QUALITY ASSURANCE PROJECT PLAN
UTE MOUNTAIN UTE TRIBE
AIR QUALITY MONITORING PROGRAM
FOR AIRBORNE RADIONUCLIDES
WHITE MESA, UTAH

Tomoé Natori

Environmental Programs Department

Ute Mountain Ute Tribe

UTE MOUNTAIN UTE TRIBE
AIR QUALITY PROGRAM IN WHITE MESA UTAH
QUALITY ASSURANCE PROJECT PLAN
IDENTIFICATION AND APPROVAL

Document approved by:

____ Date: _________________
Scott Clow
Director, the Environmental Programs Department/Ute Mountain Ute Tribe

____ Date: _________________
Tomoé Natori
Environmental Specialist/Ute Mountain Ute Tribe

____ Date: _________________
Randy Brown
Tribal Program Manager/EPA Region 8

____ Date: _________________
Carl Daly
Director, Air & Radiation Program/EPA Region 8

____ Date: _________________
Linda Himmelbauer
Director, Quality Assurance Program/EPA Region 8

Acronyms:

AADT-Average Annual Daily Traffic

ADT-Average Daily Traffic

ALARA-As Low as Reasonably Achievable

AMTIC- Ambient Monitoring Technology Information Center

AQS-Air Quality System

AQT-Air Quality Technician

CFR-Code of Federal Regulations

COC-Chain of Custody

DOE-Department of Energy

DQO-Data Quality Objectives

ECL-Effluent Concentration Limits

EPA-Environmental Protection Agency

EPD-Environmental Programs Department

ES-Environmental Specialist

GPS-Global Positioning System

ITEP-Institute for Tribal Environmental Professionals

MQO-Measurement Quality Objective

NAAQS-National Ambient Air Quality Standards

NESHAPS-National Emission Standards for Hazardous Air Pollutants

NIST-National Institute for Standards and Technology

NRC-Nuclear Regulatory Commission

PM-Particulate Matter

QAPP-Quality Assurance Project Plan

QA/QC-Quality Assurance/Quality Control

RH-Relative Humidity

RML-Radioactive Materials License

RPM-Radionuclide-laden Particulate Matter

SOP-Standard Operating Procedure

TSP-Total Suspended Particulates

UAC-Utah Administrative Code

UDAQ-Utah Division of Air Quality

UDEQ-Utah Department of Environmental Quality

UDOT-Utah Department of Transportation

UDRC-Utah Division of Radiation Control

UMUT-Ute Mountain Ute Tribe

UMUAQ-Ute Mountain Ute Tribe Air Quality Monitoring Program

USGS-United States Geological Survey

WM-White Mesa Ute Community

TABLE OF CONTENTS

Distribution List

Paper copies of this QAPP are distributed to the administrators in this **Distribution List**. Revised sections or the entire QAPP are sent to these people. Additionally, this QAPP will be distributed to contractors analyzing data for this program. Upon approval by EPA, this QAPP will also be distributed to Ute Mountain Ute Tribe Council and published on the Environmental Programs Department's website: www.utemountainuteenvironmental.org.

Carl Daly
Director, Air & Radiation Program, EPA Region 8
1595 Wynkoop Street Denver, Colorado 80202-1129
E-mail: daly.carl@epa.gov

Linda Himmelbauer
Director, Quality Assurance Program, EPA Region 8
1595 Wynkoop Street Denver, Colorado 80202-1129
E-mail: himmelbauer.linda@epa.gov

Randy Brown
Tribal Program Manager, EPA Region 8
1595 Wynkoop Street Denver, Colorado 80202-1129
E-mail: brown03.randy@epa.gov

Scott Clow
Director
Ute Mountain Ute Tribe Environmental Programs Department
PO Box 448 Towaoc, CO 81334
E-mail: sclow@utemountain.org

Tomoé Natori
Environmental Specialist
Ute Mountain Ute Tribe Environmental Programs Department
PO Box 448 Towaoc, CO 81334
E-mail:tnatori@utemounatin.org

PROJECT ORGANIZATION

Assignment: Organizational Chart Ute Mountain Ute Tribe Air Quality Monitoring Program

Scott Clow
Director
Ute Mountain Ute Tribe
Environmental Programs Department
PO Box 448 Towaoc, CO 81334
E-mail: sclow@utemountain.org

Responsibilities: Final review of reports, budgeting and grant writing, and review of external audit reports.

Tomoé Natori
Environmental Specialist
Ute Mountain Ute Tribe
Environmental Programs Department
PO Box 448 Towaoc, CO 81334
E-mail: tnatori@utemounatin.org

Responsibilities: Generates reports to EPA and to the public for review by Director. Generates project proposal planning and budgeting, and reviews data collection and procedural responsibilities of Air Quality Technician. Also creates and modifies the summary reports and updates the website.

QA officer, reviews results of QC checks, perform QC of data imports and database, archiving and backing up all the result quarterly for QA to meet the data quality objectives.

Vacant
Air Quality Technician
Ute Mountain Ute Tribe
Environmental Programs Department
E-mail:

Responsibilities: Downloading met station data every four weeks, collecting PM10 filters every week, conducts routine QC checks and logging results, data entry of QC results and importing data into database; reviews and analyzes data. Ships filters to lab and keeps track of COC forms and all filing. Validates and verifies data and data usability.

Reviews all data, including results of QC checks and verifies that they are within limits, flags any data that was gathered if any QC checks fail, files and keeps receipts of lab reports with analysis data and imports the lab data into the database, review of lab data including lab QC checks, verification that the lab is meeting the QC objectives in the contract.

Carl Daly
EPA Region 8
Air & Radiation Program
1595 Wynkoop Street Denver, Colorado 80202-1129
E-mail: daly.carl@epa.gov

Randy Brown
EPA Region 8
Tribal Program Manager
1595 Wynkoop Street Denver, Colorado 80202-1129
E-mail: brown03.randy@epa.gov

Linda Himmelbauer
EPA Region 8
QA Program
1595 Wynkoop Street Denver, Colorado 80202-1129
E-mail: himmelbauer.linda@epa.gov

Amy Wolf
ALS Environmental
Radiochemistry Laboratory
225 Commerce Drive
Fort Collins, CO 80524
E-mail: Amy.Wolf@ALSGlobal.com

I. PROBLEM DEFINITION/BACKGROUND

The Ute Mountain Ute Tribe's Environmental Programs Department (EPD) is initiating Total Suspended Particle (TSP) filter-based local conditions survey and monitoring as part of an area source environmental protection effort following the Environmental Protection Agency (EPA) recommended meteorological data measurement. The monitoring station will be located in White Mesa, Utah. The objective of this air quality (AQ) survey and monitoring effort is to characterize the local AQ conditions by chemical speciation for radioactive particulate matter (RPM) where the ambient AQ measurements are made, to determine the presence or absence of radiation in air and their activities, if present, on Tribal Lands potentially migrating from the neighboring White Mesa Uranium Mill (the Mill). The data will then be used to support the further development and continuation of Tribe's Air Quality Monitoring Program (UMUAQ) in White Mesa, Utah and also to inform the Tribal Council of the result. This Quality Assurance Project Plan (QAPP) describes project locations and methods, refers to EPA-established data quality objectives, and defines data quality assurance and control (QA/QC) methods for AQ monitoring by the UMUAQ. The QAPP was developed to ensure consistent, repeatable results and to improve the reliability and comparability of data collected. This project was developed in response to growing concerns about AQ from the transport and dispersal of radioactive dust, volatile organic compounds and other hazardous air pollutants from the nearby Uranium, Vanadium and alternate feed material processing facility, adjacent to the Tribal lands.

Unidentified emission from White Mesa Uranium Mill. Photo was taken in March 2012.

II. WHITE MESA AIR QUALITY PROJECT DESCRIPTION

The Ute Mountain Ute Tribe (the Tribe) received its first CAA 103 federal funding for the Fiscal Year (FY) 2011, was awarded $75,000 to develop its air quality monitoring program to assess the environmental effects that the Mill may have to the nearby Tribal Lands, and has since been awarded both CAA 103 FY 12 and FY 13 funding of $153,681 each to continue the program development. The measurement goal of the UMUAQ in White Mesa is to estimate the activity, in units of microcuries per milliliter, of RPM in the ambient air on the Tribal land. The Measurement goal is achieved by utilizing American Ecotech's MegaVol 3000 Particulate Sampler (MV3000), purchased in 2012 for $12,000. The primary goal is to survey for the baseline measurements of radionuclide laden particulate matter through selective analysis of the filter, specifically Uranium and those metals associated with the Uranium decay series including Uranium 238, Uranium 235, Uranium 234, Thorium 230, Radium 226, Lead 210 and Polonium 210. Measurements will be performed by using a filter that has been carefully handled according to the UMUAQ's QA/QC protocol, set to collect particulate matter (PM) using the MV3000 for 24 hours at 2,880-3,600m^3 dependent on the performance of the instrument, to then be sent to ALS Laboratory for selective radiochemical analysis. The elapsed run time and estimated volume is chosen to maximize the amount of air volume collected without overloading the filter media, and to avoid excessive wear on the motor.

Installation of the meteorological station, North Pump House White Mesa, Utah.

Data collected will be closely correlated with meteorological measurements to accurately qualify conditions in atmospheric variability to particulate matter collected. QC checks will be made before and after each measurement. The measurements are made to estimate activities of radioactive isotopes in accordance with the EPA guidance and equipment manufacturer's recommendations. Some of the method and performance requirements of the analyzer are adopted from Appendix B of 40 Code of Federal Regulations (CFR) Part 50 (also known as "High Volume Method) to meet our monitoring needs, as this project is not meant to compare against National Ambient Air Quality Standards (NAAQS). Measurements will be made at locations described in Section **VIII-*i***. Measurements will be obtained for time periods at one-in-six day intervals initially. Other studies for our environmental protection effort include a pilot dust study to assess the re-suspension of the ground level RPM and an accompanying Geiger survey for potential soil surface activities where the dust is sampled.

Installation of MV3000 in White Mesa, Utah.

i. Project location

The location of this survey and monitoring program is in White Mesa, Utah, the second population center of the Ute Mountain Ute Tribe. Approximately 200 Tribal members live in White Mesa Community (WM), adjacent to the Mill property, and the closest residence is three miles away. Our AQ monitoring station is installed at North Pump House on Beaver Lane, and consists of the meteorological station and MV3000.

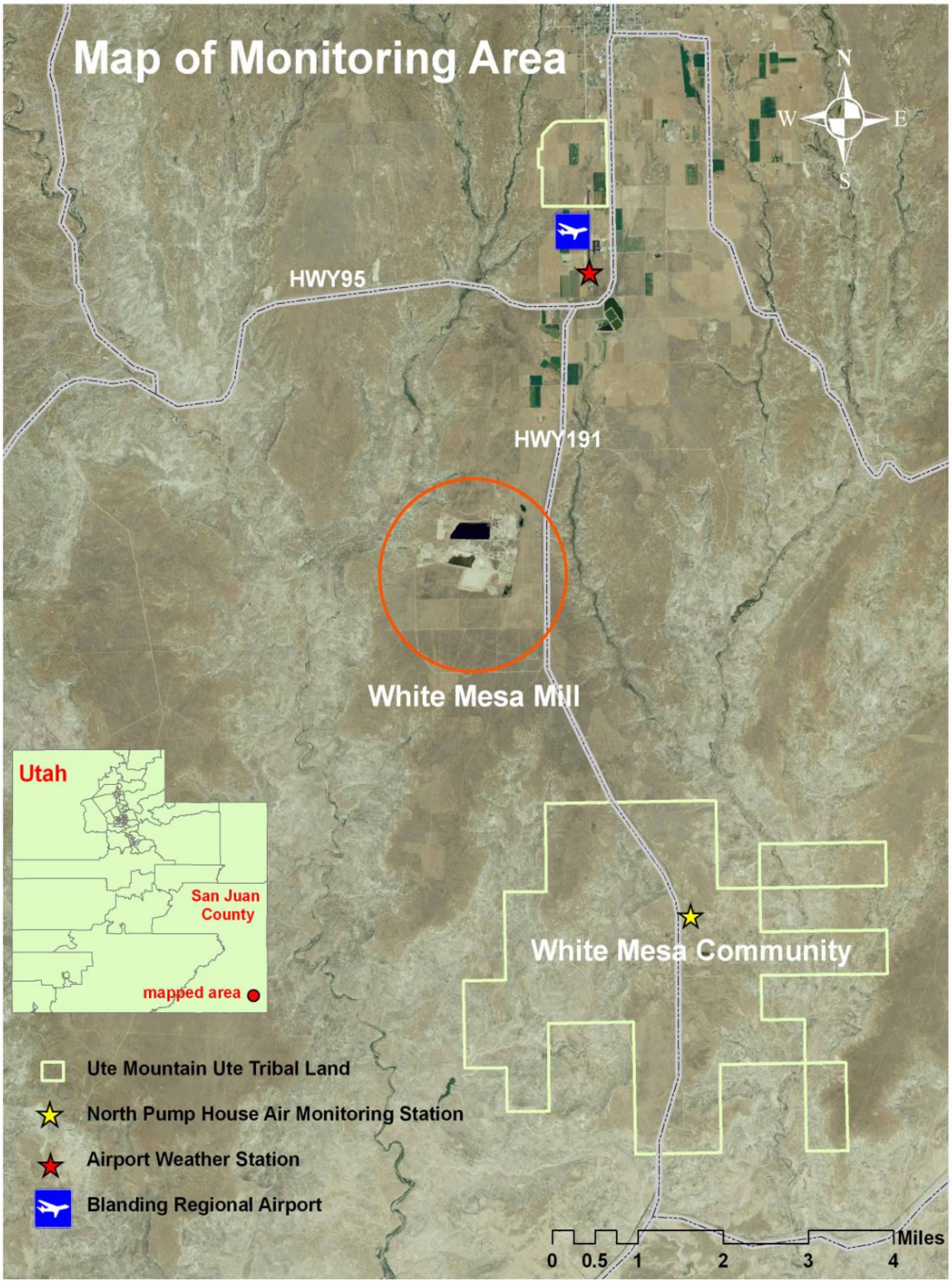

Figure 2.1: Map of southeastern Utah showing White Mesa Mill in relation to White Mesa Ute Community, the air monitoring station located at 37°28'6"N and 109°28'3"W, and surrounding topographic and geographical features.

III. QUALITY OBJECTIVES AND CRITERIA FOR MEASURING DATA

i. Stating the problem

The UMUAQ's inception is derived from concern that AQ conditions have deteriorated on the Tribal land from the Mill three miles North of WM. The EPD Office has received complaints about acidic and rusted metal smells, particularly in the morning and evening and fear of radioactive contamination from drinking the water or grazing their animals on the land. The EPD's past studies on radionuclide analysis on water, sediment and vegetative sampling has suggested offsite migration of Uranium and Vanadium. In 2006, the Tribe requested the EPA and the U.S. Geological Survey (USGS) perform an independent evaluation of the potential offsite migration of radionuclides and trace elements associated with the ore storage and milling process through various exposure pathways to WM. "Potential air…exposure pathways of Uranium and other trace elements to WM include: (1) airborne dust from uncovered ore storage pads; (2) airborne emissions from the Mill's drying ovens; (3) dissolution of airborne dust deposited on soil and plant surfaces; and (4) transport of material from the ore storage pads that are eroded into ephemeral channels draining the Mill site during rain and snowmelt events…resulting in offsite migration toward the reservation (p. 3, David, L. Naftz, 2012). We do not have information on the Tribal lands' AQ and wish to screen the air in WM, beginning first for radionuclides to address the Tribal members' concerns.

a. White Mesa Mill

The Mill has been in operation since 1980 for the conventional processing of Uranium ore for the production of yellow cake (U_3O_8) in addition to a byproduct Vanadium (V_2O_5) recovery circuit. The mill uses sulfuric acid (H_2SO_4), kerosene and other reagents in a leaching and a solvent extraction recovery process to extract and recover the U_3O_8 and V_2O_5. The mill is licensed to process an average of 2,000 tons per day of ore and produce 8.0 million pounds of U_3O_8 per year. This includes 15 license amendments to receive and process 18 different alternate feed materials. The Mill is considered an area pollution source which includes evaporative tailings ponds, ore storage pads and high temperature smokestacks from the drying of U_3O_8 and V_2O_5. The ore delivered to the Mill from mines on the Colorado Plateau has a typical U_3O_8 grade of 0.25-0.30%, naturally occurring U_3O_8, following processing is concentrated to around 90% U_3O_8. The ore remaining after processing or sludge retains around 85% of its initial radioactivity arising from Thorium 230 and Radium 226. Destined for the tailings cells, the sludge contributes the largest source of Radon 222 emissions on the Mill site. With a total of 2,000 tons of ore delivered on site per day, ore piles rapidly accumulate, contributing a large source of offsite migration of RPM. The Mill is regulated by the Utah Department of Environmental Quality (UDEQ) to monitor the ambient air using analysis of the filters at five different locations through the Utah Division of Air Quality (UDAQ) and Radiation Control (UDRC) as stated in the Mill's Radioactive Materials License (RML). The RML requires that the AQ monitoring filters are collected on a weekly basis, averaged for a month, and reported in semi-annual effluent reports. The Mill's analysis includes total Uranium 238, Thorium 230, Lead 210, Radium 226, and total alpha emitted radiation.

ii. Identifying the decision

The UMUAQ's monitoring effort in WM has two purposes: first, to assess the radionuclide presence and activity in the PM in ambient air in picocuries per cubic meters on Tribal lands to compile Tribe's own baseline data so that changes in AQ can be tracked; and second, to collect data to support a conceptual site model of airborne radionuclide transport and migration surrounding WM, which we plan to develop in 2014. The conceptual site model includes pollution fate and transport modeling, and a pilot dust study utilizing 1m x 1m adhesive paper to quantify the re-suspension of particulate matter, accompanied by a Geiger survey of the soil surface. If the AQ is found to exceed the "Low Limit" (10%) of Effluent Concentration Limits (ECL) as set by the Nuclear Regulatory Commission (NRC), proper decisions will be made by consulting Tribal Council and EPA.

The UMUAQ does not have background radiation data of its own in the ambient air of WM but has reviewed the past records based on the field measurements made by other organizations. Some existing data, particularly of the pre-mill dates and the Mill's "background" data from air quality monitoring station BHV-3 are being considered. In April 1977, prior to Mill construction and operations, the air particulate Lead 210 concentration was measured at the current Mill site to be 1.3E-14 uCi/ml (Denison Mines 2011). Because Lead 210 concentration is predicted to be the highest, due to its low position in the decay chain of Uranium. So we will begin with this value as a background for Lead 210 and revise if our measurement is lower than this. No data is available for Polonium 210 thus far. We are searching for the past data for this isotope. It also has been published that when the Mill is not operating, the measurements at the background BHV-3 station for Radium 226 was 1.10E-16; Thorium 230, 2.00E-16; Lead 210, 1.70E-14; Uranium 238, 2.00E-16; Uranium 234, 2.00E-16; and Uranium 235, 2.00E-16 (p. 17, Nielson, et. al. 1998). Considering the fact that Uranium series measurements are twice the detection limits of the laboratory, the UMUAQ will adopt these values.

iii. Identify the inputs to the decision

The inputs to the decision are the data collected and analyzed. At this point no other data will be gathered specifically for this project besides data from the MV3000, meteorological monitors, a pilot dust study and a Geiger radiation detector. The data gathered will be in accordance with all EPA recommendations and industry practice in terms of schedule, siting, etc.

iv. Deciding on a decision rule

If it is determined that the selected isotope concentration levels in air in WM exceed the Low Limit of ECL as set by NRC, the UMUAQ will confer with the Tribal Council to determine the best course of action. Alternately, if the selected isotope concentration levels in WM are lower than the Low Limit of ECL as set by NRC, the UMUAQ will continue the monitoring effort at the same location and confer with the Tribal Council and the EPA about the needs for an additional monitoring station. If it is determined that the selected isotope concentration levels in WM are lower than the adopted background levels, the UMUAQ will confer with the Tribal Council and the EPA about using the current location as the background station as well as needs for an additional monitoring station. In these circumstances, it is predicted that we will request additional funds from the EPA to conduct more intensive monitoring to determine the likely migration of the elevated levels, integrate processes to mitigate those levels, relocate the existing monitors, increase the monitoring frequency if feasible, and purchase additional monitors.

v. Optimize the design

The design has been optimized to address the needs of the Tribe, which are to make the most informed public health decisions based on scientifically and statistically sound investigations. The monitor is located at an existing enclosure with an existing power source. As seen in the ***Representativeness*** in the following section (**IV-*iii***), it is important here to quantify what people are breathing in the WM. If the site location changes, proper changes to the QAPP will be made.

IV. DATA QUALITY INDICATORS

i. Precision

Precision is the ability of a measurement to be consistently reproduced. The UMUAQ method for precision checks for manual PM measurements (and for all instruments when a collocated sampler is not available), is to track the random variability in flow rate. This is generally the most important contributor to precision error. MV3000 is microprocessor controlled to maintain a constant flow rate. As the instrument is in operation, it adjusts its flow rate based on the filter load, and thus maintains a constant flow based upon the voltage of the motor. A top-loading orifice plate and digital manometer will be utilized once a month to determine percentile variations in flow rate, with a three point flow rate check and associated R-value determined, followed by calibration. Table 12-4 in (**XII**) displays the equations to determine adequate flow rate checks. Tracking the random variability in flow will be minimized by calibrating the instrument with the equation below allowing corrections based upon the exact ambient temperature and pressure conditions, as opposed to generalized values and rounding conventions.

$\Delta H = (Q_{display} / 4.138)^2 \text{ x } P_a/T_a$

$Q_{display}$ = flow rate as indicated by the sampler display

ΔH = corresponding manometer pressure drop (mmHg)

T_a = ambient temperature in Kelvin (= °C + 273.15)

P_a = ambient pressure in kPa (= mbar/10)

4.183 = orifice constant

The precision in calibration will minimize the band of deviation in flow, and if the manometer pressure drop calculated is +/-10% different from the actual flow rate pressure drop, it is unacceptable and calibrations must occur more frequently, and the associated data will be properly flagged. The percent difference will be carefully tracked and each result will be assessed to ensure the instrument is in control. This flow rate deviation will be used as a surrogate for field uncertainty and used in combination with the laboratory's estimated uncertainty, following EPA recommendations (G9s) and NIST guidance (NIST 1297), and as described in the final section of this QAPP.

ii. Bias

Bias is estimated by evaluating our measurement results against a known standard used as the "true" value. It is expressed as a positive or negative percentage of the "true" value. Bias in this program is measured by comparing results of the flow rate of the instruments used by the UMUAQ to the flow rate measured using a flow rate transfer standard that is not calibrated using the same primary calibration standard as those used to calibrate the UMUAQ's instruments. In other words, a flow rate transfer standard used by another tribe, EPA Region 8 or its contractor, or a contractor may be used to compare against the flow rate measured by the UMUAQ's equipment, as long as that external flow rate measurement was made using equipment not calibrated with the same primary calibration source. Since there is no "standard" for PM, flow rate is the best representation of PM; this works because the PM on the filter and corresponding radionuclide concentration is directly proportional to the flow rate through the filter. So, if the flow rate is ten percent low then the PM per volume gathered will also be ten percent low. The difference between the flow rate measured with the PM instrument operated by the UMUAQ and the flow rate measured using the outside source is used as the estimate of bias and shown in the equations table 12-4.

iii. Representativeness

Representativeness is defined as 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. The representativeness of measurements made in this program is ensured by following the EPA siting guidelines, and is fully explained in Section **VIII**. The goal of UMUAQ is to measure the pollutant concentrations that most members of the Community actually breathe. The meteorological station and MV3000 are installed at an enclosed location known as the North Pump House monitoring station, surrounded by a few Tribal members' houses and a nearby highway.

iv. Detection Limits

A detection limit is defined as the lowest value that a procedure can reliably discern. In other words, the level below which the instrument cannot discriminate from zero. Because the instrument does not analyze the sample, the detection limit is set by the laboratory and the analytical method used. The detection limits for radionuclide are shown in the table below as well as the levels for environmental compliance, and regulatory effluent concentrations limits. The laboratories detection limits were determined based upon the volume of air collected for the given run time of the instrument for all isotopes.

Radionuclide Concentration Levels (units in µCi/ml)

Radionuclide	10 CFR Part 20 Regulatory ECL's *	Low Limit of Detection**	ALS Detection Limits***	Background Concentration****
Ra-226	9.00E-13	9.00E-14	1.00E-16	1.10E-16
Th-230	3.00E-14	3.00E-15	1.00E-16	2.00E-16
Pb-210	6.00E-13	6.00E-14	1.00E-16	1.70E-14
Po-210	9.00E-13	9.00E-14	1.00E-16	
U-238	6.00E-14	6.00E-15	1.00E-16	2.00E-16
U-233	3.00E-12	3.00E-13	1.00E-16	
U-234	3.00E-12	3.00E-13	1.00E-16	2.00E-16
U-235	3.00E-12	3.00E-13	1.00E-16	2.00E-16
U-236	3.00E-12	3.00E-13	1.00E-16	

*: Regulatory Effluent Concentration Limits (ECL's) CFR, Appendix B Table 2as set by NRC based on one year values for a calculated total effective dose equivalent (TEDE) not to exceed those levels.
**10% of the appropriate concentration limits listed in Table II of Appendix B to 10 CFR Part 20 as set by NRC Regulatory Guide 4.14
***Detection limits specified by laboratory for analysis based upon total flow of instrument 2,880-3,600m^3/24 hr
****Background Concentration as set by the Mill (Nielson et. al 1998). Please see Section III-ii in this QAPP for additional information.

v. Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions. Data completeness requirements for the UMUAQ's goal for completeness is 90% or greater.

vi. Comparability

UMUAQ has researched what other AQ programs are doing in terms of general practices, and obtained example SOPs from other tribal and/or federal AQ programs with regards to PM monitoring. At this time the UMUAQ is the only Tribe utilizing the MV3000 method and approach to monitoring airborne radionuclides. To help ensure that UMUAQ results will be comparable to other methods of airborne radionuclide monitoring, flow rate checks performed by an external entity will be used as a measure of comparability.

vii. Accuracy

Accuracy has been a term frequently used to represent closeness to truth and includes a combination of precision and bias uncertainty components. Accuracy should be used when a standard, such as a flow rate or other standard is used to compare against the equipment routinely used by the UMUAQ. This will occur only during audits. In this program, accuracy or total errors, is estimated using the results of the performance audits described in Sections **XII-*viii*** and **XII-*ix*** (Performance Evaluations, and Independent Audits) and in the Tables in Sections **XII-*i***, **XII-*ii***, and **XII-*iii***. A performance audit is conducted with a measurement system that has been calibrated with a different standard than that used to calibrate the field equipment, and by an operator other than the Air Quality Technician (AQT) or Environmental Specialist (ES). Because of this, the differences in results between the performance audit and the field instrument's result, as averaged over all the times such performance evaluations have been conducted, will represent the best estimate of the inaccuracies of our measurement system.

V. SPECIAL TRAINING / CERTIFICATION

Workshops and courses hosted by the Institute for Tribal Environmental Professionals (ITEP) in Arizona and Tribal Air Monitoring Support Center (TAMS) in Nevada, as well as other similar resource agencies will be made available to project personnel. Records on personnel qualifications and training are maintained in personnel files and are accessible for review during audit activities. 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 EPD. Sufficient time (at least 16 hours) will be provided to the UMUAQ staff directly involved in this project to read and understand this QAPP and the referenced documents. The EPD also monitors the availability of training courses offered by EPA's Air Pollution Training Institute and other Region 8 facilities, ITEP, and private consulting firms. Such institutions conduct professional services and ensure certification of their courses offered. When circumstances warrant, the UMUAQ staff may be enrolled in one or more training courses offered by these institutions.

VI. DOCUMENTS AND RECORDS

It is critical that the Tribe's management understand that properly documenting the project's activities takes time. The UMUAQ's monitoring network is being established to assess risks in WM. The UMUAQ is committed to fully document all activities relating to data collection, analysis, validation, and reporting. The custody documentation requirements outlined below will ensure that the disposition and location of the data records are known, and that the data are legally defensible. 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 the records listed in Chart 6.1 and Table 6.1 in this section. Each set of records that is often used is listed on a master file location/accessibility map showing where these files are, by whom they are accessible, and procedures for checking out files. This file map is posted to allow easy revisions and locations of the files. The EPD Office keeps a list of official UMUAQ files, who is responsible for each file, and where each file is located. This list is posted so that when improvements and additions are made they can be noted on the list so that others can find the files. On this list are specified which files are to be left in the file folders at all times, and when removed their places are marked. These files may be removed but only after; (1) copies are made and replaced in the file, or (2) the person responsible for that file has established a system for removal such as noting on a file folder cover page who has taken the file and when.

i. Documentation and Records for Planning Organizational Chart 6.1

Scott Clow Director UMU EPD	Administrative	Approve the final copies of CAA 103 Grant
	Budgeting	Manages AQ Program budget
	AQ Program Review	Review AQ Program
	Staffing	Hiring and keeping the Personnel Records
	Contracting	Copies of contracts and all instrument vendors and labs
Tomoe Natori Environmental Specialist	Administrative	Draft and finalize copies of CAA 103 Grant
	Budgeting	Draft AQ Program budget and keep track of expenditures
	Data Validation	Validates all data
	Reviews Drafted Procedures	Revisions changed in pen and dated until document is officially revised
	Training	Keep the Training Records
Vacant Air Quality Technician	Training	Keep the Training Records
	Draft Procedures	Documents all changes made to technical Air Systems procedures
	Plans site locations	Site maps and photos
	Data Verification and Reporting	Verifies Data, AQS submittal
	Instrumentation/Purchasing	Maintenance agreement with instrument vendors, calibration labs/vendors
	Site Data Sheets	Procedures for how data is downloaded, transferred, who is responsible for setting up routine verifications, site visits and audits.
	Data Transfer logs/collection	SOPs for data download, transfer, and analysis

ii. Table 6-1 Documentation and Records for Project Operations

Action/Event	Information Recorded (what)	Recorded in (where)	By Whom	How Often (when)
Initial readiness review	Copy of readiness review report/checklist	Audit file	Audit reports or memos (or copies of notes) reviewed and filed by ES	Within 30 days
Operations-Assessments and Audits: Periodic	Audit Report	Audit file	Reviewed by Director	Within 60 days after the audit is complete
Operations-Data gathered/received: Data transfer from analyzer	Data on computer hard drive and paper	Instrument download log or log sheet (paper and computer in parallel and according to file structure and naming conventions)	Filed by AQT	MV3000: once per week Met Station: Every 2 weeks
Operations-Maintenance	Check instruments, such as pump, lines, leaks as specified by instrument manual	Site log with notes of what was checked and results of the checks- 3-ring binder for that site	AQT	At least every month
Operations-Shipping/Receiving	Logs for shipping and receiving set up	Shipping/receiving file stores copies of shipping papers, the logbook contains notes of shipments made/received	ES AQT	As items come and go
Operations Site QC checks	QC check sheet Flow rate parameters and sensors as specified in SOP's	Site log, and monthly QC checklist posted in shelter/inside door of unit and checked off with dates and initials	AQT, initialed and dated both in site log and checklist	The results of QC checks are reviewed once per month
Operations-Calibrations	Information on calibration data sheet Notes	Calibration data sheet, Site Log, and Personal log	AQT	Annually or as needed, shown by QC checks

iii. Data Review Documentation Guidelines

a. Some portion of the final data review (at least five percent) is conducted by hand, including collecting and checking site logs, and maintenance sheets posted in the North Pump House. In order to write the data review SOP, one initial data review exercise is conducted with all logs, QC sheets, hard copies of data and validation tables, and audit reports. All of the steps of data review and flagged data are documented in an SOP, which is also edited at least once a year to reflect changes in procedures discovered to be beneficial.

b. Automation of the data review process is implemented to reduce manual error and increase speed. This may be done in a variety of programs, including Excel or Access, however complete documentation of the software and process will be conducted so that a checklist is followed and the steps of data review can be reproduced if questioned.

c. Data validation will produce a report or completed checklist in the SOP indicating which documents, reports, files, and sheets were reviewed and the reason(s) for invalidation of any set of data.

VII. SAMPLING DESIGN: METEOROLOGICAL STATION

i. Campbell Scientific Meteorological Station

The meteorological station utilized by the UMUAQ in White Mesa is a Campbell Scientific model tripod with four sensors including six parameters for measurement. The sensors include temperature, relative humidity, precipitation, wind speed, wind direction and barometric pressure. A comprehensive list of the model numbers and specifications are presented below along with calibration and accuracy criteria for verifications and audits.

Sensor/Datalogger	Temperature	Relative Humidity	Precipitation	Wind Speed/Wind Direction	Barometric Pressure	Datalogger
Model	CS-HMP60	CS-HMP60	CS-TE525	RM Young-05103	CS106	CR200X

Detailed instructions for procedural methods in conducting annual/biannual verifications and audits are contained in the meteorological station SOPs.

ii. Table 7.1 Modeling Application Calibration and Accuracy Criteria

Measurement	**Type**	**Acceptance Criteria**	**Frequency**
Temperature	3 pt. water bath with NIST-traceable thermistor or thermometer	+/-0.5°C	Semi-Annually
Relative Humidity	NIST-traceable Psychrometer or standard conditions	+/-7% RH	Semi-Annually
Precipitation	Separatory funnel and graduated cylinder	+/-10% of input volume	Semi-Annually
Wind Speed	NIST-traceable Synchronous Motor, CTS method	+/-0.2 m/s	Semi-Annually
Wind Direction	Solar Noon, GPS, Magnetic Compass, CTS method	+/-3-5 degrees	Semi-Annually
Pressure	NIST-traceable Aneroid Barometer	+/-3mb	Semi-Annually

VIII. SAMPLING DESIGN: MEGAVOL 3000 PARTICULATE SAMPLER

i. Siting Location/Specifications

The PM inlet must be 2 to 15 meters above ground level. The inlet must also be located more than one meter vertically and two meters horizontally away from any supporting structure. There must be at least 10 meters from the inlet to the drip line of any tree when the tree acts as an obstruction, and should be 20 meters from the drip line of any tree. Any site, 2 to 15 meters high and further back than the middle scale requirements will generally be neighborhood, urban or regional scale. For example, according to Figure E-1 of 40 CFR 58 Appendix E, if a PM sampler is primarily influenced by roadway emissions and that sampler is set back 10 meters from a 30,000 average daily traffic (ADT) road, the site should be classified as microscale, if the sampler height is between 2 and 7 meters. If the sampler height is between 7 and 15 meters, the site should be classified as middle scale. If the sample is 20 meters from the same road, it will be classified as middle scale; if 40 meters, neighborhood scale; and if 110 meters, an urban scale. The average annual daily traffic (AADT) for the stretch of highway nearest our pollutant monitor is 2,000-3,000 as detailed by the Utah Department of Transportation (UDOT) and is set back 30 meters from the Highway, is thus classified between middle and neighborhood scale.

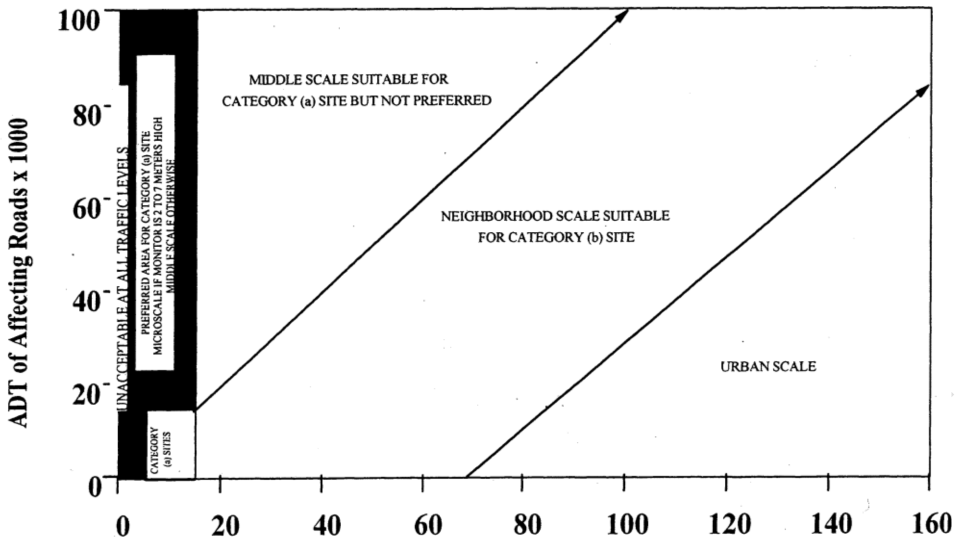

Figure E-1. Distance of PM samplers to nearest traffic lane (meters)

The inlet must also be located away from obstacles and buildings such that the distance between the obstacles and the inlet is at least twice the height that the obstacle protrudes above the inlet, unless the site is a middle scale site. The inlet is considered to be obstructed if an imaginary line extended 30 degrees up from the horizontal and rotated 360 degrees intersects any obstruction within 30 meters. Airflow must be unrestricted in an arc of at least 270 degrees around the inlet, and the predominant wind direction for the season of greatest pollutant concentration potential must be included in the 270 degrees arc. If the inlet is located on the side of a building, 180 degrees of clearance is required. An exception to this requirement can be made for measurements taken in street canyons or at source-oriented sites where buildings and other structures are unavoidable.

The inlet should be away from minor sources such as furnace or incineration flues. The separation distance is dependent of the height of the minor source's emission point (such as a flue), the type of fuel or waste burned, and the quality of the fuel (sulfur, ash, or lead content). This is to avoid strong influences on the PM concentration from these sources over a short distance.

ii. Number of Sites

The procedure for siting the monitors to achieve the basic objectives is based on convenience of location for power source, protection from vandalism, ease of access and proximity to homes in WM. Knowledge of diffuse and point source emissions is available, although with the exception of meteorological data, and the Mill's semi-annual effluent reports, no existing monitoring networks with current usable data are obtainable. The site is located within WM and complies with site location requirements in terms of distance from high density traffic areas, trees and other obstructive structures. This method of sampling is thus based on both the combined criteria of judgmental sampling and random sampling.

iii. Table 8-1 Site Monitor Design Summary

Site Number	Monitor Number	Method Name	Monitor Objective	Sampling Frequency	Scale
Site 1	PM-Filter based local conditions	American Ecotech MegaVol 3000	To characterize concentrations of radionuclide laden particulate matter	Frequency of monitoring is dependent upon the objectives. In this case, monitoring is being conducted to monitor and quantify the amount of particulate matter accumulated	Middle

iv. Table 8-2 Project Schedule

Monitor	**Meteorological Station**	**Mega Volume PM10**
Collection Frequency	Two tables of data, including both hourly averages and 10 minutes averages for all parameters are collected and stored monthly.	Once every six days, 24 hour elapsed run time
Data Procurement	Data downloaded to laptop and stored in two locations. Analyzed alongside PM measurements	Filter and chain of custody sent to laboratory for analysis. COC forms kept in office for five years.
Laboratory Schedule	N/A	Filters sent to laboratory with COC form, while new filters are collecting samples
Project Duration	Through FY2013	Through FY2013

IX. SAMPLING METHODS

The MV3000 is installed and operated according to 40 CFR Part 58 Subpart C, a Special Purpose Monitor, not to be compared to NAAQS. In the Appendix B at the end of this document, the sampler manufacturer's operation manual, and the SOPs are attached. Sampling methods are detailed in this QAPP to adhere to proper QA/QC protocol set by the UMUAQ.

Please see the Appendix E: Standard Operating Procedure 3-Dust Study for the pilot dust study and Geiger-Mueller tube radiation survey methods.

X. SAMPLE HANDLING

i. Chain of Custody (COC)

One of the most important values in the sample custody procedure is the unique filter ID number. The filter ID is an alphanumeric value.

a. *Pre-Sampling Custody*

The proper COC form from the contracting laboratory is used with signature, date, time and volume of air collected. The filter ID number is recorded as sampling is begun.

b. *Post-Sampling Custody*

The field sampling SOPs specify the techniques for properly collecting and handling the sample filters. Upon visiting the site:

1) Select the appropriate Filter COC Record. Ensure that the Site ID and the protective Container ID(s) are correct.
2) Remove filter from the sampler. Briefly examine it to determine appropriate filter integrity flag and place it into the protective container per SOPs.
3) Place the protective container(s) into the shipping/transport package.
4) Record “Post Sampling Filter Recovery Information” on the PM Filter COC Record.

Exposed filters will be shipped back to the lab as soon as possible. The AQT will send the sample to the laboratory. Pre-addressed mailing slips are available for the AQT. The isotopes being analyzed are U-238, Th-230, Ra-226, Pb-210, and Po-210 with respective half-lives of 4.46 billion years, 80,000 years, 1,602 years, 22.3 years and 138.4 days. With the exception of Po-210, these all have relatively long half-lives, allowing the holding limit for the filters to be practicably indefinite. The UMUAQ has thus set a filter holding time limit of one year. If samples are kept for longer than a week, a decay-correct result for Po-210 will be calculated back to the sample collection date.

Shipping requirements include:

1) Notify courier for pick-up.
2) Fill out the “Shipping Info” on the Filter COC Record(s).
3) Photocopy the Filter COC Records that pertains to the shipment.
4) Place the photocopied records in a plastic zip lock bag and include it in one of the shipping/transport containers.

5) Seal all shipping/transport containers per SOPs.
6) The AQT will take the original Filter COC Records(s) and attach the air bill to the records.
7) The AQT will contact the receiving laboratory of a shipment the day of the shipment.

c. *Filter Receipt*

Upon receipt of the exposed filters, the laboratory personnel will:

1) Receive shipping/transport container(s).
2) Upon receipt, open the container(s) to find PM Filter COC Record(s) or collect the originals from the site operator (if delivered by operator).
3) Fill out the "Filter Receipt" area of the PM Filter COC Records(s). Check sample container seals.

Please see the Appendix C for a copy of the COC form ALS Laboratory.

XI. ANALYTICAL METHODS

i. Table 11.1 Analytical Method

ALS Laboratory operates the radiochemistry laboratory in compliance with Colorado State Rules and Regulations Pertaining to Radiation Control. Each batch (no more than 20) samples that ALS prepares and analyzes has a laboratory control spike (LCS) sample at a duplicate sample. The duplicate is either a prepared duplicate of a client sample or a laboratory control spike duplicate sample. The LCS will indicate what the potential bias is for a given analysis. Each duplicate and native sample is evaluated for precision by calculating the duplicate error ratio (DER). This is similar to a relative percent different except that the DER takes into account the total propagate uncertainty associated with each measurement. The following methods are identified in the table below.

Contracted By	Filter	Radionuclide	Analytical Method	Reporting Units
ALS Laboratory	Borosilicate Glass EPM Grade 8"x10"	Lead 210	Liquid Scintillation ALS SOP 726 and 704	µCi/ml
ALS Laboratory	Borosilicate Glass EPM Grade 8"x10"	Polonium 210	Alpha Spectrometry ASTM D3972	µCi/ml
ALS Laboratory	Borosilicate Glass EPM Grade8"x10"	Radium 226	Alpha Scintillation EPA 903.1	µCi/ml

ALS Laboratory	Borosilicate Glass EPM Grade 8”x10”	Thorium 230	Alpha Spectrometry ASTM D3972	µCi/ml
ALS Laboratory	Borosilicate Glass EPM Grade 8”x”10”	Uranium 238	Alpha Spectrometry ASTM D3972	µCi/ml

ii. Method Description

Please see the Appendix A, ALS Laboratory’s QA.

iii. Laboratory Requirements

Please see the Appendix A, ALS Laboratory’s QA.

XII. QUALITY CONTROL REQUIREMENTS

Quality Control (QC) is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the Tribe. Day-to-day quality control is implemented through the use of various checks or instruments that are used for comparison. The QC Tables below (12-1, 12-2 and12-3) summarize the field QC procedures and the Measurement Quality Objective (MQO).

i. Table 12-1 Critical Criteria

Requirement	**Frequency**	**Acceptance Criteria**	**Information/Action**
Filter, filter integrity, both before and after sampling, and filter recovery should be as soon as possible after sampling	Inspect every filter	No defects including tears, folds, or dirt spots	Dispose of filter and use new one
Sampling instrument, Average Flow Rate	Every filter	+/-10% of inlet design flow rate	Note obstructions
Sampling Instrument, Sample Run Time	Every filter	+/- 60 minutes	Record run time
Sampling instrument, Monthly 3 point flow check	Monthly; and if flow rate is stable after six months then this check can be done only once every 3 months	Within +/-10% of transfer standard’s flow rate	If fails, then recalibrate
Sampling instrument, elapsed timer check	Every 6 months	+/-14 minutes for weekly run time	If fail, adjust or repair

ii. Table 12-2 Operational Criteria

Requirement	**Frequency**	**Acceptance Criteria**
Sampling Instrument, multi-point verification	1/month; if flow rate is stable after six months then once every 3 months	At least 3 points within +/- 10% of design flow rate
Sampling Instrument, Flow Rate (FR) 3-point calibration	If needed as shown by 3-point verification	+/- 2% of transfer standard for EVERY point
Recertification against NIST primary standards	Annually	As per certificate issued by certification lab

iii. Routine Maintenance

a. Inspect all gaskets (including motor cushion) to assure they are in good shape and that they seal properly. For the TSP Inlet to seal properly, all gaskets must function properly and retain their resilience. Replace when necessary.
b. Power cords should be periodically inspected for good connections and for cracks (replace if necessary). **CAUTION:** Do not allow power cord or outlets to be immersed in water.
c. Inspect the filter screen and remove any foreign deposits.
d. Inspect the filter media holder frame gasket each sample period. This gasket must make an airtight seal.
e. Insure the elapsed time indicator is operating by watching under power.

iv. Table 12-3 Systematic Criteria

Requirement	**Frequency**	**Acceptance Criteria**
Data Completeness, and rounding convention	Quarterly	>=90%, and rounded quarterly to the nearest 10th
Standards Recertifications, Field Thermometer	1/yr	0 to 50°C to the nearest 0.1 °C
Standards Recertifications, Field Barometer	1/yr	+/- 1 mmHg
Standards Recertifications, Standard Barometer accuracy	1/yr	+/- 5 mmHg
Standards Recertifications, orifice transfer standard (e.g., top-hop orifice, variable orifice, or reference flow device)	1/yr	+/- 2% of the NIST-traceable primary standard
Standards Recertifications, Clock/timer Verification	4/yr	Accurate +/- 1 min/month

v. Table 12-4 Equations

Criterion	Equation	CFR #
%Difference Assessment for One Point Flow Rate Verifications. For each verification check of flow rate with a standard calculate the percent difference between the samplers flow rate and that indicated by the standard, using equation 1 where Yi is the samplers flow rate and Xi is the flow rate from the audit instrument.	$d_i = \frac{Y_i - X_i}{X_i} \times 100$	1
Absolute Bias Upper Bound of Flow Rate Verifications Bias is estimated using an upper bound on the mean absolute value of the percent differences where n is the number of flow rate verifications being aggregated; t 0.95,n-1 is the 95th quantile of a t-distribution with n-1 degrees of freedom. The quantity AB is the mean of the absolute values of the d*i*'s and is calculated using equation 4 and AS is the standard deviation of the absolute values and is calculated using equation 5.	$\lvert bias \rvert = AB + t_{0.95,n-1} \cdot \frac{AS}{\sqrt{n}}$	3
Mean Absolute Bias Value of the Flow Rate Verifications. The quantity AB is the mean of the absolute values of the percent differences and will be calculated from equation 4 or using the AVERAGE function in an Excel spreadsheet.	$AB = \frac{1}{n} \cdot \sum_{i=1}^{n} \lvert d_i \rvert$	4
Standard Deviation of the Absolute Bias Value of the Flow Rate Verifications AS is the standard deviation of the absolute values of the percent differences, d*i*'s of the flow rate verification and will be calculated from Equation 5 or using the STDEV function in an Excel spreadsheet.	$AS = \sqrt{\frac{n \cdot \sum_{i=1}^{n} \lvert d_i \rvert^2 - \left(\sum_{i=1}^{n} \lvert d_i \rvert \right)^2}{n(n-1)}}$	5
Semi Annual Flow Rate Audit Assessment- For each audit of flow rate with a standard calculate the percent difference between the samplers flow rate and that indicated by the standard, using equation 1 where Y*i* is the samplers flow rate and Xi is the flow rate from the audit instrument.	$d_i = \frac{Y_i - X_i}{X_i} \times 100$	1
Semi Annual Flow Rate Audit Assessments- To quantify flow rate audits annually at the site level and over 3 years, probability limits will be calculated from the flow rate audits percent difference di values using equations 6 and 7 where m is the mean over the time period being evaluated from equation 8 and S is the standard deviation of the percent differences as calculated in equation 9. Ninety-five percent of the individual percent differences (all checks) for the performance evaluations should be within this probability interval.	$Lower\ Probability\ Limit = m - 1.96 \cdot S$ $Upper\ Probability\ Limit = m + 1.96 \cdot S$	7 and 6

Semi-Annual Flow Rate Audits Average Percent Difference. The average percent difference for each analyzer will be calculated from Equation 8 or using the AVERAGE function in an Excel spreadsheet, where k is the total number of audits being evaluated.	$m = \frac{1}{k} \cdot \sum_{i=1}^{k} d_i$	8
Semi-Annual Flow Rate Audits Standard deviation of the Percent Differences.	$S = \sqrt{\frac{k \cdot \sum_{i=1}^{k} d_i^2 - \left(\sum_{i=1}^{k} d_i\right)^2}{k(k-1)}}$	9

vi. Quarterly Calculations

Precision is the measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. In order to meet the data quality objectives for precision, we must ensure the entire measurement process is within statistical control (stable).

vii. Accuracy or Total Error Checks

Accuracy is defined as the degree of agreement between an observed value (the value produced by our instruments) and an accepted reference value (a standard or "known" value that is accepted to be the "truth") and includes a combination of random error (imprecision) and systematic error (bias). In order to estimate accuracy, some external instrument must be compared against the field instruments. This external standard can be from another tribe, the EPA regional office, etc. but it must not have been calibrated with the same primary standard as the field equipment against which it is to be compared. Parameters compared are typically the flow rates of the instruments.

viii.Performance Evaluation

A performance evaluation on the Particulate Sampler will be conducted every six months by the UMUAQ using the Tribe's independent flow rate standard. Air Resource Specialists (ARS) or Tribal Air Monitoring Support (TAMS) will perform our bi-annual performance evaluation. The limits for the relative percent difference between the standard’s flow rate and the field sampler's flow rate are shown in Table 12.1 (Critical Criteria). A performance evaluation for the meteorological station will also be conducted every six months for calibration and verification purposes to maintain proper quality control in providing accurate data based on manufacturer’s recommendations.

ix. Independent Audits

Audits of the UMUAQ: The EPA Region 8 Office is available to periodically conduct site performance audits and/or technical reviews for the UMUAQ. These audits and/or reviews will be conducted when necessary and if resources are available. The audit and/or review results will be summarized and reported to the UMUAQ when they are finalized by the EPA Region 8 Office.

Audits of the Laboratory: The UMUAQ will visit the contracting laboratory annually for a quality control audit. The purpose of the visit is to meet the labs' QC personnel and to review the LCS and other QC checks for the analyses.

x. Field Blanks

Field blanks provide an estimate of total measurement system contamination, or what happens to each filter by everything other than the actual sampling in the monitor. A new filter in its protective cassette is inserted into the sampler and immediately removed and placed back into its baggie and set inside the sampler box out of the way of the intake mechanism. The routine filter is then inserted into the sampler as usual. The field blank is kept in the sampler box during the period the sampler is on and pumping air through the routine filter. When the routine filter is retrieved, the field blank is also. The field blank is then packaged and shipped with the routine filter. In this way any contamination in the sampler, transport cooler, or baggies can be detected.

A minimum of one in every ten routine filters will be a field blank. Field blanks may or may not be identified as field blanks to the analysis laboratory. Field blanks are identified as such in the field data sheet and the copy of the chain of custody sheet that is kept by the Tribal office using the notation "FB".

XIII. INSTRUMENTATION

i. Table 13-1 QA/QC Checklist

Item	Frequency	Parameter	Action	Documentation
Inlet	Monthly	Inner Surface	Clean and dry	Document in log book
In-line filter	6 Months	Check for loading	Replace	Document in log book
Air Screens	6 months	Under samplers rain hood	Clean and dry	Reference checklists or SOPs
Clean filter holding area, internal and external	Monthly		Clean and dry	Reference checklists or SOPs

Please see the Appendix E: Standard Operating Procedure 3-Dust Study for a Geiger-Mueller tube radiation survey monitor.

XIV. INSTRUMENT CALIBRATION

The MV3000 flow rate calibration is performed using a flow rate transfer standard, which mounts on top of the filter cassette. One simple method of calibrating the sampler is to use the optional top-loading orifice plate. This unit is specifically designed for the MV3000 and each orifice plate has been calibrated against a certified reference standard. A digital manometer is connected to the orifice plate and gives a pressure drop across the orifice which is related to volumetric flow rate. Calibrations include adjusting the instrument or sensor to produce a response that is consistent with a standard. Calibration of a flow rate, for example, must consist of at least three separate flow rate measurements (a multipoint calibration, which is different than a multipoint verification) approximately evenly spaced within the range of the operational flow rate. Table 14-1 summarizes the calibration frequency and requirements of the equipment used in this program. (Verifications, on the other hand, are made to verify that the operations of the instrument are within specified limits. Verifications do NOT include any adjustment to the sampler).

i. Table 14-1 Calibration Criteria

Equipment	Frequency	Method	Acceptance Criteria
MegaVol 3000 Particulate Sampler	Upon installation and then once per month	3 point flow rate calibration	+/- $2m^3$/hour

Certifying the calibration standard (this may be a thermometer kept in the office except when it is used for calibrations, a flow rate transfer standard, a barometer, or whatever is appropriate to the sensor or instrument being calibrated) against a NIST standard (usually done by sending the calibration standard to a weights and measures laboratory), and comparing the calibration standard and/or transfer standard against the routine samplers or sensors.

Please see the Appendix E: Standard Operating Procedure 3-Dust Study for the calibration of a Geiger-Mueller tube radiation survey monitor.

ii. Standards for Pressure and Temperature

Temperature- and pressure-sensing hardware must be calibrated annually. It is also necessary to recalibrate temperature and pressure sensors for other reasons, such as radical changes in equipment performance, before a complete instrument calibration. The CS106 barometer will be compared against a NIST traceable barometer. The calibration of the standard thermometer used to compare against the sampler (that serves as the temperature transfer standard) should be conducted if the temperature sensor on the sampler fails a check, and the requirement for the calibration of the standard thermometer is that the standard thermometer agrees to the standard against which it is compared to less than ±2%. The calibration of the standard barometer used to compare against the sampler (that serves as the pressure transfer standard) should be conducted if the pressure sensor on the sampler fails a check, and the requirement for the calibration of the standard barometer is that the standard barometer agrees to the standard against which it is compared to less than ±10 mmHg.

XV. DATA MANAGEMENT

i. Transmittal

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

The ES is assigned the task of making a random selection of at least five percent of the data during each quarter that has been transmitted from one form to another or one place to another and checking its accuracy. This check and the results will be documented in the records for data validation; notes made in the header of each file or in the top several lines include what information/sources were compared, results, name, and date.

ii. Table 15-1 Data Storage and Retrieval

Description	**Originator**	**Recipient**	**QA Measures**
Database Entry	Laptop Computer	Backup Modem	Check of 100% of all data (field data sheets, QC)
Electronic Data Transfer	Data Acquisition System	Laptop Computer	Parity Checking, Transmission Protocols
Electronic Data Transfer	Laptop Computer	AQT	Transmission Protocols
Calibration and audit data	AQT	ES	Checked by Environmental Specialist bi-annually
AQS data summaries	AQT	EPA Region 8	Periodically checked by Environmental Specialist or Air Quality Technician
Datalogger support software	Datalogger	Laptop Computer	Raw data, only transmission protocols apply

iii. Storage

Raw data sheets are retained on file at the EPD for a minimum of five years, and are readily available for audits and data verification activities. After five years, hardcopy records and computer backup media are cataloged and boxed for storage. Data archival policies for the data are listed in following table. Security of data in the database is ensured by password protection.

iv. Table 15-2 Data Storage

Data Type	**Medium**	**Location**	**Retention Time**	**Final Disposal**
Chain-of-custody forms	Hardcopy	Office	5 years	Archived
Field Notebooks	Hardcopy	Site and archived in EPD office when full	5 years	Archived

Database	Electronic (on-line)	EPD Office	5 years	Archived

XVI. ASSESSMENTS AND RESPONSE ACTION

An assessment of the system and its elements for the effectiveness to achieve goals of survey and monitoring takes place regularly. The assessment results are shared and discussed in the EPD management, and response (or corrective) actions are implemented if needed. The predictable scenario and the corrective actions to respond are charted below.

i. Table 16-1 Assessment and Corrective Action Chart

Type	Assessment	Response	Corrective Action	Follow Up
Flow rate	Varied more than 10% of the sampling period	Discard the filter	Calibrate the flow rate. The filter will not be analyzed.	If this occurs 3 sampling periods in row, the UMUAQ will contact the manufacturer.
Filter	No dust collected	Discard the filter	Re-programming the sampler for correct timing and duration. The filter will not be analyzed.	If this occurs 3 sampling periods in row, the UMUAQ will contact the manufacturer.
	Dropped on the ground before or after sampling	Discard the filter	To avoid the contamination or loss of dust, dropped filters, pre- or post sampling, will not be analyzed.	Emphasis on: preparing the fresh filter and cartridge before leaving the office and handling post-sampling filter on the top of the sampler (i.e. taking the bag to the top and then open the cartridge to fold and place the filter rather than taking the filter out and move it to the bag.
Malfunctions	Sampler does not turn on and/or off.	Discard the filter	Run all the maintenance protocols and re-program the sampling timing and duration. The filter will not be analyzed.	If not corrected immediately after the corrective action, contact the manufacturer to request a repair.

XVII. REPORTS TO MANAGEMENT

i. Reports to Tribal Authorities

There are two types of routine reports made to the Tribal authorities: an annual report and a quarterly verbal report if deemed necessary.

The annual report describes the AQ survey and monitoring that may be pertinent such as problems encountered, AQ problems reported by the Community and comparison to AQ measured on those days, etc. Maps showing AQ during different seasons may be appropriate.

The quarterly verbal report could provide updates on the same topics, and may cover administrative issues such as personnel, allocation of funds for purchase or repair of equipment, and possible site relocation.

ii. Reports to EPA

Whenever there is a change in the list of monitoring sites (see Table 8-1), the ES will report this change to the EPA Region 8 Office and to AQS. When there are changes in location of monitors or the network design is reviewed and changed, a revised QAPP will be submitted for approval. Copies of the revisions will be included in the annual report to the EPA Region 8.

XVIII. DATA REVIEW, VERIFICATION AND VALIDATION

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

i. The critical requirements listed in Table 12-1 Critical Criteria (Section **XII-*i***) apply to all data. If any particular data point does not meet each and every criterion on the Critical Criteria Table, that point should be invalidated unless there is a compelling reason and justification for not doing so. Basically, the concentration or time period for which one or more of these criteria are not met is invalid until proven otherwise. The cause of not operating in the acceptable range for each of the violated criteria must be investigated and minimized to reduce the likelihood that additional data will be invalidated.

ii. The operational requirements listed in Table 12-2 Operational Criteria (Section **XII-*ii***) are important for maintaining and evaluating the quality of the data collection system. Violation of a criterion or a number of criteria may be cause for invalidation. The decision to invalidate or not should consider other quality control information that may indicate the data are acceptable. Therefore, the concentration or time period for which one or more of these criteria are not met is suspect unless other quality control information demonstrates otherwise. The reason for not meeting the criteria MUST be investigated, mitigated or justified, and always documented.

iii. Systematic criteria listed in Table 12-3 Systematic Data (Section **XII-*iii***) are criteria that are important for the correct interpretation of the data but do not usually impact the validity of a sample or group of samples. If these objectives are not met, this does not invalidate any of the data but it may impact the error rate associated with the attainment/non-attainment decision.

XIX. VALIDATION AND VERIFICATION METHODS

This section describes how the UMUAQ verifies and validates data collection operations. Verification is confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Verification usually consists of checking that the SOPs were followed and that QC limits were met. Validation is confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Validation consists of "stepping back" from the process and evaluating whether the data gathered is useful. Data validation is conducted by the ES by checking that the SOP's are followed as well as the steps of data transmittal and criteria in tables 12-1, 12-2, and 12-3. Elements of this QAPP describe in detail how the activities in these data collection phases are implemented to meet the data quality objectives (DQOs) of the UMUAQ. Review and approval of this QAPP by the personnel listed on the approval page provide initial agreement that the processes described in the QAPP, if implemented, will provide data of adequate quality. In order to verify and validate the phases of the data collection operation, the UMUAQ uses qualitative assessments (e.g., technical systems audits, network reviews) to verify that the QAPP is being followed, and relies on the various quality control samples, inserted at various phases of the data collection operation, to validate that the data will meet the DQOs.

The ambient air data is used to evaluate the adequacy of the sampling design. By continuously reviewing the data and whether it is consistent with the objectives of the UMUAQ can determine whether monitors should be relocated, new monitors or monitor types purchased, etc. This information is included in network review documentation. The use of QC checks throughout the measurement process helps validate the activities occurring at each phase. The review of QC data such as the precision data, the performance evaluation, and the equipment verification checks that were described earlier are used to validate these activities. Validation of QC procedures requires a review of the documentation of the corrective actions that were taken when QC samples failed to meet the acceptance criteria, and the potential effect of the corrective actions on the validity of the routine data.

XX. RECONCILIATION WITH USER REQUIREMENTS

This section is required to address how the UMUAQ plans to evaluate the measurement goals and continuously improve. The resulting measurement quality objectives (MQOs) are listed in Tables 12-1, 12-2 and 12-3. This QAPP outlines the procedures that the UMUAQ will follow to determine whether the monitors are producing data that comply with the DQOs as well as other factors that affect the usability of the data and what action are taken as a result of the assessment process.

The QA reports are reviewed, and basic summary statistics are calculated, the data are plotted, and evaluated. Common sense is applied to how well the data conform to expectations. Strange data, missing values, and any deviations from standard operating procedures are reviewed. This is a qualitative review. The UMUAQ will generate some summary statistics for its primary analyzers by quarter, and year, as well as all results to date. The summary statistics are number of samples, mean concentration, standard deviation, coefficient of variation, maximum concentration, and minimum concentration at the site, by year and quarter, and season if that provides useful information. Statistical analysis in tracking the random variability in flow will be performed by taking the standard deviation of monthly flow rate verifications deviations in a percentile form to estimate variability and uncertainty. Compiling data into at least five classes of frequency distributions and calculating percent frequencies of the empirical data can also be used to estimate variability. Though this is important to track the variability in volumetric flow, the monitor stores an average flow rate for the given run time which will be recorded every collection period for lab analysis. For example, if the flow rate is programmed at $100m^3$/hour, the actual average flow may be recorded as $93m^3$/hour. The 7% variability is used for statistical analysis to qualify the frequency of calibration to limit the deviation in volumetric flow to continuously improve, whereas the $93m^3$/hour, or a total of 2.232E+9 ml/24 hours, recorded average will be sent to the lab. In addition, the variation in flow rate of the instrument and the precision error of the lab are both squared, summed and the square root of the summation of uncertainties is estimated as the standard error. If the results are close to the ECL levels of environmental compliance (NRC, 2012), measurement uncertainties are clarified by utilizing the average percent difference in flow rate of the sampler as a surrogate for the imprecision estimate for the field component, and will be combined in quadrature (NIST 1297) with the laboratory’s estimated error of 3%. Using the standard root sum of the squares method, if the average percent difference in flow rate is 10%, the overall estimated uncertainty in the results will be 11% (estimated slightly higher than the calculated 10.4%). If results are close to the ECL, this uncertainty will be taken into account and further measurements will be necessary to clarify whether actual concentrations at the measurement sites are over the Limits.

XXI. GLOSSARY OF TERMS

Average Annual Daily Traffic (AADT)
It is the total volume of vehicle traffic of a highway or road for a year divided by 365 days.

Average Daily Traffic (ADT)
It is the total volume of vehicle traffic of a highway or road for 24 hours.

As Low as Reasonably Achievable (ALARA)
The lowest possible emissions from a pollutant source self-imposed here by White Mesa Mill as 25% of the Effluent Concentration Limits utilizing best available control technologies to limit those pollutants.

Air Quality System (AQS)
An EPA regulated database of air quality data. The Air Quality System database contains measurements of air pollutant concentrations in the 50 United States, the District of Columbia, Puerto Rico, and the Virgin Islands. The measurements include both criteria air pollutants and hazardous air pollutants.

Calibration Standard
The artifact of known accuracy that is traceable to the national standard of the country concerned. It is used with Measurement Systems to calibrate measuring devices

Chain of Custody (COC)
COC refers to the chronological documentation or paper trail, showing the seizure, custody, control, transfer, analysis, and disposition of data, physical or electronic.

Critical Criteria
Basic operating parameters of the system that is part of the quality control system which measures the attributes and performance of a process.

Data Quality Objectives (DQOs)
Objective's set out for the air monitoring program that ensure precise, repeatable, and reliable results based on proper planning and design.

Diffusion
Describes the flow of particles from regions of high concentration to regions of low concentration

Effluent
An outflowing of gas from a man-made structure such as a flue pipe or smoke stack

Effluent Concentration Limits (ECLs)
The Mill's effluent stack concentration limits set by the NRC based on one year values for a calculated total effective dose equivalent (TEDE) levels for different radionuclides as to not to exceed those levels.

National Ambient Air Quality Standards (NAAQS)
The Clean Air Act which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (40 CFR part 50) for pollutants considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. *Primary standards* set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the

elderly. *Secondary standards* set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

National Environmental Standards for Hazardous Air Pollutants (NESHAPS)
Stationary source standards for hazardous air pollutants. Hazardous air pollutants (HAPs) are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. There 188 regulated HAPs under 40 CFR Part 61.

National Performance Audit Program (NPAP)
A program that uses through-the-probe audits, conducted using an NPAP van that travels to the site or some central location for Tribes that receive federal funds for environmental monitoring efforts. The NPAP uses an externally calibrated instrument that documents the machines measurement precision in comparison to internal audit reports.

Nuclear Regulatory Commission (NRC)
The Commission formulates policies, develops regulations governing nuclear reactor and nuclear material safety, issues orders to licensees, and adjudicates legal matters. The NRC oversees reactor safety and security, reactor licensing and renewal, radioactive material safety, security and licensing, and spent fuel management (storage, security, recycling, and disposal).

Picocurie (pCi)
A unit of radioactivity equal to 2.2 counts per minute (cpm)

Radioactivity
Radioactivity refers to the particles which are emitted from nuclei as a result of nuclear instability, including alpha, beta and gamma radiation.

Radionuclides
An atom with an unstable nucleus which undergoes radioactive decay

Radionuclide Laden Particulate Matter
Radionuclides electrostatically bound to dust, dirt and rock surfaces, which enables the migration of these particulates

Radioactive Materials License (RML)
License required for the use and possession of all radioactive materials.

United States Geologic Society (USGS)
A scientific agency of the United States government that studies the landscape of the United States, its natural resources, and the natural hazards that threaten it.

Utah Administrative Code (UAC)
A compilation of permanent administrative rules that are legally promulgated by Utah State agencies.

Volatile Organic Compounds (VOCs)
VOCs are organic compounds that have a high vapor pressure at ordinary, room-temperature conditions. Their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublimate from the liquid or solid form of the compound and enter the surrounding air.

XXII. REFERENCES

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XXIII. LIST OF APPENDICES

All the appendices on this QAPP are submitted electronically as attachments separately. Here is the list of appendices that are submitted as parts of the QAPP.

Appendix A	**QA ALS Laboratory**
Appendix B	**Chain of Custody RecordALS Laboratory**
Appendix C	**Standard Operating Procedure 1-MegaVol 3000**
Appendix D	**Standard Operating Procedure 2-Met Station**
Appendix E	**Standard Operating Procedure 3-Dust Study**
Appendix F	**Terms and Conditions SRC Analytical Laboratory**
Appendix G	**Chain of Custody Record –SRC Analytical Laboratory**
Appendix H	**Microwave Digestion Method-SRC Analytical Laboratory**