QUALITY ASSURANCE PROJECT PLAN FOR THE STATE OF ALASKA $PM_{2.5}$ AMBIENT AIR QUALITY MONITORING PROGRAM

December 1998

State of Alaska
Department of Environmental Conservation
410 Willoughby Ave. Suite 105
Juneau, Alaska 99801-1795

1. QA PROJECT PLAN IDENTIFICATION AND APPROVAL

Title: *Quality Assurance Project Plan for the State of Alaska $PM_{2.5}$ Ambient Air Quality Monitoring Program*

The attached Quality Assurance Project Plan for the State of Alaska $PM_{2.5}$ Ambient Air Quality Monitoring Program is hereby recommended for approval and commits the Alaska Department of Environmental Conservation to follow the elements described within.

Alaska Department of Environmental Conservation

1) Signature: _____ Date: _____

Ronald G. King, Chief
Air Quality Improvement Section

EPA Region 10

1) Signature: _____ Date: _____

Barry Towns
Quality Assurance Manger

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3. DISTRIBUTION

A hardcopy of this Quality Assurance Project Plan for the State of Alaska $PM_{2.5}$ Ambient Air Quality Monitoring Program has been distributed to the individuals listed in Table 3.1. The document can also be obtained from the Alaska Department of Environmental Conservation Air Quality Improvement Section.

NAME	POSITION	AGENCY	DIVISION/BRANCH
Ronald King	Section Chief	ADEC-AQI	
Gerald Guay	Project Manager	ADEC-AQI	Ambient Analysis Group
Richard Heffern	QA Coordinator/ chemist	ADEC-AQI	Ambient Analysis Group
Abel Vargas	Electronics Technician	ADEC-AQI	Ambient Analysis Group
Gus van Vliet	Environmental Specialist	ADEC-AQI	Ambient Analysis Group
Toivo Luick	Chemist	ADEC-AQI	Ambient Analysis Group
Steven Cooper	Environmental Specialist	ADEC-AQI	Ambient Analysis Group
John Stone	Section Chief	ADEC-AQM	
John Kuterbach	Supervisor	ADEC-AQM	Regulation Development
Jim Baumgartner	Supervisor	ADEC-AQM	Construction Permits
Robert Cannone	Supervisor	ADEC-AQM	Inspection Services
William MacClarence	Supervisor	ADEC-AQM	Operating Permits
Steve Morris	Manager	MOA-DHHS	Air Quality Programs
Kent Monroe	Manager	FNSB-DOT	Air Quality Division
Barry Towns	QA Manager	EPA Region 10	Environmental Assessment
Edward Jones	Project Officer	EPA Region 10	Office of Air Quality

Table 3.1 Distribution

4. PROJECT/TASK ORGANIZATION

This document presents the Quality Assurance Project Plan (QAPP) for the $PM_{2.5}$ Ambient Air Quality Monitoring Program that has been implemented by the State of Alaska. The monitoring program is being administered by the Alaska Department of Environmental Conservation (ADEC). The major responsibility of the ADEC is the implementation of a satisfactory monitoring program, which includes an appropriate quality assurance program. It is the responsibility of the ADEC to ensure that the quality assurance programs for the field, laboratory, and data processing phases of the monitoring program are implemented.

The ADEC is organized into six main divisions: Administrative Services (AS), Air & Water Quality (A&WQ), Environmental Health (EH), Facility Construction and Operation (FC&O), Spill Prevention and Response (SPAR) and Statewide Public Service (SPS). The Commissioner of the ADEC has the overall responsibility for managing these divisions according to stated ADEC policy. The Commissioner delegates the responsibility of QA development and implementation in accordance with ADEC policy to the Division Directors. Each division is headed by a Director. The responsibility for assuring data quality rests with these Directors and the line management under them.

The organizational structure of the ADEC for the implementation of the $PM_{2.5}$ Monitoring Program is shown in Figure 4.1. The following information lists the specific responsibilities of each significant $PM_{2.5}$ position within the ADEC.

4.1 Air & Water Quality Division

The Air & Water Quality Division contains the Air Quality Improvement Section and is responsible for coordinating all aspects (quality assurance, data collection, and data processing) of the ADEC $PM_{2.5}$ Monitoring Program.

Air & Water Quality (A&WQ) Division Director. The Division Director has direct access to the Commissioner on all matters relating to the Division's operation. The Division Director's duties include:

- maintaining oversight of the QA activities of the AQI;
- maintaining overall responsibility for the monitoring network design and review; and
- reviewing budgets, contracts, grants and proposals.

Air Quality Improvement (AQI) Section Chief. The AQI Chief reports directly to the Air & WQ Director and is responsible for the activities of the AQI. Duties include:

- review and approval of QA programs for the AQI section;
- serving as QA liaison with the EPA Region 10;
- reviewing contracts, project plans, and work plans;

- coordinating monitoring network design and review; and
- maintaining the AQI section's budget.

Ambient Monitoring Group (AMG) Program Manager. The AMG Manager reports directly to the AQI Section Chief and has the overall responsibility for the development and maintenance of the Quality Assurance activities for the AMG program. Responsibilities include:

- directs the monitoring network design and review process;
- ensures that reviews, assessments and audits are scheduled and completed at the appropriate times;
- ensures that environmental data collection activities are covered by appropriate QA planning documentation;
- directs and assists in the implementation of QAPPs, work plans, contracts, reports and resource allocation, and ensures that monitoring personnel follow the QAPPs;
- ensures that a QAPP is in place for all environmental data collection activities and that it is up to date;
- communicates with EPA Project Officers and EPA QA personnel on issues related to routine sampling and QA activities;
- provides program costs necessary for EPA allocation activities;
- purchasing equipment and issuance of contracts necessary for the implementation of monitoring programs;
- ensures that all personnel involved in environmental data collection have access to any training or QA information needed to be knowledgeable in QA requirements, protocols and technology; and
- recommends required management level corrective action.

Air Quality Assurance Coordinator**.** Regarding matters of quality assurance, the Air Quality assurance coordinator reports directly to the Air Quality Improvement Section Chief. All other directives and reporting responsibilities are managed by the Ambient Monitoring Group Program Manager. . Responsibilities include:

- conducts QA performance and systems audits of all $PM_{2.5}$ SLAMS/NAMS/SPM monitoring networks in Alaska;

- develops and/or recommends for approval procedures for establishing and assuring data quality, use and control of ambient air quality data;
- recommends modifications to the Alaska Quality Assurance Manual for Ambient Air Quality Monitoring;
- develops and/or reviews and recommends for approval ambient air monitoring quality assurance project plans;
- provides training and certification to field and laboratory personnel;
- recommends actions to be taken in response to unsatisfactory operation or maintenance of ambient monitors; and
- assists air monitoring community in developing QA documentation and provides answers to technical questions.

Environmental Specialists, Chemists & Electronics Technician - These positions work under the supervision of the AMG program manager and perform all of ADEC's $PM_{2.5}$ field monitoring operations. Juneau staff conduct both field monitoring operations (in Juneau) and state-wide $PM_{2.5}$ laboratory analyses. Specific duties include, but are not limited to:

- collection, calculation and review of environmental data;
- participate in training and certification activities;
- verifying that all required QA activities are performed and that measurement quality objectives are met as prescribed in the QAPP;
- documenting deviations from established procedures and methods;
- reporting all problems and corrective actions to the AMG program manager and the QA coordinator;
- assessing data quality and flagging suspect data;
- preparing data reports for submission to the AIRS database manager.
- maintaining QA records, flagging suspect data, and assessing and reporting data quality;
- performing and documenting maintenance of field and laboratory equipment;

AIRS Database Manager – This position works under the AMG Program manager and is responsible for:

- coordinating the information management activities for NAMS/SLAMS/SPM data entry;

- validating data reliability prior to submission of AIRS data to EPA;
- timely reporting and interpretation and ensuring timely delivery of all required NAMS/SLAMS/SPM data to the AIRS system.

4.2 Municipality of Anchorage, Anchorage Air Pollution Control Agency

Structure **-** The Municipality of Anchorage (MOA) maintains the Anchorage Air Pollution Control Agency (AAPCA) which conducts ambient air monitoring within the boundaries of the MOA. This agency is within the Department of Health and Human Services.

Responsibilities and Authority – The State of Alaska has delegated responsibilities to MOA for air quality monitoring. A Memorandum of Understanding between authorities of both agencies formally delineates the responsibilities of each agency. It is the responsibility of AAPCA to conduct $PM_{2.5}$ ambient air quality monitoring within the physical boundaries of the Municipality of Anchorage in accordance with the methods, procedures and criteria established within this document. Specifically, the AAPCA responsibilities include, but are not limited to:

- monitor site preparation;
- instrument installation, operation, maintenance; corrective action(s);
- data reduction, data validation and data reporting;
- database management;
- site de-installation;
- instrument inventory control and repair; and
- contract management.

In addition, the AAPCA will assist the ADEC in site selection/network reviews and quality assurance oversight auditing for ambient monitoring activities performed in the MOA.

4.3 Fairbanks North Star Borough, Dept Transportation, Air Quality Division

Structure **-** Fairbanks North Star Borough (FNSB) maintains the Air Quality Division within the Department of Transportation. The ADEC has delegated responsibilities for air quality monitoring to the FNSB. A Memorandum of Understanding between authorities of both agencies has formally delineated the responsibilities of each agency.

Responsibilities and Authority – Responsibilities and Authority of the Air Quality Division are identical to those listed for the Municipality of Anchorage.

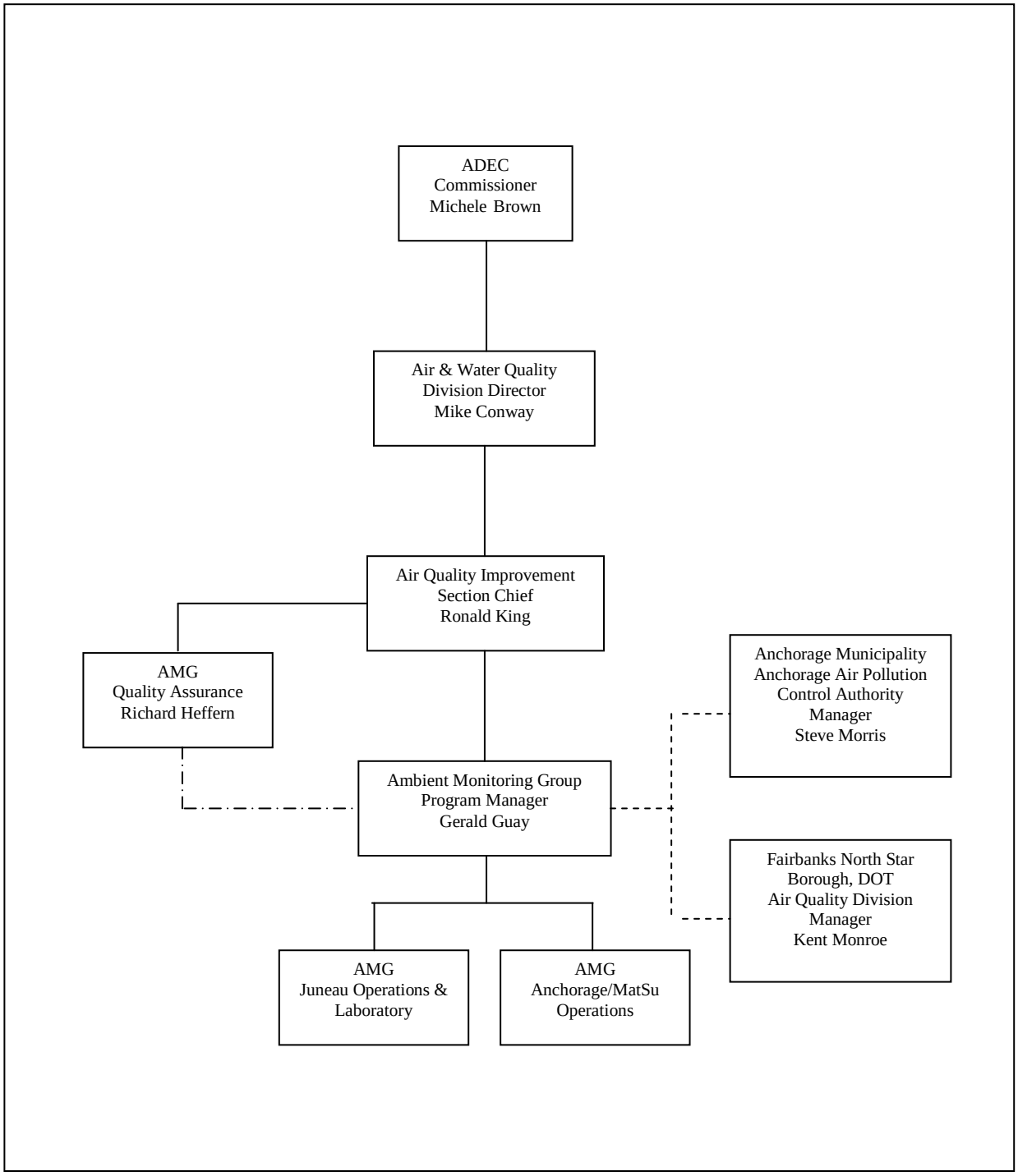

Figure 4.1 Organizational Structure of the ADEC $PM_{2.5}$ Monitoring Program

5. PROBLEM DEFINITION/BACKGROUND

5.1 Problem Statement and Background

In 1970 the Clean Air Act (CAA) was signed into law. The CAA and its amendments provides the framework for all pertinent organizations to protect air quality. This framework provides for the monitoring of criteria pollutants (particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead) by state and local organizations through the *Air Quality Monitoring Program*.

The criteria pollutant defined as particulate matter is a general term used to describe a broad class of substances that exist as liquid or solid particles over a wide range of sizes. Prior to July 1997, the NAAQS was for particulate matter with a nominal aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}). In July 1997 (Federal Register, 62(138):38651-38760, July 18, 1997), EPA promulgated new federal regulations establishing daily and annual ambient air standards for particulate matter with a nominal aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$). The $PM_{2.5}$ standards are a 15 $\mu g/m^3$ annual average and a 65 $\mu g/m^3$ 24-hour average. The annual standard is met when the 3-year average of annual arithmetic means is less than or equal to 15 $\mu g/m^3$. Due to rounding, the 3-year average does not meet the NAAQS if it equals or exceeds 15.05 μg/m3 prior to rounding. The 24-hour average standard is met when the 3-year average 98^{th} percentile of daily $PM_{2.5}$ concentrations is less than or equal to 65 $\mu g/m^3$.

As part of the new $PM_{2.5}$ standard, states are required to install monitoring networks to characterize ambient concentrations of $PM_{2.5}$. This QAPP outlines the State of Alaska's $PM_{2.5}$ ambient air quality monitoring program in fulfillment of the federal requirements to establish such monitoring programs as part of the *Ambient Air Quality Monitoring Program*. This QAPP follows the EPA Model QAPP for $PM_{2.5}$ Monitoring (*Quality Assurance Guidance Document, Model Quality Assurance Project Plan for the $PM_{2.5}$ Ambient Air Monitoring Program at State and Local Air Monitoring Stations (SLAMS)*, EPA-454/R-98-005, April 1998).

The background and rationale for the implementation of the $PM_{2.5}$ ambient air monitoring network can be found in 40 CFR Part 50. In general, some of the findings are listed below.

- The characteristics, sources, and potential health effects of larger or "coarse" particles (from 2.5 to 10 micrometers in diameter) and smaller or "fine" particles (smaller than 2.5 micrometers in diameter) are very different.

- Coarse particles come from sources such as windblown dust from the desert or agricultural fields and dust generated on unpaved roads from vehicle traffic.

- Fine particles are generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. Fine particles are also formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds that are emitted from combustion activities and then become particles as a result of chemical transformations in the air.

- Coarse particles can deposit in the respiratory system and contribute to health effects such as aggravation of asthma. EPA's "staff paper" concludes that fine particles, which also deposit deeply in the lungs, are more likely than coarse particles to contribute to the health effects (e.g., premature mortality and hospital admissions) found in a number of recently published community epidemiological studies.

- These recent community studies find that adverse public health effects are associated with exposure to particles at levels well below the current PM standards for both short-term (e.g., less than 1 day to up to 5 days) and long-term (generally a year to several years) periods.

- These health effects include premature death and increased hospital admissions and emergency room visits (primarily among the elderly and individuals with cardiopulmonary disease); increased respiratory symptoms and disease (among children and individuals with cardiopulmonary disease such as asthma); decreased lung function (particularly in children and individuals with asthma); and alterations in lung tissue and structure and in respiratory tract defense mechanisms.

Air quality samples are generally collected for one or more of the following purposes:

- To judge compliance with and/or progress made towards meeting the NAAQS;

- To develop, modify or activate control strategies that prevent or alleviate air pollution episodes;

- To observe pollution trends throughout the region, including non-urban areas; and

- To provide a data base for research and evaluation of effects.

With the end use of the air quality samples as a prime consideration, various networks can designed to meet one of six basic monitoring objectives listed below:

- Determine the highest concentrations to occur in the area covered by the network;

- Determine representative concentrations in areas of high population density;

- Determine the impact on ambient pollution levels of significant source or source categories;

- Determine general background concentration levels;

- Determine the extent of Regional pollutant transport among populated areas, and in support of secondary standards; and

- Determine the welfare-related impacts in more rural and remote areas.

The monitoring network consists of four major categories of monitoring stations that measure the criteria pollutants. These stations are described below.

- The **SLAMS** consist of a network of ~ 3,500 monitoring stations whose size and distribution is largely determined by the needs of State and local air pollution control agencies to meet their respective State Implementation Plan (SIP) requirements.

- The **NAMS** (~1,080 stations) are a subset of the SLAMS network with emphasis being given to urban and multi-source areas. In effect, they are key sites under SLAMS, with emphasis on areas of maximum concentrations and high population density.

- The **PAMS** network is required to measure ozone precursors in each ozone non-attainment area that is designated serious, severe, or extreme. The required networks will have from two to five sites, depending on the population of the area. There is a phase-in period of one site per year starting in 1994. The ultimate PAMS network could exceed 90 sites at the end of the 5 year phase-in period. **Note: No PAMS network exists in the State of Alaska.**

- **Special Purpose Monitoring Stations (SPMS)** provide for special studies needed by State and local agencies to support their SIPs and other air program activities. The SPMS are not permanently established and, thus, can be adjusted easily to accommodate changing needs and priorities. The SPMS are used to supplement the fixed monitoring network as circumstances require and resources permit. If the data from SPMS are used for SIP purposes, they must meet all QA and methodology requirements for SLAMS monitoring.

The quality of the data will be based on the priority objective of determining compliance and/or violations of the NAAQS. This QAPP describes how the ADEC $PM_{2.5}$ Ambient Air Quality Monitoring Program intends to control and evaluate data quality to meet the NAAQS data quality objectives.

6. PROJECT/TASK DESCRIPTION

6.1 Description of Work to be Performed

In general, the measurement goal of this $PM_{2.5}$ Ambient Air Quality Monitoring Program is to estimate the concentration, in units of micrograms per cubic meter ($\mu g/m^3$), of particulates less than or equal to 2.5 micrometers (μm) that have been collected on a 46.2mm polytetrafluoroethylene (PTFE) filters. For the SLAMS/NAMS network, which is what this QAPP describes, the primary goal is to compare the $PM_{2.5}$ concentrations to the annual and 24-hour NAAQS. The national primary and secondary ambient air quality standards for $PM_{2.5}$ are 15.0 $\mu g/m^3$ annual arithmetic mean concentration and 65 $\mu g/m^3$ 24-hour average concentration measured in ambient air.

The following sections describe the measurements required for the routine field and laboratory activities for the network. In addition to these measurements, an initial set of measurements will be required to fulfill the requirements of the AIRS data base.

6.2 Field Activities

The performance requirements of the air sampler has been specified in Appendix L of 40 CFR Part 50. Some of the more critical performance requirements are summarized in Table 6.1.

The air samplers used to measure $PM_{2.5}$ are designated as either EPA Federal Reference Method (FRM) or Class II or Class III EPA Federal Equivalent Method (FEM) samplers for $PM_{2.5}$ in accordance with 40 CFR Part 53. Therefore, the ADEC assumes the sampling instruments to be adequate for the sampling of $PM_{2.5}$. Other than the required federal reference or equivalent air sampler, there are no special personnel or equipment requirements. Section 15 lists all the equipment requirements for the ADEC $PM_{2.5}$ data collection operations.

6.2.1 Field Measurements

The field measurements that will be collected are presented in Table 6.2. Information listed in Table 6.2 is also presented in Table L-1 of Appendix L of 40 CFR Part 50. These measurements are made by the air sampler and are stored in the instrument for downloading via modem or by the field operator during routine visits.

In addition to the measurements collected in Table 6.2, the information identified in Table 6.3 will be recorded. These parameters are explained in the EPA Guidance Document 2.12 (*Quality Assurance Guidance Document 2.12, Monitoring $PM_{2.5}$ in Ambient Air Using Designated Reference or Class I Equivalent Methods*, USEPA, Quality Assurance Handbook, Vol. II, Part II, April 1998).

Table 6.1 Design/Performance Specifications

Equipment	Frequency	Acceptance Criteria	Reference
Filter Design Specs.	Vendor Cert.	see reference	40 CFR 50, App. L Sec 6.0
Size	"	46.2 mm dia $\pm$ 0.25mm	" Sec 6.1
Medium	"	Polytetrafluoroethylene	" Sec 6.2
Support ring	"	Polymethylpentene	" Sec 6.3
	"	0.38mm thick	"
	"	46.2 mm $\pm$ 0.25mm outer dia.	"
	"	3.68 ($\pm$0.00, -0.51mm) width	"
Pore size	"	2 µm	"Sec 6.4
Filter thickness	"	30-50 µm	"Sec 6.5
Max. pressure drop	"	30 cm H_2O @ 16.67L/min	"Sec 6.6
Max. Moisture pickup	"	10 µg increase in 24 hr.	"Sec 6.7
Collection efficiency	"	99.7%	"Sec 6.8
Filter weight stability	"	<20 µg	"Sec 6.9.1 and 6.9.2
Alkalinity	"	<25.0 micro equivalents/gram	"Sec 6.10
Sampler Performance Specs.	All Instruments		
Sample Flow Rate	"	1.000 m^3/hr.	40 CFR 50, App. L Sec7.4
Flow Regulation	"	1.000 $\pm$ 5% m^3/hr.	"
Flow Rate Precision	"	2% CV	
Flow Rate Accuracy	"	$\pm$2%	"
External Leakage	"	Vendor specs	"
Internal Leakage	"	Vendor specs	"
Ambient Temp Sensor	"	-30° – 45° C	Vol.-II-MS. 2.12
		0.1° C res. $\pm$1.6°C accuracy	40 CFR 50, App. L Sec7.4
Filter Temp Sensor	"	-30° – 45° C	"
		0.1° C res. $\pm$1.0°C accuracy	
Barometric Pressure	"	600-800 mm Hg	"
		5 mm res.$\pm$10 mm accuracy	
Clock/Timer	"	1 sec. res. $\pm$ 1 min/month	"
		accuracy	

Table 6.2 Field Measurement Requirements

Information to be Provided	Appendix L Section Reference	Availability				Format	
		Anytime[a]	End of period[b]	Visual display	Data output[d]	Digital reading[e]	Units
Flow rate, 30-second maximum interval	7.4.5.1	✓	—	✓	*	XX.X	L/min
Flow rate, average for the sample period	7.4.5.2	*	✓	*	✓	XX.X	L/min
Flow rate, CV, for the sample period	7.4.5.2	*	✓	*	✓●	XX.X	%
Flow rate, 5-min average out of spec. (FLAG)[f]	7.4.5.2	✓	✓	✓	✓●	On/Off	
Sample volume, total	7.4.5.2	*	✓	✓	✓●	XX.X	m^3
Temperature, ambient,30-second interval	7.4.8	✓	—	✓	—	XX.X	^oC
Temperature, ambient, min., max., average for the sample period	7.4.8	*	✓	✓	✓●	XX.X	^oC
Barometric pressure, ambient, 30-second interval	7.4.9	✓	—	✓	—	XXX	mm Hg
Barometric pressure, ambient, min., max., average for the sample period	7.4.9	*	✓	✓	✓●	XXX	mm Hg
Filter temperature, 30-second interval	7.4.11	✓	—	✓	—	XX.X	^oC
Filter temperature, differential, 30-minute interval, out of spec. (FLAG)[f]	7.4.11	*	✓	✓	✓●	On/Off	
Filter temperature, maximum differential from ambient, date, time of occurrence	7.4.11	*	*	*	*	X.X, YY/MM/DD HH:mm	^oC, Yr/Mo/Day Hr min
Date and time	7.4.12	✓	—	✓	—	YY/MM/DD HH:mm	Yr/Mo/Day Hr min
Sample start and stop time settings	7.4.12	✓	✓	✓	✓	YY/MM/DD HH:mm	Yr/Mo/Day Hr min
Sample period start time	7.4.12	—	✓	✓	✓●	YYYY/MM/DD HH:mm	Yr/Mo/Day Hr min
Elapsed Sample time	7.4.13	*	✓	✓	✓●	HH:mm	Hr min
Elapsed sample time out of spec. (FLAG)[f]	7.4.13	—	✓	✓	✓●	On/Off	
Power interruptions >1 min, start time of first 10	7.4.15.5	*	✓	*	✓	1HH:mm, 2HH:mm, etc.	Hr min
User-entered information, such as sampler and site identification	7.4.16	✓	✓	✓	✓●	As entered	

✓ Provision of this information is required.
* Provision of this information is optional. If information related to the entire sample period is optionally provided prior to the end of the sample period, the value provided should be the value calculated for the portion of the sampler period completed up to the time the information is provided.
● Indicates that this information is also required to be provided to the AIRS data bank.
[a] Information is required to be available to the operator at any time the sampler is operating, whether sampling or not.
[b] Information relates to the entire sampler period and must be provided following the end of the sample period until reset manually by the operator or automatically by the sampler upon the start of a new sample period.
[c] Information shall be available to the operator visually.
[d] Information is to be available as digital data at the sampler's data output port following the end of the sample period until reset manually by the operator or automatically by the sampler upon the start of a new sample period.
[e] Digital readings, both visual and data output, shall have no less than the number of significant digits and resolution specified.
[f] Flag warnings may be displayed to the operator by a single-flag indicator or each flag may be displayed individually. Only a set (on) flag warning must be indicated; an off (unset) flag may be indicated by the absence of a flag warning. Sampler users should refer to Section 10.12 of Appendix L regarding the validity of samples for which the sampler provided an associated flag warning.

Table 6.3 Additional Field Measurements

Parameter	Parameter Code	Frequency	Units	Comment
Monitor ID	MONID	Every sample event	see AIRS	Unique AIRS Monitor ID that include the combination of STATE, COUNTY, SITE, PARAMETER, and POC fields
Site Name	SITENAM	Every sample event	AAA…	Unique site name associated with the site
Sampler ID	SAMPID	Every sample event	AAXXX	Sampler model number or unique bar code number associated with the model number
Filter ID	FID	Every sample event	AAYYXXXX	Unique filter ID of filter given by the weighing laboratory
Filter Integrity flag	FFIF	Every sample event	QFI/VFI/GFI	QFI-Questionable filter integrity VFI-Void Filter Integrity GFI-Good Filter Integrity
Site Operator Initial	SOI	Every sample event	AAA	Initials of the site operator setting up the sampling run
Site Operator Final	SOF	Every sample event	AAA	Initials of the site operator completing the sampling run
Free Form Notes	FFM	As needed	AAA….	Free Form notes about the sampling run

6.3 Laboratory Activities

Laboratory activities for the $PM_{2.5}$ program include preparing the filters for the routine field operator, which includes three general phases:

- Pre-Sampling Weighing
- Shipping/Receiving
- Post-Sampling Weighing
- Storage of filters

The details for these activities are included in various sections of this document as well as Guidance Document 2.12. The performance specifications of the laboratory environment and equipment are provided in Table 6.4.

Table 6.4 Laboratory Performance Specifications

Equipment	Acceptance Criteria
Microbalance	Resolution of 1µg, repeatability of 1 µg
Microbalance environment	Climate-controlled, room (free from drafts that might affect filter measurements) or equivalent. Mean relative humidity between 30 and 40 %, with a variability of not more than $\pm$5 % over 24 hours. Mean temperature should be held between 20 and 23 ^{o}C, with a variability of not more than $\pm$2 ^{o}C over 24 hours.
Mass reference standards	Standards bracket weight of filter, individual standard's tolerance less than 25 µg, handle with smooth, nonmetallic forceps.

6.3.1 Laboratory Measurements

With the exception of the shipping/receiving, which is discussed in Appendix B ($PM_{2.5}$ Filter Processing SOP), the parameters that will be required to be recorded for pre and post-sampling weighing laboratory activities are listed Table 6.5.

6.4 Project Assessment Techniques

An assessment is an evaluation process used to measure the performance or effectiveness of a system and its elements. As used here, assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation (PE), management systems review (MSR), peer review, inspection, or surveillance. Section 20 will discuss the details of the ADEC's assessments. Information on the parties implementing the assessments and their frequency is provided in Table 6.6.

6.5 Project Records

The ADEC will establish and maintain procedures for the timely preparation, review, approval, issuance, use, control, revision and maintenance of documents and records. The categories and types of records and documents which are applicable to document control for $PM_{2.5}$ information are presented in Table 6.7. Information on key documents in each category are explained in more detail in Section 9.

Table 6.5 Laboratory Measurements

Parameter	Parameter Code	Frequency	Units	Comments
Filter Conditioning				
Start Date	CNSDATE	every filter	YY/MM/DD	Date of start of conditioning period
Start Time	CNSHOUR	every filter	XX.XX	Start hour and minute of conditioning
Filter Number	RFID LBFID FBID	every filter	RFYYXXXX LBYYXXXX FBYYXXXX	Unique filter ID of routine filter (RF) Lab Blanks (LB) Field Blanks (FB).
Relative Humidity	CONRH	1/run	XX%	Average % relative humidity value for conditioning session based upon continuous readings
Temperature	CONTEMP	1/run	XX°C	Average temperature value for conditioning session based upon continuous readings
End Date	CONDATE	every filter	YY/MM/DD	Date of start of conditioning period
End Time	CNEHOUR	every filter	XX.XX	End hour and minute of conditioning
Pre-Sampling Filter Weighing Date	PREDATE	1/RUN[1/]	yy/mm/dd	Date for pre-sampling run of filters that can then be associated with each filter
Filter Lot Number	FLN	every filter	AAAXXX	Lot number associated with filter
Balance Number	BALID	1/run	AAAXXX	Unique balance ID for balance used in pre-weighing
Analyst	PREANL	1/run	AAA	Initials of the technician pre-weighing filters
QA Reviewer	PREQC	1/run	AAA	Initials of the QA Reviewer overseeing pre-weighing filters

Table 6.5 Laboratory Measurements

Parameter	Parameter Code	Frequency	Units	Comments
Relative Humidity	PRERH	1/run	XX%	Average % relative humidity value for weighing session based upon continuous readings
Temperature	PRETEMP	1/run	XX°C	Average temperature value for weighing session based upon continuous readings
Filter Number	RFID LBFID FBID FCID DFID[2/]	every filter	RFYYXXXX LBYYXXXX FBYYXXXX FCYYXXXX DFYYXXXX	Unique filter ID of routine filter (RF) Lab Blanks (LB) Field Blanks (FB) Flow Check Filter (FC) and Duplicate Filter.
QC Sample Number	PREQC	every QC check	C1XXX C2XXX C3XXX	Unique ID for calibration checks and or other types of QC samples used.
Pre-Sampling Mass	PREMASS	every filter	XXX.XXX mg	Mass weight in mg of the filter
Transport container ID	CONTID	every filter	AAAXXX	Identification of the filter transport container
Monitor ID	MONID	Every sample	see AIRS	Unique AIRS Monitor ID that include the combination of STATE, COUNTY, SITE, PARAMETER, and POC fields
Free Form Notes	PREFFM	As needed		Pre-weighing Free Form notes
Post-Sampling Filter Weighing Date	PSTDATE	1/run	YY/MM/DD	Date for post-sampling run of filters that can then be associated with each filter
Balance Number	BALID	1/run	AAAXXX	Unique balance ID for balance used in post-weighing
Analyst	PSTANL	1/run	AAA	Initials of the technician post-weighing filters
QA Officer	PSTQC	1/run	AAA	Initials of the QA Reviewer overseeing pre-weighing filters
Relative Humidity	PSTRH	1/run	XX%	Average % relative humidity value for weighing period based upon continuous readings
Temperature	PSTEMP	1/run	XX°C	Average temperature value for weighing period based upon continuous readings
Filter Number	RFID LBID FBID DFID[2/]	every filter	RFYYXXXX LBYYXXXX FBYYXXXX DFYYXXXX	Unique filter ID of routine filter (RF) Lab Blanks (LB) Field Blanks (FB) and Duplicate Sample.
QC Sample Number	PSTQC	every QC check	C1XXX C2XXX C3XXX	Unique id for calibration checks and or other types of QC samples used.
Post Sampling Mass	PSTMASS	every filter	XXX.XXX mg	Mass weight in mg of the filter
Net Mass	NETMASS	every filter	XX.XXX mg	Net weight (PSTMASS-PREMASS)-in mg of $PM_{2.5}$ catch.
Weighing Flag	PSTFLAG	as needed	AAA	Flags associated with concentration
Free Form Notes	PSTFFM	as needed	AAA…	Past weighing free form notes

1- information is associated with a "session" and the values will be able to be associated with individual filters.

2- This identifies a second weighing of a routine filter and not a unique filter.

Table 6.6 Assessment Schedule

Assessment Type	Assessment Agency	Frequency
Technical Systems Audit	EPA Region 10 Office ADEC-AQI	1999 and every 3 years thereafter
Network Review	EPA Region 10 Office ADEC-AQI	1999 and every year thereafter
Data Qualifiers/Flags Review	ADEC-AQI	1999 and every year thereafter
FRM Performance Evaluation	EPA Region 10 Office	25% of sites/year/4 times per year
Data Quality Assessment	ADEC-AQI	1999 and every year thereafter

Table 6.7 Critical Documents and Records

Categories	Record/Document Types
Site Information	Network description Site characterization file Site maps Site Pictures
Environmental Data Operations	QA Project Plans Standard operating procedures (SOPs) Field and laboratory notebooks Sample handling/custody records Inspection/maintenance records
Raw Data	Any original data (routine and QC data) including data entry forms
Data Reporting	Air quality index report Annual SLAMS air quality information Data/summary reports
Data Management	Data algorithms Data management plans/flowcharts $PM_{2.5}$ Data Data Management Systems
Quality Assurance	Network reviews Control charts Data quality assessments QA reports System audits Response/Corrective action reports Site Audits

7. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

7.1 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements that:

- clarify the intended use of the data,
- define the type of data needed, and
- specify the tolerable limits on the probability of making a decision error due to uncertainty in the data.

7.1.1 Intended Use of Data

In this case, the $PM_{2.5}$ measurements are being collected with the intent to:

- quantify ambient $PM_{2.5}$ concentrations at selected monitoring sites throughout Alaska, and
- based on the $PM_{2.5}$ measurements, determine compliance at each site with respect to the applicable $PM_{2.5}$ NAAQS.

7.1.2 Type of Data Needed

The type of data needed is defined by the intended use of the data. In this case, the type of data needed is defined by the applicable NAAQS. The $PM_{2.5}$ NAAQS are a 15 $\mu g/m^3$ annual average and a 65 $\mu g/m^3$ 24-hour average. The annual standard is met when the 3-year average of annual arithmetic means is less than or equal to 15 $\mu g/m^3$. The 24-hour average standard is met when the 3-year average 98^{th} percentile of daily $PM_{2.5}$ concentrations is less than or equal to 65 $\mu g/m^3$. The sampling has been designed to provide the data necessary to determine 24-hour and annual $PM_{2.5}$ concentrations. The specifics of the sampling design, including identification of the monitoring locations, is presented in Section 10.

7.1.3 Tolerable Error Limits

In the development of the EPA Model QAAP for $PM_{2.5}$, the EPA utilized the formal DQO Process (see: *Guidance on Quality Assurance Objectives Process*, EPA QA/G-4, EPA/600/R-96-055, September 1994) to specify tolerable limits on the probability of making a decision error due to uncertainty in the data. That is, limits on the probability of coming up with a false positive error whereby the estimated 3-year average $PM_{2.5}$ concentration exceeds the standard when in fact, due to errors in the data, it doesn't; or coming up with a false negative error whereby the estimated 3-year average $PM_{2.5}$ concentration does not exceed the standard when in fact, due to errors in the data, it does. Based on the use of the DQO Process, the EPA determined that the objectives regarding the quality of the $PM_{2.5}$ measurement system should be to control precision and bias in order to reduce the probability of decision errors.

These same objectives will be pursued in the ADEC $PM_{2.5}$ Monitoring Program with an acceptable precision of 10% as measured by coefficient of variation, and an acceptable bias of ±10%. By controlling precision and bias at these levels, the decision error probability limit will be 5%.

7.2 Measurement Quality Objectives

Once a DQO is established, the quality of the data must be evaluated and controlled to ensure that it is maintained within the established acceptance criteria. Measurement Quality Objectives (MQOs) are designed to evaluate and control various phases (sampling, preparation, analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the DQOs. The MQOs for the ADEC $PM_{2.5}$ Monitoring Program will be defined in terms of the following data quality indicators:

Precision - a measure of mutual agreement among individual measurements of the same property usually under prescribed similar conditions. Precision is estimated by various statistical techniques using some derivation of the standard deviation.

Bias - the systematic or persistent distortion of a measurement process which causes error in one direction. Bias will be determined by estimating the positive and negative deviation from the true value as a percentage of the true value.

Representativeness - a measure of the degree which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Detectability - The determination of the low range critical value of a characteristic that a method specific procedure can reliably discern.

Completeness - a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions. Data completeness requirements are included in the reference methods (40 CFR Part 50).

Comparability - a measure of confidence with which one data set can be compared to another.

For each of these attributes, acceptance criteria have been developed using various parts of 40 CFR as well as Guidance Document 2.12. The MQOs for the ADEC $PM_{2.5}$ program are listed in Table 7.1. More detailed descriptions of these MQOs and how they will be used to control and assess measurement uncertainty are described in other elements, as well as in the SOPs of this QAPP.

Table 7.1 Measurement Quality Objectives – ADEC $PM_{2.5}$ Monitoring Program

Requirement	Frequency	Acceptance Criteria	40 CFR Reference	QA Guidance Document 2.12 Reference
Filter Holding Times				
Pre-sampling	All Filters	<30 days before sampling	Part 50, App. L Sec 8.3	Sec. 7.8
Post-sampling weighing	"	<10 days at 25° C <30 days at 4° C	" "	Sec 7.10
Reporting Units	All data	µg/m^3	Part 50.3	Sec. 11.1
Detection Limit				
Lower DL	All data	2 µg/m^3	Part 50, APP. L Sec 3.1	
Upper Conc. Limit	All data	200 µg/m^3	Part 50, App. L Sec 3.2	
Data Completeness	Quarterly	75%	Part 50, App. N, Sec. 2.1	
Filter				
Visual defect check	All Filters	See reference	Part 50, App. L Sec 6.0	Sec 7.5
Filter Conditioning Environment				
Pre- & Post Equilibration	All filters	24 hours minimum	Part 50, App. L Sec 8.2	Sec. 7.6
Mean Temp. Range	"	20-23° C	"	"
Temp. Control	"	±2° C over 24 hr	"	"
Mean Humidity Range	"	30% - 40% RH	"	"
Humidity Control	"	±5% RH over 24 hr.	"	"
Lot Blanks	3 filters per lot	less than 15 µg		Sec. 7.6
Lab QC Checks				
Field Filter Blank	see 2.12 reference	±30 µg change between weighings	Part 50, App. L Sec 8.2	Sec. 7.7
Lab Filter Blank	3 per weighing session	±15 µg change between weighings	"	"
Balance Check	beginning, every 10th samples, end	≤ 3 µg		Sec. 7.9
Duplicate Filter Weighing	1 per sample batch	±15 µg change between weighings		Sec 7.7

Table 7.1 Measurement Quality Objectives – ADEC $PM_{2.5}$ Monitoring Program

Calibration/Verification				
Flow Rate (FR) Calibration	If multi-point failure	±2% of transfer standard	Part 50, App. L, Sec 9.2	Sec 6.3 and 6.6
FR multi-point verification	1/yr	±2% of transfer standard	Part 50, App. L, Sec 9.2.5	Sec 8.3
One point FR verification	1/month	±4% of transfer standard		Sec 8.3
External Leak Check	every 5 sampling events	80 mL/min	Part 50, App. L, Sec 7.4	Sec. 8.3
Internal Leak Check	every 5 sampling events	80 mL/min	"	Sec. 8.3
Temperature Calibration	If multi-point failure	±2° C of standard	Part 50, App. L, Sec 9.3	Sec. 6.4
Temp multi-point verification	on installation, then 1/yr	±2° C of standard	Part 50, App. L, Sec 9.3	Sec. 6.4 and 8.2
One-point temp Verification	1/month	± 4°C of standard	"	Sec. 6.4 and 8.2
Pressure Calibration	on installation, then 1/yr	±10 mm Hg	"	Sec. 6.5
Pressure Verification	1/month	±10 mm Hg	"	Sec. 8.2
Clock/timer Verification	1/month	1 min/mo	Part 50, App. L, Sec 7.4	not described
Accuracy				
FRM performance evaluation	25% of sites 4/yr	±10%	Part 58, App A, Sec 3.5	Sec 10.3
Flow Rate Audit	1/2 wk (automated) 4/yr (manual)	±4% of audit standard	"	Sec. 10.2
Temperature Audit	4/yr	±2° C	not described	"
Pressure Audit	4/yr	±10 mm Hg	not described	"
Balance audit	1/yr	Manufacturers specs	not described	"
Precision				
Collocated samples	every 6 days for 25% of sites	CV ≤10%	Part 58, App. A, Sec 3.5 and 5.5	Sec. 10.3
Single analyzer	1/3 mo.	CV ≤10%	not described	not described
Single Analyzer	1/yr	CV ≤10%	not described	not described
Reporting Org.	1/3 mo.	CV ≤10%	not described	not described
Calibration & Check Standards				
Flow Rate Transfer Std.	1/yr	±2% of NIST-traceable Std.	Part 50, App. L Sec 9.1 and 9.2	Sec. 6.3
Field Thermometer	1/yr	±0.1° C resolution ±0.5° C accuracy	not described not described	Sec 4.2 and 8.3 "
Field Barometer	1/yr	±1 mm Hg resolution ±5 mm Hg accuracy	not described not described	" "
Working Mass Stds.	3-6 mo.	0.025 mg	not described	Sec 4.3 and 7.3
Primary Mass Stds.	1/yr	0.025 mg	not described	"

8. TRAINING REQUIREMENTS

Personnel assigned to the $PM_{2.5}$ ambient air monitoring activities will meet the educational, work experience, responsibility, personal attributes, and training requirements for their positions. Records on personnel qualifications and training will be maintained in personnel files and will be accessible for review during audit activities.

8.1 Measurement Quality Objectives

Appropriate training is available to employees supporting the Ambient Air Quality Monitoring Program, commensurate with their duties. In August 1998, ADEC sent ADEC and local government $PM_{2.5}$ staff to a WESTAR sponsored $PM_{2.5}$ field and laboratory training workshop. Additional training may consist of courses, workshops, classroom lectures, teleconferences, and on-the-job-training. The following groups provide training: U.S. EPA's Air Pollution Training Institute (APTI), U.S. EPA Quality Assurance Division (QAD), U.S.EPA Office of Air Quality Planning and Standards (OAQPS), American Society for Quality Control (ASQC) and Air & Waste Management Association (AWMA). A suggested list of courses can be found in Table 8.1 at the end of this section.

Training Courses from table 8.1 are suggested for:

Field Personnel	422, 424, 435, 443, PM1
Laboratory Personnel	422, 434, 435, 464, 443, PM1
Data Management	434, AIRS1
QA Personnel	422, 434, 435, 443, QA1, QA2, QA3, QA4, QA6, QA7, PM1
QA Management	422, 452, QA1, 434, 471, 470, QA2, QA3, QA4, QA5, 473, 473**,** QA6, STAT1, QA7, PM1

Table 8.1 Suggested Core Ambient Air $PM_{2.5}$ Training Courses

Sequence	Course Title (SI = self instructional)	Course #	Source
1	Air Pollution Control Orientation Course (Revised), SI	422	APTI
2	Principles and Practices of Air Pollution Control,	452	APTI
3	Orientation to Quality Assurance Management	QA1	EPA QAD
4	Introduction to Ambient Air Monitoring (Under Revision), SI	434	APTI
5	General Quality Assurance Considerations for Ambient Air Monitoring (Under Revision), SI	471	APTI
7	Data Quality Objectives Workshop	QA2	QAD
8	Quality Assurance Project Plan	QA3	QAD
9	Atmospheric Sampling (Under Revision)	435	APTI
10	Analytical Methods for Air Quality Standards	464	APTI
11	Chain of Custody Procedures for Samples and Data, SI	443	APTI
	Data Quality Assessment	QA4	QAD
	Management Systems Review	QA5	QAD
	Beginning Environmental Statistical Techniques (Revised), SI	473	APTI
	Introduction to Environmental Statistics, SI	473B	APTI
	Quality Audits for Improved Performance	QA6	AWMA
	Statistics for Effective Decision Making	STAT1	ASQC
	AIRS Training	AIRS1	OAQPS
	FRM Performance Evaluation Training (field/lab)	QA7	OAQPS
	$PM_{2.5}$ Monitoring Implementation (Video)	PM1	OAQPS

9. DOCUMENTATION AND RECORDS

The following information describes the ADEC's document and records procedures for the $PM_{2.5}$ Monitoring Program. The documents and records required to support the concentration data reported to EPA, which includes all data required to be collected as well as data deemed important by the ADEC are listed in Table 9.1.

9.1 Information Included in the Reporting Package

9.1.1 Routine Data Activities

The ADEC maintains records in appropriate files that allows for the efficient archive and retrieval of records. The $PM_{2.5}$ information will be included in this system. In addition, ADEC Air Quality Lab recently purchased a laboratory information management system (LIMS) to coordinate the downloading of sample data from ADEC's field $PM_{2.5}$ monitors, and all the required laboratory measurements and documents. Table 9.1 includes the documents and records that will be filed according to the statute of limitations discussed in Section 9.3.

9.1.2 Annual Summary Reports Submitted to EPA

As indicated in 40 CFR Part 58, the ADEC shall submit to the EPA Administrator, through the Region 10 Office, an annual summary report of all the ambient air quality monitoring data from all monitoring stations designated as SLAMS. The report will be submitted by July 1 of each year for the data collected from January 1 to December 31 of the previous year. The report will contain the following information:

Site and Monitoring Information.

- City name (when applicable),
- County name and street address of site location,
- AIRS-AQS site code, and
- AIRS-AQS monitoring method code.

Summary Data

- Annual arithmetic mean (μg/m3) as specified in 40 CFR Part 50, Appendix N (Annual arithmetic mean NAAQS is 15 μg/m3),
- All daily $PM_{2.5}$ values above the level of the 24-hour NAAQS (65 μg/m3) and the dates of occurrence,
- Sampling schedule used, and

Table 9.1 Reporting Package Information

Categories	Record/Document Types	File Locations
Management and Organization	State Implementation Plan Reporting agency information Organizational structure Personnel qualifications and training Training Certification Quality management plan Document control plan EPA Directives Grant allocations Support Contract	ADEC-AQI Anchorage/Juneau “ “ “ “ “ “ “ “ “
Site Information	Network description Site characterization file Site maps Site Pictures	ADEC-AQI Anchorage/Juneau “ “ “
Environmental Data Operations	QA Project Plans Standard Operating Procedures (SOPs) Field notebooks Inspection/Maintenance records Laboratory notebooks Sample handling/custody records	ADEC-AQI Anch.&Juneau/FNSB/MOA “ ADEC-AQI Anch.&Juneau/FNSB/MOA “ ADEC AQI Laboratory (Juneau) “
Raw Data	Any original data (routine and QC data) including data entry forms	ADEC AQI Laboratory (Juneau)
Data Reporting	Air quality index report Annual SLAMS air quality information Data/summary reports Journal articles/papers/presentations	ADEC-AQI Anch.&Juneau/FNSB/MOA ADEC-AQI Anchorage/Juneau “ ADEC-AQI Anch.&Juneau/FNSB/MOA
Data Management	Data algorithms Data management plans/flowcharts $PM_{2.5}$ Data Data Management Systems	ADEC AQI Laboratory (Juneau) ADEC-AQI Anchorage/Juneau “ ADEC AQI Juneau
Quality Assurance	Network reviews Control charts Data quality assessments QA reports System audits Response/Corrective action reports Site Audits	ADEC-AQI Anchorage/Juneau “ “ ADEC-AQI Anch.&Juneau/FNSB/MOA “ “ “

- Number of 24-hour average concentration in the following ranges ($\mu g/m^3$): 0 to 15; 16 to 30; 31 to 50; 51 to 70; 71 to 90; 91 to 110; and greater than 110.

ADEC-AQI's Air Quality Data Manager will certify that the annual summary is accurate to the best of his knowledge. This certification will be based on the various assessments and reports performed by the organization, in particular, the Annual QA Report discussed in Section 21 that documents the quality of the $PM_{2.5}$ data and the effectiveness of the quality system.

9.2 Data Reporting Package Format and Documentation Control

Table 9.1 lists the documents and records, at a minimum, that must be filed into the reporting package. The details of these various documents and records will be discussed in the appropriate sections of this document. All raw data required for the calculation of $PM_{2.5}$ concentrations, the submission to the AIRS database, and QA/QC data, are collected electronically or on data forms that are included in the field and analytical methods sections. All hardcopy information will be filled out in indelible ink. Corrections will be made by inserting one line through the incorrect entry, initialing this correction, and placing the correct entry alongside the incorrect entry, if this can be accomplished legibly, or by providing the information on a new line.

9.2.1 Notebooks

The ADEC will issue notebooks to each ADEC field/laboratory technician. Other local agencies conducting SLAMS/NAMS/SPM monitoring will provide field notebooks for their own technicians. Although data entry forms are associated with all routine environmental data operations, the notebooks will be used to record additional information about these operations.

Field Notebooks - Notebooks will be issued for each sampling site. These may be 3-ring binders that contain the appropriate data forms for routine operations as well as inspection and maintenance forms and SOPs.

Lab Notebooks - Notebooks will also be issued for the laboratory. These notebooks will be uniquely numbered and associated with the $PM_{2.5}$ Program. One notebook will be available for general comments/notes; others will be associated with, the temperature and humidity recording instruments, the refrigerator, calibration equipment/standards, and the analytical balances used for this program.

Laboratory Information Management System(LIMS) - The Juneau LIMS system will record the sample data downloaded from field instruments as well as all other laboratory measurements used in generating reliable $PM_{2.5}$ sample data.

Electronic Data Collection - It is anticipated that certain instruments will provide an automated means for collecting information that would otherwise be recorded on data entry forms. Information on these systems are detailed in Sections 18 and 19. In order to reduce the potential for data entry errors, automated systems will be utilized where appropriate and will record the same information that is found on data entry forms. In order to provide a back-up, a hardcopy of automated data collection information will be stored for the appropriate time frame in project files.

9.3 Data Reporting Package Archiving and Retrieval

As stated in 40 CFR Part 31.42, in general, all the information listed in Table 9.1 will be retained for three years from the date of collection. However, if any litigation, claim, negotiation, audit or other action involving the records has been started before the expiration of the three year period, the records will be retained until completion of the action and resolution of all issues which arise from it, or until the end of the regular three year period, whichever is later. The ADEC will extend this regulation in order to store records for three full years past the year of collection. For example, any data collected in calendar year 1999 (1/1/99 - 12/31/99) will be retained until, at a minimum, January 1, 2003; unless the information is used for litigation purposes.

10. SAMPLING DESIGN

The purpose of this section is to describe the relevant components of the $PM_{2.5}$ monitoring network to be operated by the ADEC. A complete description of the monitoring network is provided in Appendix A, which contains a copy of the document: Alaska's *$PM_{2.5}$ Monitoring Network Description,* July 1998. The network design components comply with the regulations stipulated in 40 CFR Part 58 Section 58.13, Appendix A, and Appendix D, and further described in Guidance for Network Design and Optimum Site Exposure for $PM_{2.5}$ and PM_{10}.

10.1 Network Objectives

The ADEC $PM_{2.5}$ Monitoring Network is designed to: (a) determine compliance or non-compliance with the NAAQS; (b) best represent the exposure of populations that may be affected by elevated $PM_{2.5}$ concentrations; and (c) meet EPA objectives. The design of the State and Local Air Monitoring Stations (SLAMS) $PM_{2.5}$ network must achieve one of six basic monitoring objectives as described in 40 CFR Part 58, Appendix D. These are:

1. To determine the highest concentrations expected to occur in the area covered by the network;

2. To determine representative concentrations in areas of high population density;

3. To determine the impact on ambient pollution levels of significant sources or source categories;

4. To determine general background concentrations levels;

5. To determine the extent of regional pollution transport among populated areas, and in support of secondary standards; and

6. To determine the welfare-related impacts in more rural and remote areas (such as visibility impairment and effects on vegetation.

The ADEC $PM_{2.5}$ monitoring network is designed to protect the health and welfare its residents and visitors. To meet this objective, monitoring sites will be installed at locations specifically selected to evaluate public impacts of $PM_{2.5}$ in areas with the highest potential for exceeding the fine particulate standards. Where problems exist, priority will be given to communities with high population density. Where impacts are seasonal, monitoring studies will be designed to examine seasonal impacts on local residents.

The ADEC has decided not to emphasize the integration of the $PM_{2.5}$ NAAQS and visibility monitoring programs for various reasons as explained in Appendix A. In the development of the monitoring network, the ADEC has placed an emphasis on obtaining measurements at locations that represent concentrations at the neighborhood scale.

10.2 Selection of $PM_{2.5}$ Monitoring Areas

Alaska does not meet the traditional concept of population centers envisioned in the guidance document for the $PM_{2.5}$ standard. Instead, Alaska's "population centers" closely resemble the supply centers of the 1800's used to explore the West. Alaska has only five communities over 15,000 people: Anchorage, Fairbanks, Juneau, Wasilla/Palmer and Ketchikan. Each of these areas must be considered separately and independent from the others when considering air quality impacts and influences on neighboring communities.

For monitoring prioritization, the State will install SLAMS objective #1 microscale stations if we receive complaints from the public, and substantiated by subsequent SPM investigations, that show there is a micro-scale $PM_{2.5}$ problem in the area. A SLAMS objective #1 station may also be installed if localized emissions are observed impacting residential areas.

The State defines high population density for SLAMS objective #2 as a residential area in a community with a population of at least 5,000 people.

Alaska's long-term goals are split between using SPM monitors to help characterize the most representative SLAMS sites and evaluating potential microscale impacts on the public.

10.3 Selection of Monitoring Sites

$PM_{2.5}$ site locations will be based on the State's present understanding of local sources and their potential $PM_{2.5}$ contributions. Sites will contain a mix of SLAMS and SPM monitoring locations to address neighborhood-scale, micro-scale and associated gradients where necessary to develop effective control strategies. Sites were selected to meet the following criteria:

- measured concentrations will represent exposure to $PM_{2.5}$ at the neighborhood scale (500 meters to 4 kilometers);
- the site is at least 1 kilometer from source areas occupied by major industries; measured concentrations will represent exposure to $PM_{2.5}$ at the neighborhood scale (500 meters to 4 kilometers);
- the site is at least 100 meters from unpaved roads and wood burning appliances;
- the site is at least 50 meters from busy, paved roadways;
- the site is at least 20 meters from trees; and
- the site is sufficiently distant from buildings higher than the monitor elevation to escape their influence on pollutant concentrations.

If siting criteria was not met, sufficient justification was given to justify the selection:

10.4 Monitoring Network Description

The configuration of ADEC's monitoring network, based on the site selection criteria described above and in Appendix A, consists of five $PM_{2.5}$ monitoring stations. The composition of these sites is as follows:

- Five sites are equipped with Federal Reference Method (FRM) samplers. Of these five sites, four are NAAQS compliance sites, and one is the CORE site.
- Two sites utilize either a Federal Equivalent Method (FEM) Class II monitor (i.e., dichotomous (dichot) sampler) or a nephelometer;
- Two sites are equipped with collocated FRM samplers for quality assurance purposes.

General site information is provided in Table 10.1. Detailed site information, including the rationale for each site selection, is provided in Appendix A.

10.5 Monitoring Sites Planned for 1999

During the calendar year 1999, ADEC will establish 8 additional $PM_{2.5}$ monitoring sites, all of which will be equipped with FRM samplers. In addition, 2 collocation samplers will be added to the Alaska Network. In 1999, the FEM Class II samplers will be removed from the network.. This QAPP will be revised as these additions and changes to the monitoring network are implemented.

10.6 Rationale for the Design

10.6.1 Primary Samplers

The primary purpose of the gravimetric mass $PM_{2.5}$ ambient air monitoring program operated by ADEC is to measure compliance with national standards for particulates less than or equal to 2.5 micrometers. These standards, detailed in 40 CFR Part 50, are based on twenty-four hour average $PM_{2.5}$ concentrations, and are summarized as:

- The three-year average of the annual 98th percentiles of $PM_{2.5}$ concentrations at any population-oriented monitoring site is not to exceed 65 $\mu g/m^3$.
- The three-year average of the annual mean of $PM_{2.5}$ concentrations is not to exceed 15 $\mu g/m^3$. The average may be based on a single community-oriented monitoring site or may be based on the spatial average of community-oriented monitoring sites in a community monitoring zone (CMZ).

Thus the key characteristics being measured are annual 98th percentiles and annual means of twenty-four hour average $PM_{2.5}$ concentrations.

The ADEC monitoring network employs FRM/FEM samplers to assure that $PM_{2.5}$ concentrations are being properly measured. In addition, by complying with the sampling frequency requirements of 40 CFR Part 58, Section 58.13, ADEC assumes that the sampling frequency is sufficient to attain the desired confidence in the annual 98th percentile and annual mean of $PM_{2.5}$ concentrations in the vicinity of each monitor. By selecting sampler locations using the rules in 40 CFR Part 58, Appendix D, IDEQ is confident that the $PM_{2.5}$ concentrations will be adequately characterized.

Table 10.1 ADEC $PM_{2.5}$ Monitoring Network Site Information

City	Site Location	Sampler	Frequency	SLAMS Objectives [a]	Collocated FRM
Anchorage	16th & Garden	FRM (sequential)	1-in-1	Objectives 1, 2	Yes
Anchorage	Gambell Road Worthington Ford (selection tentative—site to be razed early spring '99) Gambell Road Worthington Ford	FRM (sequential) Dichotomous FEM	1-in-3 1-in-3	Objectives 1,2 Objective 2	No No
Butte	Pioneer Peak/ Harrison Court	FRM (manual)	1-in-3	Objective 3	Yes
Fairbanks	State Office Building	FRM (sequential)	1-in-3	Objective 2	No
Juneau	Floyd Dryden Middle School Floyd Dryden Middle School	FRM (sequential) FEM Nephelometer	1-in-1 1-in-1	Objectives 1, 2 Objective 2	Yes No

[a] Objectives as stated in Section 10.1.

10.6.2 QA Samplers

The purpose of collocated samplers and the FRM performance evaluation is to estimate the precision and bias of the various $PM_{2.5}$ samplers. The DQOs developed in Section 7 state that, for a 3-year period, the concentrations measured by a sampler must be within ±10% of the true concentration as measured by an FRM sampler and that the coefficient of variation of the relative differences must be less than 10%. These levels of bias and precision need to be accomplished so that decision makers can make decisions about attainment and/or non-attainment of the $PM_{2.5}$ NAAQS with sufficient

confidence. To estimate the level of bias and precision being achieved in the field, three of the sites will operate collocated samplers and all of the sites will be audited using FRM samplers.

In order to measure these characteristics with sufficient confidence, ADEC will address sampler type, sampling frequency, and sampler siting for the QA network. As with the primary PM network, by using FRM/FEM samplers, maintaining the sampling frequency specified in 40 CFR Part 58, Appendix A, and collocating the number of samplers as specified in 40 CFR Part 58, Appendix A, ADEC assumes its QA network will measure bias and precision with sufficient confidence.

10.7 Design Assumptions

The sampling design is based on the assumption that following the rules and guidance provided in the CFR and *Guidance for Network Design and Optimum Site Exposure for PM_{10} and $PM_{2.5}$* will result in data that can be used to measure compliance with the national standards.

11. SAMPLING METHODS REQUIREMENTS

11.1 Purpose/Background

This method provides for measurement of the mass concentration of fine particulate matter having an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$) in ambient air over a 24-hour period for purposes of determining whether the primary and secondary national ambient air quality standards for particulate matter specified in 40 CFR Part 50.6 are met. The measurement process is considered to be non-destructive, and the $PM_{2.5}$ sample obtained can be subjected to subsequent physical or chemical analyses.

11.2 Sample Collection and Preparation

FRM samplers will be used as the monitor for collection of $PM_{2.5}$ samples for comparison to the NAAQS. In the ADEC network, FRM samplers will be either Rupprecht & Patashnick Model 2000 Partisol or Model 2025 Partisol Plus $PM_{2.5}$ FRM samplers. Both the Model 2000 (manual filter change) samplers and the Model 2025 (sequential filter change) samplers meet the FRM designation. Each model sampler will be installed with adherence to procedures, guidance, and requirements detailed in 40 CFR Parts 50, 53 and 58; Section 2.12 of the QA Handbook; the sampler manufacturer's operation manual, and the SOPs in this QAPP.

11.2.1 Sample Set-up

Sample set-up of the FRM sampler in the ADEC network will take place any day after the previous sample has been recovered. It is important to recognize that the only holding time that affects sample set-up is the 30 day window from the time a filter is pre-weighed to sample collection. At collocated sites, the second monitor will be set up to run at a sample frequency of 1 in 6 days; however, sample set-up will take place on the same day as the primary sampler. Detailed sample set-up procedures are available from the $PM_{2.5}$ sample methods SOP.

11.2.2 Sample Recovery

Sample recovery of any individual filter from the FRM or equivalent sampler in the ADEC network must occur within 96 hours of the end of the sample period for that filter. At collocated sites the sample from the second monitor will be recovered on the same day as the primary sampler. Sample recovery procedures are detailed in the $PM_{2.5}$ sample methods SOP. The ADEC Ambient Analysis Group program manager will establish and maintain the sampling/sample recovery calendar for all the sites the state manages. These calendars will specify the sampling days for the year. Local agencies conducting $PM_{2.5}$ monitoring for the State are responsible to follow the State's specified sampling frequencies, and develop their own sampling/sample recovery site calendars accordingly.

11.3 Sampling/Measurement System Corrective Action

Corrective action measures in the $PM_{2.5}$ Air Quality Monitoring Network will be taken to ensure the data quality objectives are attained. There is the potential for many types of sampling and

measurement system corrective actions. Table 11.4 is an attempt to detail the expected problems and corrective actions needed for a well-run PM network.

Table 11.1 Field Corrective Actions

Item	Problem	Action	Notification
Filter Inspection (Pre-sample)	Pinhole(s) or torn	1) If additional filters have been brought, use one of them. Void filter with pinhole or tear. 2) Use new field blank filter as sample filter. 3) Obtain a new filter from lab.	1) Document on field data sheet. 2) Document on field data sheet. 3) Notify Supervisor.
Filter Inspection (Post-sample)	Torn or otherwise suspect particulate by-passing 46.2 mm filter.	1) Inspect area downstream of where filter rests in sampler and determine if particulate has been by-passing filter. 2) Inspect in-line filter before sample pump and determine if excessive loading has occurred. Replace as necessary.	1) Document on field data sheet. 2) Document in log book.
WINS Impactor	Heavily loaded with course particulate. Will be obvious due to a "cone" shape on the impactor well.	Clean downtube and WINS impactor. Load new impactor oil in WINS impactor well.	Document in log book.
Sample Flow Rate Verification	Out of Specification ($\pm$ 4% of transfer standard)	1) Completely remove flow rate device, re-connect and re-perform flow rate check. 2) Perform leak test. 3) Re-calibrate flow rate	1) Document on data sheet. 2) Document on data sheet. 3) Document on data sheet and notify supervisor.
Leak Test	Leak outside acceptable tolerance (80 mL/min)	1) Completely remove flow rate device, re-connect and re-perform leak test. 2) Inspect all seals and O-rings, replace as necessary and re-perform leak test. 3) Check sampler with different leak test device.	1) Document in log book. 2) Document in log book and flag data since last successful leak test. 3) Document in log book and notify Regional Manager.
Sample Flow Rate	Consistently low flows documented during sample run	1) Check programming of sampler flowrate. 2) Check flow with a flow rate verification filter and determine if actual flow is low. 3) Inspect in-line filter downstream of 46.2 mm filter location, replace as necessary. 4) Recalibrate flows.	1) Document in log book. 2) Document in log book. 3) Document in log book. 4) Document in log book and notify supervisor.

Table 11.1 Field Corrective Actions

Item	Problem	Action	Notification
Ambient Temperature Verification, and Filter Temperature Verification.	Out of Specification (±4°C of standard)	1) Make certain temperature sensor is immersed in same media at same point without touching sides or bottom of container. 2) Use ice bath or warm water bath to check a different temperature or use a cold temperature calibration block to generate a different temperature. If acceptable, re-perform ambient temperature verification. 3) Connect new temperature sensor. 4) Check ambient temperature with another NIST traceable thermometer. 5) Recalibrate temperature sensor.	1) Document on data sheet. 2) Document on data sheet. 3) Document on data sheet. 4) Document on data sheet. 5) Document on data sheet and notify supervisor.
Ambient Pressure Verification	Out of Specification (±10 mm Hg)	1) Make certain pressure sensors are each exposed to the ambient air and are not in direct sunlight. 2) Call local Airport or other source of ambient pressure data and compare that pressure to pressure data from monitor's sensor. Pressure correction may be required. 3) Connect new pressure sensor. 4) Recalibrate pressure sensor.	1) Document on data sheet. 2) Document on data sheet. 3) Document on data sheet. 4) Document on data sheet and notify supervisor.
Elapsed Sample Time	Sample did not run	1) Check Programming 2) Try programming sample run to start while operator is at site. Use a flow verification filter.	1) Document on data sheet. 2) Document in log book and notify supervisor.
Power	Power Interruptions	Check Line Voltage	Notify supervisor.
Power	LCD panel on, but sample not working.	Check circuit breaker, some samplers have battery back-up for data but will not work without AC power.	Document in log book.
Data Downloading	Data will not transfer to	Document key information on sample data sheet. Make certain problem is resolved before data is written over in sampler microprocessor.	Notify supervisor.

11.4 Sampling Equipment, Preservation, and Holding Time Requirements

This section details the requirements needed to prevent sample contamination, the volume of air to be sampled, how to protect the sample from contamination, temperature preservation requirements, and the permissible holding times to ensure against degradation of sample integrity.

11.4.1 Sample Contamination Prevention

The $PM_{2.5}$ network has rigid requirements for preventing sample contamination. Care will be implemented while handling filter cassettes. Once the filter cassette is taken outside of the weigh room it should not be opened as damage may result to the 46.2 mm Teflon filter. Filter cassettes are to be stored in filter cassette storage containers or anti-static bags as provided by the sampler manufacturer during transport to and from the laboratory. Once samples have been weighed, they are to be stored with the particulate side up. It is suggested that sample filters be archived in static resistant zip-lock bags.

11.4.2 Sample Volume

The volume of air to be sampled is specified in 40 CFR Part 50. Sample flow rate of air is 16.67 L/min. The total volume of air collected will be 24 cubic meters based upon a 24 hour sample. Samples are expected to be 24 hours $\pm$1 hour. Since capture of the fine particulate is predicated upon a design flow rate of 16.67 L/min, deviations of greater than 10% from the design flow rate will enable a shut-off mechanism for the sampler. If a sample period is less than 23 hours or greater than 25 hours, the sample will be flagged and QA personnel notified.

11.4.3 Temperature Preservation Requirements

The temperature requirements of the $PM_{2.5}$ network are explicitly detailed in 40 CFR Part 50, Appendix L. During transport from the weigh room to the sample location, there are no specific requirements for temperature control; however, the filters will be located in their protective container and in the transport container. Excessive heat must be avoided (e.g., do not leave indirect sunlight or a closed-up car during summer). The filter temperature requirements are detailed in Table 11.2.

11.4.4 Permissible Holding Times

The permissible holding times for the $PM_{2.5}$ sample are clearly detailed in both 40 CFR Part 50, Appendix L, and Section 2.12 of the U.S. EPA QA Handbook. These holding times are provided in Table 11.3.

Table 11.2 Filter Temperature Requirements

Item	Temperature Requirement	Reference
Filter temperature control during sampling and until recovery.	No More than 5°C above ambient temperature.	40 CFR Part 50, Appendix L, Section 7.4.10
Filter temperature control from time of recovery to start of conditioning.	Protected from exposure to temperatures over 25°C.	40 CFR Part 50, Appendix L, Section 10.13
Post sample transport so that final weight may be determined up to 30 days after end of sample period.	4° C or less.	40 CFR Part 50, Appendix L, Section 8.3.6

Table 11.3 Permissible Holding Times

Item	Holding Time	From:	To:	Reference
Pre-weighed Filter	≤ 30 days	Date of Pre-weigh	Date of Sample	40 CFR Part 50 Appendix L, Section 8.3.5
Recovery of Filter	≤ 96 hours	Completion of Sample Period	Time of Sample Recovery	40 CFR Part 50 Appendix L, Section 10.10
Transport of Filter	< 24 Hours (ideally)	Time of Recovery	Time Placed in Conditioning Room	40 CFR Part 50 Appendix L, Section 10.13
Post Sample Filter Stored at < 4° C	≤ 30 days	Sample End Date/Time	Date of Post Weigh	40 CFR Part 50 Appendix L, Section 8.3.6
Post Sample Filter Continuously Stored at < 25° C.	≤ 10 days	Sample End Date/Time	Date of Post Weigh	40 CFR Part 50 Appendix L, Section 8.3.6

12. SAMPLING CUSTODY

The State of Alaska does not follow strict Sample "Chain of Custody" for Alaska's SLAMS and SPM $PM_{2.5}$ monitoring program. The State, however, does maintain sample/sample data integrity by tracking samples/sample data from sample pre-filter equilibration through sample post-weight analysis, data reduction, data validation, data reporting and archiving of sample/sample data. These procedures can be found in Appendix B, "$PM_{2.5}$ FILTER PROCESSING STANDARD OPERATING PROCEDURES."

13. ANALYTICAL METHODS REQUIREMENTS

13.1 Purpose/Background

This method provides for gravimetric analyses of filters used in the ADEC $PM_{2.5}$ monitoring network. These analyses will be conducted by the ADEC-AQI Air Quality Lab in Juneau. The net weight gain of a sample is calculated by subtracting the initial weight from the final weight. Once calculated, the net weight gain can be used with the total flow passed through a filter to calculate the concentration for comparison to the daily and annual NAAQS. Since the method is non-destructive, and due to possible interest in sample composition, the filters will be archived after final gravimetric analyses has occurred.

13.2 Preparation of Samples

The ADEC $PM_{2.5}$ Filter Processing SOP outlining activities associated with preparing pre-sample batches will be followed. In addition to the primary and collocated sampler filters, field blanks, and lab blanks will also be prepared.

Upon delivery of approved 46.2 mm Teflon filters, the receipt will be documented in the laboratory log book and the filters stored in the conditioning/weighing room/laboratory. Upon receipt, cases of filters will be labeled with the date of receipt, opened one at a time, and used completely before opening another case. All filters in a lot will be used (or rejected) before a case containing another lot is opened. Filters will be visually inspected according to the FRM criteria to determine compliance. Filters will then be stored in the filter conditioning room in unmarked slide-petri dishes (or similar receptacles). The minimum conditioning period is 24 hours. Filters will not be left out for excessive periods of conditioning since some settling of dust is possible on the top sides of the filters.

13.3 Analysis Method

13.3.1 Analytical Equipment and Method

The analytical instrument that will be used for gravimetric analysis in the FRM $PM_{2.5}$ sampler method will be a Mettler Model MT5 semi-microbalance which has a readability of 1 μg and a repeatability of 1μg. The microbalance will be set-up and annually calibrated/certified by a reliable analytical balance service company.

13.3.2 Conditioning and Weighing Room

The primary support facility for the $PM_{2.5}$ network is the ADEC-AQI Air Quality Laboratory in Juneau. This laboratory is used to conduct both pre-sampling weighing and post-sampling weighing of each $PM_{2.5}$ filter sample. The laboratory is an environmentally controlled room with temperature and humidity controls. Mean temperature is controlled at a minimum from 20 to23 °C. Mean relative humidity is controlled from 30 to 40%. Temperature and relative humidity are measured and recorded continuously during equilibration. The balance is located on a balance table which rests on an independent poured concrete slab and caulked with 2 inches of rubber to further insulate the

balance from the building's vibrational effects. The balance is also located out of the path of draft sources. Filters are conditioned before both the pre- and post-sampling weighings. Filters are conditioned for at least 24 hours to allow their weights to stabilize before being weighed. Specific requirements for environmental control of the conditioning/weighing room laboratory are detailed in 40 CFR Part 50, Appendix L.

13.4 Internal QC and Corrective Action for Measurement System

A QC notebook or Laboratory Information Management System (LIMS) will be maintained which will contain QC data, including the microbalance calibration and maintenance information, routine internal QC checks of mass reference standards and laboratory and field filter blanks, and external QA audits. Long-term gravimetric analysis trends will be monitored by QC charts. QC charts will be automatically maintained by the LIMS.

At the beginning of each weighing day the analyst will zero and calibrate the microbalance, and measuring the working standards before weighing filters. One lab blank and one field blank will be weighed for every 10 filters weighed. A minimum of one lab and one field blank will be weighed per each weighing session. The balance will be re-zeroed between each weighing and after every tenth filter weighing, the two working standards will be re-weighed. The analyst will record the zero, working standard, and blank measurements in the LIMS. If the working standard measurements differ from the certified values or the pre-sampling values by more than 3 µg, the analyst will repeat the working standard measurements. If the blank measurements differ from the pre-sampling values by more than 15 µg, the analyst will repeat the blank measurements. If the two measurements still disagree, the analyst will contact the Laboratory Manager, who may direct the analyst to (1) reweigh some or all of the previously weighed filters, (2) re-certify the working standard against the laboratory primary standard, (3) conduct diagnostic troubleshooting, and/or (4) arrange to have the original vendor or an independent, authorized service technician troubleshoot or repair the microbalance.

Corrective action measures in the $PM_{2.5}$ FRM system will be taken to ensure good quality data. Filter preparation and analysis checks along with corrective actions are detailed in the SOP. Filter weighing will be delayed until corrective actions are satisfactorily implemented.

13.5 Filter Sample Contamination Prevention

13.5.1 Sample Contamination Prevention

The analytical support component of the $PM_{2.5}$ network has rigid requirements for preventing sample contamination. Filters are equilibrated/conditioned in the same room where they are weighed. Extreme care is taken while handling filters and filters are only contacted with the use of smooth non-serrated forceps. Upon determination of its pre-sampling weight, the filter is placed in its cassette and then placed in a protective petri dish. The petri dish is labeled with a uniquely identifying number that is a sequential number that includes all filters originating from the ADEC laboratory. Once the filter cassette is taken outside of the weigh room it will not be opened as damage may result to the 46.2 mm teflon filter.

13.5.2 Sample Volume

The volume of air to be sampled is specified in 40 CFR Part 50. Sample flow rate of air is 16.67 L/min. Total sample volume of air collected will be 24 cubic meters based upon a 24-hour sample.

14. QUALITY CONTROL REQUIREMENTS

To assure the quality of data from air monitoring measurements, two distinct and important interrelated functions must be performed. One function is the control of the measurement process through broad quality assurance activities, such as establishing policies and procedures, developing data quality objectives, assigning roles and responsibilities, conducting oversight and reviews, and implementing corrective actions. The other function is the control of the measurement process through the implementation of specific quality control procedures, such as audits, calibrations, checks, replicates, routine self-assessments, etc.

Quality Control (QC) is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer. In the case of the Ambient Air Quality Monitoring Network, QC activities are used to ensure that measurement uncertainty, as discussed in Section 7, is maintained within acceptance criteria for the attainment of the DQO.

14.1 QC Procedures

Day-to-day quality control is implemented through the use of various check samples or instruments that are used for comparison. The measurement quality objectives table in Section 7 contains a complete listing of these QC samples as well as other requirements for the $PM_{2.5}$ Program. The procedures for implementing the QC samples are included in the field and analytical methods sections (Sections 11 and 13, respectively). Tables 14.1 and 14.2 contain a summary of all the field and laboratory QC samples. The following information provides some additional descriptions of these QC activities, how they will be used in the evaluation process, and what corrective actions will be taken when they do not meet acceptance criteria.

14.1.1 Calibrations

Calibration is the comparison of a measurement standard or instrument with another standard or instrument to report, or eliminate by adjustment, any variation (deviation) in the accuracy of the item being compared . The purpose of calibration is to minimize bias. For $PM_{2.5}$, calibration activities follow a three step process:

- Certifying the calibration standard and/or transfer standard against an authoritative standard;
- Comparing the calibration standard and or transfer standard against the routine sampling/analytical instruments; and
- Adjusting the sampling/analytical instruments to remove the bias.

Calibration requirements for the critical field and laboratory equipment are found in Tables 14.1 and 14.2, respectively; the details of the calibration methods are included in the calibration section (Section 16); in the field and laboratory methods sections (11 and 13, respectively); and in the respective SOPs.

Table 14.1 Field QC Checks

Requirement	Frequency	Acceptance Criteria	CFR Reference	2.12 Reference	Information Provided
Calibration Standards					
Flow Rate Transfer Std.	1/yr	±2% of NIST-traceable Std.	Part 50, App. L Sec 9.1, 9.2	Sec. 6.3	Certification of Traceability
Field Thermometer	1/yr	±0.1° C resolution	±0.5° C accuracy	not described	not described
Sec 4.2 and 8.3	"	Certification of Traceability	Field Barometer	1/yr	±1 mm Hg resolution
±5 mm Hg accuracy	not described	not described	"	"	Certification of Traceability
Calibration/Verification					
Flow Rate (FR) Calibration	If multi-point failure	± 2% of transfer standard	Part 50, App. L, Sec 9.2	Sec 6.3 and 6.6	Calibration drift and memory effects
FR Multi-Point Verification	1/yr	± 2% of transfer standard	Part 50, App. L, Sec 9.2.5	Sec 8.3	Calibration drift and memory effects
One Point FR Verification	monthly	±4% of transfer standard		Sec 8.3	Calibration drift and memory effects
External Leak Check	every 5 sampling events	80 mL/min	Part 50, App. L, Sec 7.4	Sec. 8.3	Sampler function
Internal Leak Check	every 5 sampling events	80 mL/min	"	Sec. 8.3	Sampler function
Temperature Calibration	If multi-point failure	±2° C of standard	Part 50, App. L, Sec 9.3	Sec. 6.4	Calibration drift and memory effects
Temp Multi-Point Verification	on installation, then 1/yr	±2° C of standard	Part 50, App. L, Sec 9.3	Sec. 6.4 and 8.2	Calibration drift and memory effects
One-Point Temp Verification	monthly	±4° C of standard	"	Sec. 6.4 and 8.2	Calibration drift and memory effects
Pressure Calibration	on installation, then 1/yr	±10 mm Hg	"	Sec. 6.5	Calibration drift and memory effects
Pressure Verification	monthly	±10 mm Hg	"	Sec. 8.2	Calibration drift and memory effects
Clock/timer Verification	monthly	1 min/mo	Part 50, App. L, Sec 7.4	not described	Verification of to assure proper function
Blanks					
Field Blanks	10%	±30 µg	Part 50, App. L, Sec 8.2	Sec. 7.10	Measurement system contamination
Precision Checks					
Collocated Samples	every 6 days	CV ≤10%	Part 58, App. A, Sec 3.5, 5.5	Sec. 10.3	Measurement system precision
Accuracy					
Flow Rate Audit	4/yr	±4% of transfer standard	Part 58, App. A, Sec 3.5.1	Sec. 8.1	Instrument bias/accuracy
Temperature Check	4/yr	±2° C	not described	"	Calibration drift and memory effects
Pressure Check	4/yr	±10 mm Hg		"	Calibration drift and memory effects
Audits (external assessments)					
FRM Performance Evaluation	25% of sites 4/yr	±10%	Part 58, App A, Sec 3.5.3	Sec 10.3	Measurement system bias
Flow rate audit	1/yr	±4% of audit standard	not described	Sec 10.2	External verification bias/accuracy
Temperature Audit	1/yr	±2° C	not described		Calibration drift and memory effects
Pressure Audit	1/yr	±10 mm Hg	not described		Calibration drift and memory effects

Table 14.2 Laboratory QC

Requirement	Frequency	Acceptance Criteria	QA Guidance Document 2.12 Reference	Information Provided
Blanks				
Lot Blanks	3/lot	±15 µg difference	2.12 Sec. 7	Filter stabilization/equilibrium
Lab Blanks	10% or at least one per weighing session	±15 µg difference	Part 50, App. L Sec 8.2 2.12 Sec.7.10	Laboratory contamination
Calibration/Verification				
Balance Calibration	1/yr	Manufacturers spec.	2.12 sec 7.2	Verification of equipment operation
Lab Temp. Calibration	3 month	±2° C	QAPP Sec. 13/16	Verification of equipment operation
Lab Humidity Calibration	3 month	±2%	QAPP Sec. 13/16	Verification of equipment operation
Accuracy				
Balance Audit	1/yr	±15 µg for unexposed filters	2.12 Sec 10.2	Laboratory technician operation
Balance Check	beginning, every 10th samples, end	≤3 µg	2.12 Sec. 7.8	Balance accuracy/stability
Calibration standards				
Working Mass Stds.	3-6 month	25 µg	2.12 Sec 4.3 and 7.3	Standards verification
Primary Mass Stds.	1/yr	25 µg	"	Primary standards verification
Precision				
Duplicate filter weighings	1 per weighing session	±15 µg difference	2.12 Tab 7-1 QAPP Sec. 13/16	Weighing repeatability/filter stability

14.1.2 Blanks

Blank samples are used to determine contamination arising from principally four sources: (1) the environment from which the sample was collected/analyzed, (2) the reagents used in the analysis, (3) the apparatus used, and (4) the operator/analyst performing the data operation. Three types of blanks will be implemented in the $PM_{2.5}$ Program:

Lot blanks - a shipment of 46.2mm filters will be periodically sent from EPA to the ADEC. Each shipment will be tested to determine the length of time it takes the filters to stabilize. Upon arrival of each shipment, 3 lot blanks will be randomly selected for the shipment and be subjected to the conditioning/pre-sampling weighing procedures. The blanks will be measured every 24 hours for a minimum of one week to determine the length of time it takes to maintain a stable weight reading.

Field blanks - provides an estimate of total measurement system contamination. By comparing information from laboratory blanks against the field blanks, the contamination from field activities can be assessed. Details of the use of the field blanks can be found in the laboratory SOP.

Lab blanks -provides an estimate of contamination occurring at the weighing facility. Details of the use of the lab blanks can be found in can be found in the laboratory SOP.

Blank Evaluation

The ADEC will include 1 field and 1 lab blank for each 10 filters or at least one blank per each weighing session (whichever is more). The following statistics will be generated for data evaluation purposes:

Difference for a Single Check (d) - The difference, d, for each check is calculated using Equation 14.1, where X represents the concentration produced from the original weight and Y represents the concentration reported for the duplicate weight.

$$d = |Y - X|$$

Equation 14.1

Percent Difference for a Single Check (d_i). The percentage difference, d_i, for each check is calculated using Equation 14.2 where X_i represents the original weight and Y_i represents the concentration reported for the duplicate weight.

$$d_i = \frac{Y_i - X_i}{(Y_i + X_i)/2} \times 100$$

Equation 14.2

Mean Difference for Weighing Session (d_z) - The mean difference d_z for both field and lab blanks within a weighing session, is calculated using Equation 14.3 where d_1 through d_n represent individual differences (calculated from Equation 1) and n represents the number of blanks in each weighing session.

$$d_z = \frac{d_1 + d_2 + d_3 \ldots d_n}{n}$$

Equation 14.3

Corrective Action - The acceptance criteria for field blanks is 30 μg difference, while lot and lab blanks is 15 μg difference and is determined by Equation 14.1. However, the mean difference based upon the number of blanks in each weighing session will be used for comparison against the acceptance criteria. If the mean difference of either the field or laboratory blanks is greater than 15 μg, all the samples in the weighing session will be re-weighed. Prior to re-weighing, the laboratory balance will be checked for proper operation. If the blank means of either the field or lab blanks are still out of the acceptance criteria, all samples within the weighing session will be flagged with the appropriate flag in the free notes section of the laboratory data sheet, and efforts will be made to determine the source of contamination. In theory, field blanks should contain more contamination than laboratory blanks. Therefore, if the field blanks are outside of the criteria while the lab blanks are acceptable, weighing can continue on the next batch of samples while field contamination sources are investigated. If the mean difference of the laboratory blanks is greater than 20μg and 2 or more of the blanks were greater than 15 μg, the laboratory weighing will stop until the issue is satisfactorily resolved. The laboratory technician will alert the QA Reviewer of the problem. The problem and solution will be reported and appropriately filed under response and corrective action reports.

Lab and field blanks will be control charted (see Section 14.3). The percent difference calculation (Equation 14.2) is used for control charting purposes and can be used to determine equilibrium status.

14.1.3 Precision Checks

Precision is the measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. In order to meet the data quality objectives for precision, the ADEC will ensure the entire measurement process is within statistical control. Two types of precision measurements will be made in the $PM_{2.5}$ Program.

- Collocated monitoring
- Filter duplicates

Collocated Monitoring

The first phase of the ADEC $PM_{2.5}$ Monitoring Program includes 5 sites with FRM monitors. The ADEC will have 3 collocated monitors. The location of these monitors is described in Section 10. These 3 sites with collocated FRM samplers will be used to evaluate total measurement precision.

Evaluation of Collocated Data - Collocated measurement pairs are selected for use in the precision calculations only when both measurements are above 6 $\mu g/m^3$. However, all collocated data will be reported to AIRS.

The following algorithms will be used to evaluate collocated data. These algorithms are included in 40 CFR Part 58 Appendix A.

Percent Difference for a Single Check (d_i). The percentage difference, d_i, for each check is calculated by using Equation 14.4, where X_i represents the concentration produced from the primary sampler and Y_i represents the concentration reported for the duplicate sampler.

$$d_i = \frac{Y_i - X_i}{(Y_i + X_i)/2} \times 100$$

Equation 14.4

Coefficient of Variation (CV) for a Single Check (CV_i). The coefficient of variation, CV_i, for each check is calculated by dividing the absolute value of the percentage difference, d_i , by the square root of two as shown in Equation 14.5.

$$CV_i = \frac{|d_i|}{\sqrt{2}}$$

Equation 14.5

Precision of a Single Sampler - Quarterly Basis ($CV_{j,q}$). For particulate sampler j, the individual coefficients of variation ($CV_{j,q}$) during the quarter are pooled using Equation 14.6, where $n_{j,q}$ is the number of pairs of measurements from collocated samplers during the quarter.

$$CV_{j,q} = \sqrt{\frac{\sum_{i=1}^{n_j} CV_i^2}{n_{j,q}}}$$

Equation 14.6

The 90 Percent Confidence Limits for the Single Sampler's CV. These limits are calculated using Equations 14.7 and 14.8, where $\chi^2_{0.05,df}$ and $\chi^2_{0.95,df}$ are the 0.05 and 0.95 quantiles of the chi-square χ^2 distribution with $n_{j,q}$ degrees of freedom.

$$Lower\ Confidence\ Limit = CV_{j,q}\sqrt{\frac{n_{j,q}}{X^2_{0.95,\,n_{j,q}}}}$$

Equation 14.7

$$Upper\ Confidence\ Limit = CV_{j,q}\sqrt{\frac{n_{j,q}}{X^2_{0.05,\,n_{j,q}}}}$$

Equation 14.8

Precision of a Single Sampler - Annual Basis. For particulate sampler j, the individual coefficients of variation, CV_i, produced during the calendar year are pooled using Equation 14.6, where n_j is the number of checks made during the calendar year. The 90 percent confidence limits for the single sampler's CV are calculated using Equations 14.7 and 14.8, where $\chi^2_{0.05,df}$ and $\chi^2_{0.95,df}$ are the 0.05 and 0.95 quantiles of the chi-square (χ^2) distribution with n_j degrees of freedom.

Corrective Action: Single Monitor - The precision data quality objective of 10% coefficient of variation (CV) is based upon the evaluation of three years of collocated precision data. The goal is to ensure that precision is maintained at this level. Therefore, precision estimates for a single pair of collocated instruments, or even for a quarter, may be greater than 10% while the three year average is less than or equal to 10%. Therefore, single collocated pairs with values >10% will be flagged and re-weighed. If the value remains between 10-20% the field technician will be alerted to the problem. If the CV is greater than 20%CV for both the initial and reweigh, all the primary sampler data will be flagged from the last precision check and corrective action will be initiated. Paired CVs and percent differences will be control charted to determine trends. The laboratory technician will alert the QA Reviewer and ADEC Quality Assurance Coordinator of the problem.

Corrective Action: Quarter - Usually, corrective action will be initiated and imprecision rectified before a quarter's worth of data fail to meet 10% CV. However in the case were the quarter's CV is greater than 20% the routine data for that monitor for that quarter will be flagged. The Air Quality Monitoring Analyst will work to identify the problem and a solution. The EPA Regional Office will be alerted of the issue and may be asked to help find a common solution. The problem and solution will be reported and appropriately filed under response and corrective action reports.

Duplicate Laboratory Measurements – During laboratory pre-weighing and post weighing sessions, a routine filter from the sampling batch will be selected for a second weighing. Equations 14.1 and 14.2 will be generated for this information. The difference among the weights of these two filters must be less than 15μg. If this criteria is not it met, the pair of values will be flagged. Failure may be due to transcription errors, microbalance malfunction, or that the routine samples have not reached equilibrium. Other QC checks (balance standards and lab blanks) will eliminate microbalance malfunction. If the duplicate does not meet the criteria, a second routine sample will be selected and re-weighed as a second duplicate check. If this second check fails the acceptance criteria and the possibility of balance malfunction and transcription errors have been eliminated, all samples in the batch will be equilibrated for another 24 hours and re-weighed. Corrective actions will continue until duplicate weights for the batch meet acceptance criteria.

14.1.4 Accuracy or Bias Checks

Accuracy is defined as the degree of agreement between an observed value and an accepted reference value and includes a combination of random error (precision) and systematic error (bias). Four accuracy checks are implemented in the $PM_{2.5}$ program:

- Collocated monitors
- Flow rate audits

- Balance checks
- FRM performance evaluations

Collocated Monitors

Although the collocated monitors are primarily used for evaluating and controlling precision, they can be used to determine accuracy or bias. By using Equation 14.4 to determine percent difference, one can track trends or bias between the two instruments without knowing which instrument is producing the "true" value. Use of the FRM performance evaluation information (discussed below) in conjunction with collocation data should help improve the quality of data.

Corrective Action - The percent difference of the paired values will be control charted to determine trends. If it appears that there is a statistically significant bias (> 10% at the 90% confidence level) between the pairs, corrective action will be initiated. The process will include eliminating uncertainties that may be occurring at filter handling, transport and laboratory stages, in order to determine that the bias is truly at the instrument. Corrective actions at the instrument will include multi-point temperature, pressure, and flow rate checks as well as complete maintenance activities. Additional corrective action could include a request for vendor servicing or a request for Region 10 to implement an FRM performance evaluation.

Flow Rate Audits

Every quarter flow rate audits will be performed. Details of the implementation aspects of the audit are included in Section 11. The audit is made by measuring the analyzer's normal operating flow rate using a certified flow rate transfer standard. The flow rate standard used for auditing will not be the same flow rate standard used to calibrate the analyzer. However, both the calibration standard and the audit standard may be referenced to the same primary flow rate or volume standard. Report the audit (actual) flow rate and the corresponding flow rate indicated or assumed by the sampler. The procedures used to calculate measurement uncertainty are described below.

Accuracy of a Single Sampler - Single Check (Quarterly) Basis (d_i). The percentage difference (d_i) for a single flow rate audit is calculated using Equation 14.9, where X_i represents the audit standard flow rate (known) and Y_i represents the indicated flow rate.

$$d_i = \frac{Y_i - X_i}{X_i} \times 100$$

Equation 14.9

Bias of a Single Sampler - Annual Basis (D_j). For an individual particulate sampler j, the average (D_j) of the individual percentage differences (d_i) during the calendar year is calculated using Equation 14.10, where n_j is the number of individual percentage differences produced for sampler j during the calendar year.

$$D_j = \frac{1}{n_j} \times \sum_{i-1}^{n_j} d_i$$

Equation 14.10

Bias for Each EPA Federal Reference and Equivalent Method Designation Employed by the ADEC - Quarterly Basis ($D_{k,q}$). For each method designation k used by the ADEC, quarter q's single sampler percentage differences (d_i) are averaged using Equation 14.11, where $n_{k,q}$ is the number of individual percentage differences produced for method designation k in quarter q.

$$D_{k,q} = \frac{1}{n_{k,q}} \times \sum_{i-1}^{n_{k,q}} d_i$$

Equation 14.11

Corrective Action - The single sampler accuracy requirement is ±4%. If the audit violates the acceptance criteria, the sampling instrument will be checked for internal and external leaks, the operator will ensure that temperature and pressure are within acceptable ranges, and the audit conducted a second time. If the audit is still unacceptable, a multi-point calibration followed by a one-point verification is required. Routine data, back to an acceptable audit, will be flagged and reviewed to determine validity (see Section 23). In addition, one would expect that the flow rate calibration verification checks that will be implemented every month would indicate a drift towards unacceptable accuracy. If a review of the flow rate calibration verification check data does not show a problem, there is a potential that one or both of the flow rate standards need to be re-certified.

Balance Checks

Balance checks are frequent checks of the balance working standards (100 and 200 mg standards) against the balance to ensure that the balance is within acceptance criteria throughout the pre- and post-sampling weighing sessions. The ADEC will use ASTM class 1 weights for its primary and secondary (working) standards. Both working standards will be measured at the beginning and end of each weighing session and one will be selected for a measure after every 10 filters. Balance check samples will be controlled charted.

Balance Check Evaluation - The following algorithm will be used to evaluate the balance checks.

Difference for a single check (d_y) - The difference, d_y, for each check is calculated using Equation 14.12, where X represents the certified mass weight and Y represents the reported weight.

$$d_y = Y - X$$

Equation 14.12

Corrective Action - The difference among the reported weight and the certified weight must be ≤3μg. Since this is the first check before any pre-or post-sampling weighings, if the acceptance

criteria is not met, corrective action will be initiated. Corrective action may be as simple as allowing the balance to perform internal calibrations or to sufficiently warm-up, which may require checking the balance weights a number of times. If the acceptance criteria is still not met, the laboratory technician will be required to verify the working standards to the primary standards. Finally, if it is established that the balance does not meet acceptance criteria for both the working and primary standards, and other trouble shooting techniques fail, a service technician will be called to perform corrective action.

If the balance check fails acceptance criteria during a run, the 10 filters weighed prior to the failure will be re-weighed. If the balance check continues to fail, trouble shooting, as discussed above, will be initiated. The samples values of the 10 samples weighed prior to the failure will be recorded and flagged, but will remain with the un-weighed samples to be re-weighed when the balance meets the acceptance criteria. Any balance check outside the acceptance criteria will be flagged.

FRM Performance Evaluation

The FRM Performance Evaluation is a quality assurance activity which will be used to evaluate measurement system bias of the $PM_{2.5}$ monitoring network. The pertinent regulations for this performance evaluation are found in 40 CFR Part 58, Appendix A, Section 3.5.3 . The strategy is to collocate a portable FRM $PM_{2.5}$ air sampling instrument with an established routine air monitoring site, operate both monitors in exactly the same manner, and then compare the results of this instrument against the routine sampler at the site. The EPA will be implementing this program and will inform the ADEC when an evaluation will be conducted. The evaluation will be conducted on a regularly scheduled sampling day and the filters from the evaluation instrument will be sent to a national laboratory in Region 10 for measurement. The comparison of data will be accomplished by EPA personnel using the Aerometric Information Retrieval System (AIRS) data base. It must be noted that the performance evaluation is an estimate of the uncertainty of the measurement system and not the instrument. Therefore, biases may be attributed to sample handling, transportation and laboratory activities as well as to the instrument. The statistics used in the assessment are included in 40 CFR part 58.

Corrective Action - The U.S. EPA will notify the ADEC of the evaluation results within 10 days of sampling. The bias acceptance criteria for the data comparison is $\pm$ 10%. If it appears that there is a bias, corrective action will be initiated. The process will include an attempt to determine at what data collection phase(s) the majority of the measurement errors are occurring. This may require that Region 10 conduct additional FRM performance evaluations to troubleshoot the process.

14.2 Control Charts

Control charts will be used extensively by the ADEC. They provide a graphical means of determining whether various phases of the measurement process are in statistical control. The ADEC will utilize property charts which graph single measurements of a standard or a mean of several measurements. The ADEC will also use precision charts which utilize the standard deviation of the measurement process. The control charts will be utilized as an “early warning system” to evaluate trends in precision and bias. They will be appropriately filed and archived.

15. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

15.1 Purpose/Background

The purpose of this element in the QAPP is to discuss the procedures used to verify that all instruments and equipment are maintained in sound operating condition and are capable of operating at acceptable performance levels. All instrument inspection and maintenance activities are documented and filed. See Section 9 for document and record details.

15.2 Testing

All $PM_{2.5}$ samplers used in the ADEC $PM_{2.5}$ Ambient Air Quality Monitoring Network will be designated FRM that have been certified as such by EPA. Therefore, they are assumed to be of sufficient quality for the data collection operation. Testing of such equipment is accomplished by EPA through the procedures described in 40 CFR Part 50. ADEC will assemble and run the samplers prior to field installation. The field operators will perform external and internal leak checks and temperature, pressure and flow rate multi-point verification checks. If any of these checks are out of specification (see Table 14.1), the ADEC will contact the vendor for initial corrective action. Once installed at the site, the field operators will run the tests mentioned above. If the sampling instrument meets the acceptance criteria, it will be assumed to be operating properly. These tests will be properly documented and filed as indicated in Section 9.

15.3 Inspection

Inspection of various equipment and components are provided here. Inspections are subdivided into two sections: one pertaining to weigh room laboratory issues and one associated with field activities.

15.3.1 Inspection in Weigh Room Laboratory

There are several items that need routine inspection in the weigh room laboratory. Table 15-1 details the items to inspect and how to appropriately document the inspection.

Table 15.1 Inspections in Weigh Room Laboratory

Item	Inspection Frequency	Inspection Parameter	Action if Item Fails Inspection	Documentation Required
Weigh Room Temperature	Daily	20-23°C	1) Check HVAC System 2) Call Maintenance	1) Record in Log Book 2) Notify Lab Manager
Weigh Room Humidity	Daily	30-40% RH	1) Check HVAC System 2) Call Maintenance	1) Record in Log Book 2) Notify Lab Manager
Dust in Weigh Room	Daily	Use glove and visually inspect	Clean Weigh Room	Record in Log Book

15.3.2 Inspection of Field Items

There are several items to inspect in the field periodically and before and after a $PM_{2.5}$ sample has been taken.

Table 15.2 Inspection of Field Items

Item	Inspection Frequency	Inspection Parameter	Action if Item Fails Inspection	Documentation Required
Sample downtube	Every site visit	Visible particulate	Clean with clean dry cloth	Document in log book
WINS impactor well	Every site visit	"Cone shape of particulate on impactor well"	Replace impactor well (including new impactor oil)	Document in log book
Rain collector	Every site visit	>1/3	Empty	Document in log book
O-rings	Every site visit	Any damage	Replace	Document in log book
Filter Cassettes	After each sample run	Visible particulate	Check downtube and WINS impactor	Document in log book
Cassette seals	Each sample	Clean & smooth	Clean with a clean dry cloth or replace as needed	Document when replaced
In-line filter	Every 6 months	Loaded particulate	Replace	Document in log book

15.4 Maintenance

15.4.1 Weigh Room Maintenance Items

Preventive maintenance for the micro-balance will be performed by a certified service technician. Preventive maintenance for the micro-balance is scheduled to occur at initial set-up and annually thereafter. Other routine maintenance will be performed by ADEC laboratory and maintenance personnel.

15.4.2 Field Maintenance Items

Field equipment will be maintained according to manufacturer's specifications which are found in the appropriate SOPs.

16. INSTRUMENT CALIBRATION AND FREQUENCY

16.1 Calibration of Local Primary Standards

16.1.1 ASTM Class I Mass Standards

The ASTM Class I mass standards, which will be used to calibrate the laboratory microbalance, will be re-certified annually. During the annual visit by the service technician the in-house primary standard weights will be checked against the service technicians standards to ensure acceptability. These actions will be documented in the service technician's report, a copy of which will be provided to the laboratory manager, which after review, will be appropriately filed (see Section 9).

16.1.2 Local Primary Flow Rate Standard

Until the ADEC purchases/establishes its own local primary flow standard, the local primary flow rate standard used to calibrate the field flow rate transfer standards will be maintained and re-certified against a NIST-traceable flow rate standard by the manufacturer.

16.1.3 Local Primary Temperature Standard

The local primary temperature standard used to verify the accuracy of the field temperature transfer standards will be ASTM certified mercury-in-glass thermometers. These thermometers will not be recertified unless the mercury column separates. Accuracy criteria for the temperature standards is not so tight that glass viscosity (at ambient temperatures), etc. would significantly affect measurement accuracy. Requiring annual recertification is unnecessary and costly for this type of local primary temperature standard.

16.1.4 Local Primary Pressure Standard

The local primary pressure standard used to verify the accuracy of the field barometer transfer standards will be a stationary mercury barometer maintained by the ADEC.

16.2 Calibration of Transfer Standards

16.2.1 Flow Transfer Standard

The field flow transfer standards used for flow-rate calibration will have their own certifications and will be traceable to the local primary flow rate standard. The ADEC will employ Chinook Engineering Streamline FTS, automatic dry-piston flow meter or other certified FTS models manufactured to support the $PM_{2.5}$ monitoring program. These FTS will be used for field calibrations and flow rate verifications of the flow rates of the network samplers. These devices have the advantage of providing volumetric flow rate values directly, without requiring conversion from mass flow measurements, temperature, pressure, or water vapor corrections. A calibration relationship for the flow-rate standard, such as an equation, curve, or family of curves, is established by the manufacturer (and verified if needed) that is accurate to within 2% over the expected range of ambient temperatures and pressures at which the flow-rate standard is used. The flow rate standards will be re-calibrated and re-certified annually.

16.2.2 Temperature Transfer Standard

The field temperature transfer standards used for calibration of the FRM temperature sensors will be hand held digital thermometers that will have their own certification. They will be re-verified/re-certified at least annually against the local primary temperature standard to within 2° C over the expected range of ambient temperatures at which the temperature standard is to be used.

Pressure Transfer Standard

The field pressure transfer standards will be hand held barometers (aneroid, digital aneroid, etc). Pressure transfer standards will be quarterly compared against a local primary standard or local flight service. All pressure comparison readings will be documented.

Calibration of Laboratory/Field Equipment

The specific calibration procedures for the laboratory and field equipment which will require calibrations can be found in the applicable SOPs or operation manuals.. The laboratory and field equipment that will require calibrations follow:

- Laboratory Microbalance: Mettler MT5
- FRM Sampler Flow Rates: R&P models 2000 and 2025
- FRM Sampler Temperatures (filter and ambient): R&Pmodels 2000 and 2025
- FRM Sampler Pressure: R&Pmodels 2000 and 2025

16.3 Document Calibration Frequency

See Table 14.1 for a summary of field QC checks that includes frequency and acceptance criteria and references for calibration and verification tests of single and sequential sampler flow rate, temperature, pressure, and time. See Table 14.2 for a similar summary of laboratory QC, including frequency of primary and working mass standards and conditioning/weighing room temperature and relative humidity.

The field sampler flow rate, temperature and pressure sensor verification checks include monthly 1-point checks.

All of these events, as well as sampler and calibration equipment maintenance will be documented in field data records and notebooks and annotated with the flags required in Appendix L of 40 CFR Part 50, and the manufacturer's operating instruction manual. Laboratory and field activities associated with equipment used by the respective technical staff will be kept in record notebooks as well. The records will normally be controlled by the Laboratory and/or the Managers responsible for the local monitoring network. Record notebooks should be located in the labs or field sites when in use or at the local monitoring network's offices when being reviewed or used for data validation.

17. DATA ACQUISITION REQUIREMENTS

This section addresses data not obtained by direct measurement from the $PM_{2.5}$ Ambient Air Quality Monitoring Program. This includes both outside data and historical monitoring data. At this time, the ADEC has not formalized the types of additional data that may be needed in support of the monitoring program. Possible data bases which might be used include:

- Chemical and Physical Properties Data
- Sampler Operation and Manufacturers' Literature
- Geographic Location
- Historical Monitoring Information
- External Monitoring Data Bases
- Lead and Speciated Particulate Data
- U.S. Weather Service Data

Any use of outside data will be quality controlled to the extent possible following QA procedures outlined in this document and in applicable EPA guidance documents

18. DATA MANAGEMENT

18.1 Data Recording

Data entry, validation, and verification functions are all integrated in the $PM_{2.5}$ data management scheme. Procedures for data entry are provided in SOPs included in Appendix B.

18.2 Data Validation

Data validation is a combination of checking that data processing operations have been carried out correctly and of monitoring the quality of the field operations. Data validation can identify problems in either of these areas. Once problems are identified, the data can be corrected or invalidated, and corrective actions can be taken for field or laboratory operations.

The validation functions that are incorporated into the ADEC data management scheme to ensure quality of data entry and data processing operations are listed in Table 18.1. Since some of the limits for data input are not regulatory requirements, the Air Monitoring Program Manager, through the Air Quality Improvement Section Chief, may adjust them from time to time to better meet quality goals.

Unexposed filters will be prepared in the Juneau Air Quality Lab and the Laboratory Information Management System (LIMS) will assign unique sample IDs. Unexposed filters will be shipped to state and local monitoring networks for sample collection. Sample data will be downloaded direct from samplers to the Juneau LIMS. The local networks will also document in logbooks or download (and print) from each sampler all necessary sample information within 24 hours from retrieval of sample exposed filter. Filters will be returned to the Juneau Lab for filter analysis. Final sample weights will be sent to the local monitoring network monthly. At least 5% of sample field data will be reduced and validated by the local network. The local network will compute the sample concentrations and compare them against Juneau LIMS sample computed results. If sample results agree, the LIMS sample results will be accepted as valid and submitted to the AIRS database manager

The AIRS database manager will review/verify sample data. Prior to updating the EPA AIRS database, the AIRS database manager will check submitted sample data against primary validated data for accuracy. Additional consistency and other checks will be implemented as the result of problems encountered during data screening.

18.2.1 Data Retention

Raw data is retained on file in the respective local $PM_{2.5}$ networks' office for a minimum of three years, and are readily available for audits and data verification activities. After three years, hardcopy records and computer backup media are cataloged and stored. Physical samples such as filters may be discarded after one year.

Table 18.1 Data Validation Checks

Type of Check	Parameter	Range
FRM Range Check	Average Ambient Temperature	-20° to 40° C
FRM Range Check	Sample Run Time	23 to 25 hours
FRM Range Check	Average Flow Rate	15.03 l/min to 18.37 l/min
FRM Range Check	Flow Rate % CV	± 4%
FRM Range Check	Maximum Temperature Difference	-5° to 5° C
Dichot Range Check	Coarse Flow Rate	1.67 ± 10%
Dichot Range Check	Total Flow rate	16.67 ± 10%
Filters Range Check	Pre-weight Mass	125 mg to 250 mg
Filters Range Check	Post-weight Mass	125 mg to 300 mg
Completeness Check	Sample Start Time	Must Be Recorded
Completeness Check	Sample End Time	Must Be Recorded
Completeness Check	Average Flow Rate	Must Be Recorded
Completeness Check	Filter Weigh dates	Must Be Recorded
Completeness Check	Operator Names	Must Be Recorded
Internal Consistency Check	Comparison of Filter Start and End Times	End time of a filter must be greater than the start time.
Internal Consistency Check	Comparison of Volume and Exposure Time	Computed filter volume (integrated flow) must be approximately equal to the exposure time multiplied by the nominal flow.

18.2.2 Precision and Accuracy

Two key operational criteria for $PM_{2.5}$ sampling are precision and accuracy. As defined in 40 CFR Part 58, Appendix A, these are based on differences between collocated sampler results and FRM performance evaluations. The ADEC will inspect the results of collocated sampling during each batch validation activity. This data will be evaluated as early in the process as possible, so that potential operational problems can be addressed. The objective will be to optimize the performance of the monitoring equipment. Initially, the results of collocated operations will be control charted (see Section 14). From these charts, control limits will be established to flag potential problems. Multiple

collocation results must be accumulated to assess data quality with confidence. However, even limited data can be used for system maintenance and corrective action.

18.3 Data Transformation

Calculations for transforming raw data from measured units to final concentrations are relatively straightforward, and many are carried out in the sampler data processing unit before being recorded. The calculation equations are in the SOPs in Appendix B.

18.4 Data Transmittal

Data transmittal occurs when data are transferred from one person or location to another or when data are copied from one form to another. Some examples of data transmittal are copying raw data from a notebook onto a data entry form for keying into a computer file and electronic transfer of data over a telephone or computer network.

The ADEC will report all $PM_{2.5}$ ambient air quality data and information specified by the AIRS Users Guide (Volume II, Air Quality Data Coding, and Volume III, Air Quality Data Storage), coded in the AIRS-AQS format. Such air quality data and information will be fully screened and validated and will be submitted directly to the AIRS-AQS via electronic transmission, in the format of the AIRS-AQS, and in accordance with the quarterly schedule. Specific quarterly reporting periods will be submitted by the end of the following quarter.

18.5 Data Reduction

Data reduction processes involve aggregating and summarizing results so that they can be understood and interpreted in different ways. The $PM_{2.5}$ monitoring regulations require certain summary data to be computed and reported regularly to U.S. EPA. Other data are reduced and reported for other purposes such as station maintenance. The ADEC will provide the following data summaries:

- average $PM_{2.5}$ concentration for a station or set of stations for a specific time period;
- accuracy, bias, and precision statistics based on accumulated FRM/FEM data; and
- data completeness reports based on numbers of valid samples collected during a specified period.

18.6 Data Analysis

The ADEC will be implementing the data summary and analysis requirements contained in 40CFR Part 58, Appendix A. The following specific summary statistics will be tracked and reported for the monitoring network:

- Single sampler bias or accuracy (based on collocated FRM data, flow rate performance audits, and FRM performance evaluations)

- Single sampler precision (based on collocated data)
- Network-wide bias and precision (based on collocated FRM data, flow rate performance audits, and FRM performance evaluations)
- Data completeness

18.7 Data Flagging -Sample Qualifiers

The ADEC will flag a data value that: (a) did not produce a numeric result, (b) produced a numeric result but is qualified in some respect related to the type or validity of the result, or (c) produced a numeric result but for administrative reasons is not to be reported outside the laboratory. Qualifiers will be used in the free form notes area of field and laboratory work sheets to signify samples that may be suspect due to contamination, special events, or failure of QC limits. Some flags will be generated by the sampling instrument (see Table 6.2). Null Data Codes will be generated for suspect data as they are entered into the AIRS database. Appendix D contains a complete list of Null Data Codes used by the ADEC.

18.8 Data Storage and Retrieval

Data archival policies for the $PM_{2.5}$ data are listed in Table 18.2. Security of data in the $PM_{2.5}$ database is ensured by password protection.

Table 18.2 ADEC Data Archive Polices

Data Type	Medium	Location	Retention Time	Final Disposition
Weighing Records	Weekly Electronic database backup	ADEC Air Laboratory	3 years	Electronic Backup Retained Indefinitely
Laboratory Notebooks	Hardcopy	ADEC Air Laboratory	3 years	Discarded
Field Notebooks, Sample Run Data	Hardcopy, Electronic	Local Network Offices; ADEC Air Lab	3 years	Discarded
$PM_{2.5}$ Data Base (excluding audit trails)	ELECTRONIC (on-line)	ADEC Air Laboratory	Indefinite (may be moved to backup media after 5 years)	Electronic Backup Retained Indefinitely
$PM_{2.5}$ Audit Trail Records	Hardcopy, Electronic,	ADEC AQI Juneau Office	3 years	Discarded
Filters	Filters	ADEC Air Laboratory	1 year (unless notified otherwise by EPA Region 10)	Discarded

19. ASSESSMENTS AND RESPONSE ACTIONS

An assessment, for this QAPP, is defined as an evaluation process used to measure the performance or effectiveness of the quality system, the establishment of the monitoring network and sites and various measurement phases of the data operation. In order to ensure the adequate performance of the quality system, the ADEC will perform the following assessments:

- Management Systems Reviews
- Network Reviews
- Technical Systems Audits
- Audits of Data Quality
- Data Quality Assessments

19.1 ASSESSMENT ACTIVITIES AND PROJECT PLANNING

19.1.1 Management Systems Review

A management systems review (MSR) is a qualitative assessment of a data collection operation or organization to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate for ensuring that the type and quality of data needed are obtained. Management systems reviews of the Ambient Air Monitoring Program will be conducted every three years by the ADEC. The MSR will use appropriate federal regulations, and the QAPP to determine the adequate operation of the air program and its related quality system. The ADEC will report its findings to upper management within 30 days of completion of the MSR. The report will be appropriately filed and follow-up and progress on corrective action(s) will be determined during regularly scheduled AQI meetings.

19.1.2 Network Reviews

Conformance with network requirements of the Ambient Air Monitoring Network set forth in 40 CFR Part 58, Appendices D and E are determined through annual network reviews of the ambient air quality monitoring system. The network review is used to determine how well a particular air monitoring network is achieving its required air monitoring objective, and how it should be modified to continue to meet its objective. A $PM_{2.5}$ network review will be accomplished every year. Since the EPA Regions are also required to perform these reviews, the ADEC will coordinate its activity with Region 10 in order to perform the activity at the same time (if possible). The following criteria will be considered during the review:

- date of last review;
- areas where attainment/nonattainment redesignations are taking place or are likely to take place;

- results of special studies, saturation sampling, point source oriented ambient monitoring, etc; and
- proposed network modifications since the last network review.

In addition, pollutant-specific priorities may be considered (e.g., newly designated nonattainment areas, "problem areas", etc.).

Prior to the implementation of the network review, significant data and information pertaining to the review will be compiled and evaluated. Such information might include the following:

Network files (including updated site information and site photographs);

- AIRS reports;
- air quality summaries for the past five years for the monitors in the network;
- emissions trends reports for major metropolitan area;
- emission information, such as emission density maps for the region in which the monitor is located and emission maps showing the major sources of emissions; and
- National Weather Service summaries for monitoring network area.

Upon receiving the information it will be checked to ensure it is the most current. Discrepancies will be noted on the checklist and resolved during the review. Files and/or photographs that need to be updated should be identified. The following categories will be emphasized during network reviews:

Number of Monitors-For SLAMS, the number of monitors required for $PM_{2.5}$ depending upon the measurement objectives is discussed in 40 CFR Part 58 with additional details in the Guidance for Network Design and Optimum Exposure for $PM_{2.5}$ and PM_{10}. Section 10 of this QAPP discusses the $PM_{2.5}$ Network. Adequacy of the network can be determined by using the following information:

- maps of historical monitoring data;
- maps of emission densities;
- dispersion modeling;
- special studies/saturation sampling;
- best professional judgement;
- SIP requirements; and
- revised monitoring strategies (e.g., lead strategy, reengineering air monitoring network).

For NAMS, areas to be monitored must be selected based on urbanized population and pollutant concentration levels. To determine whether the number of NAMS are adequate, the number of NAMS

operating will be compared to the number of NAMS specified in 40 CFR 58 Appendix D. The number of NAMS operating can be determined from the AMP220 report in AIRS.

Location of Monitors - For SLAMS, the location of monitors is not specified in the regulations, but is determined by the ADEC on a case-by-case basis to meet the monitoring objectives specified in 40 CFR Part 58, Appendix D. Adequacy of the location of monitors can only be determined on the basis of stated objectives. Maps, graphical overlays, and GIS-based information will be helpful in visualizing or assessing the adequacy of monitor locations. Plots of potential emissions, historical monitoring data, and/or saturation study findings versus monitor locations will also be helpful.

During the network review, the stated objective for each monitoring location or site (see section 10) will be “reconfirmed” and the spatial scale “re-verified” and then compared to each location to determine whether these objectives can still be attained at the present location.

Conformance to 40 CFR Part 58, Appendix E - Probe Siting Requirements- Applicable siting criteria for SLAMS, and NAMS are specified in 40 CFR 58, Appendix E. The on-site visit will consist of the physical measurements and observations to determine compliance with the Appendix E requirements, such as height above ground level, distance from trees, paved or vegetative ground cover, etc. Since many of the Appendix E requirements will not change within one year, this check at each site will be performed every 3 years.

Prior to the site visit, the reviewer will obtain and review the following:

- most recent hard copy of site description (including any photographs);
- data on the seasons with the greatest potential for high concentrations for specified pollutants; and
- predominant wind direction by season.

A checklist similar to the checklist used by the EPA Regional offices during their scheduled network reviews will be used. This checklist can be found in the SLAMS/NAMS/PAMS Network Review Guidance which is intended to assist the reviewers in determining conformance with Appendix E. In addition to the items on the checklist, the reviewer will also perform the following tasks:

- ensure that the inlet is clean;
- check equipment for missing parts, frayed cords, damage, etc;
- record findings in field notebook and/or checklist;
- take photographs/videotape in the 8 directions; and
- document site conditions, with additional photographs/videotape.

Other Discussion Topics- In addition to the items included in the checklists, other subjects for discussion as part of the network review and overall adequacy of the monitoring program will include:

- installation of new monitors;
- relocation of existing monitors;
- siting criteria problems and suggested solutions;
- problems with data submittals and data completeness;
- maintenance and replacement of existing monitors and related equipment;
- quality assurance problems;
- air quality studies and special monitoring programs; and
- other issues such as proposed regulations and funding.

A report of the network review will be written within two months of the review (Section 21) and appropriately filed (Section 10).

19.1.3 Technical Systems Audits

A Technical Systems Audit (TSA) is a thorough and systematic onsite qualitative audit, where facilities, equipment, personnel, training, procedures, and record keeping are examined for conformance to the QAPP. TSAs of the $PM_{2.5}$ network will be accomplished every three years and will stagger the required TSA conducted by EPA Regional Office. The ADEC will implement the TSA either as a team or as an individual auditor. The ADEC will perform three TSA activities that can be accomplished separately or combined:

- Field - handling, sampling, shipping.
- Laboratory - Pre-sampling weighing, shipping. receiving, post-sampling weighing, archiving, and associated QA/QC.
- Data management –Information collection, flagging, data editing, security, upload.

Key personnel to be interviewed during the audit are those individuals with responsibilities for: planning, field operations, laboratory operations, QA/QC, data management, and reporting.

The audit team will prepare a brief written summary of findings, organized into the following areas: planning, field operations, laboratory operations, quality assurance/quality control, data management, and reporting. Problems with specific areas will be discussed and an attempt made to rank them in order of their potential impact on data quality. For the more serious of these problems, audit findings will be drafted.

Post-Audit Activities - The major post-audit activity is the preparation of the systems audit report. The report will include:

- audit title and number and any other identifying information;

- audit team leaders, audit team participants and audited participants;
- background information about the project, purpose of the audit, dates of the audit, particular measurement phase or parameters that were audited, and a brief description of the audit process;
- summary and conclusions of the audit and corrective action requirements; and
- attachments or appendices that include all audit evaluations and audit finding forms.

To prepare the report, the audit team will meet and compare observations with collected documents and results of interviews and discussions with key personnel. Expected QA Project Plan implementation is compared with observed accomplishments and deficiencies and the audit findings are reviewed in detail. Within thirty (30) calendar days of the completion of the audit, the audit report will be prepared and submitted.

If the affected parties have written comments or questions concerning the audit report, the Audit Team will review and incorporate them as appropriate, and subsequently prepare and resubmit a report in final form within thirty (30) days of receipt of the written comments. The report will include an agreed-upon schedule for corrective action implementation.

Follow-up and Corrective Action Requirements - The ADEC and the audited organization may work together to solve required corrective actions. As part of corrective action and follow-up, an audit finding response will be generated by the audited organization for each finding submitted by the ADEC. The audit finding response is signed by the local monitoring network manager or (where appropriate) the Laboratory Manager and sent to the ADEC Air Quality Assurance Coordinator and AQI Section Chief which reviews and accepts the corrective action. The audit response will be completed within 30 days of acceptance of the audit report.

19.1.4 Audit of Data Quality (ADQ)

An ADQ reveals how the data are handled, what judgments were made, and whether uncorrected mistakes were made. ADQs can often identify the means to correct systematic data reduction errors. An ADQ will be performed every year and will also be part of the TSA (every 3 years). Thus, sufficient time and effort will be devoted to this activity so that the auditor or team has a clear understanding and complete documentation of data flow. Pertinent ADQ questions will appear on the TSA check sheets to ensure that the data collected at each stage maintains its integrity. The ADQ will serve as an effective framework for organizing the extensive amount of information gathered during the audit of laboratory, field monitoring, and support functions within the agency. The ADQ will have the same reporting/corrective action requirements as the TSA.

19.1.5 Data Quality Assessments

A data quality assessment (DQA) is the statistical analysis of environmental data to determine whether the quality of data is adequate to support the decision which are based on the DQOs. Data are appropriate if the level of uncertainty in a decision based on the data is acceptable. The DQA

process is described in detail in Guidance for the Data Quality Assessment Process, EPA QA/G-9 and is summarized below.

- Review the data quality objectives (DQOs) and sampling design of the program: review the DQO and develop one, if it has not already been done. Define statistical hypothesis, tolerance limits, and/or confidence intervals.

- Conduct preliminary data review. Review Precision &Accuracy (P&A) and other available QA reports, calculate summary statistics, plots and graphs. Look for patterns, relationships, or anomalies.

- Select the statistical test: select the best test for analysis based on the preliminary review, and identify underlying assumptions about the data for that test.

- Verify test assumptions: decide whether the underlying assumptions made by the selected test hold true for the data and the consequences.

- Perform the statistical test: perform test and document inferences. Evaluate the performance for future use.

Data quality assessment will be included in the QA Annual Report. Details of these reports are discussed in Section 21.

Measurement uncertainty will be estimated for both automated and manual methods. Terminology associated with measurement uncertainty are found within 40 CFR Part 58, Appendix A and includes: (a) Precision - a measurement of mutual agreement among individual measurements of the same property usually under prescribed similar conditions, expressed generally in terms of the standard deviation; (b) Accuracy- the degree of agreement between an observed value and an accepted reference value, accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; (c) Bias - the systematic or persistent distortion of a measurement process which causes errors in one direction. The individual results of these tests for each method or analyzer shall be reported to EPA.

Estimates of the data quality will be calculated on the basis of single monitors and aggregated to all monitors.

20. REPORTS TO MANAGEMENT

This section describes the quality-related reports and communications to management necessary to support SLAMS/NAMS $PM_{2.5}$ network operations and the associated data acquisition, validation, assessment, and reporting. Unless otherwise indicated, data pertaining to $PM_{2.5}$ will be included in reports containing monitoring data for other pollutants.

20.1 Frequency, Content, and Distribution of Reports

Required reports to management for $PM_{2.5}$ monitoring and the SLAMS program in general are discussed in various sections of 40 CFR Parts 50, 53, and 58. Guidance for management report format and content are provided in guidance developed by EPA's Quality Assurance Division (QAD) and the Office of Air Quality Planning and Standards (OAQPS). These reports are described in the following subsections.

20.1.1 QA Annual Report

Periodic assessments of SLAMS data quality are required to be reported to EPA (40 CFR 58, Appendix A, Section 1.4, revised July 18, 1997). The ADEC's QA Annual Report is issued to meet this requirement. This document describes the quality objectives for measurement data and how those objectives have been met. The QA Annual Report also provides for the review of the SLAMS air quality surveillance system on an annual basis to determine if the system meets the monitoring objectives defined in 40 CFR Part 58, Appendix D. Such review will identify needed modifications to the network such as termination or relocation of unnecessary stations or establishment of new stations which are necessary.

The QA Annual Report will include the following summary information required by 40 CFR 58, Appendix A (Section 3.5, revised July 18, 1997):

- Flow Rate Audits (Section 3.5.1)
- Collocated Federal Reference Method Samplers (Section 3.5.2)
- Collocated Equivalent Samplers of same designation (Section 3.5.2)
- Assessment of Bias Using the FRM Audit Procedure (Section 3.5.3)

20.1.2 Network Reviews

The EPA Regional office prepares network reviews in accordance with requirements in 40 CFR Part 58.20(d). The purpose of the network reviews is to determine if the system meets the monitoring objectives defined in 40 CFR Part 58, Appendix D. The review identifies needed modifications to the network including termination or relocation of unnecessary stations or establishment of new stations which are necessary.

As required by 40 CFR Part 58, Appendix A, Section 4(a), revised July 18, 1997, the ADEC has provided a list of all monitoring sites and their AIRS site identification codes and submits the list to the

EPA Regional Office, with a copy to AIRS-AQS. Whenever there is a change in this list of monitoring sites in a reporting organization, ADEC will report this change to the EPA Regional Office and to AIRS-AQS.

20.1.3 Quarterly Reports

Each quarter, the ADEC will report to AIRS-AQS the results of all precision, bias and accuracy tests it has carried out during the quarter. The quarterly reports will be submitted, consistent with the data reporting requirements specified for air quality data as set forth in 40 CFR Parts 58.26, 58.35 and 40 CFR Part 58, Appendix A, Section 4. The data reporting requirements of 40 CFR Part 58.35 apply to those stations designated SLAMS or NAMS. Required accuracy and precision data are to be reported on the same schedule as quarterly monitoring data submittals.

In accord with the Federal Register Notice of July 18, 1997, all QA/QC data collected will be reported and will be flagged appropriately. This data includes: "results from invalid tests, from tests carried out during a time period for which ambient data immediately prior or subsequent to the tests were invalidated for appropriate reasons, and from tests of methods or analyzers not approved for use in SLAMS monitoring networks . . ." (40 CFR Part 58, Appendix A, Section 4, revised July 18, 1997).

Air quality data submitted for each reporting period will be edited, validated, and entered into the AIRS-AQS using the procedures described in the AIRS Users Guide, Volume II, Air Quality Data Coding. The local monitoring networks will be responsible for preparing the data reports, which will be reviewed by the ADEC before they are transmitted to EPA.

20.1.4 Technical System Audit Reports

The ADEC performs Technical System Audits of the monitoring system. These reports are issued by the ADEC AQI QA coordinator and are reviewed by the ADEC AQI Section Chief. These reports will be filed and made available to EPA personnel during their technical systems audits. External systems audits are conducted at least every three years by the EPA Regional Office as required by 40 CFR Part 58, Appendix A, Section 2.5.

20.1.5 Response/Corrective Action Reports

The Response/Corrective Action Report procedure will be followed whenever a problem is found such as a safety defect, an operational problem, or a failure to comply with procedures. The Response/Corrective Action Report is one of the most important ongoing reports to management because it documents primary QA activities and provides valuable records of QA activities that can be used in preparing other summary reports. Copies of the Response/Corrective Action Report will be distributed twice: first when the problem has been identified and the action has been scheduled; and second when the correction has been completed.

20.1.6 Control Charts with Summary

Control charts for laboratory instruments and field samplers should be updated after every new calibration or standardization as defined in the relevant SOP. Analysts are responsible for reviewing each control chart immediately after it is updated and for taking corrective actions whenever an out-of-control condition is observed. Control charts are to be reviewed at least quarterly by the laboratory supervisor. The supervisor(s) will provide summary information to the QA coordinator or the Annual QA Report to Management. Control charts are also subject to inspection.

20.2 Responsible Personnel

This section outlines the responsibilities of individuals within the monitoring organization for preparing QA reports, evaluating their impact, and implementing follow-up actions. The following paragraphs describe key personnel involved with QA reporting.

ADEC-AQI Section Chief - The ADEC-AQI Section Chief maintains overall responsibility for management and administrative aspects of the QA program.

ADEC-AQI Ambient Analysis Group Program Manager – The AMG Program Manager is responsible for:

- developing and assuring that $PM_{2.5}$ network documentation is maintained and for disseminating information appearing in audit reports and other quality-related documents to operations personnel;
- establishing and maintaining a computerized NAMS/SLAMS/SPM $PM_{2.5}$ Network database;
- managing statewide $PM_{2.5}$ monitoring and QA objectives through coordination with ADEC staff, U.S.EPA and local government agencies;
- assisting the AQI Section Chief in setting department and statewide priorities for $PM_{2.5}$ monitoring and QA activities;
- assigning Response/Corrective Action Reports to specific personnel, and assuring that the work is completed and that the corrections are effective.

Air Quality Assurance Coordinator - The Air QA Coordinator is responsible for:

- conducting QA performance and systems audits of all $PM_{2.5}$ SLAMS/NAMS/SPM monitoring networks in Alaska;
- identifying problems, issuing appropriate Response/Corrective Action Reports,
- writing/issuing $PM_{2.5}$ annual QA report;
- developing and/or recommending for approval procedures for establishing and assuring data quality, use and control of $PM_{2.5}$ data; and

- developing and/or reviewing and recommending for approval ambient air monitoring quality assurance project plans.

Air Quality Environmental Specialists, Chemists & Electronics Technician - These positions are responsible for the day to day implementation of QA activities for the Ambient Air Monitoring Program, generating control charts, assisting with data quality assessments and other internal audits, and calculating and/or reviewing precision and bias data generated by the collocated $PM_{2.5}$ monitors.

AIRS Database Manager - This position is responsible for coordinating the information management activities for SLAMS/NAMS data entry. Specific activities related to management reports include ensuring access to data for timely reporting and interpretation and ensuring timely delivery of all required data to the AIRS system.

Juneau Laboratory Supervisor – this position is responsible for related day to day weighing activities, reviewing laboratory QC data such as control charts, assuring that repairs and preventive maintenance are completed and that the maintenance is effective, and assuring that staff under their technical supervision maintain their documentation files as defined in the relevant SOPs. The Laboratory Supervisor will assist the Air QA Coordinator in preparing QA reports.

APPENDIX A

ALASKA's $PM_{2.5}$ MONITORING NETWORK DESCRIPTION

APPENDIX B

$PM_{2.5}$ MONITORING NETWORK SOPs

APPENDIX C

DATA QUALIFIERS/FLAGS

APPENDIX D

Table D1 Null Data Codes

DATA QUALIFIERS/FLAGS		
New Code	**Item Code**	**Item Description**
AA	9967	Sample pressure out of limits
AB	9968	Technician unavailable
AC	9969	Construction/repairs in area
AD	9970	Shelter storm damage
AE	9971	Shelter temperature outside limits
AF	9972	Scheduled but not collected
AG	9973	Sample time out of limits
AH	9974	Sample flow rate out of limits
AI	9975	Insufficient data (can't calculate)
AJ	9976	Filter damage
AK	9977	Filter leak
AL	9978	Voided by operator
AM	9979	Miscellaneous void
AN	9980	Machine malfunction
AO	9981	Bad weather
AP	9982	Vandalism
AQ	9983	Collection error
AR	9984	Lab error
AS	9985	Poor quality assurance results
AT	9986	Calibration
AU	9987	Monitoring waived
AV	9988	Power failure (powr)
AW	9989	Wildlife damage
AX	9990	Precision check (prec)
AY	9991	QC control points (zero/span)
AZ	9992	QC audit (audit)
BA	9993	Maintenance/routine repairs
BB	9994	Unable to reach site
BC	9995	Multi-point calibration
BD	9996	Auto calibration
BE	9997	Building/site repair
BF	9998	Precision/zero/span
BG	9966	Missing ozone data not likely to exceed level of standard