitoring data submitted to AQS for the prior calendar year. Tables are utilized to indicate the highest measurement values for each parameter, violations of state and federal air quality standards, data completeness percentage, calculated precision, and confidence intervals for each parameter.

9.10 Assessment of Precision and Accuracy Results

As required by 40 CFR, Part 58, Appendix A, data and information reported to AQS for each reporting period (i.e., quarter) must include all data gathered and must be

uploaded to AQS within 90 days after the end of each quarterly reporting period. 90 days following the end of a calendar year, QAS staff generates reports in AQS to review and verify the precision and accuracy data. ARB QAS staff is responsible for review and assessment of all accuracy data reported to AQS for all monitoring organizations within its PQAO and precision data for those local air districts for which ARB has AQS submittal authority. The assessment includes review of AQS's Data Quality Indicator Report, AMP 255 or equivalent report, which provides statistical estimates of the precision, bias, and accuracy of monitors reporting data for criteria air pollutants, and summarizes the completeness of precision and accuracy checks from which the statistical estimates are derived. The primary purpose of the assessment is to analyze and assess quality assurance data in accordance with data requirements prescribed in 40 CFR, Part 58, Appendix A and to investigate and resolve any issues identified.

9.11 Annual Monitoring Network Report

The Annual Monitoring Network Report describes the network of ambient air monitors operated by air monitoring organizations in more than 20 counties in California. The report meets requirements for an annual network plan as defined in 40 CFR, Part 58.10. As required by regulations, this report includes detailed information about Federal Reference Method and Federal Equivalent Method monitors that are covered in the scope of the report. Regulations require submittal of this report to U.S. EPA by July 1 of each year. The most current version of this report can be found at http://www.arb.ca.gov/aqd/amnr/amnr.htm.

The Ambient Air Monitoring Network Assessment performed by PTSD every five years is an assessment of the technical aspects of ARB's air monitoring network. The purpose is to evaluate and determine if the air monitoring network meets all monitoring objectives. Additionally, the assessment determines if new sites are needed, if existing sites should be discontinued, and if new technologies are appropriate for incorporation into the ambient air monitoring network.

9.12 Annual Data Quality Report

The Annual Data Quality Report generated by QAS provides a summary of the quality of ambient data in quantifiable terms. The report presents an overview of various QA/QC activities. Tables included in the report summarize data for ambient air monitoring stations in the statewide network. This report can be found at http://www.arb.ca.gov/aaqm/qa/dqreports/dqreports.htm.

9.13 Annual Certification Letter and Summary Report

ARB's AQPB is responsible for submitting ambient air quality data to AQS for SLAMS and special purpose monitors operated by ARB, and a number of monitoring

organizations in California, for which ARB has data submittal authority. In accordance with 40 CFR, Part 58, Section 15, ARB submits an annual data certification letter to U.S. EPA by May 1 of each year. Along with the annual certification letter, ARB also submits AQS reports (i.e., AMP 600 and 450NC) as required by federal regulations. These reports include both criteria and non-criteria data for which ARB is the certifying agency. ARB certifies that the previous year of ambient air data and any previously certified data that was modified is complete and accurate.

9.14 Surveillance and Internal Quality Control

Internal quality control procedures are an integral part of the surveillance process and are included in SOPs for specific monitoring and laboratory activities. Quality control procedures are utilized by monitoring and laboratory personnel to ensure that equipment is operating properly and that data meet program DQOs. The general areas where quality control elements are utilized by air monitoring organizations include the following: continuous analyzers, sample preparation, collection procedures for discrete samplers, and laboratory instruments. Examples of internal quality control parameters include:

Continuous Analyzers

- NIST traceable daily zero/span and periodic multi-point calibrations per frequencies of SOP.
- Quality control failure action levels and data acceptance criteria.
- Reanalysis acceptance criteria.
- Blank acceptance criteria.
- Calibration, continuing calibration, and control acceptance criteria including calibration drift allowance criteria.
- Common mitigation procedures and policies.
- Audit practices and acceptance criteria.
- References.
- Other checks as specified in SOPs.

Discrete Sampler- Sample Preparation, Collection, and Recovery

- As appropriate, NIST traceable standards such as S class weights for balances.
- Blanks and acceptance criteria.
- Calibration, calibration curve, continuing calibration, and control acceptance criteria including drift allowance criteria.
- Procedural acceptance criteria.
- As appropriate, duplicate analysis frequency and acceptance criteria.
- Quality control failure action levels and data acceptance criteria.
- Common mitigation procedures and policies.
- Audit practices and acceptance criteria.

- Chain of custody.
- References.
- Other checks as specified in SOPs.

Laboratory Instruments

- NIST traceable daily calibration standards and multi-point calibration standards for calibration curve preparation performed periodically as defined in the appropriate SOP.
- Blanks and acceptance criteria.
- Calibration, calibration curve, continuing calibration, and control acceptance criteria including drift allowance criteria.
- Analysis acceptance criteria.
- Duplicate analysis frequency and acceptance criteria.
- Quality Control failure action levels and data acceptance criteria.
- Common mitigation procedures and policies.
- Audit practices and acceptance criteria.
- Chain of custody.
- References.
- Other checks as specified in SOPs.

9.15 Air Quality Data Action

An AQDA is a request for an investigation of the validity of ambient air quality data for a certain period of time. AQDAs are generally issued by QMB staff based upon review of field calibrations or audit results that show air monitoring equipment operating outside ARB's control limits or not meeting appropriate siting conditions. AQDAs are issued to the person responsible for data collection and submittal for the monitoring organization. A copy of it is also sent to PTSD's AQPB, which withholds potentially impacted data from processing and publication until appropriate actions are taken. The monitoring organization is directed to review the applicable quality control parameters in question, specifically identify associated time periods in question, and recommend corrective action, as appropriate.

QMB may request that AQPB delete the questionable data in the absence of response from the responsible organization within 45 days or if the data deviates beyond established control limits from true levels, as determined by zero, span, precision, or other applicable checks. QMB may recommend data be invalidated or corrected back to the initial occurrence of the malfunction. If the date of malfunction cannot be verified, the data may be invalidated or corrected back to the last successful calibration or audit date. After the resolution of an AQDA, a re-audit is performed to verify resolution of any issue identified.

9.16 Corrective Action Notification Process

ARB's CAN process documents issues that may impact or potentially impact data quality, completeness, storage, or reporting. The process may be initiated by any person in ARB's PQAO and is an overall effort to investigate and correct air monitoring issues and to prevent recurrence. The objective is to improve data quality and to ensure compliance with applicable state, federal, and local requirements. This process is intended to complement ARB's AQDA process by identifying, documenting, and adequately addressing issues other than those resulting from the performance audit process.

Monitoring organizations within ARB's PQAO are encouraged to adopt ARB's CAN process. If a monitoring organization chooses to use an alternative process, the monitoring organization must submit the process to ARB for review and approval. An SOP for ARB's CAN process is located at http://www.arb.ca.gov/aaqm/qa/pqao/can/can_sop.pdf. ARB's CAN form is available at http://www.arb.ca.gov/aaqm/qa/pqao/can/can-form.pdf.

9.17 Dispute Resolution

In the event that a quality assurance related dispute arises, QMB's Chief will review and discuss the identified issue with appropriate staff and management. QMB's chief will recommend corrective action after collaborative discussion with appropriate management from the impacted division or monitoring organization. If ARB and a participating monitoring organization are not able to resolve an issue, ARB's QMB Chief and associated monitoring organization personnel will work collaboratively with U.S. EPA to address the issue appropriately. The goal is to ensure that data generated within ARB's PQAO is legally and scientifically defensible.

SECTION 10 – QUALITY IMPROVEMENT

10.1 Introduction

ARB is committed to ensuring that air monitoring data collected by and on behalf of its PQAO is scientifically and legally valid and of sufficient quality and quantity to meet or exceed all applicable requirements. It is the responsibility of QMB's Chief to ensure that ARB's mission and policies as specified in this document are followed. This is accomplished by implementation and management of a system that emphasizes and promotes continuous quality improvement, utilizes a consistent process of assessing the quality system, encouraging recommendations, identifying and implementing improvements to the quality system, and promoting ongoing training of all staff, as appropriate. Open and timely communication of quality assurance topics are encouraged at all levels within ARB's PQAO through routine meetings, conference calls,

newsletters, website updates, and other reports. Timely identification and prevention of data errors that potentially affect data quality is achieved through quality control activities prescribed in appropriate quality management documents (QAPPs and SOPs).

10.2 Operational Activities

Field and laboratory personnel shall document significant anomalies or deviation from SOPs in the monitoring station's instrument log books and notify management and ARB as described in Section 9 (CAN and AQDA processes).

10.3 Data Validation and Reporting Activities

Data validation and reporting issues for field and laboratory operations are reported to appropriate managers through the use of CAN and AQDA processes as described in Section 9. Affected staff work collaboratively with staff and management within the monitoring organization, ARB, and U.S. EPA, as appropriate, to develop and implement appropriate corrective action for data verification and reporting procedures and improve data quality.

10.4 Quality Assurance Communication

Accurate and timely communication of information within ARB's PQAO is an important component of the overall quality system. Workgroups, conference calls, newsletters, webpages, email List Serve, and direct communication are used to facilitate the dissemination of information within ARB and monitoring organization personnel.

The Air Monitoring Technical Advisory Committee is a working group comprised of ARB and local air monitoring organization management and staff that meet periodically to discuss issues and provide training relevant to ambient air monitoring. The group provides an open forum for communication and resolution of issues. ARB also holds monthly quality assurance conference calls with monitoring organization in its PQAO. Also, PQAO and California Air Pollution Control Officers Association conference calls will be held on an ongoing basis to further discuss quality assurance related issues.

QMB's Chief meets with staff and managers within ARB's PQAO, as needed, to review and address quality assurance assessments, training needs and resources, corrective actions, and any other quality assurance related issues. Any critical information from these meetings will be communicated to ARB's Executive Staff, as appropriate. Additional information related to the ambient air monitoring network is accessible at http://www.arb.ca.gov/aqd/aqmoninca.htm. A webpage with PQAO related information is available at http://www.arb.ca.gov/aaqm/qa/qa.htm, and email address, pqao@arb.ca.gov, is also available to ensure relevant information is disseminated efficiently and effectively within ARB's PQAO.

ARB REFERENCES	
Title	**Website**
Contract Services Resource Guide*	A binder prepared by ARB's Contract Services Section, Business Management Branch and Administrative Services Division, September 2012
Health and Safety Plans and Policies*	http://inside.arb.ca.gov/as/safety/safety.htm
Health and Safety Training*	http://inside.arb.ca.gov/as/train/train.htm
Human Resources (Examination/Hiring Process)	http://www.arb.ca.gov/personnel/personnel.htm
Procurement Services Guide	http://www.arb.ca.gov/personnel/asl/attto97-12.htm
Quality Assurance Manual	http://www.arb.ca.gov/aaqm/qa/qa-manual/qa-manual.htm
Quality Assurance Webpage	http://www.arb.ca.gov/aaqm/qa/qa.htm
Records Management Program	http://www.arb.ca.gov/personnel/asl/06-01.pdf
SOPs (Vol 2-AQSB, Vol 3-NLB, Vol 4-QMB)	http://www.arb.ca.gov/airwebmanual/index.php
SOP Template	http://www.arb.ca.gov/airwebmanual/otherdocs/index.php
State Administrative Manual**	http://sam.dgs.ca.gov/TOC.aspx
State and Local Air Monitoring Network Plan	http://www.arb.ca.gov/adam/netrpt/
Training Resources	http://inside.arb.ca.gov/as/train/train.htm

***** These references are available to ARB staff only

** The State Administrative Manual is a reference source for statewide policies, procedures, regulations and information developed and issued by authoring agencies such as the Governor's Office, Department of General Services, Department of Finance, and Department of Personnel Administration. In order to provide a uniform approach to statewide management policy, the contents have the approval of and are published by the authority of the Directors of these Departments.

OTHER REFERENCES	
EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II Ambient Air Quality Monitoring Program, EPA-454/B-08-003, December 2008	http://www.epa.gov/ttnamti1/files/ambient/pm25/qa/QA-Handbook-Vol-II.pdf
EPA Requirements for Quality Assurance Project Plans (QA/R-5), EPA/240/B-01/003, March 2001	http://www.epa.gov/quality/qs-docs/r5-final.pdf
EPA Requirements for Quality Management Plans (QA/R-2), EPA/240/B-01/002, March 2001, Reissued Notice May 2006	http://www.epa.gov/quality/qs-docs/r2-final.pdf
Guidance for Developing Quality Systems for Environmental Programs (QA/G-1), EPA/240/R-02/008, November 2002	http://www.epa.gov/quality/qs-docs/g1-final.pdf
Guidance for Quality Assurance Project Plans, (QA/G-5), EPA/240/R-02/009, December 2002	http://www.epa.gov/quality/qs-docs/g5-final.pdf
Guidance on Assessing Quality Systems (QA/G-3), EPA/240/R-03/002, March 2003	http://www.epa.gov/quality/qs-docs/g3-final.pdf
Guidance on Systematic Planning using the Data Quality Objectives Process (AQ/G-4), EPA/240/B-06/001, February 2006	http://www.epa.gov/quality/qs-docs/g4-final.pdf
Quality Management Plan, January 2009	South Coast Air Quality Management District
Records Retention Schedule Template, Department of General Services	http://sam.dgs.ca.gov/TOC/1600/1671.aspx

APPENDIX A

Monitoring Organizations in ARB's PQAO

1. Amador County Air Pollution Control District*****
2. Antelope Valley Air Quality Management District
3. Butte County Air Quality Management District*
4. Calaveras County Air Pollution Control District*
5. Colusa County Air Pollution Control District*
6. Eastern Kern County Air Pollution Control District
7. El Dorado County Air Quality Management District*
8. Feather River Air Quality Management District*
9. Glenn County Air Pollution Control District*
10. Great Basin Unified Air Pollution Control District
11. Imperial County Air Pollution Control District
12. Lake County Air Quality Management District
13. Lassen County Air Pollution Control District*
14. Mariposa County Air Pollution Control District*
15. Mendocino County Air Quality Management District
16. Modoc County Air Pollution Control District*
17. Mojave Desert Air Quality Management District
18. Monterey Bay Unified Air Pollution Control District
19. North Coast Unified Air Quality Management District
20. Northern Sierra Air Quality Management District
21. Northern Sonoma County Air Pollution Control District
22. Placer County Air Pollution Control District
23. Sacramento Metropolitan Air Quality Management District
24. San Joaquin Valley Air Pollution Control District
25. San Luis Obispo County Air Pollution Control District
26. Santa Barbara County Air Pollution Control District
27. Shasta County Air Pollution Control District
28. Siskiyou County Air Pollution Control District
29. Tehama County Air Pollution Control District
30. Tuolumne County Air Pollution Control District*
31. Ventura County Air Pollution Control District
32. Yolo-Solano Air Quality Management District

***** Indicates that no air monitoring data is generated by local air district (11 total)

- Ambient air monitoring data is generated by ARB plus 21 of the 32 local air districts listed above
- In some cases, ARB and local air districts share ambient air monitoring responsibilities within a local district's jurisdiction

APPENDIX B

California Air Basins

Air Basin	County(s)	PQAO
Great Basin Valleys	Alpine, Inyo, Mono	ARB
Lake County	Lake	ARB
Lake Tahoe	El Dorado, Placer	ARB
Mojave Desert	**Kern**, **Los Angeles**, **San Bernardino**, **Riverside**	ARB/ SCAQMD
Mountain Counties	Amador, Calaveras, El Dorado, Mariposa, Nevada, Placer, Plumas, Sierra, Tuolumne	ARB
North Central Coast	Monterey, San Benito, Santa Cruz	ARB
North Coast	Del Norte, Humboldt, Mendocino, **Sonoma**, Trinity	ARB
Northeast Plateau	Lassen, Modoc, Siskiyou	ARB
Sacramento Valley	Butte, Colusa, Glenn, Placer, Sacramento, Shasta, **Solano**, Sutter, Tehama, Yolo, Yuba	ARB
Salton Sea	Imperial, **Riverside**	ARB/ SCAQMD
San Diego	San Diego	SDCAPCD
San Francisco Bay Area	Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, **Solano**, **Sonoma**	BAAQMD
San Joaquin Valley	Fresno, **Kern**, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare	ARB
South Central Coast	San Luis Obispo, Santa Barbara, Ventura	ARB
South Coast	**Los Angeles**, Orange, **Riverside**, **San Bernardino**	SCAQMD

Note: The National Park Service and tribal authorities also operate air monitoring networks throughout California.

*****Kern, Los Angeles, San Bernardino, Sonoma, and Solano counties are in two different air basins. Riverside County resides in three different air basins (listed in bold).

ARB- Air Resources Board; BAAQMD- Bay Area Air Quality Management District; SCAQMD- South Coast Air Quality Management District; SDCAPCD- San Diego County Air Pollution Control District

APPENDIX C

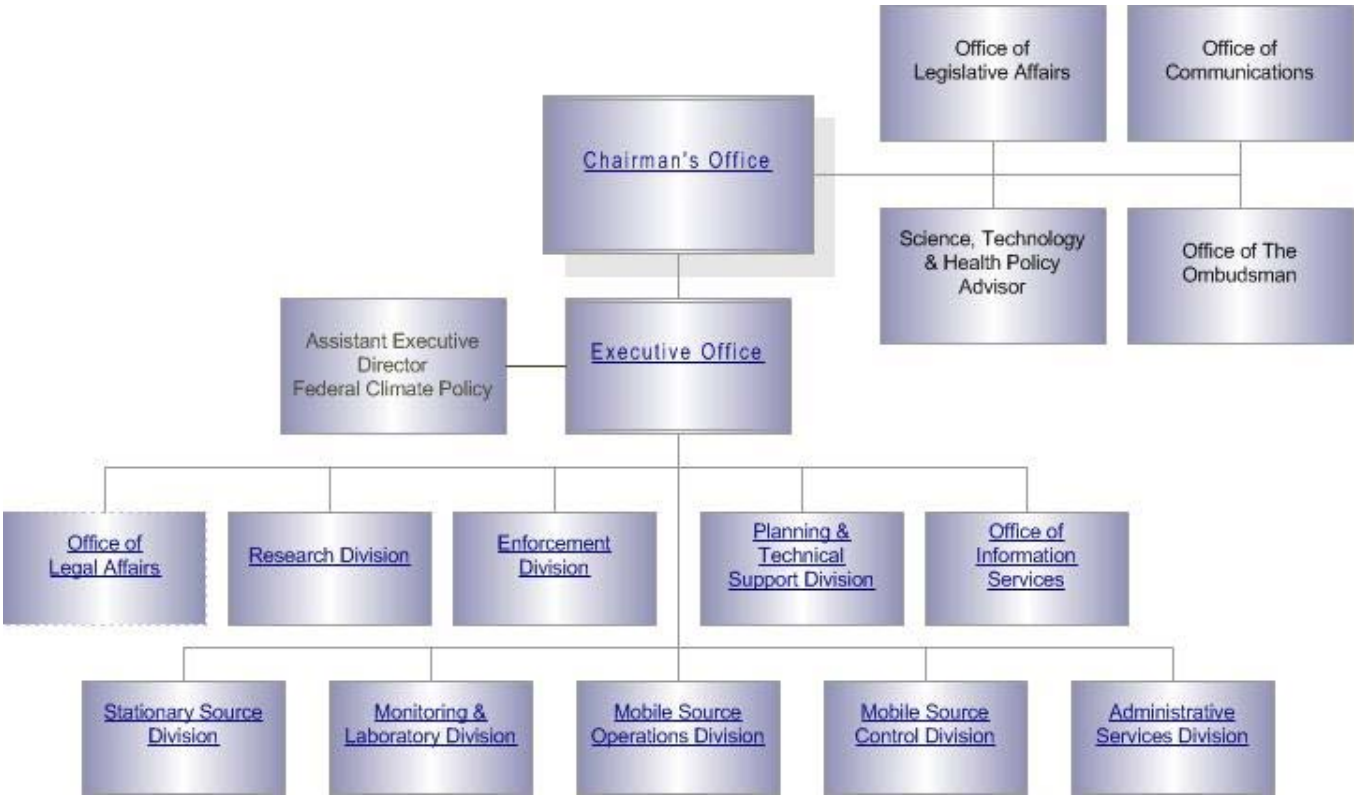
Annual Network Plans

Local Air Districts Developing Own Network Plan	Local Air Districts Included in ARB's Network Plan
Great Basin Unified	Amador
Imperial	Antelope Valley
Monterey Bay Unified	Butte
North Coast Unified	Calaveras
Sacramento Metropolitan	Colusa
San Diego*	Eastern Kern
San Francisco Bay*	El Dorado
San Joaquin Valley Unified	Feather River
San Luis Obispo	Glenn
Santa Barbara	Lake
South Coast*	Lassen
Ventura	Mariposa
	Mendocino
	Modoc
	Mojave Desert
	Northern Sierra
	Northern Sonoma
	Placer
	Shasta
	Siskiyou
	Tehama
	Tuolumne
	Yolo-Solano

Source: Annual Monitoring Network Plan for Small Districts, ARB 2012
***** These Air Districts are not within ARB's PQAO

APPENDIX D

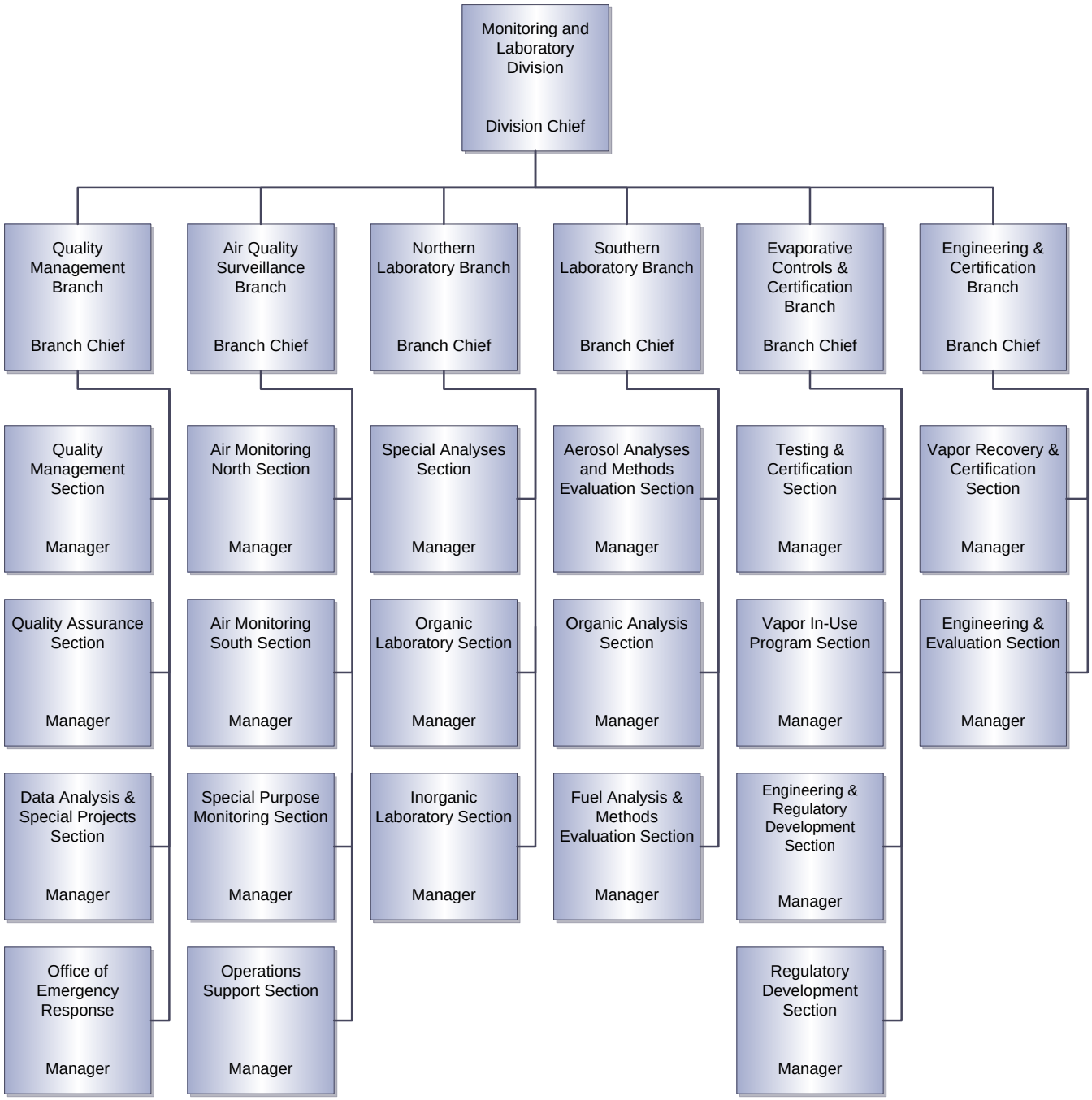
Air Resources Board Organizational Chart



Source: ARB website at http://www.arb.ca.gov/html/org/org.htm

APPENDIX E

Monitoring and Laboratory Division Organizational Chart



Source: ARB website at http://www.arb.ca.gov/html/org/orgmld.htm

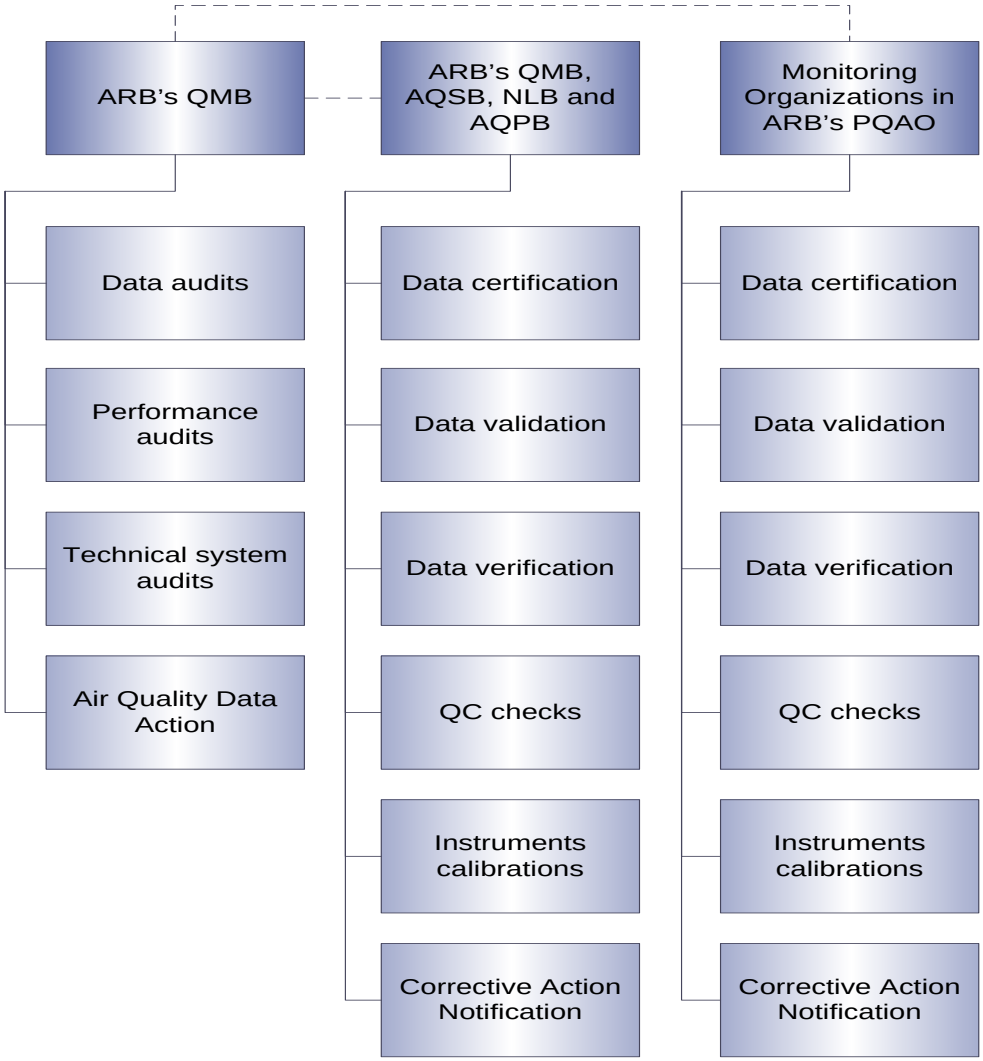
APPENDIX F

Planning and Technical Support Division Organizational Chart

Source: ARB website at http://www.arb.ca.gov/html/org/orgptsd.htm

APPENDIX G

QUALITY ASSURANCE FUNCTION SUMMARY



NOTE: Dotted lines indicate the QMB performs oversight and additional QA functions for specified programs.

See Appendix F for data verification/validation/certification pathways.

ARB- Air Resources Board; QMB- Quality Management Branch; AQSB- Air Quality Surveillance Branch; NLB- Northern Laboratory Branch; AQPB- Air Quality Planning Branch

APPENDIX H

Roles and Responsibilities Template Document

PRIMARY QUALITY ASSURANCE ORGANIZATION
ROLES AND RESPONSIBILITIES

Five common factors have been identified by U.S. EPA that should be considered in defining a Primary Quality Assurance Organization (PQAO). Under the Air Resources Board (ARB) PQAO, ARB and Monitoring Organizations (MOs) shall strive to collaboratively address the following common factors to the extent practical. ARB has defined the roles and responsibilities of ARB and MOs within the ARB PQAO in regard to operation of the PQAO ambient air monitoring network in order to ensure the generation of high quality, legally defensible data.

1. Operation by a common team of field operators according to a common set of procedures.

ARB recognizes the unique air monitoring challenges that face California and that field operations by a common team may not be feasible. ARB and MOs acknowledge the need to strive for uniformity of procedures, thus both parties agree to work together toward employing consistent and reliable field operations.

ARB Responsibilities:

- Maintain and disseminate a Quality Management Plan (QMP). ARB shall regularly request input from MOs within the ARB PQAO and agrees to review and update the QMP as needed. ARB will communicate updates to MOs accordingly;
- Review and approve alternative QMPs prepared by MOs seeking ARB and EPA approval;
- Maintain a PQAO contact list and working webpage to disseminate information;
- Serve as a liaison between MOs within ARB's PQAO;
- Provide adequate training on key air monitoring fundamentals related to operations, maintenance, quality assurance/quality control, and data management procedures ;
- Facilitate Ambient Monitoring Technical Advisory Committee (AMTAC) meetings and information updates. Topics may include field, laboratory, quality assurance, and data management related items; and
- Participate in CAPCOA Monitoring Committee meetings and other informational forums.

MO Responsibilities:

- Adopt and implement ARB's QMP or an ARB and/or EPA approved alternative;
- Provide a supervisory level PQAO Point-of-Contact to ARB. The PQAO contact will be added to a list serve to allow for effective and timely dissemination of information;
- Participate in ARB and EPA sponsored ambient air monitoring training;
- Participate in AMTAC meetings and review information updates; and
- Participate in CAPCOA Monitoring Committee meetings and other informational forums.

2 Use of a common Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOP) for state and federally mandated air monitoring projects.

ARB Responsibilities:

- Maintain and disseminate a ARB and/or EPA QAPP for state and federally mandated air monitoring projects or programs;
- Maintain and disseminate SOPs for monitoring and analysis. These SOPs may also include forms (i.e., check sheets, calibration forms, maintenance forms, etc.);
- Provide notification of updates/revisions, as they occur, to ARB QAPPs and SOPs via the PQAO point-of-contact list; and
- Review and approve alternative QAPPs and SOPs prepared by MOs.

MO Responsibilities:

- Adopt ARB and/or EPA QAPP, or approved alternative;
- Adopt ARB SOPs, or ARB and/or EPAapproved alternatives;
- Review/update SOPs on an established schedule and notify ARB of any revisions made as they occur; and
- Agree to make available to ARB a record of quality assurance related documents (QMP, QAPP, SOP, training plan, etc.) being utilized by the MO's ambient air monitoring network.

If a District conducts a special purpose monitoring program funded by EPA, the MO shall seek quality assurance assistance from the EPA or ARB Quality Management Branch.

3. Common calibration facilities and standards

MOs within the ARB PQAO are encouraged to utilize the services provided by ARB's Standards Laboratory for certifications, calibrations, and verifications. Organizations choosing to utilize external calibration facilities or vendor produced standard materials, must provide documentation of traceability upon request by ARB or EPA.

ARB Responsibilities:

- Provide timely certification, calibration, and verification services that meet or exceed 40 CFR Part 58 requirements via the ARB Standards Laboratory upon request.

MO Responsibilities:

- Utilize ARB certification, calibration, and verification services, or provide the name of the facility being used and the record of traceability to NIST.

Additionally, ARB may provide equipment acceptance testing, repair, and field calibration services to MOs upon prior or mutual agreement, which may depend upon budget feasibility and staff availability.

4 Oversight by a common quality assurance organization

ARB Responsibilities:

- Identify pollutant-specific parameters that are included in the ARB PQAO;
- Conduct Performance Evaluation (PE) audits of MO monitoring sites as required in 40 CFR Part 58, Appendix A, including Section 3.2.2 (PE audits for SO2, NO2, O3, and CO), and Section 3.2.4 (semiannual flow rate audit for Particulate Matter (PM samplers), as well as, meteorological audits, and lead sampler audits, as appropriate;
- Conduct annual siting evaluations at each air monitoring station to determine compliance with 40 CFR Part 58, Appendix E, and consistency with current Air Quality System (AQS) parameters;
- If an instrument or analyzer is found to be outside acceptable limits, ARB shall initiate Air Quality Data Action (AQDA) requests. The AQDA will request the MO to correct the identified deficiencies and ensure associated ambient air data are verified to be good quality data. To ensure compliance, ARB shall conduct a re-audit to verify the corrective action once the problem has been resolved;
- Conduct technical systems audits (TSA) of all MOs within the ARB PQAO;
- ARB shall maintain a database, Corrective Action Notification (CAN), to be used by monitoring organizations to report operational problems, instrument malfunctions, and/or any items needing corrective action or investigation;
- Provide procedures and criteria for data acceptability and corrective action determination;
- Perform annual certification of data for which ARB has AQS submittal authority by May 1st of each year; and
- Perform an annual evaluation of the statistical summaries of quality assurance and quality control data from all MOs in the ARB PQAO.

MO Responsibilities:

- Review and verify pollutant-specific parameters on an annual basis that are included in the ARB PQAO;
- Participate in criteria pollutant, particulate and meteorological PE audits;
- Participate in laboratory PE audits. For laboratory programs not supported by ARB, the MO agrees to participate in a EPA or ARB approved alternative audit program, if available;
- Participate in EPA required technical system audits conducted either by ARB or EPA;

- Review and verify data quality against ARB or EPA established acceptance criteria prior to submittal to AQS;
- Review MO data in AQS on a quarterly basis to verify accuracy and completeness (AMP 255 and 430 or equivalent reports); and
- Utilize ARB's CAN process to report instrument malfunctions, operational problems, and/or any items needing corrective action or investigation

In addition, the MO is responsible to:

- Resolve AQDAs, CANs and TSA findings, or develop corrective action plan as appropriate, within 45 days of issuance;
- Utilize the CAN process to notify ARB's Quality Management Branch of issues regarding data quality as well as impending data actions in EPA's Air Quality System (AQS) within 45 days of determination of issue;
- Validate air monitoring data prior to submission to ARB for upload to AQS; and communicate to ARB when data have been altered or modified after it has been submitted (Note- Districts performing their own data validation and upload to AQS shall communicate directly with ARB after the data has been modified in AQS) ;
- Districts uploading data directly to AQS shall validate data before upload to AQS; and certify their data annually by May 1st of each year; and
- Upload air quality data in accordance with EPA requirements [Note: Districts who submit data directly to AQS shall have an MOU on file with ARB's PTSD].

5. Support by a common management, laboratory or headquarters

Operating California's complex ambient air monitoring network requires ARB to work collaboratively with each MO. In order to accurately assess the MO's monitoring network, both parties must document and evaluate potential or scheduled modifications to the air monitoring network.

ARB Responsibilities:

- Provide and review an annual survey questionnaire regarding MOs monitoring network planned changes (i.e., new/removed instruments, site closures, new sites, contracted services, etc.) for MOs in ARBs PQAO that are not drafting their own annual network plans as required by 40 CFR 58.10. ARB shall review completed questionnaires within 30 days of receipt and provide feedback as necessary to MOs regarding network changes;
- Participate in annual meeting/teleconference during the network review period to discuss ARB PQAO monitoring network status; and
- Provide laboratory analytical support as required (i.e., PM2.5 and PM10 mass analysis, Toxics analysis, speciation, etc.) upon prior or mutual agreement.

MO Responsibilities:

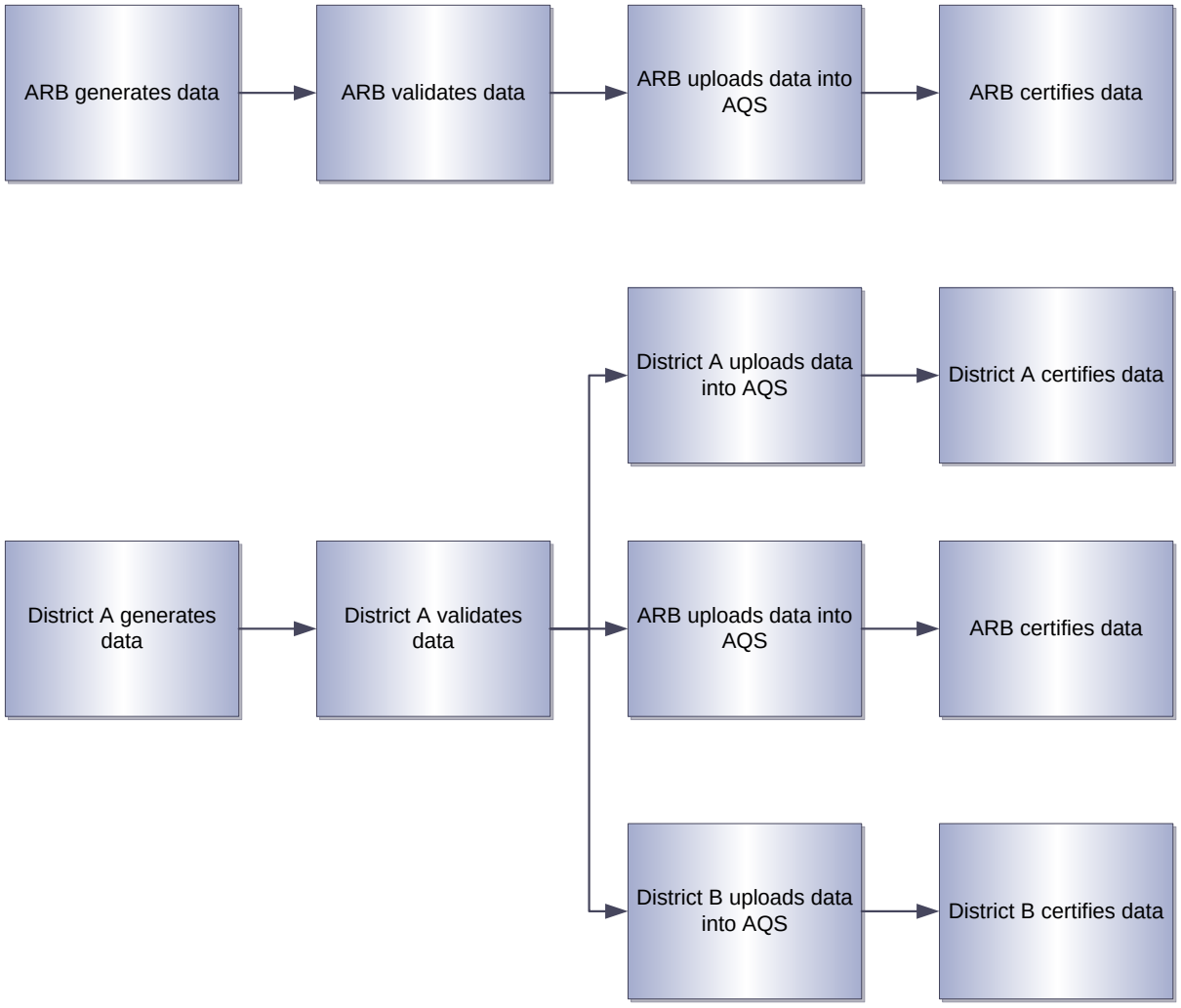
- Complete the annual questionnaire regarding MO monitoring network changes within 30 day of receipt from ARB (if applicable);
- Communicate all site changes (i.e., openings, closures, relocations), not mentioned in the annual questionnaire to ARB, in a timely manner;
- Participate in ARB PQAO monitoring network status meetings/teleconferences; and
- Provide timely sample return and proper documentation of field sample collection activities (i.e., chain-of-custody, sample collection dates and times, etc.).

MOs submitting annual Network Monitoring Plans directly to EPA shall continue to submit plans directly with a copy provided to ARB's PTSD.

If circumstances should arise that prevent either the ARB and/or MO from meeting the PQAO requirements, the organizations shall work collaboratively to ensure that the tasks are completed to meet the common goal of generating legally and scientifically defensible data throughout the PQAO monitoring network. As needed, both organizations will work with EPA Region IX to assist in meeting the PQAO requirements.

APPENDIX I

Data Pathway Summary



ARB- Air Resources Board; AQS- Air Quality System

APPENDIX J

Data Upload and Certification by Monitoring Organization

Operation of Monitoring Site	Upload of Continuous Data	Certification	Upload of PM Filter-based Laboratory Data	Certification
Antelope	Mojave	Mojave	Mojave	Mojave
ARB	ARB	ARB	ARB/Ventura - PM2.5 (2 ARB sites)/San Diego (1 ARB site)	ARB
Eastern Kern*	ARB	ARB	ARB	ARB
Great Basin	Great Basin	Great Basin	Great Basin	Great Basin
Imperial	ARB	ARB	ARB - PM10/ San Diego - PM2.5	ARB – PM10/ Imperial – PM2.5
Lake	ARB	ARB	ARB	ARB
Mendocino	ARB	ARB	N/A	N/A
Mojave	Mojave	Mojave	Mojave	Mojave
Monterey Bay	Monterey Bay	Monterey Bay	Bay Area	Monterey Bay
North Coast	ARB	ARB	ARB - PM10+/ Bay Area - PM2.5	ARB – PM10/ North Coast - PM2.5-
Northern Sierra	Northern Sierra	Northern Sierra	ARB	ARB
Northern Sonoma	ARB	ARB	ARB - PM10	ARB
Placer	ARB	ARB	ARB x	ARB x
Sacramento	ARB	ARB	ARB - PM2.5 and PM10 coarse /ARB – PM10+	ARB - PM2.5, PM10 coarse and PM10+
San Joaquin Valley	San Joaquin	San Joaquin	Ventura	San Joaquin
San Luis Obispo	San Luis Obispo	San Luis Obispo	N/A	N/A
Santa Barbara	Santa Barbara	Santa Barbara	Santa Barbarax	Santa Barbara
Shasta	Shasta	Shasta	ARB	ARB
Siskiyou	ARB	ARB	ARB	ARB
Tehama	ARB	ARB	ARB	ARB
Ventura	Ventura	Ventura	Ventura	Ventura
Yolo/Solano	ARB	ARB	ARB	ARB

Note: Operating agencies are responsible for data management from generation through validation, except as noted above. Agencies not performing upload and certification of their own data must provide a letter to the agency performing data upload and certification verifying that data has been validated according to an ARB and/or U.S. EPA approved procedure.

***** Two of the three monitoring sites (i.e., Canebrake and Mojave) are operated by ARB. The other site, Ridgecrest, has PM monitors only and is also operated by ARB.
+ These data are weighed by local air district but uploaded by ARB.
x Applies only to filter-based PM10 measurements.