BISHOP PAIUTE TRIBE

Environmental Management Office

Air Quality Program

QUALITY ASSURANCE PROJECT PLAN

Ambient Air Monitoring Program for Measuring PM-10

Using an Automated Tapered Element Oscillating Microbalance (TEOM)
With the Filter Dynamics Measurement System (FDMS) Series 8500B
Bishop Paiute Tribe
Environmental Management Office

Prepared for
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1.0 QA PROJECT PLAN IDENTIFICATION AND APPROVAL (Element A1)

Title: *Quality Assurance Project Plan for the Bishop Paiute Tribe Environmental Management Office Ambient Air Monitoring Program for Measuring PM-10 Using an Automated Tapered Element Oscillating Microbalance (TEOM) With the Filter Dynamics Measurement System (FDMS) Series 8500B* (QAPP). This QAPP commits the Bishop Tribe's Air Quality Program housed in the Environmental Management Office (EMO) to follow the procedures described and referenced in this plan. Plan development was supported by the General Assistance Program grant # GA-97962701-0 and Clean Air Act grant # XA-97967201-0 from the U.S. Environmental Protection Agency. . This revision was supported by the Clean Air Act Grant # TX–97900001–0.

Environmental Management Office

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EPA Region 9

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Name

Title

Branch

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3.0 DISTRIBUTION LIST (Element A3)

Paper copies of this QAPP have been distributed to the people listed in Table 1. As portions of this QAPP are revised, revised sections or the entire QAPP are sent to the people on this list.

Table 1. Distribution List

Name	Position	Address and email
Environmental Management Office		
Donna Vasquez	Chair, Tribal Environmental Protection Agency	437 Winuba Lane Bishop, CA 93514
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4.0 PROJECT/TASK ORGANIZATION (Element A4)

4.1 The Role of the Environmental Management Office

This tribal office incorporates quality assurance activities as an integral part of any program that gathers environmental data, from work in the field, from their own data analysis and reporting, and from any consulting and contractor laboratories which they may use.

The following sections list the responsibilities of each individual in the Bishop Paiute Tribe's Environmental Management Office involved in the Air Quality Program.

Environmental Manager – Brian Adkins
The Environmental Manager has overall responsibility for managing the Environmental Management Office's Air Quality Program. Ultimately, the Environmental Manager is responsible for establishing QA policy and for resolving QA issues identified through the QA program. Major QA-related responsibilities of the Environmental Manager include:

- Reviewing acquisition packages (contracts, grants, cooperative agreements, inter-agency agreements) to determine the necessary QA requirements;

- Assuring that the Environmental Management Office develops and maintains this QAPP and ensuring adherence to the document by staff, and outside contractors and consultants as appropriate;
- Maintaining regular communication with the field, and other technical staff;
- Ensuring that all personnel involved in this program have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology of that activity;
- Reviewing and approving this QAPP;
- Ensuring that this program is covered by appropriate QA planning documentation (e.g., QA project plans and data quality objectives);
- Ensuring that reviews, assessments and audits are scheduled and completed, and at times, conducting or participating in these QA activities;
- Recommending required management-level corrective actions; and
- Serving as the program QA liaison with EPA regional QA Managers or QA Officers and the EPA regional Project Officer.

Air Quality Specialist – Toni Richards, Ph.D.
The Air Quality Specialist is responsible for carrying out the work in the field and ensuring that the data they gather meet the requirements of this QAPP. Responsibilities include:

- Developing and maintaining this QAPP;
- Developing QA documentation and providing answers to technical questions;
- Participating in training and certification activities;
- Writing and modifying standard operating procedures (SOPs);
- Verifying that all required QA activities are performed and that measurement quality standards are met as required in this QAPP;
- Following all manufacturer's specifications;
- Performing and documenting preventative maintenance;
- Documenting deviations from established procedures and methods;
- Reporting all problems and corrective actions to the supervisor;
- Assessing and reporting data quality;
- Preparing and delivering reports to the supervisor; and
- Flagging suspect data.

To improve separation of duties, in the future, the Tribe proposes to add an Environmental Technician who would be responsible for routine maintenance and instrument verification. This will improve quality assurance.

Outside Auditor – Chris Lanane, GBUAPCD
The auditor from the Great Basin Unified Air Pollution Control District conducts and reviews quality assurance, quality assessment, and quality control activities and ensures that ambient air quality data meet or exceed the data quality objectives of the tribe. The auditor is responsible for certifying standards used in the field and generating audit reports.

4.2 The Role of the EPA Region 9 Office

EPA Regional Offices have been developed to address environmental issues related to the Bishop Tribe's Air Programs within their region. EPA's Region 9 Office is responsible for the following activities in support of this program:

- Reviewing, providing assistance with, and approving this QAPP;
- Responding to requests for technical and policy information and interpretations;
- Evaluating quality system performance through technical systems audits, performance evaluations and network reviews, as appropriate for each grant and the Environmental Management Office; and
- Making available the technical and quality assurance information developed by EPA to the tribal agencies, and making the tribe aware of any unmet quality assurance needs of the tribal agencies.

5.0 PROBLEM DEFINITION/BACKGROUND (Element A5)

5.1 Problem Statement and Background

The principal pollutants, also called criteria pollutants, are: particulate matter (PM-2.5, PM-10), sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead. In 1970, the Clean Air Act (CAA) was signed into law. The CAA and its amendments provide the framework for all pertinent organizations to protect air quality. This framework provides for the monitoring of PM-10 by the Bishop Tribe's Environmental Management Office (EMO). The EMO's sampling network of is designed to make comparisons with the National Ambient Air Quality Standards (NAAQS) and to determine if there are any exceedances of Tribal air quality standards (adopted in April 2006), and to meet the following additional objectives:

- Determine the highest concentrations to occur in the area covered by the network (the Bishop Paiute Reservation)
- Determine the impact on ambient pollution levels of significant sources or source categories
- Determine general background concentration levels
- Determine the extent of regional pollutant transport, and in support of secondary standards

Until the Bishop Tribe initiated PM-10 monitoring in April 2003 and PM-2.5 monitoring in June 2004, there was no air quality monitoring in the Bishop area. GBUAPCD had previously carried out PM-10 monitoring in the nearby town of Bishop from 1987 to 1997, but had discontinued monitoring. At present GBUAPCD operates a portable monitor in the nearby town of Laws. However, that monitor may be deployed to other locations as needed. The nearest particulate monitors operated by GBUAPCD are located in non-attainment areas, such as the Owens Dry Lake 60 miles to the south (the largest source of PM-10 in the nation), the town of Mammoth Lakes, 45 miles to the north, and Mono Lake, 60 miles to the north. GBUAPCD frequently requests data from the Bishop Tribe's monitoring station when they require information for the Bishop area. Other PM-10 monitors in the area are operated by the Lone Pine Paiute Shoshone Reservation, located 60 miles to the south, and the Ft. Independence Reservation, located 45 miles to the south.

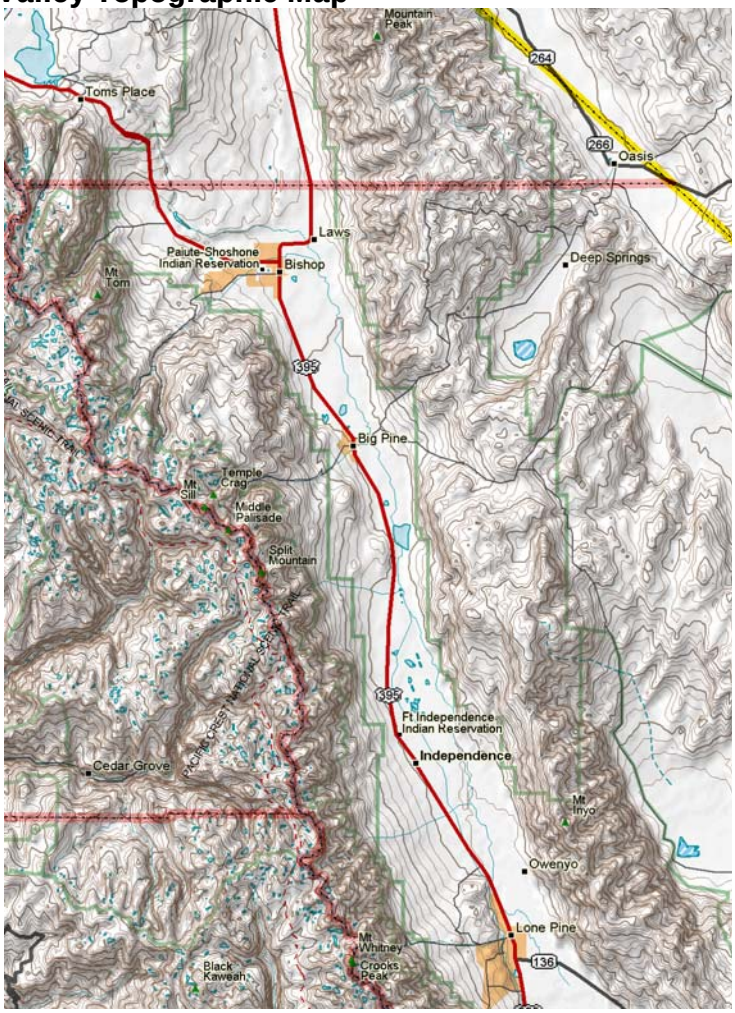
This QAPP describes how this program controls and evaluates data quality so that the objectives listed above are met. Since the highest priority objective is to determine if there are any exceedances of the tribal air quality standards and for comparisons to the NAAQS, the data quality objectives necessary for that determination are the most important. The derivation of these objectives is described in Section 7. The objective for the precision uncertainty of the

flow rate of this automated equipment is a relative percent difference (RPD) between the external flow rate transfer standard and the actual instrument flow rate of 7% or less for every check. The objective for overall accuracy, which includes both bias and precision, is 10%.

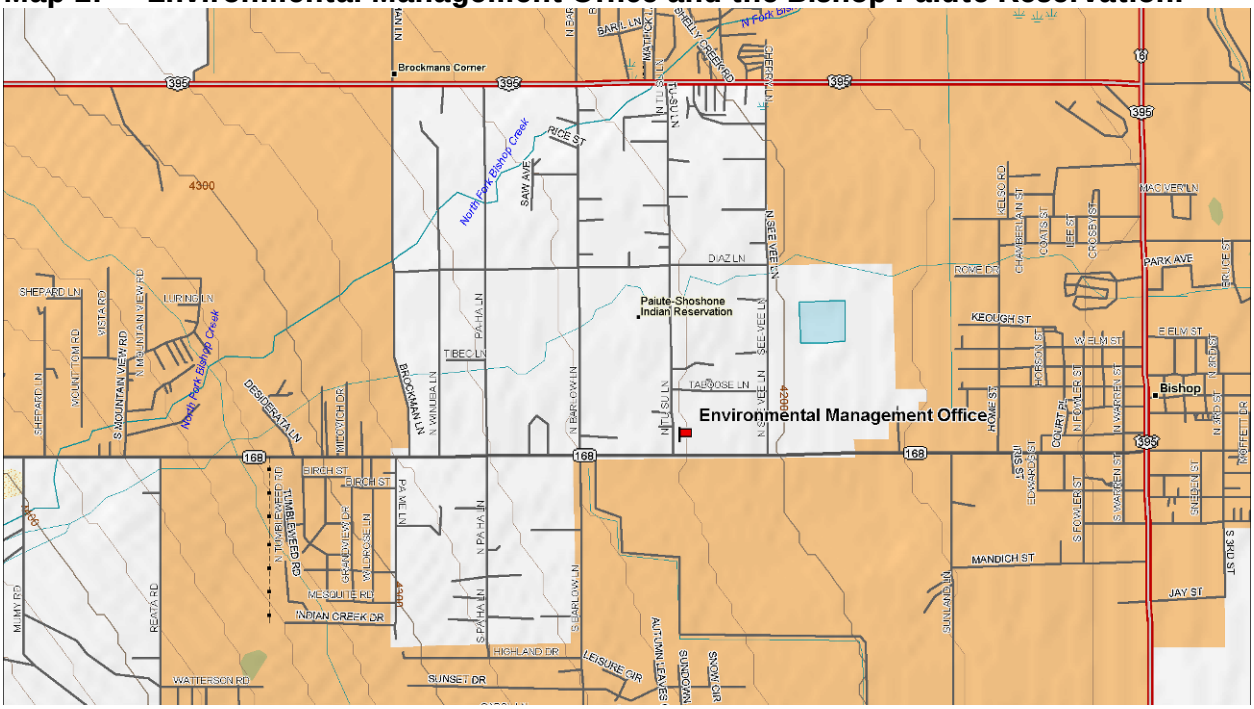
The accuracy and stability of the system is estimated using a National Institute of Standards (NIST) traceable flow, temperature and barometric pressure measurement device and a calibration verification kit available from the manufacturer. The specific measurement quality objectives (MQOs) are described in Section 7, and the methods for calculating their values are described in Sections 14 and 24. The MQOs are consistent with those used by the US EPA and the air quality community, as described in the US EPA Quality Assurance Manual, Vol. II Part 1, (EPA-454/R-98-004, August 1998) commonly termed the "Redbook" for general quality system and audit requirements, and 40 CFR 58 Appendix A for nomenclature, frequency and type of instrument checks, and data reporting.

The air monitoring equipment is located on the roof of the Environmental Management Office at 50 Tu Su Lane, on the Bishop Paiute Reservation (N37°22', W118°25' at an elevation of 4,226 ft.), shown in Maps 1 and 2 and in the photographs below. As shown in Map 1, the Bishop Paiute Reservation is located in the Owens Valley in eastern California, near the Nevada border. The reservation itself comprises 875 contiguous acres and is flanked by the City of Bishop to the East. It is surrounded by private lands and by lands owned by the Los Angeles Department of Water and Power. Approximately 1,350 people live on the Reservation. Map 2 shows the location of the Environmental Management Office on the Bishop Paiute Reservation. Photographs 1 and 2 show the equipment and location. Access is via a ladder to the roof.

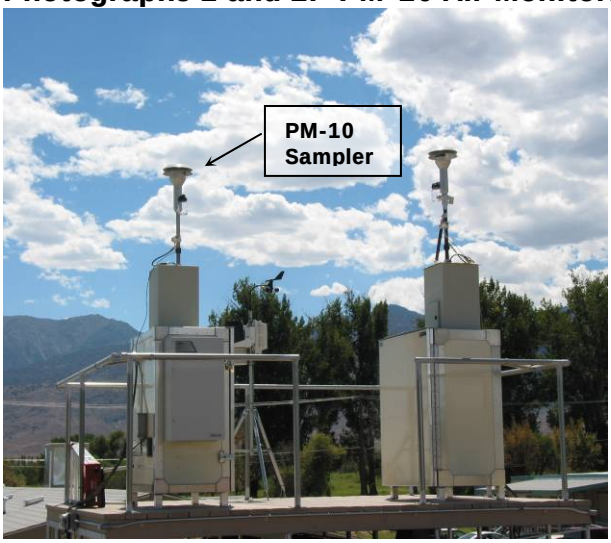
Map 1. Owens Valley Topographic Map

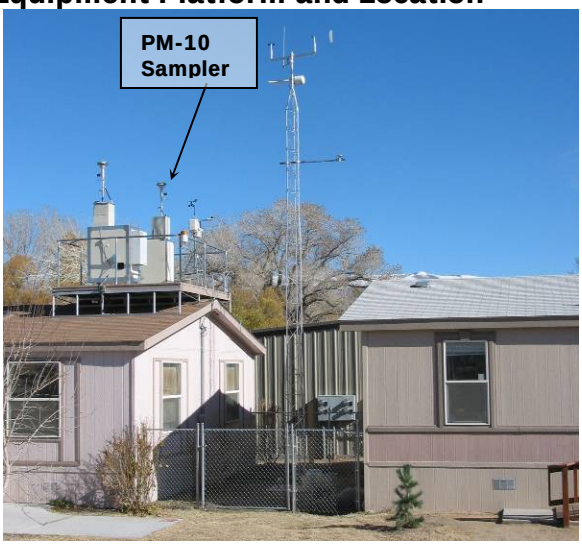


Map 2. Environmental Management Office and the Bishop Paiute Reservation.



Photographs 1 and 2. PM-10 Air Monitoring Equipment Platform and Location





6.0 PROJECT DESCRIPTION (Element A6)

The Bishop Tribe's Air Program will use the Tapered Element Oscillating Microbalance 1400A Revison B equipped with the Filter Dynamics Measurement System Series 8500B (TEOM / FDMS) automated (or continuous) monitor(s) for particulate monitoring. The PM-10 instrument measures the mass of particulate 10 microns and smaller in aerodynamic diameter that accumulates on a filter and volumetric flow of air through the instrument. It uses this to

calculate the concentration of particulate in micrograms per cubic meter of air volume as an internal component of the instrument. These automated instruments do not require the use of a laboratory or the analysis of a filter.

This instrument is manufactured by Thermo Environmental Instruments, Inc. (formely, Rupprecht and Pataschnick ,R&P). The instrument is operated in accordance with the manufacturer's instructions as contained in the operating manual, Series 8500 FDMS Filter Dynamics Measurement System, July 2003, Revision B.

The Tapered Element Oscillating Microbalance (TEOM) system which is at the foundation of the TEOM / FDMS system has been designated as an equivalent method for PM-10 (24-h average concentration) by the EPA under Designation No. EQPM-1090-079). This method has been shown to meet the requirements listed in 40 CFR 53 Subpart C (section 53.34) and D. The system equipped with the FDMS system does not have this designation, but is a California accepted method for the measurement of PM-10 (California Air Resources Board).

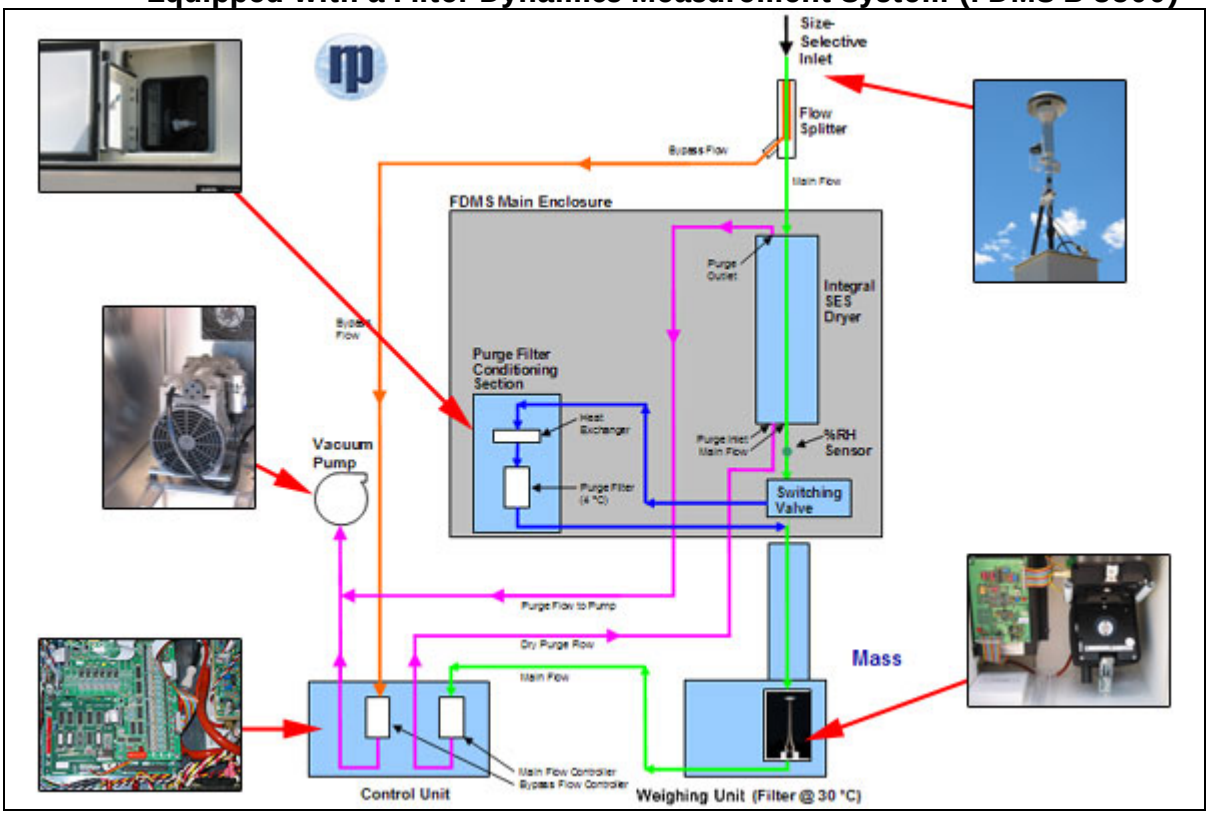
The unit consists of the following components:

- Thermo (Rupprecht & Patashnick) PM-10 Inlet (part number 57-00596);
- Flow Splitter (3 l/min sample flow);
- FDMS system;
- TEOM Sensor Unit;
- TEOM Control Unit;
- Teflon-Coated Glass Fiber Filter Cartridges;
- FDMS 47mm TX-40 coated filters.

The instrument is operated for 1-hour and 24-hour average mass concentration measurements, with the total mass averaging time set at 360 seconds, the mass rate/mass concentration averaging time set at 360 seconds, the gate time set at 2 seconds. It is housed in an Outdoor Enclosure supplied by R&P (now Thermo) and manufactured by EKTO.

The instrument and components are shown in Figure 1, below.

Figure 1. Tapered Element Oscillating Microbalance (TEOM 1400A Revision B) Equipped with a Filter Dynamics Measurement System (FDMS B 8500)



Site visits are conducted at least once every two weeks. Maintenance and audits are conducted according to the schedule shown in Table 2 below. Both analog and digital data are collected. Digital data are transmitted directly to a computer located at the Air Quality Specialist's desk via a serial port and downloaded every 24-hours. They are also transmitted to a ZENO data logger for re-transmission to the Tribal Environmental Exchange Network (TREX) server and from there to the web, using LEADS software, developed by IPS MeteoStar. All data are archived monthly.

Table 2. Quality Assurance Schedule for Ambient Air Quality Monitoring

PARTICULATE MONITORING	Daily	Weekly	Bi-weekly	Every 4 weeks	Monthly	Quarterly	Semi-annually	Annually
Check data downloads for valid information, status codes and appropriate operating temperatures.	X							
Select hourly information for plotting. Plot hourly information.	X							
Transfer data to monthly summary file and plot					X			
Validate analog data and verify flags					X			
Back up data to EMO server					X			
Check all registers on instrument and verify that values are within specification.		X	X	X	X	X	X	X
Physically check flows (total and main), temperature and barometric pressure with calibration device.			X	X	X	X	X	X

PARTICULATE MONITORING	Daily	Weekly	Bi-weekly	Every 4 weeks	Monthly	Quarterly	Semi-annually	Annually
Replace A/C filter and condenser coils. Clean A/C filter			X	X	X	X	X	X
Check mounting bolts on FDMS enclosure.			X	X	X	X	X	X
Clean pump cabinet				X	X	X	X	X
Replace TEOM and FDMS filters.				X	X	X	X	X
Exchange inlet with clean inlet. Clean inlet.				X	X	X	X	X
Measure auxiliary flow with calibration device.						X	X	X
Complete leak check.						X	X	X
Schedule audit with GBUAPCD and calibrate / repair / replace instrument as needed based on audit findings.						X	X	X
Check CPU battery.							X	X
Check pump.							X	X
Replace in-line filters							X	X
Complete software calibration of flow controller based on results of direct measurement of flow (main and by-pass) at the flow controller (as needed).[1]							X	
Clean air inlet system.								X
Clean switching valve in 8500 module								X
Analog I/O calibration.								X
Amplifier board calibration (of needed).[2]								X
Ambient air temperature calibration.								X
Ambient pressure calibration.								X
Mass transducer calibration verification.								X
Hardware flow controller calibration.								X
Replace pump and rebuild								X

[1] Software calibration of flow controller only if regular flow checks, quarterly maintenance or audit findings indicate this is necessary (per R&P and GBUAPCD).

[2] Amplifier board calibration only if aberrant findings and after technical consultation with R&P (per R&P and GBUAPCD)

7.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASURING DATA (Element A7)

The objectives of this PM-10 monitoring project are to determine the ambient air quality within the boundaries of the Bishop Paiute Reservation, whether or not the tribal 24-hour ambient air quality standard (50 µg/m^3) and the tribal annual standard (20 µg/m^3) have been exceeded, and for comparison to the national primary and secondary 24 hour ambient air quality standard (150 µg/m^3) and the national primary and secondary annual standard (50 µg/m^3). Exceedances of the California 24-hour standard (50 µg/m^3) are also examined.

Until the Tribe started monitoring for PM-10 in April 2003 and for PM-2.5 in June 2004, there was no monitoring for air quality in the Bishop area. GBUAPCD monitoring activities for PM-10 had been discontinued in 1997 and the nearest monitors were located in non-attainment areas 45 miles to the north (in the Town of Mammoth Lakes) and 60 miles to the south (at the Owens Dry Lake, largest source of PM-10 in the nation). This meant that the largest population center in Inyo County had no air quality monitoring until the Bishop Tribe initiated monitoring efforts.

At this point, the US EPA has not applied the data quality objective process to PM-10. Instead, there are measurement quality objectives which were developed using a systematic planning process that are published in the EPA Quality Assurance Handbook, Vol. II, part II (the

recommendations in section 2.10 are for a dichotomous sampler, but EPA recommends that the same overall objectives for QC be used for continuous PM-10 measurements), and "Supplemental Interim Guidance for Quality Assessment of Continuous PM Analyzers," from William J. Mitchell (MD-77B) Frank F. McElroy (MD-77) Quality Assurance Branch/AMRD, to NAMS Coordinators, Regions 1 – 10 and QA Coordinators, Regions 1 – 10, dated November 3, 1995." If EPA produces data quality objectives (DQOs) for PM-10 this program and its documentation, including this QAPP, will be revised accordingly.

This QAPP describes how this program controls and evaluates data quality so that the objectives of the project are met. Since the highest priority objective is to determine if there are any exceedances of the tribal air quality standards and for comparison to the NAAQS, the data quality objectives necessary for that determination are the most important.

Measurement quality objectives (MQOs) are the translation of the DQOs into parameters that are directly measurable. The MQOs are set so that if they are met, the data user can assume that the DQOs have been met. MQOs are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process. Information regarding these objectives and their use can be found in the US EPA's Quality Assurance Handbook, Volumes I and II. MQOs can be defined in terms of the following data quality indicators:

- Accuracy
- Precision
- Bias
- Representativeness
- Detection Limits
- Completeness
- Comparability

Precision – a measure of mutual agreement among individual measurements of the same property usually under prescribed similar conditions, or agreement among side-by-side measurements. In the case of the flow rate of an instrument, precision can be estimated through repeated measurements, using the same or similar equipment. Precision represents the random component of uncertainty. It is intrinsic to the instrumentation and is not controllable. The TEOM/FDMS instrument itself has a precision of ±2.5 $\mu g/m^3$. Precision is estimated using statistical techniques using the standard deviation or the percent difference.

Bias – the systematic or persistent distortion of a measurement process that causes error in one direction. These types of systematic errors may be caused by poor calibration, or repeated operating errors. Bias is estimated by evaluating your measurement results against some known standard. It can also be expressed as a percent difference.

Representativeness – a measure of the degree which data really represent some characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Detection Limits – the lowest value a procedure or instrument can reliably discern. The TEOM/FDMS mass transducer minimum detection limit is 0.06µg.

Completeness –the amount of valid data obtained from a measurement system compared to the amount expected under correct, normal conditions. Data completeness requirements are included in the reference methods (40 CFR 50). EPA has assumed levels of completeness of at least 75%.

Comparability – a measure of confidence with which one data set can be compared to another. Because of the strict requirements on the sampler types, analyses, and sampling procedures, EPA has helped to ensure adequate comparability for PM-10 results.

Accuracy –a combination of precision and bias. This term has been used throughout the CFR. In general, we will follow the conventions of the NIST and, more recently, of EPA (ref. NIST Report 1297 and EPA G-9) and will not use the term accuracy, but will describe measurement uncertainties as precision, bias, and total uncertainty.

Various parts of the 40 CFR have identified acceptance criteria for some of these attributes as well as the EPA Quality Assurance Handbook, Vol. II, Part II. In theory, if these MQOs are met, measurement uncertainty should be controlled to the levels required by the DQO. Table 3 lists the MQOs for the PM-10 measurements.

Table 3. PM-10 Measurement Quality Objectives for Automated (Continuous) Sampler

MEASUREMENT QUALITY OBJECTIVES				
REQUIREMENT	**FREQUENCY**	**ACCEPTANCE CRITERIA**	**REFERENCE**	**INFORMATION / ACTION**
Reporting units	All data	μ/m^3 in volumetric units (standard conditions)	40 CFR 50.6	
Flow rate transfer standard (Streamline Pro MultiCal)	Annual calibration and re-certification	±2% accuracy (NIST traceable)	40 CFR 58, Appendix A, Section 2.3.3 QA Handbook, Volume II, Part 1, Appendix 3 40 CFR 50,Appendix K	Repair or replace if manufacturer is unable to calibrate within specifications.
Lower Detection Limit	Ongoing	Mass transducer minimum detection limit $0.06\mu/m^3$, reported to the nearest $0.1\mu/m^3$	Operating Manual Series 8500 Filter Dynamics Measurement System Revision B, July 2003, page 1-5, and page 4-5	
Completeness	Quarterly	75%	40 CFR 58 Appendix A	Data are not valid unless 75%complete
System check using calibration verification kit (Thermo Part 59-002017)	Annually	±2.5% of the target value stated by the manufacturer	Operating Manual Series 8500 Filter Dynamics Measurement System Revision B, July 2003, pages 12-16 to 12-19 and Service Manual pages 3-18 and 3-19	Repeat measurement to verify. Check with manufacturer for repair / replacement.
Sampler flow control device calibration	Software calibration every 6 months (if needed); hardware calibration annually or after verified out of limits flow check or audit	For hardware calibration: ±0.03 l/min (main) and ±0.2l/min (bypass)	40 CFR 58 Appendix A Sec. 3.1.2.2.1.2 (similar to dichot samplers. See QA Handbook Sec. 2.10)	Conduct flow rate checks with an external flow rate meter every 2 weeks

MEASUREMENT QUALITY OBJECTIVES				
REQUIREMENT	**FREQUENCY**	**ACCEPTANCE CRITERIA**	**REFERENCE**	**INFORMATION / ACTION**
Accuracy – external audit with flow transfer standard other than the one used to calibrate equipment; see section 14.1 and 14.3 of this QAPP)	Quarterly	±10% difference between design flow rate (16.67 l/min) and auditor's transfer standard	40 CFR 58 Appendix A	Auditor's transfer standard is different than that used for calibrations. Recalibrate before additional sampling. Invalidate date to last acceptable flow check if the difference > 10% from design flow rate.
Precision – internal flow rate check	Bi-weekly	±7% difference between sampler's flow rate and transfer standard ±10% difference between sampler's flow rate and design rate (16.67 l/min)	Operating Manual pages 12-23 to 12-27	Repeat measurement to verify. Check FDMS filter seating. Perform leak check if necessary. Request audit if necessary. Complete any required maintenance.
Precision – ambient pressure sensor	Verify bi-weekly Calibrate annually	Bi-weekly verification: ±2°C difference between sampler's temperature and transfer standard	Operating Manual pages 12-20 and 12-21 and Service Manual pages 3-16 and 3-17	Repeat measurement to verify. Request audit if necessary. Complete any required maintenance.
Precision – ambient temperature sensor	Verify bi-weekly Calibrate annually	Bi-weekly verification: ±10 mmHg (±0.013 atm)	Operating Manual page 12-22 and Service Manual pages 3-17 and 3-18	Repeat measurement to verify. Request audit if necessary. Complete any required maintenance.
Analog calibration	Annually	Tune potentiometers to 90% of full scale	Service Manual pages 3-13 to3-15	Repeat measurement to verify. Repair or replace if unable to meet calibration standards.
Reference: QA Handbook refers to the QA Handbook for Air Pollution Measurement Systems.				

8.0 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION (Element A8)

Workshops and courses hosted by the Institute for Tribal Environmental Professionals (ITEP), the California Air Resources Board (CARB) and informal training with staff from GBUAPCD are available to project personnel. Records on personnel qualifications and training are maintained in the Environmental Management Office as a part of grant records and are accessible for review during audit activities. In addition, technical support is available from Thermo (formerly R&P), the equipment manufacturer and is used in to evaluate potential equipment problems.

Adequate education and training are integral to any monitoring program that strives for reliable and comparable data. Training is aimed at increasing the effectiveness of employees and the Environmental Management Office. All personnel directly involved with this project will have adequate time to read this document and relevant references (16 hours minimum).

9.0 DOCUMENTATION AND RECORDS (Element A9)

The Bishop Tribe's air monitoring network is established for regulatory and compliance purposes. The Air Quality Program is committed to fully document all activities relating to data collection, analysis, validation, and reporting. The documentation requirements outlined below

will ensure that the disposition and location of the data records are known, and that the data are legally defensible.

All field quality control (QC) procedures, instrument malfunctions, on-site repairs and maintenance, and out of control conditions are recorded on standard forms (See Appendix A, Standard Operating Procedures) and kept in site logbooks. Instrument malfunctions, repairs, and maintenance are also documented in instrument logbooks located at the Air Quality Specialist's desk. Site logbooks are numbered and labeled with applicable dates and site identification. The three most recent months of standard forms are retained in a separate notebook so that field comparisons with recent data are possible. The remaining original forms are filed chronologically in binders at the Air Quality Specialist's desk. The Air Quality Specialist is responsible for the collection and maintenance of all field records. The Outside Auditor is responsible for quarterly spot checks during the course of audits and for more comprehensive annual reviews of record keeping practices.

There are two methods of primary data collection. The principal method uses a ZENO data logger and the IPS MeteoStar LEADS software. The data logger polls the TEOM/FDMS every second and compiles this information into 5-minute averages. The LEADS system in turn polls the ZENO remotely via a web-based system, every 15 minutes and compiles this information into one-hour averages. This information is stored on the TREX server. The data are protected by a firewall but are available for secure editing by the Air Quality Specialist. In addition, the TEOM/FDMS is directly connected to a computer at the Air Quality Specialist's desk via serial port (RS-232). Data are downloaded every 24 hours. These data are copied daily to a second computer and backed up to the EMO server monthly. Since all data handling is automated, there is an electronic record of all activity in the form of file creation dates.

The Air Quality Specialist analyzes the PM-10 data daily, and creates charts as needed. At least monthly, a summary file is created and analyzed. Manual validation of the analog data on the LEADS system is completed monthly in preparation for submission to AQS (quarterly).

The Air Quality Specialist is responsible for the configuration, operation and management of the data acquisition system, and is also responsible for processing, compiling, analyzing and reporting the data collected. Data logger configuration and programming is carried out by the Air Quality Specialist, with assistance from IPS MeteoStar.

Files are organized in a way that allows each data point to be tracked from the point of the beginning of the measurement through validation, analysis, and reporting. These include those records listed in Table 4 below. All records are organized and retrievable for audit purposes.

Table 4. Record Categories and Types

Category	Record/Document Types
Management and Organization	Tribal air grant application and associated records Personnel qualifications and training Training certifications Grant allocations, records of funds, expenditures Support contracts
Site Information	Network (site) description(s) Site maps Site pictures

Category	Record/Document Types
Data Operations	QA Project Plans Standard operating procedures (SOPs) Field notebooks Inspection/maintenance/repair records Shipping/receiving records
Raw Data	Any original data (routine and QC data)
Data Reporting	Air quality index report (reported automatically to AIRNOW) Daily, monthly and annual tribal air quality information Data/summary reports Articles/papers/presentations
Data Management	Data algorithms Data management plans Equipment repair records Data validation notes and records
Quality Assurance	Network reviews Control charts Data quality assessments QA reports System audits Response/corrective action reports

All the information listed in table 4 is kept for a minimum of 3 years after it was gathered. However, if any litigation, claim, negotiation, audit or other action involving the records has been started before the expiration of the 3-year period, the records are retained until completion of the action and resolution of all issues which arise from it, or until the end of the regular 3-year period, whichever is later. At least three complete calendar years (in addition to the current year) are maintained at all times.

All data transfers are electronic. Transfers involve only copying files. Edited files are maintained separately with documentation of all changes. The original raw data are always backed up in at least two locations.

10.0 SAMPLING DESIGN (Element B1)

This section describes the rationale for the locations of the measurements, the frequency of sampling, the types of samplers used at each site and the location and frequency of the performance evaluations. The network design components comply with the recommendations in 40 CFR 58.13, Appendices A and D. Siting criteria comply with 40 CFR 58 Appendix E. Specific requirements are shown in Table 5 below.

Table 5. PM-10 Sampler Siting Criteria

Scale	Vertical Height above ground (m)	Horizontal[a] Height above ground (m)	Other spacing criteria
Micro	2 to 7	>2	• >20m from trees. • Distance from sampler to obstacle, such as buildings, must be twice the height that the obstacle protrudes above the sampler. • Must have unrestricted air flow 270 degrees around the sampler inlet. • No furnace or incineration flues should be nearby.[b] • Spacing from roads varies with traffic (see 40 CFR 58, Appendix E; if less than 10,000 vehicles per day the distance from the road needs to be at least 10m except for (a) microscale traffic corridors or street canyon stations it should be within 15 m of the road, or (b) for Pb and TSP it must be at least 50 m for neighborhood scale). • Sampler inlet is at least 2m but not >4m from any collocated PM sampler (see 40 CFR 58, Appendix A).
Middle, neighborhood, urban, and regional scale	2 to 15	>2	

[a] When inlet is located on rooftop, this separation distance is in reference to walls, parapets, or penthouses located on the roof.
[b] Distance depends on the height of furnace or incineration flues, type of fuel or waste burned, and quality of fuel (sulfur, ash, or lead content). If there is natural gas combustion the sampler should be at least 5 m away.

Prior to installation, the Air Quality Specialist together with the Auditor from GBUAPCD verified that the site met the requirements in Table 5. The site is shown in Photographs 1 and 2. The sampler is located on the roof of the EMO building and in unobstructed. It is over 70m from both nearby roads, Highway 168 and from TuSu Lane. Neither road has traffic in excess of 10,000 vehicles per day. The inlets for the two PM samplers are over 2m but less than 4m apart. There are no nearby trees or other obstacles. These criteria continue to be met.

10.1 Project Schedule

This project involves measuring PM-10 concentrations at the Environmental Management Office, on the Bishop Paiute Reservation. The sampler location is shown in Photographs 1 and 2. This location meets siting criteria, and was selected with technical assistance from GBUAPCD. The project schedule is given in Table 6 below.

Table 6. Schedule of Sampling-Related Activities

Activity	Due Date	Comments
Order samplers	Ordered 1/23/04	From R&P, now Thermo
Receive samplers	Received 2/28/03	
Install sampler	Installed 4/8/03	
Begin routine sampling	4/9/03	

Activity	Due Date	Comments
Report routine data to AIRS-AQS	Ongoing - due within 90 days after end of quarterly reporting period	Initiated 2005
Performance Evaluations	Informal evaluations are ongoing; audits occur quarterly and formal evaluations occur annually	
Review internal and external QA reports	Ongoing	Needed to determine which, if any, samplers fail QC limits.
Primary network review	Annually	Evaluate reasonableness of siting, frequency, number of samplers.
Evaluate location of samplers	Annually	At time of network review.

10.2 Rationale for the Design

The procedure for siting the samplers to achieve the basic objectives is based on judgmental sampling, as is the case for most ambient air monitoring networks. Judgmental sampling uses data from existing monitoring networks, knowledge of source emissions and population distribution, and weather information to select the best sampler locations.

The network has been designed to meet the following basic monitoring objectives:

1. Supply monitoring data that is representative of concentrations on the Bishop Paiute Reservation.
2. Capture the highest concentrations affecting the Reservation population.
3. Measure the impact from significant sources of PM expected to impact the Reservation:
   a. Off Reservation: the Owens Dry Lake, largest source of PM-10 in the nation, located 60 miles to the South.
   b. On Reservation: smoke from wood burning for residential heating and dust from dirt roads.

The TEOM/FDMS is a continuous monitor that provides hourly and 24-hour concentrations.

11.0 SAMPLING METHODS (Element B2)

The Bishop Tribe's Air Program collects air quality data on the Bishop Paiute Reservation to be used for comparisons with future measurements and to determine compliance with tribal air quality standards. This method provides for measurement of the mass concentration of particulate matter having an aerodynamic diameter less than or equal to a nominal 10 microns (µm) – PM-10 – in ambient air over a 24-hour period for determining whether tribal standards for particulate matter (adopted in April 2006) are met and for comparison to the primary and secondary national ambient air quality standards for particulate matter specified in 40 CFR 50.7. The TEOM is a Federal Equivalence Method (FEM) for PM-10 for comparison to the standard. The TEOM/FDMS is approved in the State of California for PM-10 and PM-2.5 (California Air Resources Board). The sampler was installed with adherence to procedures, guidance, and requirements detailed in 40 CFR 50, 53, and 58; U.S.EPA QA guidance documents, and the sampler manufacturers operation manual, with assistance from staff from GBUAPCD.

11.1 Method Overview

The theory of operations for the TEOM/FDMS is described in detail in Section 1 of the manufacturer's operating manual. It is shown schematically in Figure 1 of this document and is summarized below. The system is made up of three major components:

1. The TEOM Series 1400a sensor unit
2. The TEOM Series 1400a control unit
3. The 8500 (FDMS) module

The sensor unit contains the mass measurement hardware that continuously monitors the accumulated mass on the exchangeable TEOM filter. The system draws ambient air through a filter at a constant flow rate, continuously weighing the filer and calculating mass concentrations.

The FDMS has five air stream flows. Initially the air stream passes through a size selective inlet and is split isokinetically into a 3 l/min main flow, used from PM measurement and a bypass flow of 13.67 l/min. The main flow enters the FDMS module where it is either the base or reference flow depending on the valve position. Inside the FDMS module, the base flow is dried and then enters the TEOM sensor unit where it passes through an exchangeable filter mounted on a microbalance that continuously provides a direct measurement of the mass collected on the filter. When the base flow exits the TEOM control unit, it becomes the purge flow. In the alternate valve position, the reference flow is a sample air stream without particulate matter. The airflow passes through a 47 mm filter, maintained at 4° C and subsequently enters the sensor unit where it passes through the exchangeable filter on the microbalance. Mass measurements taken during the reference flow reflect chemical changes occurring on the filter that may cause mass to be lost or gained. The resulting combined base and reference mass measurements provide a more accurate measurement of the particulate mass, especially under conditions where volatilization is an issue, for example sources like wood smoke.

11.2 PM-10 Sampler Set-up

Set-up of the PM samplers was conducted in according to the manufacturer's specification, described in the Operating Manual (Section 2 and Appendix K), with technical assistance from GBUAPCD.

11.3 Data Acquisition

All data are downloaded automatically to dedicated computers. Both analog and digital data are collected. Analog data are transmitted to a ZENO data logger, located at the Air Quality Specialist's desk, and automatically relayed to the remotely located TREX server for storage and for web transmission. The server polls the ZENO every 15 minutes for nearly continuous data transmission and storage. Digital data are downloaded every 24-hours to a second dedicated computer, also located at the Air Quality Specialist's desk and stored in sequentially numbered files. They are backed up daily on a second computer for analysis purposes and copied monthly to the EMO server.

11.4 Support Facilities for Sampling Methods

Table 7 lists the supplies that are available to PM-10 field operators.

Table 7. Support Facility Supplies

Item	Minimum Quantity	Notes
Field log book	1 per sampler	Available for field use, and kept at the Air Quality Specialist's desk
Sampler Operations Manual	1 per sampler	Available for field use, and kept at the Air Quality Specialist's desk
PM-10 Sampler SOP	1 per sampler	Available for field use, and kept at the Air Quality Specialist's desk
Filter exchange tool	1 per sampler	Stored inside the sensor unit box
Spare filters for the TEOM	1 box per sampler	Stored inside the sensor unit box
Spare 47 mm filters, cassettes and transport cases for the FDMS	1 box filters 6 cassettes 6 transport cases	Available for field use, and kept at the Air Quality Specialist's desk in closed containers
Filter cassette separator	1	Kept at the Air Quality Specialist's desk
Teflon tweezers	2	Kept at the Air Quality Specialist's desk
Hi-Vac lubricant for o-rings	1 tube	Available for field use, and kept at the Air Quality Specialist's desk
In-line filters	4	Available for field use, and kept at the Air Quality Specialist's desk
Miscellaneous tubing and fittings	Various diameters	Available for field use, and kept at the Air Quality Specialist's desk
Miscellaneous cleaning supplies	1 box each lint free wipes (2 sizes) 1 gal distilled water 1 box each lint free swabs (2 sizes) 6 lab bottles	Kept at the Air Quality Specialist's desk
Tools	1 box 1 case for field use	Screw drivers, wrenches, hammer, tape measures, etc.
Lap top computer and accessories	2	For manual downloads and for software installation as needed
Spare inlet	1	Replacement kept at Air Quality Specialist's desk
Spare pump and re-build kit	1	Replacement kept at Air Quality Specialist's desk

11.5 Sampling / Measurement System Corrective Action

Corrective action measures in the PM Network will be taken to ensure the data quality objectives are attained. Table 8 lists some of the expected problems and corrective actions.

Table 8. Field Corrective Actions

Item	Problem	Action	Notification
Power	Power interruptions	1. Check uninterruptible power supply 2. Verify settings 3. Restart if necessary 4. Check manual for additional diagnostics 5. Contact technical support and repair/replace as necessary	1. Document in Logbook 2. Notify Environmental Manager
Sample Flow Rate Verification	Out of Specification	1. Check and record system status codes and operating parameters in log book 2. Repeat flow verification 3. Check pressure drop across filter and date of last replacement; replace filters if necessary 4. Perform leak check and check connections if leak check fails 5. Check air pump with vacuum gauge (in line), replace if needed following manufacturers' specifications 6. Check with manufacturer for additional diagnostics and repair/replace as needed	1. Document in Logbook and on forms 2. Notify Environmental Manager
Data Downloading	Data transfer fails	1. Document key information in logbook 2. Verify cable connections and computer status; reconnect / restart as necessary 3. Contact appropriate technical support	1. Document all storage attempts and failures 2. Notify Environmental Manager

12.0 SAMPLE HANDLING (Element B3)

For continuous monitors, PM-10 measurements are stored electronically and are not filter based. All data transfers are automated. Raw files are maintained in at least two locations and separate files are maintained for analysis. Detailed file nomenclature is used to indicate the source and type of file. Documentation of any changes for analytical purposes in integral to the file structure and is described in Section 19, Data Management.

Filters for the FDMS system are retained in an archive. Each filter is labeled with the instrument and dates of use. The archive is a freezer and temperatures are recorded each time a filter is added to the freezer. At present there are no plans for analysis. Chain of custody procedures will be developed should the filters be transferred to a laboratory for analysis.

Definitions of parameters on the forms are explained in Table 9. All data are transferred and stored electronically.

Table 9. Parameter List for the Automated PM-10 Sampler

Parameter	Frequency	Comment
ANALOG CHANNELS		
1-Hour Mass Concentration (PRC 57)	Every hour	Collected via ZENO data logger and LEADS software
Base Mass Concentration (PRC 102)	Every hour	Collected via ZENO data logger and LEADS software
Reference Mass Concentration (PRC 104)	Every hour	Collected via ZENO data logger and LEADS software
CONTACT CLOSURES		
Status (PRC 41)	Every hour	Collected via ZENO data logger and LEADS software
Filter Loading (PRC 35)	Every hour	Collected via ZENO data logger and LEADS software
DIGITAL DATA		
Date	Every hour	Automatic field
Time	Every hour	Automatic field
Main flow (PRC 39)	Every hour	
Auxiliary flow (PRC 40)	Every hour	
Cap Temperature (PRC 27)	Every hour	Diagnostic field (may vary)
Sample Dew Point (PRC 99)	Every hour	Diagnostic field (may vary)
Status (PRC 41)	Every hour	
Base Mass Concentration (PRC 102)	Every hour	
Reference Mass Concentration (PRC 104)	Every hour	
1-Hour Mass Concentration (PRC 57)	Every hour	

12.1 Sample Custody Procedure

All data transfers are automated. The file names for the analog data are automatically generated by the LEADS software. The file names for the digital data are automatically generated by the RPComm software. The dates of file creation and modification constitute the chain of custody. All file modifications are documented in operator or manual validation logs and are contained in flags embedded in the data bases.

13.0 ANALYTICAL METHODS (Element B4)

The PM-10 inlet is designed to allow only particulate matter less than 10 µm in diameter to remain suspended in the sample air stream as long as the flow rate of the system is maintained at 16.67 l/min. Other inlets allow for sampling other particle sizes. Flow is controlled with an isokinetic flow splitter in conjunction with automated flow controllers located in the control unit. A pump supplies the necessary vacuum. Mass accumulating on an exchangeable filter is measured every 2 seconds and compiled into averages that are recorded internally.

The TEOM / FDMS is shown diagrammatically in Figure 1 in Section 6, above. The theory of operations is briefly described in Section 11.1 above. More details are available in the Operations Manual, supplied by the manufacturer.

14.0 QUALITY CONTROL REQUIREMENTS (Element B5)

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. In the case of this network, QC activities are used to ensure that measurement uncertainty can be estimated and is less than the measurement quality objectives so that the DQOs can be met.

The measurement quality objectives in Table 3 of Section 7 contain a list of these QC checks as well as other requirements for the PM-10 Program. Various types of QC checks have been inserted at phases of the data operation to assess and control measurement uncertainties. Table 10 summarizes the field QC checks. 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.

Table 10. Field QC Checks

Requirement	Frequency	Acceptance	Reference
Status Codes	Daily when downloaded data are examined. Weekly during routine checks. Bi-weekly during routine instrument flow checks.	Any status code other than "OK" (digital code = blank) invalidates data and requires action.	Operating Manual, Series 8500 FDMS Filter Dyanmics Measurement System, Revision B, Sections 4.2.1 and 7.1. and EPA standard method IO-1.3, page 1.3-25 tables 2 and 4.
Noise < 0.10 after 30 minutes in operating mode 4.	Weekly during routine checks. Bi-weekly following routine instrument flow checks.	< 0.10	EPA standard method IO-1.3, page 1.3-26, Table 4
Frequency of oscillating tapered element is stable after 30 minutes of operation.	Weekly during routine checks. Bi-weekly following routine instrument flow checks.	Only last few digits change.	EPA standard method IO-1.3, page 1.3-26, Table 4
Flow rate verification	Bi-weekly	±7% of the transfer standard or ±10% of sampler flow rate and design rate and transfer standard that is accurate to ±1% at 3 and 16.67 l/min and a pressure drop of less than 0.07 bar (1 psi)	Operating Manual, Series 8500 FDMS Filter Dynamics Measurement System, Revision B, Section 12.2.4

Requirement	Frequency	Acceptance	Reference
Instrument stability with mass filter supplied by the manufacturer	Annually, unless there is reason to suspect instrument instability	± 2.5 % of target value	Operating Manual, Series 8500 FDMS Filter Dynamics Measurement System, Revision B, Sections 12.2.1, and 12.2.2 and Service Manual TEOM Series 1400a, Revision B, Section 3.2.5.

14.1 Flow Checks (Precision estimate for automated methods)

Because of the high cost of providing a collocated PM analyzer, flow checks are used to assess precision. A one-point check of each PM-10 analyzer's normal operating flow rate is made at least once every two weeks. (If a precision check is made in conjunction with any other type of instrument adjustment, it must be made prior to the adjustment.) The percent difference between the actual and the indicated flow rates are used to assess the precision of the monitoring data.

While it is acceptable to obtain the precision check flow rate data from the analyzer's internal flow meter, without the use of an external flow transfer standard, provided certain conditions are met as described in the memorandum issued by EPA regarding "Supplemental Interim Guidance for Quality Assessment of Continuous PM Analyzers," this approach is not used unless circumstances prevent regular bi-weekly precision checks.

The percentage difference (d_i) for a flow rate check (or audit) is calculated using Equation 1, where X_i represents the external transfer standard flow rate and Y_i represents the instrument's indicated flow rate.

Eq. 1 $d_i = [(Y_i - X_i) / X_i] \times 100$

If this value exceeds 7% corrective action is needed. Values of the percentage difference in sequential flow checks are monitored for trend and may be plotted over time to determine if the instrument is drifting. As least the two most recent prior flow checks are examined following each routine check to look for trends.

14.2 Instrument Stability Check using Calibration Verification Kit

The manufacturer provides a calibration verification kit that is separate from the analyzer unit and can be used to assess the unit's response to a "known" value that is stable over time. This stability check is completed annually, following the procedures described in the Operating Manual. Percentage differences are calculated by the same methods as for the flow checks.

14.3 Flow Rate Audits Conducted by an External Auditor

External audits are conducted by the Great Basin Unified Air Pollution Control District, using their transfer standards. The procedures are the same as for routine flow verifications. Audit reports are available at the Air Quality Specialist's desk and are transmitted to EPA as part of regular quarterly reports to the project officer.

14.4 Corrective Action for External Flow Rate Audit

If the percentage difference between the audit transfer standard and the instrument's design flow rate exceeds 10% action must be taken to determine the source of the problem and correct the abnormal flow rate. This may include leak checks, pump checks and software and/or hardware flow calibration. The instrument will be re-audited at the first opportunity following the corrective action. Data back to the last acceptable audit will be verified and compared to the results of routine flow checks and flagged as necessary. The flow transfer standard will be recalibrated if necessary. All corrective action will be documented in the site notebook and on QC sheets, as well as being reported to the Environmental Manager.

14.5 Control Charts

Control charts are used as needed to document instrument performance. These consist primarily of time plots of the percent difference between values displayed by the instrument and those measured by an external standard. Routine monitoring of percent differences is used as an early warning device for potential problems requiring attention.

15.0 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE
(Element B6)

This section discusses 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 in records kept at the Air Quality Specialist's desk and described in SOPs (Appendix A).

15.1 Initial testing

All PM samplers used in the Bishop Tribe's Air Quality Program are assembled according to the manufacturer's specifications and flow and leak tested prior to installation. Should the instrument appear to be operating out of specifications, the manufacturer is contacted for corrective action. An external audit is completed as soon as possible following instrument installation. Routine maintenance and audits begin immediately following installation following the schedule in Table 2, along with corresponding record-keeping as described in Section 9. Records are maintained at the Air Quality Specialist's desk and are available for inspection.

15.2 Preventive Maintenance

Table 2 in Section 6 describes the appropriate maintenance and calibration checks of the PM-10 sampler and their frequency. The SOP's in Appendix A provide a detailed description of procedures. Table 11 below summarizes the maintenance procedures and frequency.

Table 11. Instrument Maintenance Frequencies

Instrument or Component	Frequency	Reference
Clean and inspect inlet	Monthly with filter exchange	Service Manual TEOM Series 1400a, Revision B, Section 3.1.1

Instrument or Component	Frequency	Reference
Replace in-line bypass filters	Every 6 months	Service Manual TEOM Series 1400a, Revision B, Section 3.1.3
Clean air inlet system	Annually	Service Manual TEOM Series 1400a, Revision B, Section 3.1.6
Clean 8500 switching valve	Annually	Operations Manual FDMS Series 8500, Revision B, Section 12.1.3
Replace and rebuild pump	Annually or when instrument performance is out of specification	In rebuild kit

16.0 INSTRUMENT CALIBRATION AND FREQUENCY (Element B7)

16.1 Standards

The field equipment and calibration instruments follows the calibration and re-certification scheduled as listed in Table 12 and outlined in Table 2 of Section 6.

Table 12. Instruments and Calibration Frequencies

Instrument or Component	Frequency	Reference
Streamline Pro Multi Cal System, Chinook Engineering	Annually Specifications: • Flow rate range 0.8 to 19.0 l/min • Measurement uncertainty 0.6% at 22°C and ±1.2% over operating range • NIST traceable	Chinook Engineering, Streamline Pro Multical System Operating Manual, Revision 2.1a, January 2004 40 CFR 58, Appendix A, Section 2.3.3 QA Handbook, Volume II, Part 1, Appendix 3
Flow Controller Software	Every 6 months (as needed) or when flow is out of specification	Service Manual TEOM Series 1400a, Revision B, Section 3.5.1 EPA Standard Method IO-1.3, page 1.3-16, section 12.2
Flow Controller Hardware	Annually or when flow is out of specification	Service Manual TEOM Series 1400a, Revision B, Section 3.5.2 EPA Standard Method IO-1.3, page 1.3-18, section 12.4
Temperature and Pressure Sensor Calibration	Annually or when sensors are out of specification	Service Manual TEOM Series 1400a, Revision B, Sections 3.2.3 and 3.2.4
Analog Calibration	Annually or when instrument performance is out of specification	Service Manual TEOM Series 1400a, Revision B, Section 3.2.1 EPA Standard Method IO-1.3, page 1.3-17, section 12.3 and page 1.3-19, section 12.5
Mass Transducer Verification	Annually	Service Manual TEOM Series 1400a, Revision B, Section 3.2.5

The transfer standard for flow rate verification has its own certification and is NIST-traceable. The Air Quality Specialist is responsible for ensuring that the transfer standard is re-certified annually by the manufacturer using NIST traceable reference standards to within 2% over the expected range of ambient temperatures and pressures at which the flow-rate standard is used. The flow rate standard is re-calibrated as necessary (may be annually). The calibration certificate shows the results of the calibration, summarizes how it was performed, and shows when it is next due. The certificate is filed with the instrument documents at the Air Quality

Specialist's desk. During regular quarterly audits, results from the most recent flow verification are compared to the audit results to verify instrument accuracy.

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 described in 40 CFR 50, Appendix M and the manufacturer's operating manual and any other flags listed in Section 22. Logbooks will normally be located at the Air Quality Specialist's desk when not in use.

17.0 SUPPLIES AND CONSUMABLES INSPECTION/ACCEPTANCE REQUIREMENTS
(Element B8)

Table 13 describes critical supplies. Additional information is in Table 7.

Table 13. Critical Supplies and Consumables

Item	Description	Manufacturer	Supplier (if different)	Area
TEOM filters	boxes of 20	Thermo		Instrument and Air Quality Specialist's desk
FDMS filters	47 mm Pallflex filters	Thermo		Air Quality Specialist's desk
Cassette holders	holders for 47 mm filers	Thermo		Air Quality Specialist's desk
Cassette transport cases	Aliminum transport cases	BGI		Air Quality Specialist's desk
In-line filters	4 filters	Thermo		Air Quality Specialist's desk
Hi Vac Grease	High grade silicone	Dow Corning	VWR	Air Quality Specialist's desk
Low-lint wipes	4.5x8.5" and 12x12" Cleaning Wipes	Kimberly Clark	VWR	Air Quality Specialist's desk
Low lint swabs	Micro swabs and bud-type swabs	Tex Wipe	VWR	Air Quality Specialist's desk
O-rings for inlets	1 ¼" and 2 $^{3}/_{8}$"	Thermo		Air Quality Specialist's desk

17.1 Acceptance Criteria

Acceptance criteria must be consistent with overall project technical requirements. Some of the acceptance criteria are specifically detailed in 40 CFR 50. Other acceptance criteria such as observation of damage due to shipping can only be performed once the equipment has arrived on site.

17.2 Tracking and Quality Verification of Supplies and Consumables

Tracking and quality verification procedures are implemented to assure that the appropriate items are received and that adequate documentation is supplied to the Tribal Fiscal Office to ensure appropriate and timely invoice payment.

1. Packages are inspected as they are received for obvious damage during transit. Freight packages are opened immediately and inspected. If immediate inspection is not possible, the annotation "possible undetected damage" is made prior to signing the acceptance forms.
2. Packages are opened, contents inspected and compared to the packing slip and the list of items ordered.
3. Any discrepancies identified are noted on the packing slip. The original is sent to the Fiscal Office. A copy of the packing slip is retained for records. The manufacturer is notified and supplied with necessary documentation to rectify any discrepancies.
4. Supplies are stored in the appropriate area and dated with regard to receipt date.

18.0 DATA ACQUISITION REQUIREMENTS (Element B9)

This section addresses data not obtained by direct measurements. This includes both outside data and historical monitoring data. The policies and procedures described in this section apply both to data acquired through the Tribal Air Quality Program's PM-10 monitoring activities and to information previously acquired and from outside sources.

18.1 Chemical and Physical Properties Data

Chemical and physical properties data and conversion constants are often required in the processing of raw data into reporting units. This type of information that has not already been specified in the monitoring regulations will be obtained from nationally and internationally recognized sources. The following sources may be used in the PM-10 program without prior approval:

- National Institute of Standards and Technology (NIST)
- ISO, IUPAC, ANSI, and other widely-recognized national and international standards organizations
- US EPA
- The current edition of standard handbooks such as physical constants or conversions

18.2 Geographic Location

To identify the location of sampling sites maintained by the Bishop Tribe's Air Quality Program, conventional longitude and latitude coordinates and altitude are reported in AQS and Bishop Tribe's Air Program reports and with site information contained in on-line websites.

18.3 Historical Monitoring Information

Historical monitoring data and summary information derived from previous data may be used in conjunction with current monitoring results to calculate and report trends in pollutant concentrations. In calculating historical trends, it will be verified that historical data are fully

comparable to current monitoring data. If different methodologies were used to gather the historical data, the biases and other inaccuracies will be described in trends reports based on that data. Direct comparison of PM-10 with historical total suspended particulate data will not be reported or used to estimate trends.

18.4 External Monitoring Data Bases

It is the policy of this program that no data obtained from any other organization or agency shall be used in creating published reports or regulatory actions unless the data were collected under a QA program that meets the requirements of 40 CFR 58, and has been approved by the Environmental Manager in consultation with GBUAPCD.

Data from the U.S. EPA AQS database may be used in published reports with appropriate caution. Care will be taken in reviewing/using any data that contain flags or data qualifiers. If data is flagged, such data shall not be utilized unless it is clear that the data still meets critical QA/QC requirements. Users will review available QA/QC information to assure that the external data are comparable with Bishop Tribe's Air Quality Program measurements and that the original data generator had an acceptable QA program in place.

18.5 Meteorological Data from Other Sources

Meteorological data are gathered from other sources such as the U.S. Weather Service or GBBUAPCD to provide information required when developing monitoring sites, computing corrections needed to convert form standard conditions to local conditions, and to support analysis and modeling efforts. These data are not reported to AQS and are clearly identified when used.

19.0 DATA MANAGEMENT (Element B10)

This section describes the data management operations pertaining to PM-10 measurements by the Bishop Tribe's Air Quality Program. It provides the requirements data transfer from the sampler into the database and data reporting. The operations include recording, validations, calculations, transmittal, analysis, storage, and retrieval.

All sampling data will be entered into the tribal air database through direct electronic transfer. Data are organized and filed as shown in Table 4. The database is maintained on the office's desktop computers. In addition, analog data are maintained on the TREX server.

19.1 Data Transfers

All data transfers are automated. Digital data are downloaded to a dedicated computer, transferred to a second computer and verified every 24 hours. Digital data are backed up to the EMO server monthly.

Analog data are transmitted to a ZENO data logger that polls the TEOM/FDMS every second and compiles this information into 5-minute averages. The LEADS system supplied by IPS MeteoStar in turn polls the ZENO remotely via a web-based system, every 15 minutes and

compiles this information into one-hour averages. This information is stored on the TREX server, located at the Institute for Environmental Professionals at Northern Arizona University. The data are protected by a firewall but are available for secure editing by the Air Quality Specialist. Analog data are archived as part of regular server maintenance.

19.2 Data Recording

All data downloading activities are automated and the corresponding file structure and file creation / modification dates create an electronic record. Separate files are maintained for analysis, using a standard nomenclature. Any changes to the files are documented electronically within each file.

19.3 Data Validation

Data validation involves checking that data processing operations have been carried out correctly and monitoring the quality of the field operations. The original raw data files are never edited, only copied. Data flags are added to second-generation files that are maintained in separate directories, using a distinct nomenclature. Analytic files are also maintained separately and any edits for analysis are documented within those files. The original data can always be recovered because they are not changed.

The following validation functions are incorporated into the database to ensure quality of data entry and data processing operations. Digital data are examined daily. Analog data are examined monthly and during manual editing for submission to AQS. Table 14 describes the checks that are routinely performed.

Table 14. Data Validation Checks

Measurement	Range	Completeness	Internal consistency	Comments
ANALOG CHANNELS				
1-Hour Mass Concentration (PRC 57)	-50 to 1000 µg/m^3	One value for each hour. A day is complete when the data are 75% complete	1-Hour Mass Concentration = Base Mass Concentration – Reference Mass Concentration	Large negative values may occur during routine maintenance and are not valid
Base Mass Concentration (PRC 102)	-50 to 1000 µg/m^3	One value for each hour. A day is complete when the data are 75% complete		
Reference Mass Concentration (PRC 104)	-100 to 100 µg/m^3	One value for each hour. A day is complete when the data are 75% complete		
CONTACT CLOSURES				
Status (PRC 41)	NAND 511	One value for each hour	Any non-zero value indicates a potential hardware problem that must be examined.	Sum of numeric values of all status codes

Measurement	Range	Completeness	Internal consistency	Comments
Filter Loading (PRC 35)	< 90	One value for each hour.		Filter loadings over 90% require TEOM filter replacement
DIGITAL DATA				
Date	Format: Day-month-year Day: 1 to 31 Month: Jan to Dec Year: 2003 to current year	One value for each hour.		
Time	Format – hour:minute:second Hour 1-24 Minute and second 1-60	One value for each hour.		
Main flow (PRC 39)	2.70 l/min to 3.30 l/min	One value for each hour.	Sum of main and auxiliary flow = 16.67 l/min ± 10%	3.00 ± 10%, good correspondence to most recent flow check, no drift
Auxiliary flow (PRC 40)	12.30 l/min to 15.04 l/min	One value for each hour.		13.67 ± 10%, good correspondence to most recent flow check, no drift
Cap Temperature (PRC 27)	29.500 to 30.500°C	One value for each hour.	Out of range values will generate a status code T=2	30.000 ± 0.5°C
Sample Dew Point (PRC 99)	< 4°C	One value for each hour	Out of range values will generate a status code D=128	
Status (PRC 41)	0 to 511	One value for each hour	Any non-zero value indicates a potential hardware problem that must be examined.	Sum of numeric values of all status codes
Base Mass Concentration (PRC 102)	-50 to 1000 µg/m^3	One value for each hour		
Reference Mass Concentration (PRC 104)	-100 to 100 µg/m^3	One value for each hour		
1-Hour Mass Concentration (PRC 57)	-50 to 1000 µg/m^3	One value for each hour. A day is complete when the data are 75% complete		Large negative values may occur during routine maintenance and are not valid

19.4 AQS Submittal

The Bishop Tribe's Air Program reports all PM-10 ambient air quality data and information specified by the AQS Users Guide (Volume II, Air Quality Data Coding, and Volume III, Air Quality Data Storage), coded in the AQS format. Such air quality data and information are fully screened and validated and are submitted directly to the AQS via electronic transmission, in the format of the AQS, and in accordance with the quarterly schedule. The specific quarterly reporting periods and due dates are shown in the Table 15. Data submissions to AQS were

initiated in 2005. The IPS MeteoStar LEADS software provides automatic transfer of data to AQS format and electronic submittals.

Table 15. Data Reporting Schedule

Reporting Period	Due Date
January 1 – March 31	June 30
April 1 – June 30	September 31
July 1 – September 20	December 31
October 1- December 31	March 31

19.5 Data Reduction

For digital data, daily summaries are computed that included the 24-hour average mass concentration, the maximum hourly concentration and the number of complete observations.

For analog data, the IPS MeteoStar LEADS software routinely computes the maximum hourly average for a given day or month, the second highest hourly average for a given day or month, the minimum hourly average for a given day or month, the 24-hour average, the monthly average, the standard deviation for a given day or month, and the capture rate based on the number of valid hourly averages for a given day or month. These are available on both internal (secure) and external (public) webpages.

19.6 Data Analysis

The Bishop Tribe's Air Program will implement the data summary and analysis requirements contained in 40 CFR 58, Appendix A. It is anticipated that as the program develops, additional data analysis procedures will be developed. The following specific summary statistics will be tracked and reported for the PM network:

- Single sampler bias (based on external performance audits and internal performance evaluations)
- Single sampler precision (based on flow rate checks)
- Network-wide bias and precision (based on flow rate performance audits and performance evaluations)
- Data completeness

19.7 Data Flagging – Sampler Qualifiers

A sample or a result qualifier consists of three or four alphanumeric characters which act as an indicator that the data value (a) did not produce a numeric result, (b) produced a numeric result but it is qualified in some respect relating to the type or validity of the result, or (c) produced a numeric result but for administrative reasons is not to be reported. The Bishop Tribes' Air Program uses standard EPA AQS flags, supplemented by color flagging of specific data points as needed and a verbal description of the problem identified. The flags (alphanumeric and color) are included in electronic records. The verbal descriptions are included in logbooks, electronic operator logs, and validation logs.

These flags and qualifiers will be used both in the field and in the office to signify data that may be suspect due to contamination, special events, or failure to meet QC limits. Some flags are generated by the sampling instrument. These primarily indicate instrument components that

are out of range. Appendix A (SOPs) contains a complete list of the data qualifiers for the field activities.

19.8 Data Storage and Retrieval

Data archive policies are shown in Table 16.

Table 16. Data Archive Policies

Data Type	Medium	Location	Retention Time	Final Disposition
Field Notebooks	Hardcopy	Site	3 years	N/A
PM-10 Database	Electronic (on-line)	Air Quality Specialist's desk and on the TREX server	5 years	N/A

The PM-10 data reside on a database in the Bishop Tribe's Air Program. Three dedicated computers support data management efforts in addition to the TREX server that contains archives of from the on-line data.

- Downloaded digital data are initially stored on a single-use CPU that contains minimal software beyond that needed for data transfer (RPComm and 8500Config)
- Analog data pass through a second dedicated serial server that also contains only essential software for transfer from the ZENO data logger to the TREX server (ZenoCom, manual validation software)
- Data files for manipulation and analysis are stored on a third workstation CPU that is the main desk computer for the Air Quality Specialist
- Data are backed up monthly to the EMO server and subsequently to an external hard drive.

The first and third computers are networked for file sharing. Data from the TREX server are accessed via the internet. The LEADS software offers both secure and non-secure webpages for data acquisition, analysis and validation.

Security of data in the PM-10 database is ensured by the following controls:

- Only specifically identified operators using a password are able to validate and write to the data base files on the TREX server. These data are the primary data base for reporting purposes.
- Only the Air Quality Specialist has access to the two CPUs that store data. Due to the small size of the Environmental Management Office and generally secure facilities, data are not specifically password protected.
- Only EMO staff have access to the EMO server.

20.0 ASSESSMENTS AND RESPONSE ACTIONS (Element C1)

The results of assessments indicate whether the control efforts are adequate or need to be improved. Documentation of all quality assurance and quality control efforts implemented during the data collection, analysis, and reporting phases is important to data users, who can consider the impact of these control efforts on the data quality (see Section 21). Both qualitative and quantitative assessments of the effectiveness of these control efforts identify areas most likely to impact the data quality and the extent of the impact.

In order to ensure the adequate performance of the quality system, the Bishop Tribe's Air Program will perform the following assessments:

- Management Systems Reviews
- Network Reviews
- Systems Audits
- Field Performance Audits
- Data Quality Assessments

20.1 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 is obtained. If a MSR is to be conducted, the GBUAPCD will carry out the activity. Otherwise, Bishop Tribe's Air Program's internal commitment to QA/QC, systems audits, performance audits, network reviews, pre-certification, data management and reporting, and corrective action activities will collectively serve as MSR. The quality control and assessment activities that collectively represent the MSR will use appropriate federal regulations and the Bishop Tribe's Air Program's QAPP to determine the adequate operation of the PM-10 Program and its related quality system. The report will be filed and reported to the Environmental Manager and copies will be available at the Air Quality Specialist's desk (Section 9). Follow-up and progress on corrective actions will be determined by the Air Quality Specialist in consultation with GBUAPCD and the Environmental Manager.

20.2 Network Reviews

The network review is used to determine how well the Bishop Tribe's air monitoring network is achieving its required air monitoring objective, and how it should be modified to continue to meets its objective. A PM network review will be completed annually, as needed. The Air Quality Specialist, in consultation with GBUAPCD will be responsible for conducting the network review.

The following criteria will be considered during the review:

- Date of last review
- Areas where attainment/non-attainment re-designations are taking place or are likely to take place
- Proposed site changes, as needed.

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

- Network files (including updated site information and site photographs), available at the Air Quality Specialist's desk and an integral part of web-based information
- AQS reports
- Air quality summaries for the past five years for the monitors in the network
- Emission inventory information, including regional, local and on-reservation sources, and any relevant inventories conducted by neighboring tribes and GBUAPCD

- National Weather Service summaries for monitoring network area, as needed to supplement tribal meteorological monitoring

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

Number of Monitors – Adequacy of the network will be determined by using the following information:

- Historical monitoring data
- On and off reservation emissions
- Population density
- Best professional judgment

Location of Monitors – Maps, geographical overlays, and GIS-based information will be used as needed to assess the adequacy of monitor locations. Currently all monitors are for particulate matter and are located at the Bishop Tribe's Environmental Management Office. Network review will consider the adequacy of this monitoring location and will examine the need to expand to additional locations and/or monitoring for additional pollutants.

During network review, the stated objective for the current monitoring location 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.

Prior to the site visit, the Air Quality Specialist 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
- Predominant wind direction by season
- Pollution roses if available

A checklist similar to the checklist used by the USEPA Regional offices during their scheduled network reviews will be used. (See *SLAMS/NAMS/PAMS Network Review Guidance*, 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 in 8 cardinal directions (at 45 degree intervals from North, clockwise)
- Document site conditions, with additional photographs as needed

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 include:

- Siting criteria problems and suggested solutions
- Problems with data submittals and data completion
- Maintenance and replacement of existing monitors and related equipment
- Air quality assurance problems

- Air quality studies and special monitoring programs
- Proposed regulations
- Funding

A report of the network review will be written within two months of the review and filed.

20.3 System Audits

A system audit is a thorough and systematic onsite qualitative audit, where facilities, equipment, personnel, training, procedures, and record keeping are examined for conformance to the QAPP. GBUAPCD will conduct the system audit. The auditor will perform three system audit activities that may be completed separately or combined:

- Field
- Data management – including information collection, flagging, data editing, and security
- Key personnel – including interviews with individuals responsible for planning, field operations, QA/QC, data management, and reporting.

To ensure uniformity of the system audit, an audit checklist will be used.

GBUAPCD will send a copy of the final system audit report to the Bishop Tribes' Air Quality Program, who will forward the information to US EPA Region 9 as part of regular grant reporting activities. Any corrective action taken will be included in the report to US EPA Region 9.

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

- 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 required
- Attachments or appendices that include all audit evaluation and audit finding forms

To prepare the reports, 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 will be compared with observed accomplishments and deficiencies and the audit findings will be reviewed in detail. The system audit report will be submitted to the Bishop Tribe's Environmental Management Office and Air Program for review and comment.

If the Environmental Management Office and/or Air Program 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 following receipt of the written comments. The report will include an agreed-upon schedule for corrective action implementation.

Follow-up and Corrective Action Requirements – The auditor and the Bishop Tribe's Air Program may work together to solve required corrective actions. The Bishop Tribe's Air Program has 30 days to respond to the follow-up and corrective action requirements in the system audit report.

The audit team will review the Bishop Tribe's Air Program responses to the follow-up and corrective action and will work with the Bishop Tribe's Air Program to resolve any discrepancies.

20.4 Field Performance Evaluations

Field performance evaluations reveal how the data are handled, what judgments were made, and whether uncorrected mistakes were made. The audits will be performed every year and will be part of the system audit. The audits will have the same reporting/corrective action requirements as the system audit and will be conducted by GBUAPCD.

20.5 Data Quality Assessment

Measurement statistics and summaries will be calculated and reviewed for each quarter and year, as well as other time periods deemed relevant to the Bishop Tribe's Air Program. For example, data summaries may be reviewed for each season, during periods of high winds, fires, traffic, or construction. In general, the data will be reviewed each month. The statistics described in Section 14 will be calculated as well as the average PM-10 concentration during the time period, the range of valid concentrations measured, the times of the highest concentrations, times of the lowest concentrations, and the possible reason for changes in these parameters.

20.6 Documentation of Assessments

Table 17 lists each of the assessments.

Table 17. Assessment Summary

Assessment Activity	Frequency	Personnel Responsible	Schedule	Reporting/Resolution
MSR	As needed	Tribe, GBUAPCD, US EPA Region 9	On-going	Tribe, GBUAPCD, US EPA Region 9
Network Review 40 CFR 58 App E App F/G	Annually	Tribe, GBUAPCD, US EPA Region 9	Starting April 2003	Tribe, GBUAPCD, US EPA Region 9
System Audits	Annually	Tribe, GBUAPCD, US EPA Region 9	Starting in FY2005	Tribe, GBUAPCD, US EPA Region 9
Data Quality Assessment	Annually	Tribe, GBUAPCD, US EPA Region 9	Starting April 2003	Tribe, GBUAPCD, US EPA Region 9

21.0 REPORTS TO MANAGEMENT (Element C2)

This section describes the quality-related reports and communications to management necessary to support PM network operations.

21.1 Network Reviews

40 CFR Part 58 Appendix A, Section 4(a), revised July 18, 1997 states that data to be used for comparison to the NAAQS should be reported to the EPA AQS. Reporting to AQS started in 2005.

The Bishop Tribe's Air Quality Specialist has provided a list of all monitoring sites, and their AQS site identification codes and submitted the list to the US EPA Office, with a copy to the Air Quality Subsystem (AQS). The AQS is US EPA's computerized system for storing and reporting of information relating to ambient air quality data. Whenever there is a change in this list of monitoring sites in a reporting organization, the Bishop Tribe's Air Quality Specialist will report this change to the US EPA Region 9 Office and to AQS. When there are changes in location of monitors or the network design is reviewed and found to be satisfactory, a revised QAPP will be issued. Copies of the revisions will be included in the annual report to the EPA Region 9.

21.2 Quarterly Reports

Each quarter, the Bishop Tribe's Air Program reports to AQS the results of all precision and accuracy test it has carried out during the preceding quarter. The quarterly reports are submitted, consistent with the data reporting requirements specified for air quality data as set forth in 40 CFR 58, Appendix A, Section 4.

Required accuracy and precision data are to be reported on the same schedule as quarterly monitoring data submittals. The required reporting periods and due dates are listed in Table 18.

Table 18. Quarterly Reporting Schedule

Reporting Period	Due On or Before
January 1 – March 31	June 30
April 1 – June 30	September 30
July 1 – September 30	December 31
October – December 31	March 31 (following year)

Air quality data submittal for each reporting period are edited, validated, and entered into the AQS using the procedures described in the AQS Users Guide, Volume II, Air Quality Data Coding. The Bishop Tribe's Air Quality Specialist is responsible for preparing the data reports for transmission to USEPA. The IPS MeteoStar LEADS software has the capability of automatically generating AQS reports, following manual validation. This automated electronic system avoids any transcription or data entry errors that might otherwise occur in the report generation process. AQS started in 2005.

21.3 Technical System Audit Reports

The Bishop Tribe's Air Program performs regular Technical Systems Audits of the entire monitoring system (Section 20). These audits are conducted by GBUAPCD. These reports are issued by GBUAPCD and submitted to the Bishop Tribe's Air Quality Specialist for review and comment. The final reports are submitted to US EPA Region 9 and are available for review at the Air Quality Specialist's desk.

External technical system audits are conducted at least every three years by the US EPA Region 9 as required by 40 CFR 58, Appendix A, Section 2.5; provided staff are available.

21.4 Control Charts

Control charts are used as needed to supplement regular instrument performance information collected as part of bi-weekly precision checks, quarterly, semi-annual and annual maintenance. They are used to locate suspected trends in instrument performance. The charts and instrument performance data are available to auditors from GBUAPCD and are available for review at the Air Quality Specialist's desk.

21.5 Responsible Organizations

The following paragraphs describe key personnel involved with QA reporting.

Air Quality Specialist – The ultimate responsibility for the quality of the data and the technical operation of the PM monitoring network rests with the Air Quality Specialist. In addition, the Air Quality Specialist is responsible for ensuring that formal and informal performance evaluations and internal and external audits are conducted on schedule, for reviewing results and for taking appropriate corrective action.

The Air Quality Specialist is also responsible for the data collected from all PM monitors in the Bishop Tribe's Air Program monitoring network, including identifying problems and taking appropriate corrective action, documented through instruments logs. The Air Quality Specialist is also responsible for reviewing QC data and for assuring that repairs and preventive maintenance are completed and that the maintenance is effective.

The Air Quality Specialist is responsible for compiling and publishing Bishop Tribe's Air Program data; maintaining a computerized database containing the data and developing systems and processes for distributing these data in electronic form; identifying areas attaining and not attaining the Bishop Tribe's air quality standards; evaluating air quality trends and developing tools for determining and presenting these trends; and analyzing and interpreting air quality data in the context of meteorological and emission data to explain the causes and mechanisms responsible for the Bishop Tribe's air quality problems.

The Air Quality Specialist manages, archives, and distributes the data, including resolving discrepancies in data, providing for the orderly and efficient transfer of data from data collection to the database, and distributing the data to meet program needs. Further specific duties include the development and implementation of enhancements to the data management systems and to the forms of data distribution and access used to perform the above, and the evaluation of siting issues, including annual network reviews.

The Air Quality is responsible for assessing the acceptability of the air quality data prior to its use, purchasing NIST-traceable standards, assuring regular calibration of flow standards used in the field by an external entity, and generating QC reports.

Environmental Technician – In the future, the Bishop Tribe's Air Program proposes adding an Environmental Technician who will assist with routine maintenance and instrument verification. This will enhance separation of quality assurance duties.

Environmental Manager – The Environmental Manager is responsible for ensuring that the Air Quality Specialist has the appropriate skills, experience and resources necessary to carry out the job. In addition, the Environmental Manager is responsible for regular performance reviews of the Air Quality Specialist and may review any internal or external audit information.

Outside Auditor – The Outside Auditor conducts regular audits with the goal of ensuring quality assurance, quality assessment, and quality control activities and that ambient air quality data meet or exceed the data quality objectives of the tribe.

22.0 DATA REVIEW, VALIDATION AND VERIFICATION REQUIREMENTS
(Element D1)

This section describes data verification and validation procedures. Verification can be defined as confirmation by examination and provision of objective evidence that specified *requirements* have been fulfilled. Validation can be defined as confirmation by examination and provision of objective evidence that the particular requirements *for a specified intended use* are fulfilled. Although there are a number of objectives of ambient air data, the major objective for the Bishop Tribe's Air Program PM network is for comparison to the tribe's air quality standards and to the NAAQS and therefore, this will be identified as the intended use.

22.1 Sampling Design

The objective of the sampling design is to represent the population of interest at adequate levels of spatial and temporal resolution.

Once a year, the Bishop Tribe's Air Program will perform a network review to determine whether the network objectives, as described in the Network Design Plan, are still being met, and that the sites are meeting the CFR siting criteria (see Section 20).

Every three years US EPA Region 9 will conduct a network review to determine whether the network objectives, are still being met, and that the sites are meeting the CFR siting criteria, provided staff are available.

The ambient air data derived from the site will be used to validate the sampling design. This information will be included in network review documentation and communicated to the US EPA Region 9 Office.

22.2 Data Collection Procedures

System audits will be used to verify that the data collection activity is being performed as described in this QAPP and the SOPs. Deviations from the data collection activity will be noted in audit finding forms and corrected and reported to management. The use of QC checks that have been placed throughout the measurement process help validate the activities occurring at each phase. The review of QC data such as the performance evaluation, and the sampling equipment verification checks that are described in Sections 14 can be used to validate the data collection activities. Any data that indicates unacceptable levels of bias or precision or a tendency will be flagged and investigated.

22.3 Quality Control

Section 14 of this QAPP specifies the QC checks that are to be performed during data collection. These include the use of flow rate transfer standards and instrument checks, which provide indications of the quality of data.

Validation of QC procedures includes a review of the documentation of the corrective actions that were taken when QC checks failed to meet the acceptance criteria, and the potential effect of the corrective actions on the validity of the routine data. This review is conducted on an ongoing basis by the Air Quality Specialist and the Outside Auditor.

22.4 Calibration

Routine instrument performance checks are performed to ensure stable performance. The calibration certificate of the flow rate transfer standard will be kept in the instrument file and available during an audit. The flow transfer standard is sent to the manufacturer annually for re-calibration.

The calibration of the sampler itself is recorded in the original paperwork received with the sampler, and calibration is verified through the regular sequence of flow checks, calibrations and regular maintenance. If degradation in instrument performance is observed during routine instrument performance checks, calibration or maintenance, it will indicate some change in the system. Any data that indicates unacceptable levels of bias or precision will be flagged and investigated. Corrective action will be taken as needed. Validation includes the review of the documentation to ensure corrective action was taken as prescribed in the QAPP.

22.5 Data Reduction and Processing

System audits will be performed to ensure the data reduction and processing activities described in this QAPP are being followed. As part of the audits of data quality, a number of data records chosen at random will be identified. All raw data files, including the following will be selected:

- Downloaded data
- Routine instrument performance and maintenance records
- Corrective action procedures and whether they were successful
- Data reduction

Since all data transfers are electronic, no transcription errors are expected. Files will be reviewed to ensure that appropriate flags have been incorporated and appropriate corrective action has been taken when needed.

23.0 VALIDATION AND VERIFICATION METHODS (Element D2)

Exceptional field events may occur and field activities may negatively affect the integrity of data files. In addition, some of the QC checks will fail to meet the requirements. Information on problems that affect the integrity of data is identified in the form of data qualifiers or flags

(Appendix A). It is important to determine how these failures affect the routine data. This section describes the methods that will be used to evaluate the data.

A thorough review of the data will be conducted for completeness and accuracy. Data will be reviewed for outliers and values outside of acceptance criteria. These data will be flagged. Details of these activities are discussed in Section 19.

Records of all invalid data files are filed electronically and can be retrieved for future re-verification. Information noted with the result includes a brief summary of the reasons for invalidation along with the associated flags. This record will be available on the database in the operator and validation logs.

23.1 Validation of Measurement Values

Information from the owner's manual, 40 CFR 58 Appendix A and the site operator's judgment are used to invalidate a data file or measurement. The record of flags is available as part of the IPS MeteoStar LEADS system on the TREX server. It includes both the operator and the manual validation logs.

All efforts will be made to take corrective actions, depending on the type of QC checks that were outside of acceptance criteria, to correct the problem. If the results remain outside the criteria, the results will be flagged until the problem is corrected.

24.0 RECONCILIATION WITH USER REQUIREMENTS (Element D3)

Reconciliation with the data quality objectives (DQOs) involves reviewing both routine and QA/QC data to determine whether the DQOs have been attained and that the data is adequate for its intended use. This process is termed data quality assessment (DQA).

The data used in decisions on for comparison to tribal air quality standards and NAAQS are never error free and will always contain some level of uncertainty. Because of these uncertainties or errors, both false positives and false negatives may occur. There can be serious political, economic and health consequences of making such decision errors. Therefore, the Bishop Tribe's Air Program needs to understand and set limits on the probabilities of making incorrect decisions with these data. In order to set probability limits on decision errors, the Bishop Tribe's Air Program needs to understand and control uncertainty. Uncertainty is used as a generic term to describe the sum of all sources of error associated with a measurement result.

The measurement quality objectives (MQOs) listed in Table 3 are the goals for measurement uncertainty that, if met, will achieve the overall data quality objectives for this project. The following sections describe how the calculations will be made to determine if the MQOs have been met.

There are two components of measurement error. Systematic (or bias) errors cause results to be generally always high or always low. These errors are often caused by improper calibration or drift in an electronic or manual setting. Random (or precision) error causes results to be

sometimes high and sometimes low, and these errors cannot be eliminated because they are intrinsic to the instrument variability. In the NAAQS, total error is termed accuracy. The quality control measurements made in this program with this automated sampler estimate precision error of the flow rate and the bias of the constants in the sampler software. Total error, or accuracy, is estimated with the external audits described in section 24.2.

24.1 Calculations for Precision

The Bishop Tribe's Air Program maintains one PM-10 sampler and records the flow rate at least every two weeks. This flow rate is compared to the set-point flow rate, as shown in equation 1 of section 14. If at any time, this percent difference exceeds $\pm$7%, an investigation into the cause of the difference is made. This procedure is described in Section 14.

24.2 Calculations for Accuracy

Accuracy is based on the results of quarterly audits. Each sampler is externally audited quarterly (see section 14.3 for the definition of an external audit) with a flow rate transfer standard. If the percent difference between the instrument specifications and the audit flow transfer standard exceeds $\pm$10% then there will be an investigation and possible recalibration or repair.

The Bishop Tribe's Air Program will gather PM-10 data for a minimum of 3 years adhering to the requirements in this QAPP. The data will ultimately be used to make long-term decisions on the conditions affecting air quality and the operations of the air sampling network.

ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
CAA	Clean Air Act
CV	coefficient of variation, or sample standard deviation divided by the mean
CFR	Code of Federal Regulations
COC	chain of custody
DQA	data quality assessment
DQOs	data quality objectives
EMO	Environmental Management Office
EPA	Environmental Protection Agency
FEM	Federal equivalent method
MQOs	measurement quality objectives
MSR	management system review
NAAQS	National Ambient Air Quality Standards
NIST	National Institute of Standards and Technology
OAQPS	Office of Air Quality Planning and Standards
PM-10	particulate matter $\leq$ 10 microns
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RPD	relative percent difference
SOP	standard operating procedure
T_a	temperature, ambient or actual
TREX	Tribal Environmental Exchange Network
TSA	technical system audit
TSP	total suspended particulate
V_a	air volume, at ambient or actual conditions

APPENDIX A
STANDARD OPERATING PROCEDURES

SOP 1. DATA VERIFICATIONS AND MANAGEMENT

Digital Data

Downloads take place every 24 hours, using RPComm Software (Operating Manual, Series 8500 FDMS, Revision B, Section 10.2.7). These files are automatically stored into a series of sequentially numbered files that contain the machine serial number. The downloaded files are stored in the file TEOM PM10, located on a dedicated machine. Each row of the file represents one hour's worth of data.

The parameters down loaded are listed in Table A.1 below.

Table A.1. Digital Data Parameters

Parameter	Frequency	Comment
Date	Every hour	Automatic field
Time	Every hour	Automatic field
Main flow (PRC 39)	Every hour	
Auxiliary flow (PRC 40)	Every hour	
Cap Temperature (PRC 27)	Every hour	Diagnostic field (may vary)
Sample Dew Point (PRC 99)	Every hour	Diagnostic field (may vary)
Status (PRC 41)	Every hour	
Base Mass Concentration (PRC 102)	Every hour	
Reference Mass Concentration (PRC 104)	Every hour	
1-Hour Mass Concentration (PRC 57)	Every hour	

Validation – Downloaded files are copied to a second machine for validation and analysis, with no editing or changes in file names. They are stored in a similarly named directory "TEOM PM10 downloads." These files are copied to a second directory "TEOM raw data" and renamed using the nomenclature "TEOM PM10 *date*." Next the files are imported into a monthly Excel spreadsheet with a separate tab for each day, called "TEOM *month year*." This file is used for validation.

Each day the files in "TEOM *month year*" are examined to verify that flow rates and operating temperatures are within range and no additional status flags are present in the data. Using the forms for maintenance and calibration (SOP 2) spread sheet rows are flagged in *gold* during the times where maintenance is carried out. An annotation is added at the bottom of the column containing 1-hour mass concentrations indicating the nature of the maintenance and start and stop times. Additional fields may be added containing internal consistency calculations, such as verifying that flows and temperature are within standards or that Base and Reference Mass add to the 1-Hour Mass Concentration.

Analysis – Daily graphs may be carried out by creating a second daily tab with 1-Hour Mass Concentrations and appending 24-hour averages. All notes are transferred with the data and invalid values may be deleted (flagged in *gold*) for analyses.

Monthly analyses are completed by transferring the 1-Hour Mass Concentrations to an annual summary spread sheet, with one tab for each month, named "TEOM *year*." All notes are transferred with the data. Invalid values may be deleted (flagged in *gold*) for analyses.

This file contains at least the following summary statistics for each day: 24-hour average concentration, minimum hourly concentration, maximum concentration and the number of valid hours. Each month a graph is created containing 24-hour average concentrations and hourly maximum concentrations for each day of the month. This file is used for additional analyses as needed.

Data Back-Up – Data are organized into monthly files (where individual files are created for each day) using the nomenclature "TEOM *file type month year*," and are backed up to the EMO server which is in turn automatically backed up to an external hard drive.

Analog Data

Data Transfer – Analog and contact closure information is automatically transferred to the ZENO data logger. This data logger is connected to a dedicated computer which automatically transfers data to the remotely-located TREX server, using the LEAD software developed by IPS MeteoStar. Data are automatically transferred to the US EPA AirNow data base.

The parameters transferred are listed in Table A.2 below.

Table A.2. Analog and Contact Closure Data Parameters

Parameter	Frequency	Comment
ANALOG CHANNELS		
1-Hour Mass Concentration (PRC 57)	Every hour	Collected via ZENO data logger and LEADS software
Base Mass Concentration (PRC 102)	Every hour	Collected via ZENO data logger and LEADS software
Reference Mass Concentration (PRC 104)	Every hour	Collected via ZENO data logger and LEADS software
CONTACT CLOSURES		
Status (PRC 41)	Every hour	Collected via ZENO data logger and LEADS software
Filter Loading (PRC 35)	Every hour	Collected via ZENO data logger and LEADS software

Validation is carried out monthly using the Manual Validation software developed by IPS MeteoStar (MeteoStar LEADS Training Manual). Standard AQS validation codes are appended to the data at the end of each month. Table A.3 below contains these codes. Because this software is designed to accommodate many different types of monitors, only certain codes are regularly used. The codes most commonly used are highlighted in *light blue*.

Table A.3. Manual Validation Codes on Manual Validation Software

Flag	Code	Priority	Description
NOL	9987	14	Instrument not on line – seen before first successful calibration of a parameter
AQI	9979	13	Manually set to invalidate data
QRE	9985	12	Manually set to invalidate data
CAL	9995	11	Calibration in progress – automatically set by the ZENO-based communications with Dasibi

Flag	Code	Priority	Description
SPN	9998	10	Span check in progress – automatically set by the ZENO-based communications with Dasibi
SPZ	9998	9	Span-Zero check in progress – automatically set by the ZENO-based communications with Dasibi
MAL	9978	8	Instrument malfunction – this is manually set to invalidate data
QAS	9992	7	Quality Assurance check in progress – manually set during verifications and audits
PMA	9993	6	Instrument in preventative maintenance mode – manually set
LIM	9980	5	Data failed one or more automatic quality checks – automatically set
FEW	9975	4	Not enough samples to create an hourly average – automatically set
NEG	9979	3	Data failed NEG test – automatically below established minimum
MUL	9979	2	Related parameters do not balance – automatically set
LST	9983	1	Lost or missing data – insufficient data for sample period
VAL	N/A	0	Data if valid

Analysis – A variety of analytic files are created in web pages available on the IPS MeteoStar LEADS. The web pages most commonly used for analysis are the "*Monthly Summary*" and "*CAMS Data Printout*" (MeteoStar LEADS Training).

Pollution roses that combine meteorological and air quality data from the Bishop Tribe's monitoring stations are also available using the Manual Validation software and are created as necessary, at a minimum at the end of each month summarizing the previous month.

AQS Submission was initiated in 2005 using the Manual Validation software.

SOP 2. INSTRUMENT MAINTENANCE AND CALIBRATION

Weekly Checks, Bi-Weekly Precision Checks and Quarterly Maintenance

Weekly Checks involve a check of internal values measured by the instrument and available from the TEOM/FDMS main display. Values are recorded directly on the form labeled "TEOM/FDMS Weekly Check and Bi-Weekly Precision Check," attached. A new form is started every calendar month.

Bi-Weekly Precision Checks involve

- Direct measurement of the main and total flows using an external transfer standard (Operating Manual, Series 8500 FDMS, Revision B, Section 12.2.4)
- Temperature and pressure verification using an external standard (Operating Manual, Series 8500 FDMS, Revision B, Section 12.2.2 and 12.2.3)
- Cleaning the pump chamber
- Replacing the A/C filter and cleaning the condenser coils (Operating Manual, Series 8500 FDMS, Revision B, Section K.6.1.3)
- Cleaning the A/C filters

The results are recorded on the second page of the form labeled "Weekly Check and Bi-Weekly Precision Check," attached.

Every 4 Weeks the following procedures are also undertaken

- Replacing the TEOM and FDMS filters (Operating Manual, Series 8500 FDMS, Revision B, Sections 3.1.2 to 3.1.4 and 3.2)
- Replacing the inlet
- Cleaning the inlet (TEOM Series 1400a, Service Manual, Section 3.1.1)

The results are recorded on the second page of the form labeled "Weekly Check and Bi-Weekly Precision Check," attached.

Every Quarter the following additional procedures are also undertaken

- Direct measurement of the auxiliary flow using an external transfer standard (attach the flow standard to the bypass flow immediately after the flow splitter)
- Leak check (Operating Manual, Series 8500 FDMS, Revision B, Section 3.5)

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

TEOM / FDMS WEEKLY CHECK AND BI-WEEKLY PRECISION CHECK – PM-10

WEEKLY CHECK
Check Main Screen and write down all entries exactly as they appear on the TEOM/FDMS display.

Operator	Toni Richards	Toni Richards	Toni Richards	Toni Richards
Date				
Current Status Condition				
Current Operating Mode				
Status Watch				
Filter Loading Percentage*				
RS 232 Mode				
Protection Level				
Current time (PST)				
Mass Concentration				
01-Hr MC				
08-Hr MC				
12-Hr MC				
24-Hr MC				
Tot Mass				
Case Temp (°C)				
Air Temp (°C)				
Cap Temp (°C)				
Main Flow (lpm)				
Aux Flow (lpm)				
Noise				
Frequency				

Notes: * Replace TEOM and FDMS filters when filter loading reaches 90% or every 4 weeks whichever is sooner.

Comments

BI-WEEKLY PRECISION CHECK – PM-10

ZENO – set data to "q" mode. TIME _____

Flow check

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	

Flow check first then replace filters

	Teom Design Values	Teom Current Displayed Values	Percent Difference (design – display)	Limit Values	Calibration Device (1 minute collection)	Difference (display – audit)	Limit Values
Total Flow	(calculate)	(calculate)	n/a	n/a	Max Min Avg		± 1 lpm or 7%
Main Flow (lpm)				± 2 %	Max Min Avg		± 0.2 lpm or 7%
Aux Flow (lpm) -- quarterly				± 2 %	Max Min Avg		
Amb. Temperature (°C)	n/a	Start End	n/a	n/a	Max Min Avg		±2° C
Remote					Max Min Avg		
Amb. Pressure (mm Hg)	n/a		n/a	n/a	Max Min Avg		±10 mm Hg or (.013 atm)

2 weeks – A/C Maintenance

Exchange A/C filter		Clean condenser coils	

4 weeks – Filters and Inlet; check shelter attachment; clean pump chamber

Check bolts		Check Seal		Clean Pump Chamber	
Replace FDMS filter		Replace TEOM filter		Exchange Inlet	

Reset unit after replacing filters <F1>

Quarterly – Leak check

	Stage 1 – Flow audit adapter closed, pump running	Stage 2 – Flow audit adapter closed, pump off	Limiting values
Main Flow (lpm)			Less than 0.15
Auxilliary Flow (lpm)			Less than 0.65

ZENO – set data to "k" mode. TIME _____

Comments

BI-WEEKLY PRECISION CHECK – PM-10

ZENO – set data to "q" mode. TIME _____

Flow check

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	

Flow check first then replace filters

	Teom Design Values	Teom Current Displayed Values	Percent Difference (design – display)	Limit Values	Calibration Device (1 minute collection)	Difference (display – audit)	Limit Values
Total Flow	(calculate)	(calculate)	n/a	n/a	Max Min Avg		± 1 lpm or 7%
Main Flow (lpm)				± 2 %	Max Min Avg		± 0.2 lpm or 7%
Aux Flow (lpm) -- quarterly				± 2 %	Max Min Avg		
Amb. Temperature (°C)	n/a	Start End	n/a	n/a	Max Min Avg		±2° C
Remote					Max Min Avg		
Amb. Pressure (mm Hg)	n/a		n/a	n/a	Max Min Avg		±10 mm Hg or (.013 atm)

2 weeks – A/C Maintenance

Exchange A/C filter		Clean condenser coils	

4 weeks – Filters and Inlet; check shelter attachment; clean pump chamber

Check bolts		Check Seal		Clean Pump Chamber	
Replace FDMS filter		Replace TEOM filter		Exchange Inlet	

Reset unit after replacing filters <F1>

Quarterly – Leak check

	Stage 1 – Flow audit adapter closed, pump running	Stage 2 – Flow audit adapter closed, pump off	Limiting values
Main Flow (lpm)			Less than 0.15
Auxilliary Flow (lpm)			Less than 0.65

ZENO – set data to "k" mode. TIME _____

Comments

Semi-Annual Maintenance

Semi Annual Maintenance involves all of the components of weekly, bi-weekly and quarterly checks in addition to the following items. Values are recorded directly on the forms labeled "TEOM/FDMS CPU and Pump Test" and "TEOM/FDMS Mass Flow Controller Software Calibration," attached

- Battery CPU test (Service Manual, TEOM Series 1400a, Section 3.1.4)
- In-line pump verification (per R&P supplemental instructions or Service Manual TEOM Series 1400a, Section 3.1.5)
- Rebuild/replace pump if pump test fails (pump re-build kit instructions)
- Replace in-line filters (Service Manual, TEOM Series 1400a, Section 3.1.3)
- Mass flow controller software calibration (if needed) (Service Manual, TEOM Series 1400a, Section 3.5.1)

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

TEOM / FDMS CPU AND PUMP TEST

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	
Test CPU Battery	Observed voltage		Limiting value: Change battery if less than 2.75 V DC		
Test Pump in-line			Limiting value: Vacuum gauge < 20 in Hg Replace / rebuild if < 20 in Hg		

Alternate pump test

Test Pump	Filter percentage where main and / or aux flow decreases			Limiting value: Replace / rebuild pump if filter percentage less than 90 %
	Filter Percentage	Main	Aux	

Replace in-line filters every 6 months.

Comments

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ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

TEOM / FDMS FLOW CONTROLLER SOFTWARE CALIBRATION

Replace in-line filters prior to starting this procedure.

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	
Mass Flow Controlled Calibration (Software)	F-Main set point lpm		F-Aux Set point lpm		
	Avg Temp Setting (left) (T A/S)		Avg Pressure Setting (left) (P A/S)		
	F-adj Main		F-adj Aux		
	Temp reset to current condition °C		Pressure reset to current conditions Atm		
	Sensor Flow (Main) lpm	Difference between observed flow (Main) and set point lpm %		F-adj Main (final)	
	Sensor Flow (Aux) lpm	Difference between observed flow (Aux) and set point lpm %		F-adj Aux (final)	
	Reset Avg Temp Setting (left) to original setting		Reset Avg Pressure Setting (left) to original setting		

Comments

Annual Maintenance

Annual Maintenance involves all of the components of weekly, bi-weekly and quarterly checks in addition to the following items. Values are recorded directly on a series of forms for each activity, attached:

- "Checklist for Annual Maintenance"
- "TEOM/FDMS CPU and Pump Test" (TEOM Series 1400a, Service Manual, Section 3.1.5 and amended instructions from R&P)
- Pump replacement and rebuild if pump fails pump test or has been in operation for over 12 months (pump rebuild kit instructions)
- "TEOM/FDMS Analog Calibration" (TEOM Series 1400a, Service Manual, Section 3.2.1)
- "TEOM/FDMS Temperature and Pressure Calibration" (TEOM Series 1400a, Service Manual, Sections 3.2.3 and 3.2.4)
- Replacing in-line filters (TEOM Series 1400a, Service Manual, Section 3.1.3)
- "TEOM/FDMS Flow Controller Calibration" (TEOM Series 1400a, Service Manual, Section 3.5.1)
- "TEOM/FDMS Mass Transducer Verification" (TEOM Series 1400a, Service Manual, Section 3.2.5)

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

CHECKLIST FOR ANNUAL MAINTENANCE

1. Flow check using bi-weekly form (if due) ***Date completed:***_____
Notes:

2. Pump test ***Date completed:***_____
Notes:

3. Check CPU battery ***Date completed:***_____
Notes:

4. Analog calibration ***Date completed:***_____
Notes:

5. Temperature and pressure calibration ***Date completed:***_____
Notes:

6. Replace in-line filters ***Date completed:***_____
Notes:

7. Flow controller calibration ***Date completed:***_____
Notes:

8. Mass transducer verification ***Date completed:***_____
Notes:

9. Clean air inlet system ***Date completed:***_____
Notes:

10. Clean switching valve on 8500 module ***Date completed:***_____
Notes:

11. Leak check, flow check ***Date completed:***_____
Notes:

Note: amplifier board calibration has been omitted at the recommendation of R&P and GBUAPCD

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

TEOM / FDMS CPU AND PUMP TEST

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	
Test CPU Battery	Observed voltage		Limiting value: Change battery if less than 2.75 V DC		
Test Pump in-line			Limiting value: Vaccuum gauge < 20 in Hg Replace / rebuild if < 20 in Hg		

Alternate pump test

Test Pump	Filter percentage where main and / or aux flow decreases			Limiting value: Replace / rebuild pump if filter percentage less than 90 %
	Filter Percentage	Main	Aux	

Replace in-line filters every 6 months.

Comments

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

TEOM / FDMS ANALOG CALIBRATION

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	

ANALOG OUTPUT

Check Output Jumpers	Jumpers *(factory set to 10V) – (Pins 1-2 are 2VDC and Pins 2-3 are 10VDC)* *Jumpers 1, 2 and 4 are set to 2VDC as of 5/25/04* *Jumpers 0, 3 and 5 are set to 10VDC as of 5/25/04*	
	Set value	Actual value
A0	10 VDC	
A1	2 VDC	
A2	2 VDC	
A3	10 VDC	
A4	2 VDC	
A5	10 VDC	

Check Analog Output	Set A/O to 90% of full scale (90)		
	Set value	Actual value (volt meter)	Final value (volt meter)
A0	10 VDC x 0.90 = **9**		
A1	2 VDC x 0.90 = **1.8**		
A2	2 VDC x 0.90 = **1.8**		
A3	10 VDC x 0.90 = **9**		
A4	2 VDC x 0.90 = **1.8**		
A5	10 VDC x 0.90 = **9**		

ANALOG INPUT

Check Input Jumpers	Jumpers *(default value for Input 0 is 10VDC, rest are factory set to 10VDC) – (Pins 1-2 are 4-20µV, Pins 2-3 are 10V and Pin 3 is 2V)*	
	Set value	Actual value
A0	10 VDC	
A1	10 VDC	
A2	10 VDC	
A3	10 VDC	
A4	10 VDC	
A5	10 VDC	
A6	10 VDC	
A7	10 VDC	
A8 (temp)	10 VDC	
A9	10 VDC	
A10	10 VDC	
A11	10 VDC	
A12	10 VDC	
A13	10 VDC	
A14	10 VDC	
A15	10 VDC	

Check Analog Input	Set A/O to 90% of full scale (0.90 x set VDC)		
	Set value	Actual value	Final value
A0	10 VDC x 0.90 = **9**		
A1	10 VDC x 0.90 = **9**		
A2	10 VDC x 0.90 = **9**		
A3	10 VDC x 0.90 = **9**		
A4	10 VDC x 0.90 = **9**		
A5	10 VDC x 0.90 = **9**		
A6	10 VDC x 0.90 = **9**		
A7	10 VDC x 0.90 = **9**		
A8 (temp)	10 VDC x 0.90 = **9**		*Wait for temp cal*
A9	10 VDC x 0.90 = **9**		
A10	10 VDC x 0.90 = **9**		
A11	10 VDC x 0.90 = **9**		
A12	10 VDC x 0.90 = **9**		
A13	10 VDC x 0.90 = **9**		
A14	10 VDC x 0.90 = **9**		
A15	10 VDC x 0.90 = **9**		

Comments

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

TEOM / FDMS TEMPERATURE AND PRESSURE CALIBRATION

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	

AMBIENT TEMPERATURE

Current Temperature from external thermometer	TEOM current temperature
°C	°C
Adjust potentiometer for analog input 8 until TEOM temperature matches external thermometer	
Repeat current external temperature ***(after 30 seconds)***	Repeat TEOM current temperature ***(after 30 seconds)***
°C	°C
Adjust potentiometer for analog input 8 until TEOM temperature matches external thermometer	
Final Temperature from external thermometer	TEOM final temperature
°C	°C

AMBIENT PRESSURE

Current Pressure from external thermometer	TEOM current pressure
atm	atm
Current reading on Potentiometer R304	
VDC	***Adjust until reading is 10.000VDC ±0.001V***
Final reading on Potentiometer R304	
VDC	***Adjust until reading is 10.000VDC ±0.001V***
Adjust potentiometer R509 until TEOM pressure matches external barometer	
Repeat current external pressure ***(after 30 seconds)***	Repeat TEOM current pressure ***(after 30 seconds)***
atm	atm
Adjust potentiometer R509 until TEOM pressure matches external barometer	
Final Pressure from external barometer	TEOM final pressure
°C	°C

Comments

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

TEOM / FDMS FLOW CONTROLLER CALIBRATION

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	

Replace in-line filters	

MAIN FLOW

Current reading on potentiometer R116	
VDC	***Adjust until reading is 10.000VDC ±0.001V***

BYPASS FLOW

Current reading on potentiometer R116	
VDC	***Adjust until reading is 10.000VDC ±0.001V***

TEOM temperature setting (left) (TA/S) ***(99)***	TEOM pressure setting (left) (PA/S) ***(9)***
Current temperature °C	Current pressure Atm
Reset TEOM temperature and pressure to current conditions	

TEOM current FAdj Main	TEOM current FAdj Aux
Reset FAdj Main and FAdj Aux to 1.000	

MAIN (SENSOR) FLOW

Set main flow to 0.5 l/min and wait 10 seconds (use 1 l/min for Streamline Pro)	
Current main flow l/min	***Adjust potentiometer R119 until main flow is 0.5 l/min ± 0.03 l/min***
Main flow after adjustment l/min	
Set main flow to 4.5 l/min and wait 10 seconds (use 4 l/min for Streamline Pro)	
Current main flow l/min	***Adjust potentiometer R126 until main flow is 4.5 l/min ± 0.03 l/min***
Main flow after adjustment l/min	

Repeat if necessary

Set main flow to 0.5 l/min and wait 10 seconds (use 1 l/min for Streamline Pro)	
Current main flow l/min	***Adjust potentiometer R119 until main flow is 0.5 l/min ± 0.03 l/min***
Final main flow l/min	
Set main flow to 4.5 l/min and wait 10 seconds (use 4 l/min for Streamline Pro)	
Current main flow l/min	***Adjust potentiometer R126 until main flow is 4.5 l/min ± 0.03 l/min***
Final main flow l/min	
Return main flow to 3.0 l/min and wait 10 seconds	
Current main flow l/min	***Adjust potentiometer R119 until main flow is 3.0 l/min ± 0.03 l/min***
Final main flow l/min	

BYPASS FLOW

Set bypass flow to 2.0 l/min and wait 10 seconds	
Current bypass flow l/min	***Adjust potentiometer R119 until bypass flow is 2.0 l/min ± 0.2 l/min***
Bypass flow after adjustment l/min	
Set bypass flow to 18 l/min and wait 10 seconds	
Current bypassn flow l/min	***Adjust potentiometer R126 until bypass flow is 18 l/min ± 0.2 l/min***
Bypass flow after adjustment l/min	

Repeat if necessary

Set main flow to 2.0 l/min and wait 10 seconds	
Current bypass flow l/min	***Adjust potentiometer R126 until bypass flow is 2.0 l/min ± 0.2 l/min***
Final bypass flow l/min	
Set bypass flow to 18.0 l/min and wait 10 seconds	
Current bypass flow l/min	***Adjust potentiometer R119 until bypass flow is 18.0 l/min ± 0.2 l/min***
Final bypass flow l/min	
Return bypass flow to 13.67 l/min and wait 10 seconds	
Current bypass flow l/min	***Adjust potentiometer R119 until bypass flow is 13.67 l/min ± 0.2 l/min***
Final bypass flow l/min	

Return TEOM temperature and pressure settings to original settings	
TEOM temperature setting (left) (TA/S)	TEOM pressure setting (left) (PA/S)

Complete leak check and flow check, using bi-weekly form.

Comments

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR PROGRAM

TEOM / FDMS MASS TRANSDUCER VERIFICATION

Operator	Toni Richards				
Date		Start Time (PST)		End Time (PST)	

Weight of calibration filter	***Filt Wght***
Operate without a filter until oscillating frequency reaches a maximum	
Maximum oscillating frequency	f_0
Install calibration verification filter and wait until frequency reaches a maximum	
Maximum oscillating frequency	f_1
Audit K0	
Current K0	
Percentage difference	

Comments