WHITE MESA URANIUM MILL

GROUNDWATER MONITORING
QUALITY ASSURANCE PLAN (QAP)

State of Utah
Groundwater Discharge permit No. UGW370004

Denison Mines (USA) Corp.
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1.0 INTRODUCTION

This Groundwater Monitoring Quality Assurance Plan (the "QAP") details and describes all sampling equipment, field methods, laboratory methods, qualifications of environmental analytical laboratories, data validation, and sampling and other corrective actions necessary to comply with UAC R317-6-6.3(I) and (L) at the White Mesa Uranium Mill (the "Mill"), as required under paragraph I.H.6 of State of Utah Groundwater Discharge Permit No. UGW370004 (the "GWDP") for the Mill. This Procedure incorporates the applicable provisions of the United States Environmental Protection Agency ("EPA") *RCRA Groundwater Monitoring Technical Enforcement Guidance Document* (OSWER-9950.1, September, 1986), as updated by EPA's *RCRA Ground-Water Monitoring: Draft Technical Guidance* (November 1992).

Activities in an integrated program to generate quality data can be classified as management (i.e., quality assurance or "QA") and as functional (i.e., quality control or "QC"). The objective of this QAP is to ensure that monitoring data are generated at the Mill that meet the requirements for precision, accuracy, completeness, representativeness and comparability required for management purposes and to comply with the reporting requirements established by applicable permits and regulations.

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 Functional Groups

This QAP specifies roles for a QA Manager as well as representatives of three different functional groups: the data users; the data generators, and the data reviewers/approvers. The roles and responsibilities of these representatives are described below.

2.2 Overall Responsibility For the QA/QC Program

The overall responsibility for ensuring that the QA/QC measures are properly employed is the responsibility of the QA Manager. The QA Manager is typically not directly involved in the data generation (i.e., sampling or analysis) activities. The QA Manager is designated by Denison Mines (USA) Corp. ("DUSA") corporate management.

2.3 Data Requestors/Users

The generation of data that meets the objectives of this QAP is necessary for management to make informed decisions relating to the operation of the Mill facility, and to comply with the reporting requirements set out in the GWDP and other permits and applicable regulations. Accordingly, the data requesters/users (the "Data Users") are therefore DUSA's corporate management and regulatory authorities through the implementation of such permits and regulations. The data quality objectives ("DQOs") required for any groundwater sampling event, such as acceptable minimum detection limits, are specified in this QAP.

2.4 Data Generators

The individuals who carry out the sampling and analysis activities at the request of the Data Users are the data generators. For Mill activities, this involves sample collection, record keeping and QA/QC activities conducted by one or more sampling and quality control/data monitors (each a "Sampling and QC Monitor"). The Sampling and QC Monitors are qualified Mill personnel as designated by the QA Manager. The Sampling and QC Monitors perform all field sampling activities, collect all field QC samples and perform all data recording and chain of custody activities in accordance with this QAP. Data generation at the contract analytical laboratory (the "Analytical Laboratory") utilized by the Mill to analyze the environmental samples is performed by or under an employee or agent (the "Analysis Monitor") of the Analytical Laboratory, in accordance with specific requirements of the Analytical Laboratory's own QA/QC program.

The responsibilities of the data generators are as follows:

2.4.1 Sampling and QC Monitors

The Sampling and QC Monitors are responsible for field activities. These include:

a) Ensuring that samples are collected, preserved, and transported as specified in this QAP;

b) Checking that all sample documentation (labels, field data worksheets, chain-of-custody records,) is correct and transmitting that information, along with the samples, to the Analytical Laboratory in accordance with this QAP;

c) Maintaining records of all samples, tracking those samples through subsequent processing and analysis, and, ultimately, where applicable, appropriately disposing of those samples at the conclusion of the program;

d) Preparing quality control samples for field sample collection during the sampling event;

e) Preparing QC and sample data for review by the QA Manager; and

f) Preparing QC and sample data for reporting and entry into a computerized database, where appropriate.

2.4.2 Analysis Monitor

The Analysis Monitor is responsible for QA/QC activities at the Analytical Laboratory. These include:

a) Training and qualifying personnel in specified Analytical Laboratory QC and analytical procedures, prior to receiving samples;

b) Receiving samples from the field and verifying that incoming samples correspond to the packing list or chain-of-custody sheet; and

c) Verifying that Analytical Laboratory QC and analytical procedures are being followed as specified in this QAP, by the Analytical Laboratory's QA/QC program, and in accordance with the requirements for maintaining National Environmental Laboratory Accreditation Program ("NELAP") certification.

2.4.3 Data Reviewers/Approvers

The QA Manager has broad authority to approve or disapprove project plans, specific analyses and final reports. In general, the QA Manager is responsible for reviewing and advising on all aspects of QA/QC, including:

a) Ensuring that the data produced by the data generators meet the specifications set out in this QAP;

b) Making on-site evaluations and submitting audit samples to assist in reviewing QA/QC procedures;

c) Determining (with the Sampling and QC Monitor and Analysis Monitor) appropriate sampling equipment and sample containers, in accordance with this QAP, to minimize contamination; and

d) Supervising all QA/QC measures to assure proper adherence to this QAP and determining corrective measures to be taken when deviations from this QAP occur.

The QA Manager may delegate certain of these responsibilities to one or more Sampling and QC Monitors or to other qualified Mill personnel.

2.5 Responsibilities Of Analytical Laboratory

Unless otherwise specified by DUSA corporate management, all environmental analysis of groundwater sampling required by the GWDP or by other applicable permits, will be performed by a contract Analytical Laboratory.

The Analytical Laboratory is responsible for providing sample analyses for groundwater monitoring and for reviewing all analytical data to assure that data are valid and of sufficient quality. The Analytical Laboratory is also responsible for data validation in accordance with the requirements for maintaining NELAP certification.

In addition, to the extent not otherwise required to maintain NELAP certification, the Analytical Laboratory must adhere to U. S. EPA Guideline SW-846 and, to the extent consistent with NELAP and EPA practices, the applicable portions of NRC Regulatory Guide 4.14.

The Analytical Laboratory will be chosen by DUSA and must satisfy the following criteria: (1) experience in analyzing environmental samples with detail for precision and accuracy, (2) experience with similar matrix analyses, (3) operation of a stringent internal quality assurance program meeting NELAP certification requirements and that satisfies the criteria set out in Section 8 below, (4) ability to satisfy radionuclide requirements as stipulated in the applicable portions of NRC Regulatory Guide 4.14, and (5) certified by the State of Utah for and capable of performing the analytical methods set out in Table 1. The analytical procedures used by the Analytical Laboratory will be in accordance with Utah Administrative Code R317-6-6.3L.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

The objective of this QAP is to ensure that monitoring data are generated at the Mill that meet the requirements for precision, accuracy, representativeness, completeness, and comparability required for management purposes and to comply with the reporting requirements established by applicable permits and regulations (the Field and Analytical QC samples described in Sections 4.3 and 8.1 below are designed to ensure that these criteria are satisfied). Data subject to QA/QC measures are deemed more reliable than data without any QA/QC measures.

3.1 Precision

Precision is defined as the measure of variability that exists between individual sample measurements of the same property under identical conditions. Precision is measured through the analysis of samples containing identical concentrations of the parameters of concern. For duplicate measurements, precision is expressed as the relative percent difference ("RPD") of a data pair and will be calculated by the following equation:

$$RPD = [(A-B)/\{(A+B)/2\}] \times 100$$

Where A (original) and B (duplicate) are the reported concentration for field duplicate samples analyses (or, in the case of analyses performed by the Analytical Laboratory, the percent recoveries for matrix spike and matrix spike duplicate samples) (EPA SW-846, Chapter 1, Section 5.0, page 27 - 28).

3.2 Accuracy

Accuracy is defined as a measure of bias in a system or as the degree of agreement between a measured value and a known value. The accuracy of laboratory analyses is evaluated based on analyzing standards of known concentration both before and during analysis. Accuracy will be evaluated by the following equation:

$$\% \text{ Recovery} = (\,|\,A-B\,|\,/C) \times 100$$

Where:

A = the concentration of analyte in a sample
B = the concentration of analyte in an unspiked sample
C = the concentration of spike added

3.3 Representativeness

Representativeness is defined as the degree to which a set of data accurately represents the characteristics of a population, parameter, conditions at a sampling point, or an environmental condition. Representativeness is controlled by performing all sampling in compliance with this QAP.

3.4 Completeness

Completeness refers to the amount of valid data obtained from a measurement system in reference to the amount that could be obtained under ideal conditions. Laboratory completeness is a measure of the number of samples submitted for analysis compared to the number of analyses found acceptable after review of the analytical data. Completeness will be calculated by the following equation:

Completeness = (Number of valid data points/total number of measurements) x 100

Where the number of valid data points is the total number of valid analytical measurements based on the precision, accuracy, and holding time evaluation. Completeness is determined at the conclusion of the data validation.
Executive Secretary approval will be required for any completeness less than 100 percent.

3.5 Comparability

Comparability refers to the confidence with which one set of data can be compared to another measuring the same property. Data are comparable if sampling conditions, collection techniques, measurement procedures, methods, and reporting units are consistent for all samples within a sample set.

4.0 FIELD SAMPLING QUALITY ASSURANCE METHODOLOGY

4.1 Controlling Well Contamination

Well contamination from external surface factors, is controlled by installation of a cap over the surface casing and cementing the surface section of the drill hole. Wells have surface covers of mild steel with a lockable cap cover. Radiation Safety staff has access to the keys locking the wells.

4.2 Controlling Depth to Groundwater Measurements

Monitoring of depth to groundwater is controlled by comparing historical field data to actual measurement depth. This serves as a check of the field measurements.

4.3 Water Quality QC Samples

Quality assurance for groundwater monitoring consists of the following QC samples:

4.3.1 VOC Trip Blanks

Trip blanks will be used to assess contamination introduced into the sample containers by volatile organic compounds ("VOCs") through diffusion during sample transport and storage. At a minimum (at least) one trip blank will be in each shipping container containing samples to be analyzed for VOCs. Trip blanks will be prepared by the Analytical Laboratory, transported to the sampling site, and then returned to the Analytical Laboratory for analysis along with the samples collected during the sampling event. The trip blank will be unopened throughout the transportation and storage processes and will accompany the technician while sampling in the field.

4.3.2 Equipment Rinsate Samples

Where portable (non-dedicated) sampling equipment is used, a rinsate sample will be collected at a frequency of one rinsate sample per 20 field samples. Rinsate blanks will be collected after decontamination and prior to subsequent use. Rinsate blank samples for a non-dedicated pump are prepared by pumping de-ionized water into the sample containers. Rinsate blank samples for a non-disposable or non-dedicated bailerare prepared by pouring de-ionized water over and through the bailer and into the sample containers. Equipment rinsate blanks will be analyzed only for the contaminants required during the monitoring event in which they are collected.

Equipment rinsate blank sampling procedures are described in Attachments 2-2 and 2-5.

4.3.3 Field Duplicates

Field duplicate samples are collected at a frequency of one duplicate per 20 field samples. Field duplicates will be submitted to the Analytical Laboratory and analyzed for the same constituents as the parent sample.

Field duplicate sampling procedures are described in Attachment 2-5.

4.3.4 Definition of "Batch"

For the purposes of this QAP, a Batch is defined as 20 or fewer samples.

5.0 CALIBRATION

A fundamental requirement for collection of valid data is the proper calibration of all sample collection and analytical instruments. Sampling equipment shall be calibrated in accordance with manufacturers' recommendations, and Analytical Laboratory equipment shall be calibrated in accordance with Analytical Laboratory procedures.

5.1 Depth to Groundwater Measurements

Equipment used in depth to groundwater measurements will be checked prior to each use as noted in Attachment 2 to ensure that the Water Sounding Device is functional.

5.2 Water Quality

The Field Parameter Meter will be calibrated prior to each sampling event and at the beginning of each day of the sampling event according to manufacturer's specifications (for example, by using two known pH solutions and one specific conductance standard.) Temperature will be checked comparatively by using a thermometer. Calibration results will be recorded on the Field Data Worksheet.

6.0 GROUNDWATER SAMPLING AND MEASUREMENT OF FIELD PARAMETERS

6.1 Groundwater Head Monitoring

Groundwater head measurements ("depth to water") will be completed as described in Attachment 2 using the equipment specified in Attachment 2.

6.1.1 Location and Frequency of Groundwater Head Monitoring

Depth to groundwater shall be measured quarterly in the following wells and piezometers:

a) All Point of Compliance wells listed in the GWDP Parts I.E.1 (b) and (c) and I.E.2;

b) Monitoring well MW-34;

c) All piezometers (P-1, P-2, P-3, P-4, P-5 and the Dry Ridge piezometers);

d) All contaminant investigation wells required by the Executive Secretary as part of a contaminant investigation or groundwater corrective action (chloroform and nitrate wells).

6.1.2 Groundwater Head Monitoring Frequency

Depth to groundwater is measured and recorded in any well that is being sampled for groundwater quality prior to sampling. In addition, a depth to groundwater measurement campaign will be completed each quarter. The data from the quarterly campaign will be used for modeling purposes and will be completed within a 5 day period. The data from the quarterly campaign will be recorded on a data sheet. An example of a Quarterly Depth to Water data sheet is included Attachment 1. Data from the quarterly depth to water campaign will be recorded by hand on hardcopy forms in the field, but may be entered into an electronic data management system (spreadsheet or database). The data from the quarterly depth to water measurements will be included in the quarterly groundwater report.

The depth to groundwater measured immediately prior to purging/sampling will be recorded on data sheet for each well. An example of a Field Data Work Sheet for Groundwater is included in Attachment 1.

The data sheets included herein are examples and may be changed to accommodate additional data collection. If a change is made to a data sheet to accommodate additional information, a copy will be provided to the Executive Secretary. Changes to field forms will not eliminate any data collection activity without written approval of the Executive Secretary.

6.2 Ground Water Compliance Monitoring

6.2.1 Location and Frequency of Groundwater Compliance Monitoring

Groundwater quality shall be measured in the following wells at the following frequencies:

a) Semi-annually in the following Point of Compliance wells: MW-1, MW-2, MW-3, MW-3A, MW-5, MW-12, MW-15, MW-17, MW-18, MW-19, MW-23, MW-24, MW-27, MW-28, MW-29, and MW-32;

b) Semi-annually in the following General Monitoring Wells: MW-20 and MW-22;

c) Quarterly in the following Point of Compliance wells: MW-11, MW-14, MW-25, MW-26, MW-30, MW-31, MW-35, MW-36 and MW-37; and

d) Quarterly in the Chloroform Investigation and Nitrate Corrective Action wells.

In addition, quarterly or monthly sampling may be required for certain parameters in certain wells based on the requirements specified in Parts I.G.1 or I.G.2 of the GWDP. Sampling personnel should coordinate with the QA Manager prior to conducting any monitoring well sampling to determine if any parameters in any wells are subject to accelerated monitoring.

6.2.2 Quarterly and Semi-Annual Sampling Required Under Parts I.E.1.b) or I.E.1.c) of the GWDP

All quarterly and semi-annual samples collected under Parts I.E.1.b) or I.E.1.c) of the GWDP shall be analyzed for the following parameters:

a) Field parameters – depth to groundwater, pH, temperature, specific conductance, redox potential (Eh) and turbidity; and

b) Laboratory Parameters:

(i) All parameters specified in Table 2 of the GWDP; and

(ii) General inorganics – chloride, sulfate, carbonate, bicarbonate, sodium potassium, magnesium, calcium, and total anions and cations.

6.2.3 Quarterly or Monthly Sampling Required Under Paragraphs I.G.1 or I.G.2 of the GWDP

Any quarterly or monthly accelerated sampling required under paragraphs I.G.1. or I.G.2. of the GWDP shall be analyzed for the specific parameters as required by previous sampling results as determined by the QA Manager.

6.2.4 Sampling Equipment for Groundwater Compliance Monitoring

All equipment used for purging and sampling of groundwater which enters the well or may otherwise contact sampled groundwater, shall be made of inert materials.

Purging and sampling equipment is described in Attachment 2-3 of this QAP.

Field parameters are measured by using a flow cell system that enables the measurements to be taken on a real-time basis without exposing the water stream to the atmosphere;

6.2.5 Decontamination Procedure

Portable (non-dedicated) sampling equipment will be decontaminated prior to each sampling event, at the beginning of each day during the sampling event, and between each sampling location (well). Non-dedicated sampling equipment will be decontaminated using the procedure described in Attachment 2-2.

6.2.6 Pre-Purging/ Sampling Activities

Pre-purging and sampling activities are described in Attachment 2-3. The purging and sampling techniques used at each well will be a function of the well's historic recovery rates, the equipment used for purging, and the analytical suite to be completed.

6.2.7 Well Purging/Measurement of Field Parameters

The purging techniques described in Attachment 2-3 will be used for all groundwater sampling conducted at the Mill unless otherwise stated in the program-specific QAPs for the chloroform and nitrate investigations. The program-specific QAPs for the chloroform and nitrate investigations are included as Appendix A and Appendix B respectively.

Purging wells prior to sampling removes the stagnant water column present in the well casing and assures that representative samples of the formation water are collected. Purging will be completed as described in Attachment 2-3.

There are three purging strategies that will be used to remove stagnant water from the well casing during groundwater sampling at the Mill. The three strategies are as follows:

1. Purging three well casing volumes with a single measurement of field parameters
2. Purging two casing volumes with stable field parameters (within 10% RPD)
3. Purging a well to dryness and stability of a limited list of field parameters after recovery

6.2.8 Samples to be taken and order of taking samples

For each quarterly or semi-annual sampling event, samples will be collected for the analyte specified in Table 2 of the GWDP. The following is a list of the sample containers that will be collected to provide sample aliquots to the Analytical Laboratory for the completion of the analyses specified in Table 2 of the GWDP . The Analytical Laboratory will provide the sampling containers and may request that certain analytes be combined into a single container due to like sampling requirements (filtering) and/or like preservation. The container requirements will be determined by the Analytical Laboratory and specified with the bottles supplied to the Field Personnel. Bottle requirements may change if the Analytical Laboratory is changed or if advances in analytical techniques allow for reduced samples volumes. The following list is a general guideline.

a) VOCs, 3 sample containers, 40 ml each;

b) Nutrients (ammonia, nitrate and nitrite), 1 sample container, 100 ml;

c) All other non-radiologics (fluoride, general inorganics, TDS, total cations and anions), 1 sample container, 250 ml,; and

d) Gross alpha and heavy metals, 1 sample container, 1,000 ml, filtered.

The sample collection containers and sample volumes for chloroform and nitrate program sampling are specified in Appendices A and B to this document.

Accelerated samples will be analyzed for a limited list of analytes as determined by previous sampling results. Only the containers for the specific list of analytes will be collected for accelerated monitoring samples.

7.0 SAMPLE DOCUMENTATION TRACKING AND RECORD KEEPING

7.1 Field Data Worksheets

Documentation of observations and data from sampling provide important information about the sampling process and provide a permanent record for sampling activities. All observations and field sampling data will be recorded in waterproof ink on the Field Data Worksheets, which will be maintained on file at the Mill.

The Field Data Worksheets will contain the following information:

- Name of the site/facility
- description of sampling event
- location of sample (well name)
- sampler's name(s) and initials(s)
- date(s) and time(s) of well purging and sample collection

- type of well purging equipment used (pump or bailer)
- previous well sampled during the sampling event
- well depth
- depth to groundwater before purging and sampling
- field measurements (pH, specific conductance, water temperature, redox potential, turbidity)
- calculated well casing volume
- volume of water purged before sampling
- volume of water purged when field parameters are measured
- type and condition of well pump
- description of samples taken
- sample handling, including filtration and preservation
- volume of water collected for analysis
- types of sample containers and preservatives
- weather conditions and external air temperature
- name of certified Analytical Laboratory.

The Field Data Worksheets will also contain detailed notes describing any other significant factors noted during the sampling event, including, as applicable: condition of the well cap and lock; water appearance, color, odor, clarity; presence of debris or solids; any variances from this procedure; and any other relevant features or conditions. An example of a Field Data Worksheet that incorporates this information is attached in Attachment 1.

The data sheets included herein are examples and may be changed to accommodate additional data collection. If a change is made to a data sheet to accommodate additional information, a copy will be provided to the Executive Secretary. Changes to field forms will not eliminate any data collection activity without written approval of the Executive Secretary.

7.2 Chain-Of-Custody and Analytical Request Record

A Chain-of-Custody and Analytical Request Record form (the "COC Form"), provided by the Analytical Laboratory, will accompany the samples being shipped to the Analytical Laboratory. Examples of the Chain of Custody Forms used are attached as Attachment 2. If the Chain of Custody Form changes at any time, the Company shall provide a copy of the new or revised Chain of Custody Form to the Executive Secretary and substitute the new form for the old form in Attachment 2. Standard Chain-of-Custody protocol is initiated for each sample set. A COC Form is to be completed for each set of samples collected in a shipping container (cooler) and is to include the following:

- sampler's name
- company name
- date and time of collection
- sample type (e.g., water)

- sample location
- number of sample containers in the shipping container
- analyses requested
- signatures of persons involved in the chain of possession
- internal temperatures of the shipping container when opened at the laboratory
- remarks section to identify potential hazards or to relay other information to the Analytical Laboratory.

Chain-of-Custody reports will be placed inside a re-sealable bag and taped to the inside lid. Custody seals will be placed on the outside of each cooler.

The person shipping the samples to the Analytical Laboratory will sign the COC Form, document shipment method, and send the original and the second copy of the COC Form with the samples. Upon receipt of the samples, the person receiving the samples will sign the COC Form and return the second copy to the Mill's RSO.

Copies of the COC Forms and other relevant documentation will be retained at the Mill.

7.3 Record Keeping

The Field Data Worksheets are retained at the Mill.

Data from the Analytical Laboratory, showing the laboratory analytical results for the water samples, are maintained at the Mill.

Copies of the current Utah certifications of the Analytical Laboratory or Laboratories and a list of Utah Bureau of Laboratory Improvement approved parameters and methods used to perform analysis during the monitoring events conducted during the quarter will be maintained at the Mill. DUSA will ensure that the Analytical Laboratory or Laboratories used, have certifications for each parameter and method required by Section 8.2, Table 1 of the QAP.

Once all the data for the quarter (all wells sampled during the quarter) is completed, key data from the Field Data Worksheets and from the data packages are managed using electronic data management software The data management software will be managed and administered by the QA Manager or designee. The Mill Personnel will have read-only access to the electronic data management software.

8.0 ANALYTICAL PROCEDURES AND QA/QC

Analytical Laboratory QA provides a means for establishing consistency in the performance of analytical procedures and assuring adherence to analytical methods utilized. Analytical Laboratory QC programs include traceability of measurements to independent reference materials and internal controls.

8.1 Analytical Quality Control

Analytical QA/QC will be governed by the QA/QC program of the Analytical Laboratory. In choosing and retaining the Analytical Laboratory, DUSA shall ensure that the Analytical Laboratory is certified by the State of Utah and by NELAP, is capable of performing the analytical procedures specified in Section 8.2, and that the QA/QC program of the Analytical Laboratory includes the spikes, blanks and duplicates described in Section 8.1.2.

8.1.2 Spikes, Blanks and Duplicates

Analytical Laboratory QC samples will assess the accuracy and precision of the analyses. The following describes the type of QC samples that will be used by the Analytical Laboratory to assess the quality of the data. The following procedures shall be performed at least once with each analytical Batch of samples:

a) Matrix Spike/Matrix Spike Duplicate

A spiked field sample analyzed in duplicate may be analyzed with every analytical batch (depending on the analytical method requirements and or method limitations). Analytes stipulated by the analytical method, by applicable regulations, or by other specific requirements may be spiked into the samples. Selection of the sample to be spiked depends on the information required and the variety of conditions within a typical matrix. The matrix spike sample serves as a check evaluating the effect of the sample matrix on the accuracy of analysis. The matrix spike duplicate serves as a check of the analytical precision.

b) Method Blanks

Each analytical batch shall be accompanied by a method blank. The method blank shall be carried through the entire analytical procedure. Contamination detected in analysis of method blanks will be used to evaluate any Analytical Laboratory contamination of environmental samples which may have occurred.

c) Surrogate Compounds

Every blank, standard, and environmental sample (including matrix spike/matrix duplicate samples) for analysis of VOCs (or other organics only) shall be spiked with surrogate compounds prior to purging or extraction. Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. Surrogates shall be spiked into samples according to the appropriate organic analytical methods.

d) Check Sample

Each analytical batch shall contain a number of check samples. For each method, the Analytical Laboratory will normally analyze the following check samples or their equivalents: a method blank, a laboratory control spike, a matrix spike, and a matrix spike duplicate, or the equivalent, with relative percent difference reported.

8.2 Analytical Laboratory Procedures

The analytical procedures to be used by the Analytical Laboratory will be as specified in Table 1, or as otherwise authorized by the Executive Secretary. With respect to Chloroform Investigation and Nitrate Corrective Action sampling, the analytical procedures for parameters monitored under those programs are specified in Appendix A and B respectively.

Table 1

Contaminant	Analytical Methods to be Used	Reporting Limit[1]	Maximum Holding Times	Sample Preservation Requirements	Sample Temperature Requirements
Nutrients					
Ammonia (as N)	A4500-NH3 G or E350.1	0.05 mg/L	28 days	H_2SO_4 to pH<2	≤ 6°C
Nitrate & Nitrite (as N)	E353.1 or E353.2	0.1 mg/L	28 days	H_2SO_4 to pH<2	≤ 6°C
Heavy Metals					
Arsenic	E200.7 or E200.8	5 µg/L	6 months	HNO_3 to pH<2	None
Beryllium	E200.7 or E200.8	0.50 µg/L	6 months	HNO_3 to pH<2	None
Cadmium	E200.7 or E200.8	0.50 µg/L	6 months	HNO_3 to pH<2	None
Chromium	E200.7 or E200.8	25 µg/L	6 months	HNO_3 to pH<2	None
Cobalt	E200.7 or E200.8	10 µg/L	6 months	HNO_3 to pH<2	None
Copper	E200.7 or E200.8	10 µg/L	6 months	HNO_3 to pH<2	None
Iron	E200.7 or E200.7	30 µg/L	6 months	HNO_3 to pH<2	None
Lead	E200.7 or E200.8	1.0 µg/L	6 months	HNO_3 to pH<2	None
Manganese	E200.7 or E200.8	10 µg/L	6 months	HNO_3 to pH<2	None
Mercury	E 245.1 or E200.7 or E200.8	0.50 µg/L	28 days	HNO_3 to pH<2	None
Molybdenum	E200.7 or E200.8	10 µg/L	6 months	HNO_3 to pH<2	None
Nickel	E200.7 or E200.8	20 µg/L	6 months	HNO_3 to pH<2	None
Selenium	E200.7 or E200.8	5 µg/L	6 months	HNO_3 to pH<2	None
Silver	E200.7 or E200.8	10 µg/L	6 months	HNO_3 to pH<2	None
Thallium	E200.7 or E200.8	0.50 µg/L	6 months	HNO_3 to pH<2	None

Contaminant	Analytical Methods to be Used	Reporting Limit[1]	Maximum Holding Times	Sample Preservation Requirements	Sample Temperature Requirements
Tin	E200.7 or E200.8	100 µg/L	6 months	HNO_3 to pH<2	None
Uranium	E200.7 or E200.8	0.30 µg/L	6 months	HNO_3 to pH<2	None
Vanadium	E200.7 or E200.8	15 µg/L	6 months	HNO_3 to pH<2	None
Zinc	E200.7 or E200.8	10 µg/L	6 months	HNO_3 to pH<2	None
Radiologics					
Gross Alpha	E 900.0 or E900.1	1.0 pCi/L	6 months	HNO_3 to pH<2	None
Volatile Organic Compounds					
Acetone	SW8260B or SW8260C	20 µg/L	14 days	HCl to pH<2	≤ 6°C
Benzene	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
2-Butanone (MEK)	SW8260B or SW8260C	20 µg/L	14 days	HCl to pH<2	≤ 6°C
Carbon Tetrachloride	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Chloroform	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Chloromethane	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Dichloromethane (Methylene Chloride)	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Naphthalene	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Tetrahydrofuran	SW8260B	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C

Contaminant	Analytical Methods to be Used	Reporting Limit[1]	Maximum Holding Times	Sample Preservation Requirements	Sample Temperature Requirements
	or SW8260C				
Toluene	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Xylenes (total)	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Others					
Field pH (S.U.)	A4500-H B	0.01 s.u.	Immediate	None	None
Fluoride	A4500-F C or E300.0	0.1 mg/L	28 days	None	None
TDS	A2540 C	10 mg/L	7 days	None	≤ 6°C
General Inorganics					
Chloride	A4500-Cl B or A4500-Cl E or E300.0	1 mg/L	28 days	None	None
Sulfate	A4500-SO4 E or E300.0	1 mg/L	28 days	None	≤ 6°C
Carbonate as CO3	A2320 B	1 mg/L	14 days	None	≤ 6°C
Bicarbonate as HCO3	A2320 B	1 mg/L	14 days	None	≤ 6°C
Sodium	E200.7	0.5 mg/L	6 months	HNO_3 to pH<2	None
Potassium	E200.7	0.5 mg/L	6 months	HNO_3 to pH<2	None
Magnesium	E200.7	0.5 mg/L	6 months	HNO_3 to pH<2	None
Calcium	E200.7	0.5 mg/L	6 months	HNO_3 to pH<2	None

1. The Analytical Laboratory will be required to meet the reporting limits ("RLs") in the foregoing Table, unless the RL must be increased due to sample matrix interference (i.e., due to dilution gain), in which case the increased RL will be used, or unless otherwise approved by the Executive Secretary.

9.0 INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks are inherent in this QAP. The QA Manager will monitor the performance of the Sample and QC Monitors, and, to the extent practicable, the Analysis Monitor to ensure that they are following this QAP. In addition, either the QA Manager or a Sampling and QC Monitor will review and validate the analytical data generated by the Analytical Laboratory to ensure that it meets the DQOs established by this QAP. Finally, periodic system and performance audits will be performed, as detailed in Section 12 below.

9.1 Field QC Check Procedures

The QA Manager will perform the following QA/QC analysis of field procedures:

9.1.1 Review of Compliance With the Procedures Contained in this QAP

Observation of technician performance is monitored by the QA Manager on a periodic basis to ensure compliance with this QAP.

9.1.2 Analyte Completeness Review

The QA Manager will review all Analytical Results to confirm that the analytical results are complete (i.e., there is an analytical result for each required constituent in each well). The QA Manager shall also identify and report all instances of non-compliance and non-conformance (see Part I.E.1(a) of the Permit. Executive Secretary approval will be required for any completeness (prior to QA/QC analysis) less than 100 percent. Non-conformance will be defined as a failure to provide field parameter results and analytical results for each parameter and for each well required in Sections 6.2.2 and 6.2.3, for the sampling event, without prior written Executive Secretary approval.

9.1.3 Blank Comparisons

Trip blanks, method blanks, and equipment rinsate samples will be compared with original sample results. Non-conformance conditions will exist when contaminant levels in the samples(s) are not order of magnitude greater than the blank result. (TEGD, Field QA/QC Program, page 119).

Corrective actions for blank comparison non-conformance shall first determine if the non-conformance is a systematic issue which requires the procedures described in Section 10. If the non-conformance is limited in scope and nature, the QA Manager will

1. Review the data and determine the overall effect to the data quality,
2. Notify the laboratory of the discrepancy (if it is a laboratory generated blank), and
3. Request the laboratory review all analytical results for transcription and calculation errors, and (for laboratory generated blanks)

4. If the samples are still within holding time, the QA Manager may request the laboratory re-analyze the affected samples.

If re-analysis is not possible, qualifiers may be applied to the samples associated with a non-conforming blank. Recommendations regarding the usability of the data may be included in the quarterly report.

9.1.4 Duplicate Sample Comparisons

The following analyses will be performed on duplicate field samples:

a) Relative Percent Difference.

RPDs will be calculated in comparisons of duplicate and original field sample results. Non-conformance will exist when the RPD $\geq$ 20%, unless the measured concentrations are less than 5 times the required detection limit (Standard Methods, 1998) (EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994, 9240.1-05-01, p. 25).

b) Radiologics Counting Error Term

All gross alpha analyses shall be reported with an error term. All gross alpha analysis reported with an activity equal to or greater than the GWCL, shall have a counting variance that is equal to or less that 20% of the reported activity concentration. An error term may be greater than 20% of the reported activity concentration when the sum of the activity concentration and error term is less than or equal to the GWCL.

c) Radiologics, Duplicate Samples

Comparability of results between the original and duplicate radiologic samples will be evaluated by determining compliance with the following formula:

$$\left| A-B \right| / (s_a^2+s_b^2)^{1/2} \leq 2$$

Where:

A = the first duplicate measurement
B = the second duplicate measurement
s_a^2 = the uncertainty of the first measurement squared
s_b^2 = the uncertainty of the second measurement squared

Non-conformance exists when the foregoing equation is > 2.

(EPA Manual for the Certification of Laboratories Analyzing Drinking Water, Criteria and Procedures Quality Assurance, January 2005, EPA 815-R-05-004, p. VI-9).

Corrective actions for duplicate deviations shall first determine if the deviation is indicative of a systematic issue which requires the procedures described in Section 10. If the non-conformance is limited in scope and nature, the QA Manager will:

1. Notify the laboratory,
2. Request the laboratory review all analytical results for transcription and calculation errors, and
3. If the samples are still within holding time, the QA Manager may request the laboratory re-analyze the affected samples.

9.2 Analytical Laboratory QA Reviews

Full validation will include recalculation of raw data for a minimum of one or more analytes for ten percent of the samples analyzed. The remaining 90% of all data will undergo a QC review which will include validating holding times and QC samples. Overall data assessment will be a part of the validation process as well.

The Analysis Monitor or data validation specialist will evaluate the quality of the data based on SW-846, the applicable portions of NRC guide 4.14 and on analytical methods used. The reviewer will check the following:

(1) sample preparation information is correct and complete,
(2) analysis information is correct and complete,
(3) appropriate Analytical Laboratory procedures are followed,
(4) analytical results are correct and complete,
(5) QC samples are within established control limits,
(6) blanks are within QC limits,
(7) special sample preparation and analytical requirements have been met, and
(8) documentation is complete.

The Analytical Laboratory will prepare and retain full QC and analytical documentation. The Analytical Laboratory will report the data as a group of one batch or less, along with the QA/QC data. The Analytical Laboratory will provide the following information:
(1) cover sheet listing samples included in report with a narrative,
(2) results of compounds identified and quantified,
(3) reporting limits for all analytes, and
(4) QA/QC analytical results.

9.3 QA Manager Review of Analytical Laboratory Results and Procedures

The QA Manager shall perform the following QA reviews relating to Analytical Laboratory procedures:

a) Reporting Limit (RL) Comparisons

The QA Manager shall confirm that all reporting limits used by the Analytical Laboratory are in conformance with the reporting limits set out on Table 1. Non-conformance shall be defined as:
1) a reporting limit that violates these provisions, unless the reporting limit must be increased due to sample matrix interference (i.e., due to dilution); or
2) a reporting limit that exceeds the respective GWQS listed in Table 2 of the GWDP unless the reported concentration is greater than the raised reporting limit.

b) Laboratory Methods Review

The QA Manager shall confirm that the analytical methods used by the Analytical Laboratory are those specified in Table 1, unless otherwise approved by the Executive Secretary. Non-conformance shall be defined when the Analytical Laboratory uses analytical methods not listed in Table 1 and not otherwise approved by the Executive Secretary.

c) Holding Time Examination

The QA Manager will review the analytical reports to verify that the holding time for each contaminant was not exceeded. Non-conformance shall be defined when the holding time is exceeded.

d) Sample Temperature Examination

The QA Manager shall review the analytical reports to verify that the samples were received by the Analytical Laboratory at a temperature no greater than the approved temperature listed in Table 1. Non-conformance shall be defined when the sample temperature is exceeded.

9.4 Analytical Data

All QA/QC data and records required by the Analytical Laboratory's QA/QC program shall be retained by the Analytical Laboratory and shall be made available to DUSA as requested.

Analytical data submitted by the Analytical Laboratory should contain the date/time the sample was collected, the date/time the sample was received by the Analytical Laboratory, the date/time the sample was extracted (if applicable), and the date/time the sample was analyzed.

All out-of-compliance results will be logged by the Analysis Monitor with corrective actions described as well as the results of the corrective actions taken. All raw and reduced data will be stored according to the Analytical Laboratory's record keeping procedures and QA program. All Analytical Laboratory procedures and records will be available for on-site inspection at any time during the course of investigation.

If re-runs occur with increasing frequency, the Analysis Monitor and the QA Manager will be consulted to establish more appropriate analytical approaches for problem samples.

10.0 CORRECTIVE ACTION

10.1 When Corrective Action is Required

The Sampling and QC Monitors and Analytical Laboratory are responsible for following procedures in accordance with this QAP. Corrective action should be taken for any procedural or systematic deficiencies or deviations noted in this QAP. All deviations from field sampling procedures will be noted on the Field Data Worksheets or other applicable records. Any QA/QC problems that arise will be brought to the immediate attention of the QA Manager. Analytical Laboratory deviations will be recorded by the Analysis Monitor in a logbook as well.

When a procedural or systematic non-conformance is identified, DUSA shall:

a) When non-conformance occurs as specified in Sections 9.1.3 or 9.1.4 the data shall be qualified to denote the problem and the QC sample-specific corrective actions in Sections 9.1.3, 9.1.4 or 9.3 will be followed. If the non-conformance is deemed to be systematic or procedural, DUSA shall determine the root cause, and provide specific steps to resolve problems(s) in accordance with the procedure set forth in Section 10.2. Any non-conformance with QAP requirements in a given quarterly groundwater monitoring period will be corrected and reported to the Executive Secretary on or before submittal of the next quarterly ground water monitoring report.
b) When a sample is lost, sample container broken, or the sample or analyte was omitted, resample within 10 days of discovery and analyze again in compliance with all requirements of this QAP. The results for this sample(s) should be included in the same quarterly monitoring report with other samples collected for the same sampling event; and
c) For any other material deviation from this QAP, the procedure set forth in Section 10.2 shall be followed.

10.2 Procedure for Corrective Action

The need for corrective action for non-conformance with the requirements of this QAP, may be identified by system or performance audits or by standard QA/QC procedures. The procedures to be followed if the need for a corrective action is identified, are as follows:

a) Identification and definition of the problem;

b) Assignment of responsibility for investigating the problem;

c) Investigation and determination of the cause of the problem;

d) Determination of a corrective action to eliminate the problem;

e) Assigning and accepting responsibility for implementing the corrective action;

f) Implementing the corrective action and evaluating its effectiveness; and

g) Verifying that the corrective action has eliminated the problem.

The QA Manager shall ensure that these steps are taken and that the problem which led to the corrective action has been resolved. A memorandum explaining the steps outlined above will be placed in the applicable monitoring files and the Mill Central Files, and the corrective action will be documented in a Report prepared in accordance with Section 11.

11.0 REPORTING

As required under paragraph I.F.1 of the GWDP, the Mill will send a groundwater monitoring report to the Executive Secretary on a quarterly basis. Both the Routine Groundwater Monitoring Reports (pertinent to Part I.F.1 of the Permit) and Chloroform Investigation and Nitrate Corrective Action Reports shall be submitted according to the following schedule:

Quarter	Period	Due Date
First	January – March	June 1
Second	April – June	September 1
Third	July – September	December 1
Fourth	October – December	March 1

The Routine Groundwater Monitoring Reports (pertinent to Part I.F.1 of the Permit) will include the following information:

- Description of monitor wells sampled
- Description of sampling methodology, equipment an decontamination procedures to the extent they differ from those described in this QAP
- A summary data table of groundwater levels for each monitor well and piezometer
- A summary data table showing the results of the sampling event, listing all wells and the analytical results for all constituents and identifying any constituents that are subject to accelerated monitoring in any particular wells pursuant to Part I.G.1 of the GWDP or are out of compliance in any particular wells pursuant to Part I.G.2 of the GWDP
- Copies of Field Data Worksheets
- Copies of Analytical Laboratory results
- Copies of Chain of Custody Forms (included in the data packages)

- A Water Table Contour Map showing groundwater elevation data for the quarter will be contemporaneous for all wells on site, not to exceed a maximum time difference of five calendar days.
- Evaluation of groundwater levels, gradients and flow directions
- Quality assurance evaluation and data validation description (see Section 9 for further details)
- All non-conformance with this QAP and all corrective actions taken.
- Recommendations and Conclusions.

With respect to the Chloroform Investigation and Nitrate Corrective Action reporting requirements, these are specified in Appendix A and B to this document.

In addition, an electronic copy of all analytical results will be transmitted to the Executive Secretary in comma separated values (CSV) format, or as otherwise advised by the Executive Secretary.

Further reporting may be required as a result of accelerated monitoring under paragraphs I.G.1 and I.G.2 of the GWDP. The frequency and content of these reports will be defined by DUSA corporate management working with the Executive Secretary.

12.0 SYSTEM AND PERFORMANCE AUDITS

12.1 QA Manager to Perform System Audits and Performance Audits

DUSA shall perform such system audits and performance audits as it considers necessary in order to ensure that data of known and defensible quality are produced during a sampling program. The frequency and timing of system and performance audits shall be as determined by DUSA.

12.2 System Audits

System audits are qualitative evaluations of all components of field and Analytical Laboratory QC measurement systems. They determine if the measurement systems are being used appropriately. System audits will review field and Analytical Laboratory operations, including sampling equipment, laboratory equipment, sampling procedures, and equipment calibrations, to evaluate the effectiveness of the QA program and to identify any weakness that may exist. The audits may be carried out before all systems are operational, during the program, or after the completion of the program. Such audits typically involve a comparison of the activities required under this QAP with those actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

12.3 Performance Audits

The performance audit is a quantitative evaluation of the measurement systems of a program. It requires testing the measurement systems with samples of known composition or behavior to evaluate precision and accuracy. With respect to performance audits of the analytical process, either blind performance evaluation samples will be submitted to the Analytical Laboratory for analysis, or the auditor will request that it provide results of the blind studies that the Analytical Laboratory must provide to its NELAP accreditation agency on an annual basis. The performance audit is carried out without the knowledge of the analysts, to the extent practicable.

12.4 Follow-Up Actions

Response to the system audits and performance audits is required when deviations are found and corrective action is required. Where a corrective action is required, the steps set out in Section 10.2 will be followed.

12.5 Audit Records

Audit records for all audits conducted will be retained in Mill Central Files. These records will contain audit reports, written records of completion for corrective actions, and any other documents associated with the audits supporting audit findings or corrective actions.

13.0 PREVENTIVE MAINTENANCE

Preventive maintenance concerns the proper maintenance and care of field and laboratory instruments. Preventive maintenance helps ensure that monitoring data generated will be of sufficient quality to meet QA objectives. Both field and laboratory instruments have a set maintenance schedule to ensure proper functioning of the instruments.

Field instruments will be maintained as per the manufacturer's specifications and established sampling practice. Field instruments will be checked and calibrated prior to use, in accordance with Section 5. Batteries will be charged and checked daily when these instruments are in use. All equipment out of service will be immediately replaced. Field instruments will be protected from adverse weather conditions during sampling activities. Instruments will be stored properly at the end of each working day. Calibration and maintenance problems encountered will be recorded in the Field Data Worksheets or logbook.

The Analytical Laboratory is responsible for the maintenance and calibration of its instruments in accordance with Analytical Laboratory procedures and as required in order to maintain its NELAP certifications. Preventive maintenance will be performed on a scheduled basis to minimize downtime and the potential interruption of analytical work.

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

14.1 Ongoing QA/QC Reporting

The following reporting activities shall be undertaken on a regular basis:

a) The Sample and QC Monitors shall report to the QA Manager regularly regarding progress of the applicable sampling program. The Sample and QC Monitors will also brief the QA Manager on any QA/QC issues associated with such sampling activities.

b) The Analytical Laboratory shall maintain detailed procedures for laboratory record keeping. Each data set report submitted to the Mill's QA Manager or his staff will identify the analytical methods performed and all QA/QC measures not within the established control limits. Any QA/QC problems will be brought to the QA Manager's attention as soon as possible; and

c) After sampling has been completed and final analyses are completed and reviewed, a brief data evaluation summary report will be prepared by the Analytical Laboratory for review by the QA Manager, by a Sampling and QC Monitor or by such other qualified person as may be designated by the QA Manager. The report will be prepared in accordance with NELAP requirements and will summarize the data validation efforts and provide an evaluation of the data quality.

14.2 Periodic Reporting to Management

The QA Manager shall present a report to DUSA's ALARA Committee at least once per calendar year on the performance of the measurement system and the data quality. These reports shall include:

a) Periodic assessment of measurement quality indicators, i.e., data accuracy, precision and completeness;

b) Results of any performance audits, including any corrective actions;

c) Results of any system audits, including any corrective actions; and

d) Significant QA problems and recommended solutions.

15.0 AMENDMENT

This QAP may be amended from time to time by DUSA only with the approval of the Executive Secretary.

16.0 REFERENCES

United States Environmental Protection Agency, November 2004, Test Methods for Evaluating Solid Waste, EPA SW-846.

United States Environmental Protection Agency, September, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), Office of Solid Waste and Emergency Response, OSWER-9950.1.

United States Environmental Protection Agency, November 1992, RCRA Ground-water Monitoring Draft Technical Guidance (DTG), Office of Solid Waste.

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. American Public Health Association, American Water Works Association, Water Environment Federation. Washington, D.C. p. 1-7.

ATTACHMENT 1
Field and Data Forms

Attachment 1-1
Quarterly Depth to Water Data Sheet

NAME: ______________________________

DATE: ______________________________

TIME	WELL	Static level	TIME	WELL	Static Level	TIME	WELL	Static Level

ATTACHMENT 1-2
WHITE MESA URANIUM MILL
FIELD DATA WORKSHEET FOR GROUNDWATER

Mill - Groundwater Discharge Permit
Groundwater Monitoring Quality Assurance Plan (QAP)

Date: 5/25/2012 Rev. 7.1

DENISON MINES

ATTACHMENT 1-2
WHITE MESA URANIUM MILL
FIELD DATA WORKSHEET FOR GROUND WATER

Attachment 1

See instruction

Description of Sampling Event: ______

Location (well name): ______ Sampler Name and initials: ______

Field Sample ID ______

Date and Time for Purging ______ and Sampling (if different) ______

Well Purging Equip Used: ☐ pump or ☐ bailer Well Pump (if other than Bennet) ______

Purging Method Used: ☐ 2 casings ☐ 3 casings

Sampling Event ______ Prev. Well Sampled in Sampling Event ______

pH Buffer 7.0 ______ pH Buffer 4.0 ______

Specific Conductance ______ µMHOS/ cm Well Depth(0.01ft): ______

Depth to Water Before Purging ______ Casing Volume (V) 4" Well: ______ (.653h)
3" Well: ______ (.367h)

Conductance (avg) ______ pH of Water (avg) ______

Well Water Temp. (avg) ______ Redox Potential (Eh) ______ Turbidity ______

Weather Cond. ______ Ext'l Amb. Temp. °C (prior sampling event) ______

Time		Gal. Purged	
Conductance		pH	
Temp. °C			
Redox Potential Eh (mV)			
Turbidity (NTU)			

Time		Gal. Purged	
Conductance		pH	
Temp. °C			
Redox Potential Eh (mV)			
Turbidity (NTU)			

Time		Gal. Purged	
Conductance		pH	
Temp. °C			
Redox Potential Eh (mV)			
Turbidity (NTU)			

Time		Gal. Purged	
Conductance		pH	
Temp. °C			
Redox Potential Eh (mV)			
Turbidity (NTU)			

Volume of Water Purged _____ gallon(s)

Pumping Rate Calculation

Flow Rate (Q), in gpm.
S/60 = _____

Time to evacuate two casing volumes (2V)
T = 2V/Q = _____

Number of casing volumes evacuated (if other than two) _____

If well evacuated to dryness, number of gallons evacuated _____

Name of Certified Analytical Laboratory if Other Than Energy Labs _____

Type of Sample	Sample Taken		Sample Vol (indicate if other than as specified below)	Filtered		Preservative Type	Preservative Added	
	Y	N		Y	N		Y	N
VOCs	☐	☐	3x40 ml	☐	☐	HCL	☐	☐
Nutrients	☐	☐	100 ml	☐	☐	H2SO4	☐	☐
Heavy Metals	☐	☐	250 ml	☐	☐	HNO3	☐	☐
All Other Non Radiologics	☐	☐	250 ml	☐	☐	No Preserv.	☐	☐
Gross Alpha	☐	☐	1,000 ml	☐	☐	HNO3	☐	☐
Other (specify)	☐	☐	Sample volume	☐	☐		☐	☐

If preservative is used, specify
Type and Quantity of Preservative: _____

Final Depth _____ Sample Time _____

See instruction

Comment

Do not touch this cell (SheetName)

ATTACHMENT 1-3
EXAMPLE CHAIN OF CUSTODY FORMS

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page _____ of _____

PLEASE PRINT (Provide as much information as possible.)

Company Name: | Project Name, PWS, Permit, Etc. | Sample Origin State: | EPA/State Compliance: Yes ☐ No ☐

Report Mail Address: | Contact Name: Phone/Fax: | Email: | Sampler: (Please Print)

Invoice Address: | Invoice Contact & Phone: | Purchase Order: | Quote/Bottle Order:

Special Report/Formats:
☐ DW ☐ EDD/EDT (Electronic Data)
☐ POTW/WWTP Format:
☐ State: _____ ☐ LEVEL IV
☐ Other: _____ ☐ NELAC

Number of Containers
Sample Type: A W S V B O D W
Air Water Solids/Solids
Vegetation Biomass Other
DW - Drinking Water

ANALYSIS REQUESTED

SEE ATTACHED

Standard Turnaround (TAT) → RUSH

Contact ELI prior to RUSH sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by:

Cooler ID(s):

Receipt Temp _____ °C

On Ice: Y N

Custody Seal On Bottle Y N; On Cooler Y N

Intact Y N

Signature Match Y N

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by (print): Date/Time: Signature: | Received by (print): Date/Time: Signature:

Relinquished by (print): Date/Time: Signature: | Received by (print): Date/Time: Signature:

Sample Disposal: Return to Client: _____ Lab Disposal: _____ | Received by Laboratory: Date/Time: Signature:

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

heet 1 of 1

CHAIN OF CUSTODY

Samples Shipped to: _____ Contact: _____

_____ _____

_____ _____

_____ _____

Chain of Custody/Sampling Analysis Request

Project	Samplers Name	Samplers Signature

Sample ID	Date Collected	Time Collected	Laboratory Analysis Requested
Please notify Tanner Holliday of Receipt temperature on these samples Immediately! Thank you.			

Relinquished By:(Signature)	Date/Time	Received By:(Signature)	Date/Time
Relinquished By:(Signature)	Date/Time	Received By:(Signature)	Date/Time

ATTACHMENT 2
Field Procedures

Attachment 2-1
Groundwater Head (Depth to Water) Measurement Procedures

Measure and record all depth to water data to the nearest 0.01 feet.

Equipment Used For Groundwater Head Monitoring

Measurement of depth to groundwater is accomplished by using a Solinist – IT 300 or equivalent device (the "Water Level Indicator").

Equipment Checks

Equipment used in depth to groundwater measurements will be checked prior to each use to ensure that the Water Sounding Device is functional.

Check the Water Sounding Device as follows:

- Turn the Water Level Indicator on.
- Test the Water Level Indicator using the test button located on the instrument.
- If the Water Level Indicator alarms using the test button it is considered operational and can be used for depth to water measurements.

Measurement of Depth to Water

All depth to water measurements (quarterly and immediately prior to sample collection) will be completed using the following procedure:

- For monitoring wells - Measure depth to water from the top of the inner well casing at the designated measurement point.
- For the piezometers - Measure depth to water from the top of the casing at the designated measurement point.
- Measurements are taken by lowering the Water Level Indicator into the casing until the device alarms, indicating that the water surface has been reached.
- Record the depth to groundwater on the appropriate form in Attachment 1 as the distance from the measuring point to the liquid surface as indicated by the alarm. The distance is determined using the tape measure on the Water Level Indicator.

Attachment 2-2
Decontamination Procedures

Non-dedicated sampling equipment will be decontaminated using the following procedures:

Water level meter

Decontaminate the water level meter with a detergent/deionized ("DI") water mixture by pouring the solutions over the water level indicator.

Rinse the water level indicator with fresh DI water rinse by pouring the DI water over the water level indicator.

Field Parameter Instrument (Hydrolab or equivalent)

Rinse the field parameter instrument probe unit with DI water prior to each calibration.

Wash the cup of the flow through cell with a detergent/DI water mixture and rinse with fresh DI water prior to each calibration.

Non-Dedicated Purging/Sampling Pump

Non-dedicated sampling/purging equipment will be decontaminated after each use and prior to use at subsequent sampling locations using the following procedures:

a) submerge the pump into a 55-gallon drum of nonphosphate detergent/DI water mixture;

b) pump the detergent/DI water solution through the pump and pump outlet lines into the drain line connected to Cell 1;

c) pump as much of the detergent/DI water mixture from the drum through the pump and outlet lines as possible;

d) submerge the pump into a 55-gallon drum of DI water;

e) pump the DI water solution through the pump and pump outlet lines into the drain line connected to Cell 1;

f) pump as much of the detergent/DI water mixture from the drum through the pump and outlet lines as possible;

g) if an equipment rinsate blank is required, submerge the pump into a fresh 55-gallon drum of DI water and pump 50% or more of the DI water through the pump and pump outlet lines;

h) if required, collect the equipment rinsate blank directly from the pump outlet lines into the appropriate sample containers (filtering the appropriate aliquots as needed).

All water produced during decontamination of a non-dedicated pump will pumped to an appropriate drain line which outlets into Cell 1.

Attachment 2-3
Purging Procedures

The following equipment will be used for groundwater purging and sampling:

- Disposable Bailer: A bailer that is used at one specific well for one event for purging and/or sampling. These bailers are single use and are disposed of as trash after sampling in accordance with Mill disposal requirements for Mill-generated solid waste.
- Dedicated Pump: A pump that is dedicated to one specific well for the use of purging or sampling. A dedicated pump remains inside the well casing suspended and secured.
- Non – Dedicated Pump: A pump that is used for purging and sampling at one or more wells.
- Field Parameter Meter: A meter used to measure ground water quality parameters as listed below. Field parameters shall be measured using a Hydrolab M-5 with Flow Cell Multi-Parameter Meter system or equivalent that allows a continuous stream of water from the pump to the meter that enables measurements to be taken on a real-time basis without exposing the water stream to the atmosphere. The Field Parameter Meter measures the following parameters:

    - Water temperature;
    - Specific conductivity;
    - Turbidity;
    - pH;
    - Redox potential (Eh).

- Water Level Indicator: A tape measure with a water level probe on the end that alarms when contact is made with water.
- Diesel Generator: Mobile power supply to provide power for submersible pump.
- 150 psi air compressor and ancillary equipment, or equivalent to operate dedicated "bladder" pumps.

Additional supplies for purging and sampling are as follows:

- Field Data Sheets
- 45 micron in-line filters (when metals and gross alpha analyses are required)
- Calculator
- Clock, stopwatch or other timing device
- Buckets
- Sampling containers(as provided by the Analytical Laboratory)
- Field preservation chemicals (as provided by the Analytical Laboratory)
- Disposable gloves
- Appropriate health and safety equipment
- Sample labels and COCs (as provided by the Analytical Laboratory)

Pre-Purging/ Sampling Activities

If a portable (non-dedicated) pump is to be used, prior to commencing the event's sampling activities,

1. check the pumping equipment to ensure that no air is leaking into the discharge line, in order to prevent aeration of the sample;
2. decontaminate the sampling pump using the procedure described in Attachment 2-2 and collect a equipment rinsate blank as required; and
3. Prior to leaving the Mill office, place the Trip Blank(s) into a cooler that will transport the VOC samples. The Trip Blank(s) will accompany the groundwater (VOC) samples throughout the monitoring event.

Well Purging

The purging techniques described below will be used for all groundwater sampling conducted at the Mill unless otherwise stated in the program-specific QAPs for the chloroform and nitrate investigations. The program-specific QAPs for the chloroform and nitrate investigations are included as Appendix A and Appendix B respectively.

Purging is completed using the equipment described above. Purging is completed to remove stagnant water from the casing and to assure that representative samples of formation water are collected for analysis. There are three purging strategies that will be used to remove stagnant water from the casing during groundwater sampling at the Mill. The three strategies are as follows:

1. Purging three well casing volumes with a single measurement of field parameters
2. Purging two casing volumes with stable field parameters (within 10% RPD)
3. Purging a well to dryness and stability of a limited list of field parameters after recovery

The groundwater in the well should recover to within at least 90% of the measured groundwater static surface before sampling. If after 2 hours, the well has not recovered to 90% the well will be sampled as soon as sufficient water for the full analytical suite is available.

Turbidity measurement in the water should be $\leq$ 5 NTU prior to sampling unless the well is characterized by water that has a higher turbidity.

A flow-cell needs to be used for field parameters.

Procedure

a) Determine the appropriate purging strategy based on historic performance of the well (3 casing volumes, 2 casing volumes and stable parameters, or purging the well to dryness)

b) Remove the well casing cap and measure and record depth to groundwater as described in Attachment 2-1 above;

c) Determine the casing volume (V) in gallons, where h is column height of the water in the well (calculated by subtracting the depth to groundwater in the well from the total depth of the well), V = 0.653*h, for a 4" casing volume and V = .367*h for a 3" casing volume. Record the casing volume on the Field Data Worksheet;

If a portable (non-dedicated) pump is used:

- Ensure that it has been decontaminated in accordance with Attachment 2-2 since its last use.
- Lower the pump into the well. Keep the pump at least five feet from the bottom of the well.

If a non-dedicated pump or dedicated pump is used:

(i) Commence pumping;

(ii) Determine pump flow rate by using a stopwatch or other timing device and a calibrated bucket by measuring the number of seconds required to fill to the one-gallon mark. Record this in the "pumping rate" section of the Field Data Worksheet;

(iii) Calculate the amount of time to evacuate two or three casing volumes;

(iv) Evacuate two or three casing volumes by pumping for the length of time determined in paragraph (iii);

(v) If two casing volumes will be purged:

Take measurements of field parameters (pH, specific conductance, temperature, redox potential and turbidity) during well purging, using the Field Parameter Meter. These measurements will be recorded on the Field Data Worksheet. Purging is completed after two casing volumes have been removed and the field parameters pH, temperature, specific conductance, redox potential (Eh) and turbidity have stabilized to within 10% RPD over at least two consecutive measurements.

(vi) If three casing volumes will be purged:

Take one set of measurements of field parameters (pH, specific conductance, temperature, redox potential and turbidity) after three casing volumes have been purged immediately prior to sample collection using the Field Parameter Meter. Record these measurements on the Field Data Worksheet.

(vii) If the well is purged to dryness:

Record the number of gallons purged on the Field Data Worksheet.

The well should be sampled as soon as a sufficient volume of groundwater is available to fill sample containers.

Upon arrival at the well after recovery or when sufficient water is available for sampling measure depth to water and record on the Field Data Worksheet.

Take one set of measurements of field parameters for pH, specific conductance and temperature only.

Collect the samples into the appropriate sample containers.

Take an additional set of measurements of field parameters for pH, specific conductance and temperature after the samples have been collected.

If the field parameters of pH, specific conductance and temperature are within 10% RPD the samples can be shipped for analysis.

If the field parameters of pH, specific conductance and temperature are not within 10% RPD, dispose of the sample aliquots, and purge the well again as described above.

Repeat this process if necessary for three complete purging events. If after the third purging the event, the parameters of pH, specific conductance and temperature do not stabilize to within 10% RPD, the well is considered sufficiently purged and collected samples can be submitted for analysis.

Purging using a disposable bailer

For wells where a pump is not effective due to shallow water columns, a disposable bailer, made of inert materials, will be used.

When a bailer is used, the following procedure will be followed:

(i) Use the water level meter to determine the water column and figure the amount of water that must be evacuated.

(ii) Attach a disposable bailer to a rope and reel.

(iii) Lower the bailer into the well and listen for contact with the solution. Once contact is made, allow the bailer to gradually sink in the well, being careful not to allow the bailer to come in contact with the bottom sediment.

(iv) After the bailer is full, retrieve the bailer and pour the water from the bailer into 5 gallon buckets. By doing this, one can record the number of gallons purged.

(v) Repeat this process until either two casing volumes have been collected or until no more water can be bailed. When the process is finished for the well, the bailer will be disposed of.

(vi) Take field measurements from the water in the buckets.

All water produced during well purging will be containerized. Containerized water will be disposed of into an active Tailings Cell.

After the collection of all samples, and prior to leaving the sampling site, replace the well cap and lock the casing.

Attachment 2-4
Sample Collection Procedures

Sample Collection Order

Regardless of the purging method employed samples will be collected in the order specified below.

All containers and preservatives will be provided by the Analytical Laboratory. Collect the samples in accordance with the volume, container and preservation requirements specified by the Analytical Laboratory which should be provided with the supplied containers.

VOCs;
Nutrients (ammonia, nitrate and nitrite);
All other non-radiologics (fluoride, general inorganics, TDS, total cations and anions); and
Gross alpha and heavy metals (filtered).

Sample Filtering

When sampling for heavy metals and for gross alpha, the following procedure shall be followed:

a) Obtain the specifically identified sample container for the type of sample to be taken, as provided by the Analytical Laboratory;

b) Add the quantity of specified preservative provided by the Analytical Laboratory to each sample container;

c) When using a pump to sample:

   (i) Place a new 0.45 micron filter on the sample tubing;

   (ii) Pump the sample through the filter, and into the sample container containing the preservative;

   (iii) The pump should be operated in a continuous manner so that it does not produce samples that are aerated in the return tube or upon discharge;

d) When using a bailer to sample (wells with shallow water columns, i.e., where the water column is less than five feet above the bottom of the well casing), then the following procedure will be used to filter samples:

   (i) Collect samples from the bailer into a large, unused sample jug that does not contain any preservatives.

(ii) Add the appropriate preservatives to the appropriate sample container provided by the Analytical Laboratory.

(iii) Place clean unused tubing in the peristaltic pump.

(iv) Use the peristaltic pump to transfer the unpreserved sample from the large sample jug to the sample containers through a 0.45 micron filter.

Procedures to Follow After Sampling

a) In each case, once a sample is taken, identify and label the sample container using the labels provided by the Analytical Laboratory. The labels may include the following information depending on the type of analysis requested:

- Sample location
- Date and time of sample
- Any preservation method utilized
- Filtered or unfiltered

b) Immediately after sample collection, place each sample in an ice-packed cooler; and

c) Before leaving the sampling location, thoroughly document the sampling event on the Field Data Worksheet, by recording all pertinent data.

Upon returning to the office, the samples must be stored in a refrigerator at less than or equal to 6^{o} C. These samples shall be received by the Analytical Laboratory at less than or equal to 6^{o} C. Samples will then be re-packed in the plastic ice-packed cooler and transported via these sealed plastic containers by overnight delivery services to the Analytical Laboratory.

Attachment 2-5
Field QC Samples

Field Duplicates

Field duplicates are required to be collected at a frequency of one duplicate per every 20 field samples. Field duplicate samples are analyzed for the same analytes as the parent sample.

Field duplicate samples should be as near to split samples as reasonably practicable.

Collection of field duplicates is completed as follows:

Fill a single VOC vial for the parent sample. Collect a second VOC vial for the duplicate sample. Collect the second set of VOC vials for the parent immediately followed by the duplicate sample. Fill the third set of VOC vials in the same manner. Repeat this parent/duplicate process for the remaining analytes in the order specified in Attachment 2-4 blind to the Analytical Laboratory.

Field duplicate samples are labeled using a "false" well number such as MW-65 and MW-70.

Equipment Rinsate Samples

Where portable (non-dedicated) sampling equipment is used, a rinsate sample will be collected at a frequency of one rinsate sample per 20 field samples.

Equipment rinsate samples are collected after the decontamination procedure in Attachment 2-2 is completed as follows:

Submerge the pump into a fresh 55-gallon drum of DI water and pump 50% or more of the DI water through the pump and pump outlet lines;

Collect the equipment rinsate blank directly from the pump outlet lines into the appropriate sample containers (filtering the appropriate aliquots as needed).

Equipment rinsate blanks are labeled with the name of the subsequently purged well with a terminal letter "R" added (e.g. MW-11R).

Appendix A
Chloroform Investigation Monitoring
Quality Assurance Program
White Mesa Uranium Mill
Blanding, Utah

Chloroform Investigation Monitoring
Quality Assurance Program
White Mesa Uranium Mill
Blanding, Utah

This document sets out the quality assurance plan to be used by Denison Mines (USA) Corp. for Chloroform Investigation conducted pursuant to State of Utah Notice of Violation and Groundwater Corrective Action Order (UDEQ Docket No. UGW-20-01) (the "Order").

Specifically, the Mill will use the same sampling regimen for the Chloroform Investigation that is utilized for groundwater sampling under its groundwater discharge permit, as set forth in the attached groundwater discharge permit Quality Assurance Plan (QAP), except as set forth below:

1) Dedicated Purge Pump/Sampling

Chloroform Investigation samples are collected by means of disposable bailer(s) the day following the purging .The disposable bailer is used only for the collection of a sample from an individual well and disposed subsequent to the sampling. The wells are purged prior to sampling by means of a portable pump. Each quarterly purging event begins at the location least affected by chloroform (based on the previous quarters sampling event) and proceeds by affected concentration to the most affected location. Although purging will generally follows this order, the sampling order may deviate slightly from the generated list. This practice does not affect the samples for these reasons: any wells sampled in slightly different order have either dedicated pumps or are sampled via a disposable bailer. This practice does not affect the quality or usability of the data as there will be no cross-contamination resulting from sampling order. Decontamination of all sampling equipment will follow the decontamination procedure outlined in Attachment 2-2 of the QAP.

2) Chloroform Investigation Sampling Frequency, Order and Locations

The chloroform investigation wells listed below are required to be monitored on a quarterly basis under State of Utah Notice of Violation and Groundwater Corrective Action Order UDEQ Docket No. UGW-20-01. Chloroform wells shall be purged from the least contaminated to the most contaminated as based on the most recent quarterly results.

- MW-4
- TW4-1
- TW4-2
- TW4-3
- TW4-4
- TW4-5
- TW4-6
- TW4-13
- TW4-14
- MW-26
- TW4-16
- MW-32
- TW4-18
- TW4-19

- TW4-7
- TW4-8
- TW4-9
- TW4-10
- TW4-11
- TW4-12
- TW4-26
- TW4-20
- TW4-21
- TW4-22
- TW4-23
- TW4-24
- TW4-25
- TW4-27

Note: Wells MW-26 and MW-32 may be monitored under either the Chloroform Investigation Program or the Groundwater Discharge Permit Monitoring Program.

3) Chloroform Investigation Sample Containers and Collection Volume

The chloroform investigation sampling program requires a specific number of sampling containers and the collection of specific volumes of sample. Accordingly, the following sample volumes are collected by bailer from each sampling location:

- For Volatile Organic Compounds (VOC), collect three samples into three separate 40 ml containers.
- For Nitrate/Nitrite determinations, collect one sample into a 100 ml container.
- For Inorganic Chloride, collect one sample into a 100 ml container.

The Analytical Laboratory will provide the sampling containers and may request that certain analytes be combined into a single container due to like sampling requirements and/or like preservation. The container requirements will be determined by the Analytical Laboratory and specified with the bottles supplied to the Field Personnel. Bottle requirements may change if the Analytical Laboratory is changed or if advances in analytical techniques allow for reduced samples volumes. The above list is a general guideline.

4) Laboratory Requirements

Collected samples which are gathered for chloroform investigation purposes are shipped to an analytical laboratory where the requisite analyses are performed. At the laboratory the following analytical specifications must be adhered to:

Analytical Parameter	Analytical Method	Reporting Limit	Maximum Holding Times	Sample Preservation Requirement	Sample Temperature Requirement
Nitrate & Nitrite (as N)	E353.1 or E353.2	0.1 mg/L	28 days	H_2SO_4 to pH<2	≤ 6°C
Carbon Tetrachloride	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Chloroform	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Dichloromethane (Methylene Chloride)	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Chloromethane	SW8260B or SW8260C	1.0 µg/L	14 days	HCl to pH<2	≤ 6°C
Inorganic Chloride	A4500-Cl B or A4500-Cl E or E300.0	1 mg/L	28 days	None	≤ 6°C

5) Field Parameters

Only one set of field parameters are required to be measured prior to sampling in chloroform pumping wells. This includes the following wells: MW-4, MW-26, TW4-4, TW-4-19 and TW-4-20. However, if a pumping well has been out of service for 48 hours or more, DUSA shall follow the purging requirements outlined in Attachment 2-3 of the QAP before sample collection.

Field parameters will be measured in chloroform wells which are not continuously pumped as described in Attachment 2-3 of the groundwater QAP.

6) Chloroform Investigation Reports

The Chloroform Investigation Reports will include the following information:

a) Introduction

b) Sampling and Monitoring Plan

- Description of monitor wells
- Description of sampling methodology, equipment and decontamination procedures

- Identify all quality assurance samples, e.g. trip blanks, equipment blanks, duplicate samples

c) Data Interpretation

- Interpretation of groundwater levels, gradients, and flow directions. Interpretations will include a discussion on: 1) A current site groundwater contour map, 2) hydrographs to show groundwater elevation in each monitor well over time, 3) depth to groundwater measured and groundwater elevation from each monitor well summarized in a data table, that includes historic groundwater level data for each well, and 4) an evaluation of the effectiveness of hydraulic capture of all contaminants of concern.
- Interpretation of all analytical results for each well, including a discussion on: 1) a current chloroform isoconcentration map with one of the isosconentration lines showing the 70 ug/L boundary, 2) graphs showing chloroform concentration trends in each well through time and, 3) analytical results for each well summarized in a data table, that includes historic analytical results for each well.
- Calculate chloroform mass removed by pumping wells. Calculations would include: 1) total historic chloroform mass removed, 2) total historic chloroform mass removed for each pumping well, 3) total chloroform mass removed for the quarter and, 4) total chloroform mass removed from each pumping well for the quarter.

d) Conclusions and Recommendations

e) Electronic copy of all laboratory results for Chloroform Investigation monitoring conducted during the quarter.

f) Copies of DUSA field records, laboratory reports and chain of custody forms.

Except as otherwise specified above, the Mill will follow the procedure set out in the Mill's QAP.

Appendix B
Nitrate Corrective Action Monitoring
Quality Assurance Program
White Mesa Uranium Mill
Blanding, Utah

Nitrate Corrective Action Monitoring
Quality Assurance Program
White Mesa Uranium Mill
Blanding, Utah

This document sets out the quality assurance plan to be used by Denison Mines (USA) Corp. for Nitrate Corrective Action Monitoring ("Nitrate Program") conducted pursuant to State of Utah Stipulated Consent Agreement Docket Number UGW-09-03-A.

Specifically, the Mill will use the same sampling regimen for the Nitrate program that is utilized for groundwater sampling under its groundwater discharge permit, as set forth in the attached groundwater discharge permit Quality Assurance Plan (QAP), except as set forth below:

1) Purge Pump/Sampling

The Nitrate program wells are purged and sampled by means of a portable pump. If the well is purged to dryness the samples are collected the following day by means of disposable bailer(s).The disposable bailer is used only for the collection of a sample from an individual well and disposed subsequent to the sampling.

Each quarterly purging event begins at the location least affected by nitrate (based on the previous quarters sampling event) and proceeds by affected concentration to the most affected location. Purging and sampling follows this order if the wells are not purged to dryness and the samples are collected immediately after purging using the portable pump. If the well is purged to dryness and sampled with a disposable bailer, the sampling order may deviate slightly from the generated list. This practice does not affect the samples collected with a bailer for this reason: there is no cross-contamination resulting from sampling order when the samples are collected with a disposable bailer. Decontamination of all non-disposable sampling equipment will follow the decontamination procedure outlined in Attachment 2-2 of the QAP.

2) Nitrate Program Sampling Frequency, Order and Locations

The Nitrate Program wells listed below are required to be monitored on a quarterly basis under State of Utah Docket No. UGW-09-03-A. DUSA has submitted a Corrective Action Plan ("CAP") as required by the Stipulated Consent Agreement. In that CAP, DUSA has proposed the abandonment of a number of the wells listed below. The implementation of the CAP, shall supersede any requirements contained in this QAP and Appendix. Nitrate Program wells shall be purged from the least contaminated to the most contaminated as based on the most recent quarterly results.

- TWN-1
- TWN-2
- TWN-3
- TWN-4
- TWN-5*
- TWN-6**
- TWN-7
- TWN-8*
- TWN-9*
- TWN-10*
- TWN-11*
- TWN-12*
- TWN-13*
- TWN-14**
- TWN-15*
- TWN-16**
- TWN-17*
- TWN-18
- TWN-19**
- Piezometer-01
- Piezometer-02
- Piezometer-03

*Recommended for abandonment
**Recommended for depth to water measurements only. DUSA has proposed that monitoring cease.

7) Nitrate Program Sample Containers and Collection Volume

The Nitrate Program sampling requires a specific number of sampling containers and the collection of specific volumes of sample. Accordingly, the following sample volumes are collected by bailer from each sampling location:

- For Nitrate/Nitrite determinations, collect one sample into a 100 ml container.
- For Inorganic Chloride, collect one sample into a 100 ml container.

The Analytical Laboratory will provide the sampling containers and may request that certain analytes be combined into a single container due to like sampling requirements and/or like preservation. The container requirements will be determined by the Analytical Laboratory and specified with the bottles supplied to the Field Personnel. Bottle requirements may change if the Analytical Laboratory is changed or if advances in analytical techniques allow for reduced samples volumes. The above list is a general guideline.

8) Laboratory Requirements

Collected samples which are gathered for Nitrate Program purposes are shipped to an analytical laboratory where the requisite analyses are performed. At the laboratory the following analytical specifications must be adhered to:

Analytical Parameter	Analytical Method	Reporting Limit	Maximum Holding Times	Sample Preservation Requirement	Sample Temperature Requirement
Nitrate & Nitrite (as N)	E353.1 or E353.2	0.1 mg/L	28 days	H_2SO_4 to pH<2	$\leq 6^oC$
Inorganic Chloride	A4500-Cl B or A4500-Cl E or E300.0	1 mg/L	28 days	None	$\leq 6^oC$

9) Field Parameters

Field parameters will be measured in Nitrate Program wells as described in Attachment 2-3 of the groundwater QAP.

10) Nitrate Program Investigation Reports

The Nitrate Program Reports will include the following information:

a) Introduction

b) Sampling and Monitoring Plan

- Description of monitor wells
- Description of sampling methodology, equipment and decontamination procedures
- Identify all quality assurance samples, e.g. trip blanks, equipment blanks, duplicate samples

c) Data Interpretation

- Interpretation of groundwater levels, gradients, and flow directions. Interpretations will include a discussion on: 1) A current site groundwater contour map, 2) hydrographs to show groundwater elevation in each monitor well over time, 3) depth to groundwater measured and groundwater elevation from each monitor well summarized in a data table, that includes historic groundwater level data for each well, and 4) an evaluation of the effectiveness of hydraulic capture of all contaminants of concern.
- Interpretation of all analytical results for each well, analytical results for each well summarized in a data table, that includes historic analytical results for each well.
- Calculate nitrate mass removed by pumping wells (as the pumps are installed and operational). Calculations would include: 1) total nitrate

mass removed, 2) total historic nitrate mass removed for each pumping well, 3) total nitrate mass removed for the quarter and, 4) total nitrate mass removed from each pumping well for the quarter.

d) Conclusions and Recommendations

e) Electronic copy of all laboratory results for Nitrate Program monitoring conducted during the quarter.

f) Copies of DUSA field records, laboratory reports and chain of custody forms.

Except as otherwise specified above, the Mill will follow the procedure set out in the Mill's QAP.