Midnite Mine Superfund Site

100~~90~~ Percent Design

Appendix Q1 – Site-Wide Monitoring Field Sampling Plan

~~*Note: This FSP has been prepared to a 90-percent level. Minor edits to this plan are anticipated as the Midnite Mine Remedial Design is finalized.*~~

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AQMP	Air Quality Monitoring Plan
BLM	U.S. Department of the Interior, Bureau of Land Management
BODR	Basis of Design Report
BPA	Backfilled Pit Area
COC	Contaminant of Concern
DMC	Dawn Mining Company, LLC
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
EWRP	East Waste Rock Pile
FSP	Field Sampling Plan
GPS	Global Positioning System
HASP	Health and Safety Plan
JSA	Job Safety Analysis
MA	Mined Area
mHz	megahertz
Newmont	Newmont USA Limited
NELAP	National Environmental Laboratory Accreditation Program
OM&M	Operations, Maintenance and Monitoring
PCP	Pollution Control Pond
PMP	Performance Monitoring Plan
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAWS	Remote Access Weather Station
RF	radio frequency
RI	Remedial Investigation
ROD	Record of Decision
Site	Midnite Mine Superfund Site
SMP	Site-wide Monitoring Plan
SOP	Standard Operating Procedure
SWRP	South Waste Rock Pile
Tribe	Spokane Tribe of Indians

WCA	Waste Containment Area
WTP	Water Treatment Plant

Q1-1.0 INTRODUCTION

This Field Sampling Plan (FSP) presents the field-specific procedures for monitoring surface water, sediment, and groundwater during and following the remedial action (RA) at the Midnite Mine Superfund Site (Site) located in Wellpinit, Washington. This FSP is a supporting document to the *Midnite Mine Remedial Action Site-Wide Monitoring Plan* (SMP), which presents the overall goals and procedures for site-wide monitoring. In addition to this FSP, the SMP also includes a Quality Assurance Project plan (QAPP) that provides the protocols to be followed during implementation of the SMP to assure that the resulting data are of sufficient quality to support the data end uses. The SMP, QAPP, and this FSP are components of the *Midnite Mine Superfund Site Basis of Design Report* (BODR), which presents the background and supporting information relevant to the Site and the planned RAs. The BODR also contains the engineering drawings, plans, and specifications for the RA.

As described in SMP Section Q1.4, this FSP will be revised or amended as necessary during and after the RA to meet the site-wide monitoring Data Quality Objectives (DQOs). This is necessary because monitoring locations will be added and deleted as the configuration of the Site changes during the phased RA construction activities. Anticipated revisions or amendments include updating the monitoring locations and frequencies, and adding or refining monitoring procedures as necessary. Discussion of site-wide monitoring objectives is included in Section Q1.0 of the SMP (overall objectives) and in Section Q2-3.0 of the QAPP (detailed DQOs). This plan does not include monitoring or sampling information for the Water Treatment Plant (WTP) influent and effluent. That information is included in the Operation, Maintenance, and Monitoring (OM&M) Plan (located in Appendix P of the BODR).

Air Monitoring. Details of the environmental ~~Discussions with EPA and the Tribe are underway to define an air monitoring program objectives for use during the RA. Once the~~ air monitoring plan are being developed, and an Air Quality Monitoring Plan (AQMP) has been submitted for Tribe and EPA review. When finalized, the AQMP~~determined, the details of the plan~~ will be included as an attachment to the SMP~~incorporated into this FSP or in a separate air monitoring FSP~~.

Q1-2.0 FIELD PROGRAM DURING RA CONSTRUCTION

This section describes the surface water, sediment, and groundwater monitoring programs that will be initiated at the start of the RA construction activities. These monitoring programs will be

updated as necessary throughout the phased RA as described in SMP Section Q1.3 to accommodate the changing site configurations and evolving DQOs as the construction project progresses. The anticipated post-remedy monitoring network is described below in Section Q1-3.0.

Q1-2.1 MONITORING LOCATIONS, FREQUENCY, AND RATIONALE

The following monitoring locations, frequency and rationale were developed to satisfy the DQOs summarized in the tables contained in QAPP Attachment Q2-A.

Q1-2.1.1 Surface Water Monitoring

Surface water monitoring will be performed at the locations listed in Table Q1-1 and as shown on Figure Q1-1. Figure Q1-1 also shows the areas of mine affected surface water as identified during the Remedial Investigation (RI) in order to show where the sampling locations in the monitoring network are located in relation to the known areas of mine affected surface water at the start of the RA.

The site-wide surface water monitoring network was established by including the locations monitored prior to initiating the RA as part of the *Performance Monitoring Plan for the Phase I RD/RA: Interim Water Management for the Midnite Mine* (PMP; AES, 2011). The PMP surface water sampling locations were retained for data comparability and because many are located in the primary drainages down gradient of the MA where the RA construction activities will occur (i.e., the Western, Central, and Eastern drainages). These are the drainages most likely to see potential impacts from the RA construction activities. The PMP sampling locations in Blue Creek were retained both up- and down-gradient of where the main mine drainage enters Blue Creek. A new surface water monitoring location (BC-OY) was added below the confluence of Blue and Oyachen creeks to evaluate potential contaminant contributions to Blue Creek from Oyachen Creek. Data from this new sampling location will support evaluation of groundwater data collected from the new monitoring wells installed in the glacial deposits in this area (discussed below in Section Q1-2.1.3).

Other surface water monitoring locations consist of seep locations, the Pollution Control Pond (PCP), and Pits 3 and 4. These locations will be sampled until they are removed or altered by the RAs. For example, surface water sampling in Pits 3 and 4 will continue until the pits are dewatered and backfilling activities begin. Likewise, removal of above-ground mining wastes will likely eliminate several of the seeps at the toe of the waste rock piles. New seep sampling

locations will be established if seeps develop after the wastes are removed, and new surface water sampling locations will be added as new surface water impoundments are built and become operational.

Surface water sampling will be conducted quarterly during the months of January, April, July, and October to evaluate potential seasonal variation which might affect constituent concentrations. To the extent possible, the April sampling event (second quarter) will be scheduled to coincide with peak runoff, and the October sampling event (fourth quarter) will be scheduled to coincide with the first major stormwater runoff event of the fall season. In addition to the quarterly sampling, continuous measurement of indicator water-quality parameters (pH, conductivity, and temperature) will be performed at the four surface water monitoring locations in the Western, Central, Eastern, and Mine drainages (WDAC, SW 12, SW-11, and SW-6).

Throughout the RA construction activities, visual inspections will be made to evaluate the appropriateness of the surface water monitoring program as described below in Section Q1-2.1.7. The objectives of the visual inspections are to identify locations that potentially should be added to the sampling schedule, or to identify unexpected flows that occur between the quarterly sampling events that potentially should be sampled to meet the DQOs. The surface water sampling component of this FSP will remain flexible so that sample locations can be added and/or sampling frequency can be adjusted (increased/decreased) to evaluate if COCs are being released as a result of the RA.

Q1-2.1.2 Sediment Monitoring

Annual sediment sampling will be performed at the locations listed in Table Q1-2 and as shown on Figure Q1-1. Figure Q1-1 also shows the areas of mine affected sediment as identified during the RI in order to show where the sampling locations in the monitoring network are located in relation to the known areas of mine affected sediment at the start of the RA.

The site-wide sediment monitoring network was established by including the locations monitored as part of the PMP prior to initiating the RA. The PMP sediment sampling locations were retained for data comparability and because they are located in the primary drainages down gradient of the MA where the RA construction activities will occur (i.e., the Western, Central, and Eastern drainages). These are the drainages most likely to see potential impacts from the RA construction activities.

Q1-2.1.3 Groundwater Monitoring

Groundwater monitoring will be performed at the locations listed in Table Q1-3 and as shown on the following figures:

- **Figure Q1-2** shows the locations of all existing monitoring wells at the Site prior to the start of the RA. The wells depicted with orange symbols on this and all figures in this FSP are screened in the shallower regolith, and the wells with black symbols are screened in the deeper unweathered bedrock (see SMP Section Q2.1.2 for a discussion of the hydrogeologic units). The figure also shows the planned boundaries of the Waste Containment Area (WCA; which is the area of the engineered cover that will be constructed over the consolidated wastes), and the Other Remediated Areas (which are the areas where mine wastes or mine-affected sediments will be removed). The purpose of this figure is to show how existing Site monitoring wells were selected for inclusion in the site-wide monitoring network based on their location and completed depths (additional discussion is presented below). The wells shown on Figure Q1-2 with yellow halos will be retained in the site-wide monitoring network and the remaining wells will be properly abandoned during the RA.
- **Figures Q1-3 and Q1-4** show the wells that are included in the groundwater monitoring network at the start of the RA (note that the same monitoring network is depicted on both figures). The difference between the two figures is that Figure Q1-3 shows the groundwater monitoring network in relation to the known extent of shallow (regolith) mine-affected groundwater and Figure Q1-4 shows the groundwater monitoring network in relation to the known extent of deep (bedrock) mine-affected groundwater.
- **Figure Q1-5** shows the wells that will be used to provide data to evaluate the dewatering activities performed within the former MA as part of the Selected Remedy in Pits 3 and 4 and in the Backfilled Pits Area (BPA). The figure shows a combination of wells that currently exist (e.g., wells in the BPA and surrounding Pit 3 and Pit 4) and the planned dewatering wells that will be installed as Pit 3 and Pit 4 are backfilled. Figure Q1-5 also shows the anticipated extent and topography of the WCA and the Other Remediated Areas.

The site-wide groundwater monitoring network was established by reviewing the locations and screened intervals of all site monitoring wells that existed at the start of the RA (see Figure Q1-

2), and including in the network the wells that satisfy the site-wide monitoring objectives (see SMP Section Q1.1). The anticipated extents of the WCA and the Other Remediated Areas shown on Figure Q1-2 were used to identify wells that need to be removed to accommodate excavation and consolidation of the mine wastes, and therefore are not suitable for inclusion in the monitoring network. Additional considerations for developing the groundwater monitoring network included the following:

- Wells screened in regolith and wells screened in bedrock are included in the network in order to monitor the two principal hydrogeologic units at the Site (see SMP Section Q2.1.2 for a discussion of the hydrogeologic units). As depicted on Figures Q1-3 and Q1-4, the known extent of mine-affected groundwater in the regolith (referred to as alluvium in the RI report maps) differs from the known extent of mine-affected groundwater in the bedrock. Wells included in the monitoring network are located inside and outside the known extents of mine affected groundwater. Co-located well pairs are included in order to monitor hydraulic gradients between the regolith and bedrock.
- Wells located within the RA earthworks footprint generally were not included because the majority of these wells need to be decommissioned to allow removal of the mine wastes (see Figure Q1-2). Wells generally will not be retained within the WCA to protect the integrity of the waste containment liner and cover systems. However, some wells within the WCA and Other Remediated Areas footprint will be retained to provide data to evaluate the effectiveness of the dewatering activities in Pits 3 and 4 and in the BPA. Figure Q1-5 depicts the wells that will be used to provide data to evaluate the dewatering activities.
- Wells will be included (or new wells installed) to evaluate the effectiveness of the Alluvial Groundwater Controls installed in the Western, Central, and Far East Seep drainages down gradient of the MA (see Figures Q1-3 and Q1-4).
- Wells that that were monitored as part of the PMP prior to initiating the RA were included 1) for data comparability, 2) because previously established sampling locations are representative of potential releases that could occur as a result of RA activities, and 3) because previously established sampling locations are suitable for monitoring the effectiveness of the Selected Remedy following implementation. These wells are located in the Western, Central, and Eastern drainages where groundwater discharging from the MA converges. As a result, these wells are most likely to detect potential

impacts resulting from the RA construction activities, and are most likely to be the key post-remedy monitoring locations for evaluating cleanup levels in groundwater.

- The new wells installed during 2014 in the glacial deposits down gradient of the confluence of Oyachen and Blue creeks are included to evaluate groundwater conditions where Blue Creek becomes a losing stream (see Figure Q1-3).

Because a smaller degree of seasonal variation is expected in groundwater (as compared with surface water), groundwater sampling will be performed semi-annually during the spring and fall, with continuous, monthly, or semi-annual water-level monitoring depending on the DQOs for each well. Wells located near the Alluvial Groundwater Controls will be sampled quarterly to evaluate the performance of the groundwater controls. These wells may be sampled at a reduced frequency (e.g., semi-annually) after it is determined that the Alluvial Groundwater Controls are functioning as designed. The groundwater monitoring locations, frequencies, and rationale are summarized in Table Q1-3.

Q1-2.1.4 Continuous Surface Water Flow and Quality Measurements

Continuous measurement of the flow rate and field water quality parameters (pH, conductivity, and temperature) will be performed at the four surface water monitoring locations (WDAC, SW-12, SW-11, and SW-6) in the Western, Central, Eastern, and Mine drainages. This will allow for continuation of the existing data for evaluating the impacts of the RA.

Q1-2.1.5 Surface Water Level and Flow Monitoring of Water Management System

Flow monitoring of the operating water management system (e.g., PCP pond water) will be performed as summarized in Table Q1-1 support operation and maintenance of the WTP. These activities will be altered (and this FSP updated) as the RA progresses and impoundments/pits are taken off line and new impoundments are built.

Q1-2.1.6 Precipitation and Evaporation Data

Precipitation and other meteorological data are recorded by the BLM Remote Access Weather Station (RAWS) at the Midnite Mine. Daily precipitation data will be obtained from the RAWS. Daily evaporation data will be recorded during non-freezing conditions using a Class A evaporation pan installed at the site. The precipitation and evaporation data will be used to support water balance calculations.

Q1-2.1.7 Inspections to Identify New Monitoring Locations

Visual inspections will be performed weekly in remediated areas to identify new seeps that may have formed in areas that were reworked by earthmoving activities. The seep inspections will be performed by walking along the topographic contour of the downhill slopes near the contact of the remediated area with the adjacent undisturbed area. Wet areas or areas of flowing water will be documented on field forms, surveyed using a Global Positioning System (GPS) instrument, and photographed. The person performing the inspection will notify the Construction Manager immediately of wet areas or flowing water so that provisions can be made to capture and treat the water until contaminant concentrations are verified by sampling. Areas that have measureable flow will be added to the overall monitoring program as new seep locations. Areas that do not have flowing water, but are persistently wet (i.e., continuously wet for two weeks) will be added to the monitoring program at the discretion of the Supervising Contractor.

Q1-2.1.8 Inspections of the Water Management System

Visual inspections of the active seep and surface water collection systems, pump-back stations, and transfer pipelines will be conducted daily during RA construction when conditions allow safe access. The visual inspections will confirm the normal operation of collection and pumping systems, and identify any maintenance required to ensure the existing water management system is effectively intercepting and containing mine-affected surface water as designed.

Q1-2.2 WATER AND SEDIMENT SAMPLING PROCEDURES

Q1-2.2.1 Standard Operating Procedures

Field sampling methods, equipment utilized, and decontamination procedures are documented in the Site-Wide Monitoring Standard Operating Procedures (SMP-SOPs) included in the QAPP. The following SMP-SOPs apply:

- SMP-SOP1 – Groundwater Sampling
- SMP-SOP2 – Surface Water Sampling
- SMP-SOP3 – Sediment Sampling
- SMP-SOP4 – Groundwater Level Measurement
- SMP-SOP5 – Decontamination of Environmental Sampling Equipment

The sampling procedures provided in these documents are designed to provide the type and quality of data consistent with the objectives of this project.

Q1-2.2.2 Sample Handling and Analysis

The sediment and water samples will be analyzed for the parameters listed in QAPP Tables Q2-4 and Q2-5, respectively. Laboratory test methods and detection limits are provided in the QAPP. The laboratory designated for the project analytical chemistry is to be determined, and will be accredited under the National Environmental Laboratory Accreditation Program (NELAP).

QAPP Tables Q2-2 and Q2-3 provide volume, container-type, preservation and holding time requirements for each sample type and analytical method. Additional information on sample containers, preservation and holding times is provided in the QAPP.

The samples will be hand-delivered or shipped to the analytical laboratory under chain-of-custody procedures as outlined in the QAPP.

Quality assurance/quality control procedures will be consistent with generally accepted practices as presented in the QAPP.

Q1-2.2.3 Sample Collection and Documentation

Samples will be collected according to the SMP-SOPs listed above in Section Q1-2.2.1. Photographs will be taken if the sampling location changes significantly from the previous location or sampling issues occur that cannot be adequately described in writing in the sample collection notes.

Sample labels are completed with an indelible, waterproof marker. The sample numbering and nomenclature system is based on the sample location, media type, and sample type (primary, duplicate or blank). Details on sample labeling are provided in the QAPP. After the label is completed and attached to the sample container, clear plastic tape is placed over the label to protect and secure it to the container. Labels are attached and taped before filling the sample bottles, if possible. The above information may be written directly on the bottle if labels are not available.

Rinse water from decontamination will be discharged to the ground surface. Purge water from wells will also be discharged to the ground surface. Other waste resulting from non-dedicated sampling equipment (i.e. used filters, latex or nitrile gloves, tubing, bailers, etc.) will be disposed of as non-hazardous waste after sampling.

Q1-2.2.4 Quality Assurance/Quality Control Samples

Quality assurance/quality control (QA/QC) samples will be collected during sampling as described in the QAPP.

Q1-2.3 FLOW AND WATER LEVEL MEASUREMENTS

Q1-2.3.1 Continuous Stream Flow and Field Parameter Measurement

Continuous measurement of the flow rate and field water quality parameters (pH, conductivity, and temperature) is performed at the following four surface water monitoring locations: WDAC, SW-12, SW-11, and SW-6. The following instrumentation is installed at these locations:

- SW-12 – 90-deg. V-notch weir plate, pressure transducer; conductivity/temperature and pH probes; recording data logger; 900 MHz RF telemetry; sealed battery and solar panel.
- SW-11 – 6-inch Parshall flume; transducer; conductivity/temperature and pH probes; recording data logger; 900 MHz RF telemetry; sealed battery and solar panel.
- WDAC – 90-deg. V-notch weir plate; pressure transducer; conductivity/temperature and pH probes; recording data logger; 900 MHz RF telemetry; sealed battery and solar panel.
- SW-6 - 9-inch Parshall flume; transducer; conductivity/temperature and pH probes; recording data logger; 900 MHz RF telemetry; sealed battery and solar panel.

The flow rate will be determined from the stage recorded by the pressure transducer and the defined stage-discharge relationship for the flow measurement device. The flow measurement devices were sized based on historic flow measurements. In addition to the SW-6 continuous flow measurement and field data equipment installations, SW-6 is configured with cellular reporting capability which data can be accessed and downloaded from a remote webpage application.

Manufacturer's recommendations and instructions will be followed for instrument testing and calibration of the electronic pH, conductivity, and temperature sensors. Conductivity data will be automatically corrected to 25-degrees Celsius and recorded by the data logger. The pH and conductivity probes will be calibrated prior to installation and on a regular calibration schedule using standard buffer solutions to determine accuracy. The flow monitoring stations will be audited quarterly during surface sampling events for maintenance, testing, and calibration of the sensors. Probe accuracy will be compared against portable field instruments that are also calibrated using standard buffer solutions. If the remote sensors are out of calibration, the

probes will be cleaned and recalibrated against standard buffer solutions. Probe scaling factors will be adjusted as necessary to maintain calibration. All calibration readings will be recorded on field forms. The operation of the instrumentation will be verified and maintenance will be routinely performed (e.g., cleaning of the pH and conductivity probes), and the continuously recorded data will be downloaded quarterly. Probes and meters will be serviced as needed following manufacturers' recommendations and instrument replacement will be performed as necessary. The pH, conductivity, and temperature probes will be removed from the stations during prolonged periods of no flow or freezing conditions that will damage the probes or result in erroneous measurements.

Q1-2.3.2 Flow Monitoring of Water Management System

Flow monitoring of the active seeps and pump-back systems will be performed. Flow measurements will be performed daily during the work week during the high flow period and weekly during the low flow period when conditions allow safe and accurate measurements at the seep locations identified in Table Q1-1. These locations and frequencies will be updated as seeps are removed and impoundments/pits are added or taken off line during the RA.

Totalizing flow meters currently exist on the following water transfer pipelines:

- Three transfer pipelines from the Western Drainage Pump-back Station to the PCP
- Transfer pipeline from the Blood Pool Pump-back Station to Pit 3
- Two transfer pipelines from the PCP to Pit 3
- Transfer pipelines from the Western Drainage, Blood Pool, and PCP pump-back stations.

Flow meters are not installed on the pipelines from the East Seep and the Restroom (Dam Toe Seep) pump-back stations, since the flows from the East and Dam Toe seeps are negligible compared to the other seeps and do not vary appreciably in response to spring runoff and precipitation events. In addition, flow meters are not installed on the pipelines from the Far East Seep Pump-back Station, since the collected water is pumped to the Blood Pool Pump-back Station during high seep flow and the duration of flow at the Far East Seep is minimal.

The components of the existing pump-back stations, including the transfer pipelines are described in the OM&M Plan. Each meter will be calibrated according to manufacturer's specifications and compared with calculated pumping rates on a quarterly basis to verify meter

calibration. The meters will be recorded weekly during pumping to provide the cumulative water volumes pumped.

During operation of the WTP, the daily water volume pumped from Pit 3 and Pit 4 to the WTP and the daily effluent volume from the WTP will be recorded using existing flow meters, when the WTP is operational. The meters will be calibrated according to manufacturer's specifications and compared with calculated pumping rates on a quarterly basis to verify meter calibration.

Q1-2.3.3 Water Level Measurements

The pit-lake water-level measurement discussion below will be updated as necessary during the RA to keep current with the active water management system during the RA. For example, water level monitoring in Pits 3 and 4 will cease once backfilling in these pit begin; water level monitoring will begin in new surface water impoundments that discharge to the WTP once they are built and operational.

Water levels in Pit 3, Pit 4, the PCP, and the pumping wells in the BPA will be recorded daily during WTP operation and weekly thereafter during non-freezing conditions and when conditions allow safe access and accurate measurements. The water levels in Pit 3 and Pit 4 will be recorded from a staff gauge installed in each pit. The staff gauges will be re-established, as necessary, as the pit water level changes and will be surveyed to a local datum to provide continuity in the pit water elevations consistent with current DMC/Newmont practices. Water levels in the pumping wells in Pit 3 and Pit 4 will be recorded daily once these wells are installed and become operational. The water level in the PCP will be measured relative to the pumphouse steps according to current DMC/Newmont practices.

Water levels will be measured at the frequencies summarized in Table Q1-3. Water-level measurement methods, equipment utilized, and decontamination procedures are documented in SMP-SOP4 and SMP-SOP5, respectively.

Q1-2.3.4 Precipitation and Evaporation Data

Precipitation data will be obtained from the existing RAWS. In the event that precipitation monitoring at the RAWS is discontinued, a tipping bucket rain gauge and a data logger will be installed to record 15-minute precipitation values at an accuracy of 0.01-inch depth. Daily precipitation will be logged and calculated. Evaporation data will be recorded during non-

freezing conditions using a Class A evaporation pan installed at the site consisting of the following:

- Evap-1 – Class A evaporation pan; water level gauge; 250-gallon water supply tank with automated refill valve; recording data logger; 900 MHz RF telemetry and cellular modem; sealed battery and solar panel.

Daily measurements of the pan water depth and minimum and maximum water temperature will be recorded daily. Water will be added or removed from the pan as necessary. Precipitation will be subtracted from the pan measurements to determine net evaporation.

Q1-3.0 ANTICIPATED POST-REMEDY MONITORING NETWORK

The anticipated post-remedy monitoring network is shown on Figure Q1-6. This post-remedy monitoring network is based on the planned final configurations of the waste containment areas and other remediated areas included in the BODR, the conceptual site model (e.g., groundwater converges on the primary drainages in the watershed that contains the mined area), and the anticipated impacts that the RA will have on the nature and extent and fate and transport of the Site COCs (see SMP Section Q2.0). The actual post-remedy monitoring network is likely to change based on the results of the site-wide monitoring that is conducted over the scheduled 10-year duration of the RA. For example, the post-remedy groundwater monitoring network may need to be revised (expanded or reduced) to sufficiently monitor the actual extent of groundwater that exceeds the cleanup levels established in the ROD. Another example is that as the primary mine drainages are remediated, surface water flow and sediment accumulation patterns may be different, and therefore, post-remediation surface water and/or sediment sampling locations may need to be modified. These changes will be presented in subsequent revisions to this SMP/FSP/QAPP as the RA progresses, and all changes to the monitoring network both during and following implementation of the Selected Remedy will require approval by EPA.

Q1-4.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

The QAPP is required reading for all staff participating in the FSP-related tasks. The QAPP will be in the possession of the field team during sample collection and in possession of the laboratory providing analytical services. All field, office, and analytical laboratory personnel working on this project will be required to comply with the procedures documented in the QAPP to maintain comparability and representativeness of the resulting data.

The QAPP includes the following information:

- Project organization and responsibilities
- Data quality objectives and criteria
- Sampling process design, documents and records
- Calibration procedures
- Analytical procedures
- Quality control
- Data reduction, validation, and reporting
- Performance systems and audits
- Preventative maintenance of field equipment
- Specific routine procedures to assess data
- Corrective actions
- Quality assurance reporting

Q1-5.0 HEALTH AND SAFETY

All site-wide monitoring activities will be performed in accordance with the Midnite Mine Superfund Site Remedial Action Health and Safety Plan (HASP) included in Appendix L of the BODR. The Job Safety Analyses (JSAs) specific to the site-wide monitoring activities are included in Attachment Q1-B.

Q1-6.0 REFERENCES

Advanced Environmental Sciences, Inc. (AES), 2011. Performance Monitoring Plan for the Phase I RD/RA: Interim Water Management for the Midnite Mine, Revision 3. Prepared for Dawn Mining Company and Newmont USA Limited. July 20.

TABLES

Table Q1-1 –Surface Water Monitoring Schedule During Remedial Action
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Site ID	Sampling Frequency[1]	Flow Rate or Level			Location and Rationale
		Continuous	Quarterly	Daily or Weekly	
SW-2[2]	Quarterly		X		Located in Eastern Drainage and within the area of mine affected surface water as identified during RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
SW-4	Quarterly		X		Located in Blue Creek just upstream of where the mine drainage discharges to Blue Creek, and is outside the area of mine affected surface water as identified during the RI. This location was previously sampled as part of the interim water management performance monitoring program. Location will be monitored during the RA construction to provide up gradient data in Blue Creek, and is a candidate location for long-term post remedy monitoring.
SW-4U	Quarterly		X		Located in Blue Creek upstream of where the mine drainage discharges to Blue Creek, and is outside the area of mine affected surface water as identified during the RI. This location was previously sampled as part of the interim water management performance monitoring program. Location will be monitored during the RA construction to provide up gradient data in Blue Creek, and is a candidate location for long-term post remedy monitoring.
SW-5[2]	Quarterly		X		Located in Blue Creek approximately ¼ mile downstream of where the mine drainage discharges to Blue Creek, and is within the area of mine affected surface water as identified during the RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
SW-6[2]	Quarterly	X[3]			Located in the Mine Drainage just above where it discharges to Blue Creek, and is within the area of mine affected surface water as identified during RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
SW-7[2]	Quarterly		X		Located in Blue Creek approximately 1 mile downstream of where the mine drainage discharges to Blue Creek, and is within the area of mine affected surface water as identified during the RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.

Table Q1-1 –Surface Water Monitoring Schedule During Remedial Action
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Site ID	Sampling Frequency[1]	Flow Rate or Level			Location and Rationale
		Continuous	Quarterly	Daily or Weekly	
SW-10	Quarterly			X[4]	Western Drainage Seep located where the buried Western Drainage emerges at the toe of the South Waste Rock Pile (SWRP). This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the water treatment plant (WTP). Discharge from this seep will continue to be captured and treated at the operating WTP during the RA, and will continue to be monitored during the RA construction until the waste rock that sources the seep water is removed.
SW-11[2]	Quarterly	X[3]			Located in the Eastern Drainage at its confluence with the Central Drainage, and within the area of mine affected surface water as identified during RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
SW-12[2]	Quarterly	X[3]			Seep located in lower reach of the Central Drainage and within the area of mine affected surface water as identified during RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
SW-15	Quarterly		X		PCP Dam Toe Seep (also known as the Central Drainage Seep) located at the toe of the Pollution Control Pond (PCP) dam. This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Discharge from this seep will continue to be captured and treated at the operating WTP during the RA, and will continue to be monitored during the RA construction until the PCP is removed.
SW-20	Quarterly			X[4]	Pollution Control Pond water. This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Location will continue to be monitored during the RA construction until the PCP is removed.
SW-39	Quarterly			X[4]	Pit 3 water. This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Location will continue to be monitored during the RA construction until the Pit 3 is no longer used to store water.

Table Q1-1 –Surface Water Monitoring Schedule During Remedial Action
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Site ID	Sampling Frequency[1]	Flow Rate or Level			Location and Rationale
		Continuous	Quarterly	Daily or Weekly	
SW-40	Quarterly			X[4]	Pit 4 water. This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Location will continue to be monitored during the RA construction until the Pit 4 is no longer used to store water.
WDAC[2]	Quarterly	X[3]			Located in the Western Drainage and within the area of mine affected surface water as identified during RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
WDJ	Quarterly			X[4]	Western Drainage Junior Seep located where the buried Western Drainage emerges at the toe of the South Waste Rock Pile (SWRP). This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Discharge from this seep will continue to be captured and treated at the operating WTP during the RA, and will continue to be monitored during the RA construction until the waste rock that sources the seep water is removed.
ES	Quarterly			X[4]	East Seep (also known as the Boyd Seep) located where the buried East Seep Fork of the Eastern Drainage emerges at the toe of the East Waste Rock Pile (EWRP). This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Discharge from this seep will continue to be captured and treated at the operating WTP during the RA, and will continue to be monitored during the RA construction until the waste rock that sources the seep water is removed.
PHS	Quarterly		X		Pumphouse Seep located at the toe of the SWRP near the PCP. This location was previously sampled as part of the interim water management performance monitoring program. This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Discharge from this seep will continue to be captured and treated at the operating WTP during the RA, and will continue to be monitored during the RA construction until the waste rock that sources the seep water is removed.
FES	Quarterly			X[4]	Far East Seep located where the buried East Dump Fork of the Eastern Drainage emerges at the toe of the East Waste Rock Pile (EWRP). This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Discharge from this seep will continue to be captured and treated at the operating WTP during the RA, and will continue to be monitored during the RA construction until the waste rock that sources the seep water is removed.

Table Q1-1 –Surface Water Monitoring Schedule During Remedial Action
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Site ID	Sampling Frequency[1]	Flow Rate or Level			Location and Rationale
		Continuous	Quarterly	Daily or Weekly	
BP	Quarterly			X[4]	Blood Pool Seep located near the existing WTP. This location was previously sampled as part of the interim water management performance monitoring program to characterize water captured by the water management system prior to treatment at the WTP. Discharge from this seep will continue to be captured and treated at the operating WTP during the RA, and will continue to be monitored during the RA construction until the waste rock that sources the seep water is removed.
BC-01	Quarterly		X		Seep along Blue Creek above its delta and is within the area of mine affected surface water as identified during RI. This location was previously sampled as part of the interim water management performance monitoring program, but does not have pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
BC-OY	Quarterly		X		New surface water sampling location to be established just below the confluence of Blue and Oyachen creeks. Location will be monitored to 1) evaluate potential contaminant contrubutions to Blue Creek from Oyachen Creek (by comparing data from SW-7), and 2) provide analytical data immediately upstream of where Blue Creek loses flow to glacial deposits. This information also will be used to support evaluation of groundwater data collected from the new monitoring wells installed in the glacial deposits in this area.

Notes:

1) Surface water sampling will be conducted quarterly during the months of January, April, July, and October. To the extent possible, the January monitoring event (first quarter) will be scheduled to coincide with peak runoff, and the October sampling event (fourth quarter) will be scheduled to coincide with the first major stormwater runoff event of the fall season.
2) Sampling location has pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1).
3) Continuous flow and field parameter monitoring will be conducted if water present and during non-freezing conditions.
4) Water levels will be measured daily during water treatment plant operation and weekly during non-freezing conditions when conditions permit safe and accurate measurements.

EWRP = East Waste Rock Pile
PCP = Pollution Control Pond
QAPP = Quality Assurance Project Plan
RA = Remedial Action
RI = Remedial Investigation
SWRP = South Waste Rock Pile
WTP = water treatment plant

Table Q1-2 –Sediment Monitoring Schedule During Remedial Action
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Site ID	Sampling Frequency	Location and Rationale
SW-2	Annual (Fall)	Located in Eastern Drainage and within the area of mine affected sediment as identified during RI. This location was not previously sampled as part of the interim measures performance monitoring program. Location will be monitored during the RA construction to evaluate potential impacts to sediment, and is a candidate location for long-term post remedy monitoring.
SW-4	Annual (Fall)	Located in Blue Creek just upstream of where the mine drainage discharges to Blue Creek, and is outside the area of mine affected sediment as identified during the RI. This location was previously sampled as part of the interim water management performance monitoring program. Location will be monitored during the RA construction to provide up gradient data in Blue Creek, and is a candidate location for long-term post remedy monitoring.
SW-4U	Annual (Fall)	Located in Blue Creek upstream of where the mine drainage discharges to Blue Creek, and is outside the area of mine affected sediment as identified during the RI. This location was previously sampled as part of the interim water management performance monitoring program. Location will be monitored during the RA construction to provide up gradient data in Blue Creek, and is a candidate location for long-term post remedy monitoring.
SW-5[1]	Annual (Fall)	Located in Blue Creek approximately ¼ mile downstream of where the mine drainage discharges to Blue Creek, and is within the area of mine affected sediment as identified during the RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
SW-6	Annual (Fall)	Located in the Mine Drainage just above where it discharges to Blue Creek, and is within the area of mine affected sediment as identified during RI. This location was previously sampled as part of the interim measures performance monitoring program. Location will be monitored during the RA construction to evaluate potential impacts to sediment, and is a candidate location for long-term post remedy monitoring.
SW-7[1]	Annual (Fall)	Located in Blue Creek approximately 1 mile downstream of where the mine drainage discharges to Blue Creek, and is within the area of mine affected sediment as identified during the RI. This location was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to surface water, and is a candidate location for long-term post remedy monitoring.
BC-OY	Annual (Fall)	New sediment sampling location to be established just below the confluence of Blue and Oyachen creeks. Location will be monitored to evaluate potential contaminant contrubutions to Blue Creek from Oyachen Creek (by comparing data from SW-7).

Table Q1-2 –Sediment Monitoring Schedule During Remedial Action
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Site ID	Sampling Frequency	Location and Rationale
SW-11[1]	Annual (Fall)	Located in the Eastern Drainage at its confluence with the Central Drainage, and within the area of mine affected sediment as identified during RI. This location was previously sampled as part of the interim measures performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to sediment, and is a candidate location for long-term post remedy monitoring.
SW-12[1]	Annual (Fall)	Located in lower reach of the Central Drainage and within the area of mine affected sediment as identified during RI. This location was previously sampled as part of the interim measures performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to sediment, and is a candidate location for long-term post remedy monitoring.
WDAC[1]	Annual (Fall)	Located in the Western Drainage and within the area of mine affected sediment as identified during RI. This location was previously sampled as part of the interim measures performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction. Location will be monitored during the RA construction to evaluate potential impacts to sediment, and is a candidate location for long-term post remedy monitoring.

5) Sampling location has pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1).

DQO = Data Quality Objective, QAPP = Quality Assurance Project Plan, RA = Remedial Action, RI = Remedial Investigation

Table Q1-3 — Groundwater Monitoring Schedule During Remedial Action

Well ID	Well location and geology of screened Interval[1]	Sampling Frequency		Water Level Measurement Frequency			Rationale
		Quarterly	Semi-Annually	Continuous	Monthly	Semi-Annually	
MWNW-01	Northwest Ridge Bedrock		X		X		Up gradient well located outside area of mine-affected bedrock groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. Well is screened approximately 335 feet above the elevation of the Pit 4 waste rock dewatering sump and 790 feet above the elevation of the Pit 3 waste rock dewatering sump. Water level data collected during and following the RA will be used to confrim flow directions and to evaluate effects that dewatering Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
MWNW-02	Northwest Ridge Bedrock				X		Up gradient well located outside area of mine-affected bedrock groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. Well is screened approximately 335 feet above the elevation of the Pit 4 waste rock dewatering sump and 790 feet above the elevation of the Pit 3 waste rock dewatering sump. Water level data collected during and following the RA will be used to confirm flow directions.
MWNW-03	Northwest Ridge Bedrock				X		Up gradient well located outside area of mine-affected bedrock groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. Well is screened approximately 451 feet above the elevation of the Pit 4 waste rock dewatering sump and 906 feet above the elevation of the Pit 3 waste rock dewatering sump. Water level data collected during and following RA will be used to confirm flow directions.
MWNW-04	Northwest Ridge Bedrock				X		Up gradient well located outside area of mine-affected bedrock groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. Well is screened approximately 313 feet above the elevation of the Pit 4 waste rock dewatering sump and 768 feet above the elevation of the Pit 3 waste rock dewatering sump. Water level data collected during and following the RA will be used to confirm flow directions.
MWNW-07	Northwest Ridge Bedrock		X		X		Up gradient well located outside area of mine-affected bedrock groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. Well is screened approximately 294 feet above the elevation of the Pit 4 waste rock dewatering sump and 750 feet above the elevation of the Pit 3 waste rock dewatering sump. Water level data collected during and following the RA will be used to confrim flow directions and to evaluate effects that dewatering Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
MWNE-01	Northeast Drainage Regolith		X		X		Up gradient well located outside area of mine-affected regolith groundwater as identified during the RI, and was not monitoried as part of the interim water management performance monitoring program. Well is screened approximately ~~100~~ 50 feet above the elevation of the Pit 4 ~~underdrain~~ waste rock dewatering sump and ~~543~~ 505 feet above the elevation of the Pit 3 ~~underdrain~~ waste rock dewatering sump. Water level data collected during and following the RA will be used to confrim flow directions and to evaluate effects that dewatering Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
MWNE-02	Northeast Drainage Bedrock		X		X		Up gradient well located outside area of mine-affected bedrock groundwater as identified during the RI, and was not monitoried as part of the interim water management performance monitoring program. Well is screened approximately ~~10~~ 40 feet ~~above~~ below the elevation of the Pit 4 ~~underdrain~~ waste rock dewatering sump and ~~450~~ 415 feet above the elevation of the Pit 3 ~~underdrain~~ waste rock dewatering sump. Water level data collected during and following the RA will be used to confrim flow directions and to evaluate effects that dewatering Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
MWNE-03	Northeast Drainage Regolith		X		X		Up gradient well located outside area of mine-affected regolith groundwater as identified during the RI, and was not monitoried as part of the interim water management performance monitoring program. Well is screened approximately ~~45~~ 7 feet ~~above~~ below the elevation of the Pit 4 ~~underdrain~~ waste rock dewatering sump and ~~485~~ 450 feet above the elevation of the Pit 3 ~~underdrain~~ waste rock dewatering sump. Water level data collected during and following the RA will be used to confrim flow directions and to evaluate effects that dewatering Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
MWNE-04	Northeast Drainage Bedrock		X		X		Up gradient well located outside area of mine-affected bedrock groundwater as identified during the RI, and was not monitoried as part of the interim water management performance monitoring program. Well is screened approximately ~~60~~ 107 feet below the elevation of the Pit 4 waste rock dewatering ~~underdrain~~ sump and ~~382~~ 350 feet above the elevation of the Pit 3 waste rock dewatering ~~underdrain~~ sump. Water level data collected during and following the RA will be used to confrim flow directions and to evaluate effects that dewatering Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
MWNE-07	Northeast Drainage Bedrock		X		X		Up gradient well located outside area of mine-affected bedrock groundwater as identified during the RI, and was not monitoried as part of the interim water management performance monitoring program. Well is screened approximately ~~170~~ 107 feet below the elevation of the Pit 4 waste rock dewatering ~~underdrain~~ sump and ~~270~~ 230 feet above the elevation of the Pit 3 waste rock dewatering ~~underdrain~~ sump. Water level data collected during and following the RA will be used to confrim flow directions and to evaluate effects that dewatering Pit 3 and Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
BOM-89-10S	Buried Western Drainage Bedrock		X		X		Located within the mined are near the toe of the Hillside Waste Rock Pile. Well is located within the area of mine-affected bedrock groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. Well is screened approximately 53 feet below the elevation of the

Table Q1-3 — Groundwater Monitoring Schedule During Remedial Action

Well ID	Well location and geology of screened Interval[1]	Sampling Frequency		Water Level Measurement Frequency			Rationale
		Quarterly	Semi-Annually	Continuous	Monthly	Semi-Annually	
							Pit 4 underdrain sump and 387 feet above the elevation of the Pit 3 underdrain sump. Water level data collected throughout the RA will be used to confirm flow directions and to evaluate effects that dewatering Pit 3 and Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
BOM-89-10D	Buried Western Drainage Bedrock		X		X		Located within the mined are near the toe of the Hillside Waste Rock Pile. Well is located within the area of mine-affected bedrock groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. Well is screened approximately 113 feet below the elevation of the Pit 4 underdrain sump and 327 feet above the elevation of the Pit 3 underdrain sump. Water level data collected throughout the RA will be used to confirm flow directions and to evaluate effects that dewatering Pit 3 and Pit 4 has on nearby water levels. Well will be sampled semi-annualy to evaluate COC concetrations near the consolidated wastes and to support evaluation of data collected from down gradient locations.
MWFW-01	Far West Drainage Regolith		X			X	Well located outside area of mine affected regolith groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. This location is down gradient of where western portions of the MA straddle the main MA watershed boundary (see Figure Q1-2), and will be monitored during the RA construction to evaluate potential impacts to groundwater down gradient of the Construction Support Zone. Water level data from this well will be used to evaluate groundwater flow gradients (by comparing water levels with nearby MWFW-02).
MWFW-02	Far West Drainage Bedrock		X			X	Well located outside area of mine affected bedrock groundwater as identified during the RI, and was not monitored as part of the interim water management performance monitoring program. This location is down gradient of where western portions of the MA straddle the main MA watershed boundary (see Figure Q1-2), and will be monitored during the RA construction to evaluate potential impacts to groundwater down gradient of the Construction Support Zone. Water level data from this well will be used to evaluate groundwater flow gradients (by comparing water levels with nearby MWFW-01).
PBW-01	Western Drainage Regolith			X			Well was used to intermittently pump regolith groundwater during the interim water management, and was previously monitored for water levels as part of the interim water management performance monitoring program. Intermittent pumping and water-level monitoring will continue during the RA construction until the well is taken off line/decommissioned and replaced with the alluvial groundwater controls.
PBW-02	Western Drainage Regolith			X			Well was used to intermittently pump regolith groundwater during the interim water management, and was previously monitored for water levels as part of the interim water management performance monitoring program. Intermittent pumping and water-level monitoring will continue during the RA construction until the well is taken off line/decommissioned and replaced with the alluvial groundwater controls.
MWWD-02b	Western Drainage Regolith			X			Regolith well located near the Western Drainage Pumpback Station. Previously monitored for water levels as part of the interim water management performance monitoring program to evaluate effects of pumping nearby wells PBW-01 and PBW-02. Water level monitoring will continue during the RA construction these wells are taken off line/decommissioned and replaced with the alluvial groundwater controls.
MW-01	Western Drainage Regolith				X		Regolith well located near the Western Drainage Pumpback Station. Previously monitored for water levels as part of the interim water management performance monitoring program to evaluate effects of pumping nearby wells PBW-01 and PBW-02. Water level monitoring will continue during the RA construction these wells are taken off line/decommissioned and replaced with the alluvial groundwater controls.
MWWD-01	Western Drainage Bedrock			X			Bedrock well located near the Western Drainage Pumpback Station. Previously monitored for water levels as part of the interim water management performance monitoring program to evaluate effects of pumping nearby wells PBW-01 and PBW-02. Water level monitoring will continue during the RA construction these wells are taken off line/decommissioned and replaced with the alluvial groundwater controls.
GW-35a[2]	Western Drainage Regolith		X			X	Well located within the area of mine affected regolith groundwater as identified during the RI. This well was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1). Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent GW-50 screened in the bedrock) and flow direction.
GW-50[2]	Western Drainage Bedrock		X			X	Well located within the area of mine affected bedrock groundwater as identified during the RI. This well was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1). Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent GW-35a screened in the regolith) and flow direction.
PBC-01	Central Drainage Regolith			X			Well was used to intermittently pump regolith groundwater during the interim water management, and was previously monitored for water levels as part of the interim water management performance monitoring program. Intermittent pumping and water-level monitoring will continue during the RA construction until the well is taken off line/decommissioned and replaced with the alluvial groundwater controls.
PBC-02	Central Drainage Regolith			X			Well was used to intermittently pump regolith groundwater during the interim water management, and was previously monitored for water levels as part of the interim water management performance monitoring program. Intermittent pumping and water-level monitoring will continue during the RA construction until the well is taken off line/decommissioned and replaced with the alluvial groundwater controls.
PBC-03	Central Drainage Regolith			X			Well was used to intermittently pump regolith groundwater during the interim water management, and was previously monitored for water levels as part of the interim water management performance monitoring program. Intermittent pumping and water-level monitoring will continue during the RA construction until the well is taken off

Table Q1-3 — Groundwater Monitoring Schedule During Remedial Action

Well ID	Well location and geology of screened Interval[1]	Sampling Frequency		Water Level Measurement Frequency			Rationale
		Quarterly	Semi-Annually	Continuous	Monthly	Semi-Annually	
							line/decommissioned and replaced with the alluvial groundwater controls.
MWCD-02b	Central Drainage Regolith			X			Regolith well located near the Restroom Pumpback Station (Central Drainage). Previously monitored for water levels as part of the interim water management performance monitoring program to evaluate effects of pumping nearby wells PBC-01, PBC-02, and PBC-03. Water level monitoring will continue during the RA construction these wells are taken off line/decommissioned and replaced with the alluvial groundwater controls.
MW-02	Central Drainage Regolith			X			Regolith well located near the regolith well located near the Restroom Pumpback Station (Central Drainage). Previously monitored for water levels as part of the interim water management performance monitoring program to evaluate effects of pumping nearby wells PBC-01, PBC-02, and PBC-03. Water level monitoring will continue during the RA construction these wells are taken off line/decommissioned and replaced with the alluvial groundwater controls.
MWCD-01	Central Drainage Bedrock			X			Bedrock well located near the Restroom Pumpback Station (Central Drainage). Previously monitored for water levels as part of the interim water management performance monitoring program to evaluate effects of pumping nearby wells PBC-01, PBC-02, and PBC-03. Water level monitoring will continue during the RA construction these wells are taken off line/decommissioned and replaced with the alluvial groundwater controls.
GW-36a[2]	Central Drainage Regolith	X[6]			X		Well located within the area of mine affected regolith groundwater as identified during the RI. This well was previously sampled as part of the interim water management performance monitoring program and has pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1). Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent GW-51 screened in the bedrock) and flow direction. This well also is located near the planned Alluvial Groundwater Controls in the Central Drainage, and will be sampled quarterly to evaluate the performance of the groundwater controls.
GW-51[2]	Central Drainage Bedrock		X		X		Well located within the area of mine affected bedrock groundwater as identified during the RI. This well was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1). Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent GW-36a screened in the regolith) and flow direction.
GW-19[2]	Central Drainage Regolith		X			X	Well located within the area of mine affected regolith groundwater as identified during the RI. This well was previously sampled as part of the interim water management performance monitoring program, and has pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1). Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent MWCD-02a screened in the bedrock) and flow direction.
MWCD-02a	Central Drainage Bedrock		X			X	Well located within the area of mine affected bedrock groundwater as identified during the RI, and was not previously monitored as part of the interim water management performance monitoring program. Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent GW-19 screened in the regolith) and flow direction.
MWED-05	Far East Seep Regolith			X			Well was used to intermittently pump regolith groundwater during the interim water management, and was previously monitored for water levels as part of the interim water management performance monitoring program. Intermittent pumping and water-level monitoring will continue during the RA construction until the well is taken off line/decommissioned and replaced with the alluvial groundwater controls.
MWED-06	Far East Seep Bedrock			X			Well was used to intermittently pump regolith groundwater during the interim water management, and was previously monitored for water levels as part of the interim water management performance monitoring program. Intermittent pumping and water-level monitoring will continue during the RA construction until the well is taken off line/decommissioned and replaced with the alluvial groundwater controls.
MW-05[2]	Eastern Drainage Regolith		X			X	Well located within the area of mine affected alluvial groundwater as identified during the RI. This well was previously sampled as part of the interim water management performance monitoring program, but does not have pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1). Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent MWED-03 screened in the bedrock) and flow direction.
MWED-03[2]	Eastern Drainage Bedrock		X			X	Well located within the area of mine affected bedrock groundwater as identified during the RI. This well was previously sampled as part of the interim water management performance monitoring program, but does not have pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1). Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent MW-05 screened in the regolith) and flow direction.
MW-04	Eastern Drainage Regolith		X			X	Well located within the area of mine affected regolith as identified during the RI. This well was not previously included in the interim water management performance monitoring program. Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-

Table Q1-3 — Groundwater Monitoring Schedule During Remedial Action

Well ID	Well location and geology of screened Interval[1]	Sampling Frequency		Water Level Measurement Frequency			Rationale
		Quarterly	Semi-Annually	Continuous	Monthly	Semi-Annually	
							term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent MWED-04 screened in the bedrock) and flow direction.
MWED-04	Eastern Drainage Bedrock		X			X	Well located outside the area of mine affected bedrock groundwater as identified during the RI. This well was not previously included in the interim water management performance monitoring program. Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent MW-04 screened in the regolith) and flow direction.
MWED-10[2]	Mine Drainage Regolith		X			X	Well located within the area of mine affected regolith groundwater as identified during the RI. This well was previously sampled as part of the interim water management performance monitoring program, but does not have pre-established indicator-parameter action levels for use during the RA construction. (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1). Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent MWED-11 screened in the bedrock) and flow direction.
MWED-11	Mine Drainage Bedrock		X			X	Well located outside the area of mine affected bedrock groundwater as identified during the RI. This well was not previously included in the interim water management performance monitoring program. Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring. Water levels will be used to evaluate gradient (by comparing data with adjacent MWED-10 screened in the regolith) and flow direction.
MWBC-01	Middle Blue Creek Regolith		X			X	Well located in Blue Creek drainage just down gradient of the area of mine affected regolith groundwater as identified during the RI. This well was not included in the interim water management performance monitoring program. Well will be monitored during the RA construction to evaluate water levels and potential impacts to groundwater, and is a candidate well for long-term post remedy monitoring.
MWBC-02	Lower Blue Creek Regolith		X			X	New well located in the regolith near the confluence of Oyachen and Blue creeks. Will be monitored to evaluate the presence or absence of mine-related COCs in regolith groundwater and to monitor data trends during and following the RA.
MWBC-03	Lower Blue Creek Regolith		X			X	New well located in the regolith near the confluence of Oyachen and Blue creeks. Will be monitored to evaluate the presence or absence of mine-related COCs in regolith groundwater and to monitor data trends during and following the RA.
MWBC-04	Lower Blue Creek Regolith		X			X	New well located in the regolith near the confluence of Oyachen and Blue creeks. Will be monitored to evaluate the presence or absence of mine-related COCs in regolith groundwater and to monitor data trends during and following the RA.
MWBC-05	Lower Blue Creek Regolith		X			X	New well located in the regolith near the confluence of Oyachen and Blue creeks. Will be monitored to evaluate the presence or absence of mine-related COCs in regolith groundwater and to monitor data trends during and following the RA.
AMW-FES-EXT	*Far East Seep Drainage Regolith*				*X*		*New regolith monitoring well installed in the Far East Seep Drainage extraction trench to provide water-level data for evaluating the performance of the groundwater controls constructed in the Far East Seep Drainage*
AMW-FES-01	*Far East Seep Drainage Regolith*				*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Far East Seep Drainage*
AMW-FES-02	*Far East Seep Drainage Regolith*		*X*		*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Far East Seep Drainage. Well will be sampled during the RA to evaluate COC concentrations immediately down gradient of the groundwater controls.*
AMW-FES-03	*Far East Seep Drainage Regolith*				*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Far East Seep Drainage*
AMW-WD-EXT	*Western Drainage Regolith*				*X*		*New regolith monitoring well installed in the Western Drainage extraction trench to provide water-level data for evaluating the performance of the groundwater controls constructed in the Western Drainage*
AMW-WD-01	*Western Drainage Regolith*				*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Western Drainage*
AMW-WD-02	*Western Drainage Regolith*				*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Western Drainage*
AMW-WD-03	*Western Drainage Regolith*		*X*		*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Western Drainage. Well will be sampled during the RA to evaluate COC concentrations immediately down gradient of the groundwater controls.*
AMW-WD-04	*Western Drainage Regolith*				*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Western Drainage*
AMW-CD-	*Central Drainage*				*X*		*New regolith monitoring well installed in the Central Drainage extraction trench to provide water-level data for evaluating the performance of the groundwater controls*

Table Q1-3 — Groundwater Monitoring Schedule During Remedial Action

Well ID	Well location and geology of screened Interval[1]	Sampling Frequency		Water Level Measurement Frequency			Rationale
		Quarterly	Semi-Annually	Continuous	Monthly	Semi-Annually	
EXT	*Regolith*						*constructed in the Central Drainage*
AMW-CD-01	*Central Drainage Regolith*				*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Central Drainage*
AMW-CD-02	*Central Drainage Regolith*		*X*		*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Central Drainage. Well will be sampled during the RA to evaluate COC concentrations immediately down gradient of the groundwater controls.*
AMW-CD-03	*Central Drainage Regolith*				*X*		*New regolith monitoring well to provide water-level data for evaluating the performance of the groundwater controls constructed in the Central Drainage*
GW-54	Backfilled Pits Area waste rock (dewatering well)	X		X			Well located within the BPA, and was not included in the interim water management performance monitoring program. Well will be monitored during the RA to evaluate COC concentrations in BPA water and effectiveness of dewatering activities.
GW-54B	*Backfilled Pits Area waste rock (redundant dewatering well)*			*X*			*Redundant dewatering well to be installed during the RA - Water levels will be monitored to evaluate effectiveness of dewatering activities in the BPA.*
GW-56	Backfilled Pits Area waste rock (observation well)			X			Well located within the BPA, and was not included in the interim water management performance monitoring program. Water levels will be monitored during the RA to evaluate effectiveness of BPA dewatering activities.
GW-57	Backfilled Pits Area bedrock (observation well)			X			Well located within the BPA, and was not included in the interim water management performance monitoring program. Water levels will be monitored during the RA to evaluate effectiveness of BPA dewatering activities.
GW-58	Backfilled Pits Area			X			Well located within the BPA, and was not included in the interim water management performance monitoring program. Water levels will be monitored during the RA to evaluate effectiveness of BPA dewatering activities.
GW-53	Backfilled Pits Area waste rock (observation well)			X			Well located within the BPA, and was not included in the interim water management performance monitoring program. Water levels will be monitored during the RA to evaluate effectiveness of BPA dewatering activities.
BOM-89-2S	Backfilled Pits Area waste rock (observation well)			X			Well located within the BPA, and was not included in the interim water management performance monitoring program. Water levels will be monitored during the RA to evaluate effectiveness of BPA dewatering activities.
BOM-89-2D	Backfilled Pits Area bedrock (observation well)			X			Well located within the BPA, and was not included in the interim water management performance monitoring program. Water levels will be monitored during the RA to evaluate effectiveness of BPA dewatering activities.
Pit 4-UD-01	*Pit 4 Underdrain Sump Dewatering Well*	*X*		*X*			*Dewatering well to be installed during the RA and will be monitored to evaluate COC concentrations in Pit 4 underdrain sump water and effectiveness of dewatering activities.*
Pit 4-UD-02	*Pit 4 Underdrain Sump Redundant Dewatering Well*			*X*			*Redundant dewatering well to be installed during the RA - Water levels will be monitored to evaluate effectiveness of dewatering activities in the Pit 4 underdrain sump.*
Pit 4-WR-01	*Pit 4 Waste Rock Dewatering Well*	*X*		*X*			*Dewatering well to be installed during the RA and will be monitored to evaluate COC concentrations in Pit 4 waste rock sump water and effectiveness of dewatering activities.*
Pit 4-WR-02	*Pit 4 Waste Rock Redundant Dewatering Well*			*X*			*Redundant dewatering well to be installed during the RA - Water levels will be monitored to evaluate effectiveness of dewatering activities in the Pit 4 waste rock sump.*
Pit 3-UD-01	*Pit 3 Underdrain Sump Dewatering Well*	*X*		*X*			*Dewatering well to be installed during the RA and will be monitored to evaluate COC concentrations in Pit 3 underdrain sump water and effectiveness of dewatering activities.*

Table Q1-3 — Groundwater Monitoring Schedule During Remedial Action

Well ID	Well location and geology of screened Interval[1]	Sampling Frequency		Water Level Measurement Frequency			Rationale
		Quarterly	Semi-Annually	Continuous	Monthly	Semi-Annually	
Pit 3-UD-02	*Pit 3 Underdrain Sump Redundant Dewatering Well*			*X*			*Redundant dewatering well to be installed during the RA - Water levels will be monitored to evaluate effectiveness of dewatering activities in the Pit 3 underdrain sump.*
Pit 3-WR-01	*Pit 3 Waste Rock Dewatering Well*	*X*		*X*			*Dewatering well to be installed during the RA and will be monitored to evaluate COC concentrations in Pit 3 waste rock sump water and effectiveness of dewatering activities.*
Pit 3-WR-02	*Pit 3 Waste Rock Redundant Dewatering Well*			*X*			*Redundant dewatering well to be installed during the RA - Water levels will be monitored to evaluate effectiveness of dewatering activities in the Pit 3 waste rock sump.*

Sampling locations in *italics* are anticipated to be installed during ~~2014 or otherwise prior or during~~ the RA construction.

Shaded wells are located within the planned Waste Containment Area and are depicted on Figure Q1-4. All other wells are depicted on Figures Q1-2 and Q1-3.

1 Site wells generally are screened in either competent bedrock or regolith. Regolith is the unconsolidated material overlying competent bedrock, and depending on location includes waste rock, alluvium, colluvium, glacial outwash, and weathered bedrock.

2 Well has pre-established indicator-parameter action levels for use during the RA construction (See QAPP Attachment Q2-E and QAPP DQO Table Q2-A-1).

BPA = backfilled pits area

COC = constituent(s) of concern

DQO = Data Quality Objective

RA = Remedial Action

RI = Remedial Investigation

QAPP = Quality Assurance Project Plan

Table Q1-4 – Monitoring Well Summary
Page 1 of 4

Well	Location	Screened Interval (ft bgs)	Well Total Depth (ft bgs)	Elevation[1] (ft)	Northing (ft)	Easting (ft)	Survey Datum (see note)	Well Casing Diameter (in)	Pump	Comments
MWNW-01	Northwest Ridge Bedrock	80-100	100	3424.7	358946.92	2311742.65	3	4	None	Sampling procedures TBD
MWNW-02	Northwest Ridge Bedrock	180-200	200	3527.09	358,673.92	2,310,680.65	3	4	Not Applicable	Not sampled – water levels only
MWNW-03	Northwest Ridge Bedrock	97-117	117	3560.71	357,905.92	2,309,918.65	3	4	Not Applicable	Not sampled – water levels only
MWNW-04	Northwest Ridge Bedrock	171-191	191	3496.9	356,987.92	2,308,748.65	3	4	Not Applicable	Not sampled – water levels only
MWNW-07	Northwest Ridge Bedrock	63.3-83.3	88.8	2851.02	355965.18	2312369.5	3	4	None	Sampling procedures TBD
MWFW-01	Far West Drainage Alluvium (paired w/ MWFW-02)	15-30.4	30.4	2530.1	352,989.92	2,309,379.65	3	4	None	Sampling procedures TBD
MWFW-02	Far West Drainage Bedrock (paired w/ MWFW-01)	101.9-121.9	122.3	2529.7	353,015.92	2,309,363.65	3	4	None	Sampling procedures TBD
MW-01	Western Drainage Regolith (paired w/ MWWD-01)	2-12	12	2408.36	352273.4	2670907.4	4	2	Not Applicable	Not sampled – water levels only
MWWD-01	Western Drainage Bedrock (paired w/ MW-01)	73.4-93.4	93.9	2406.49	352242	2670910	4	4	Not Applicable	Not sampled – water levels only
GW-35a	Western Drainage Regolith (paired w/ GW-50)	7.4-11.7	12.5	2366.75	351650.16	311220.53	3	4	Moyno Pump[5]	Pump 3 casing volumes[6]
GW-50	Western Drainage Bedrock (paired w/ GW-35a)	49.8-70.2	70.2	2366.91	351639.76	311200.66	3	4	Dedicated electric submersible	Pumps dry sampled next day
PBW-01	Western Drainage Regolith	4.8-14.9	14.9	2408.64	352231.21	311043.33	3	6	Not Applicable	Not sampled – water levels only
PBW-02	Western Drainage Regolith	8.7-18.8	18.8	2405.55	352197.84	311022.98	3	6	Not Applicable	Not sampled – water levels only
MWWD-02b	Western Drainage Regolith	6.3-16.3	16.6	2405.53	352180.4	311042.57	3	4	Not Applicable	Not sampled – water levels only
MW-02	Central Drainage Regolith (paired w/ MWCD-01)	7-17	17	2431.64	352346.7	2671737.1	4	2	Not Applicable	Not sampled – water levels only
MWCD-01	Central Drainage Bedrock (paired w/ MW-02)	95-115	115	2431.29	352337	2671713	4	4	Not Applicable	Not sampled – water levels only
GW-36a	Central Drainage Regolith (paired w/ GW-51)	14.4-18.7	19.5	2360.16 [2]	351566.94	311856.41	3	4	Moyno Pump[5]	Pump dry twice then sample
GW-51	Central Drainage Bedrock (paired w/ GW-36a)	59.9-74.3	74.3	2370.40	351553.26	311911.18	3	4	Dedicated electric submersible	Pumps dry then sample
GW-19	Central Drainage Regolith (paired w/ MWCD-02a)	12-20	20	2318.85 [2]	351055.51	312002.97	3	4	Moyno Pump[5]	Pump dry twice then sample
MWCD-02a	Central Drainage Bedrock (paired w/ GW-19)	78-98	98.5	2319.14	351084.67	2312008.15	4	4	TBD	Pump 3 casing volumes[6] or pump dry then sample.. Paired with GW-19
PBC-01	Central Drainage Regolith	8.7-33.1	33.1	2428.91	352268.71	311850.43	3	6	Not Applicable	Not sampled – water levels only
PBC-02	Central Drainage Regolith	5.5-18.9	18.9	2431.02	352262.45	311769.06	3	6	Not Applicable	Not sampled – water levels only
PBC-03	Central Drainage Regolith	6.4-30.9	30.9	2431.08	352293.88	311900.44	3	6	Not Applicable	Not sampled – water levels only

Table Q1-4 – Monitoring Well Summary
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Well	Location	Screened Interval (ft bgs)	Well Total Depth (ft bgs)	Elevation[1] (ft)	Northing (ft)	Easting (ft)	Survey Datum (see note)	Well Casing Diameter (in)	Pump	Comments
MWCD-02b	Central Drainage Regolith	8-33.4	33.4	2427.65	352249.78	311852.69	3	4	Not Applicable	Not sampled – water levels only
MW-04	Eastern Drainage Regolith (paired w/ MWED-04)	10-20	20	2371.74	351964.06	2313100.85	4	2	Not Applicable	Not sampled – water levels only
MWED-04	Eastern Drainage Bedrock (paired w/ MW-04)	92.7-112.7	113.2	2371.74	351964.06	2313100.85	4	4	Not Applicable	Not sampled – water levels only
MW-05	Eastern Drainage Regolith (paired w/ MWED-03)	5-15	15	2462.74	353175.2	2673113.3	4	2	Moyno Pump[5]	Pump 3 casing volumes[6] or pump dry then sample. Paired with MWED-03.
MWED-03	Eastern Drainage Bedrock (paired w/ MW-05)	29.2-49.2	49.7	2467.74	353160.6	2673201.7	4	4	Moyno Pump[5]	Pump 3 casing volumes[6] or pump dry then sample. Paired with MW-5.
MWED-10	Mine Drainage Regolith (paired w/ MWED-11)	5-15	15	2133.44	349345.55	312553.62	3	4	Moyno Pump[5]	Pump 3 casing volumes[6] or pump dry then sample. Paired with MWED-11.
MWED-11	Mine Drainage Bedrock (paired w/ MWED-10)	87.9-107.9	108.4	2128.23	349336.92	2312627.65	3	4	Moyno Pump[5]	Pump 3 casing volumes[6] or pump dry then sample. Paired with MWED-10.
MWED-05	Far East Seep Regolith (paired w/ MWED-06)	9.6-24.6	25.1	2590.70	354067.94	313290.52	3	4	Not Applicable	Not sampled – water levels only
MWED-06	Far East Seep Bedrock (paired w/ MWED-05)	31-51	51.5	2590.60	354072.25	313302.2	3	4	Not Applicable	Not sampled – water levels only
BOM-89-10S	Buried Western Drainage Bedrock (paired w/BOM-89-10D	55-65	75	2957	356377.20	2310850.15	7	2	TBD	Pump 3 casing volumes[6] or pump dry then sample. Paired with BOM-89-10D.
BOM-89-10D	Buried Western Drainage Bedrock (paired w/BOM-89-10S	115-125	260	2957	356,377.20	2310850.15	7	2	TBD	Pump 3 casing volumes[6] or pump dry then sample. Paired with BOM-89-10S.
MWNE-01	Northeast Drainage Regolith (paired with MWNE-02)	39-59	59	3099.13	358056.9	2312721.52	4	4	TBD	Pump 3 casing volumes[6] or pump dry then sample. Paired with MWNE-02.
MWNE-02	Northeast Drainage Bedrock (paired with MWNE-01)	130.2-150.2	150.2	3099.63	358074.89	2312742.96	4	4	TBD	Pump 3 casing volumes[6] or pump dry then sample. Paired with MWNE-01.
MWNE-03	Northeast Drainage Regolith (paired with MWNE-04)	116.5-136.5	136.5	3119.34	357026.4	2312207.59	4	4	TBD	Pump 3 casing volumes[6] or pump dry then sample. Paired with MWNE-04.
MWNE-04	Northeast Drainage Bedrock (paired with MWNE-03)	217.5-237.5	237.5	3120.3	357037.64	2312203.52	4	4	TBD	Pump 3 casing volumes[6] or pump dry then sample. Paired with MWNE-03.
MWNE-07	Northeast Drainage Regolith	63.3-83.3	88.8	2851.02	355965.18	2312369.5	4	4	TBD	Pump 3 casing volumes[6] or pump dry then sample.
MWBC-01	Middle Blue Creek Regolith	7.1-27.1	27.6	?	348538.91	2311855.75	3	4	Moyno Pump[5]	Pump 3 casing volumes[6] or pump dry then sample
MWBC-02	Lower Blue Creek Regolith	~~TBD~~9.7-40	~~TBD~~40	~~TBD~~1527.80	~~TBD~~340287.74	~~TBD~~306750.29	~~TBD~~3	~~TBD~~2	TBD	New well ~~anticiptaed to be~~ installed during 2014
MWBC-03	Lower Blue Creek Regolith	~~TBD~~15-45.3	~~TBD~~45.3	~~TBD~~1524.69	~~TBD~~340389.02	~~TBD~~306645.67	~~TBD~~3	~~TBD~~2	TBD	New well ~~anticiptaed to be~~ installed during 2014

Table Q1-4 – Monitoring Well Summary
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Well	Location	Screened Interval (ft bgs)	Well Total Depth (ft bgs)	Elevation[1] (ft)	Northing (ft)	Easting (ft)	Survey Datum (see note)	Well Casing Diameter (in)	Pump	Comments
MWBC-04	Lower Blue Creek Regolith	~~TBD~~39.6-119.9	~~TBD~~120	~~TBD~~1336.04	~~TBD~~338219.78	~~TBD~~301681.63	~~TBD~~3	~~TBD~~2	TBD	New well ~~anticiptaed to be~~ installed during 2014
MWBC-05	Lower Blue Creek Regolith	~~TBD~~32-115.3	~~TBD~~117	~~TBD~~1339.86	~~TBD~~338304.69	~~TBD~~301643.19	~~TBD~~3	~~TBD~~2	TBD	New well ~~anticiptaed to be~~ installed during 2014
AMW-FES-EXT	*Far East Seep Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-FES-01	*Far East Seep Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-FES-02	*Far East Seep Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-FES-03	*Far East Seep Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-WD-EXT	*Western Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-WD-01	*Western Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-WD-02	*Western Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-WD-03	*Western Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-WD-04	*Western Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-CD-EXT	*Central Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-CD-01	*Central Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-CD-02	*Central Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*
AMW-CD-03	*Central Drainage Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during ~~2014~~RA construction*

Table Q1-4 – Monitoring Well Summary
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Well	Location	Screened Interval (ft bgs)	Well Total Depth (ft bgs)	Elevation[1] (ft)	Northing (ft)	Easting (ft)	Survey Datum (see note)	Well Casing Diameter (in)	Pump	Comments
GW-53	Backfilled Pits Area Regolith	133-173.9	173.9	2907.6	354799.57	2311078.61	?	6	Not Applicable	Not sampled – water levels only
GW-54	Backfilled Pits Area Regolith	88.9-129.8	129.8	2785.4	354292.09	2311426.56	?	6	Dewatering pump	Sample discharge
GW-54B	*Backfilled Pits Area Regolith*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	*New well anticiptaed to be installed during RA construction*
GW-56	Backfilled Pits Area Regolith	64-94 (?)	94.5	2762.51	354053.72	2311458.95	?	?	Not Applicable	Not sampled – water levels only Well log not available
GW-57	Backfilled Pits Area Bedrock	183.68-194.14	194.14	2783.72	354364.82	2311449.45	?	6	Not Applicable	Not sampled – water levels only Well log not available
GW-58	Backfilled Pits Area Regolith	145-173	173	2906.1	351605.34		?	6	Not Applicable	Not sampled – water levels only
BOM-89-2S	Backfilled Pits Area Regolith	95-100	110	2876	354,792.16	2311201.96	?	2	Not Applicable	Not sampled – water levels only
BOM-89-2D	Backfilled Pits Area Bedrock	130-135	145	2876	354,792.16	2311201.96	?	2	Not Applicable	Not sampled – water levels only

Notes:

1) Measuring point elevation unless noted
2) Elevation is top of protective casing lid
3) NAD 83 (CORS 96) Ground Coordinates; NAVD 88 Elevations
4) NAD 27 Ground Coordinates; NAVD 88 Elevations
5) Moyno Pump (Model #33201) is a progressing cavity pump (positive displacement). Tubing is dedicated.
6) Purge Volumes: (based on Schedule 40 PVC) 2" PVC= 0.17 gal/ft.; 4" PVC = 0.65 gal/ft; 6" PVC = 1.48 gal/ft
7) Source of coordinates is the well log.

Well locations in italics are anticipated to be installed during ~~2014~~RA construction ~~or otherwise prior to initiating the RA~~.

bgs = below ground surface, RA = Remedial Action, TBD = to be determined

FIGURES

Attachment Q1-A

Well Completion Diagrams and Lithology Logs

Attachment Q1-B

Job Safety Analyses