POTASH RIDGE

March 6, 2014

RECEIVED
MAR 0 6 2014
Utah Division of Water Quality
PZ

Department of Environmental Quality
Division of Water Quality
Groundwater Protection Section
195 North 1950 West
Salt Lake City, UT

RE: Updates to Groundwater Permit Application

Dear Mr. Hall:

The following updates are being delivered to your office today to be included as part of the current Groundwater Discharge Permit Application you currently are reviewing for Utah Alunite Corporation.

The updates are as follows:

Appendix B
New Table of Contents
Pages: 1-1, 1-2, 2-1, 2-2, 2-3, 3-1, 4-1, 4-2, 4-3, 4-4, 4-5,4-6, 4-8, 5-1,
Figures: 2.1, 4.1, 4.2, 4.3
New CD of Design Summaries
Appendix D
Completely replaced with updated version
Appendix E
Lithologic logs for monitoring wells
New Figures
Figure 8

Document Date 3/6/2014
DWQ-2014-003713

We are delivering one completely reproduced copy and will be updating your second copy in your office with the necessary replacement pages outlined above.

Thank you for your time in getting this accomplished. Any questions please call me at 801-419-2787 or Tom Munson an at 801-556-8703.

Regards,

Laura Nelson

Laura Nelson
VP Government and Regulatory Affairs

170 South Main, Suite 500 Salt Lake City, UT 84101 • 801-433-6027

Version 2.0

Utah Groundwater Discharge Permit Application
for
Utah Alunite Corporation
Blawn Mountain Project

RECEIVED
MAR 06 2014

February 4 , 2014
Updated March 1, 2014

Prepared by:

Utah Alunite Corporation
170 South Main, Suite 500
Salt Lake City, Utah 84101

Assisted by:

Norwest Corporation
136 E. South Temple, 12th Floor
Salt Lake City, Utah 84111

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Utah Groundwater Discharge Permit Application
for
Utah Alunite Corporation
Blawn Mountain Project

INTRODUCTION AND BACKGROUND INFORMATION

Utah Alunite Corporation (UAC) is a privately held corporation and is a wholly owned subsidiary of Potash Ridge Corporation. The UAC business office is located at 170 South Main, Suite 500, Salt Lake City, Utah 84101, United States of America. UAC can be contacted by phone at (801) 433-6027 and the company maintains a website at **http://www.potashridge.com/** with general information.

The Blawn Mountain Project (Project) consists of 15,403.72 acres of Utah surface and mineral tract administered by the State of Utah School and Institutional Trust Lands Administration (SITLA). UAC has rights to the property through an Exploration/Option Agreement (ML 51983.0 OBA) and two state mineral leases (ML 52513, and ML 52364) administered by SITLA. The agreement consists of a main tract of land that covers 14,923.72 acres and six individual 80 acre tracts located 3.5 to 4.5 miles northeast of the main tract of land.

The Project was first evaluated by Earth Sciences, Inc., (ESI) as part of a nationwide alunite exploration program in 1969. In 1970 ESI started the first systematic exploration of the Blawn Mountain deposit. Early extraction targeted both potash and alumina. ESI completed a total of 320 drill holes throughout the property and conducted metallurgical test programs including pilot plant testing to validate the process flowsheet for production of the associated outputs.

In June 2011, UAC acquired a collection of technical reports and materials related to the alunite deposit at Blawn Mountain, and subsequently secured the rights to the property. These data and reports were used to develop a drilling program to validate the previous exploration efforts. Three significant drilling campaigns were conducted at the site along with an extensive metallurgical testing program at Hazen Research, Inc. in Golden, Colorado.

UAC's Project targets development of sulfate of potash (SOP) and the co-product sulfuric acid through the mining and processing of alunite on the properties described in this application. Production volume is planned at an average of 645,000 tons of SOP and 1.44 million tons of sulfuric acid per year for the 40-year life of the Project.

PART A – GENERAL FACILITY INFORMATION

1.0 Administrative Information

Facility Name – Blawn Mountain Project

Mailing Address - Utah Alunite Corporation
170 South Main, Suite 500
Salt Lake City, Utah 84101
United States of America

Facility Legal Location – See Figure 1 – Location Map

- Township 28 S, R 14 West, SLB&M
    - N ½ of NW ¼ of Section 16
    - N ½ of NE ¼ of Section 21
    - N ½ of NE ¼ of Section 22
    - N ½ of NE ¼ of Section 26
    - N ½ of NE ¼ of Section 27
    - N ½ of NE ¼ of Section 35
    - Sections 1
    - Section 2
    - Section 11-12
    - Section 7
- Township 29 South, Range 15 West, SLB&M:
    - Sections 13-15
    - E1/2 of Section 16
    - Sections 21-29
    - Sections 32-35
    - W1/2 of Section 36
- Township 30 South, Range 15 West, SLB&M
    - Section 2 Lots 1, 2, 3, 4, and S1/2N1/2, S1/2

Contact Information:

Dr. Laura Nelson, VP, Government and Regulatory Affairs
Email: lnelson@potashridge.com
Phone: (801) 433-6027
Fax: (801) 433-6027

2.0 Owner/Operator Information

Owner:

Utah Alunite Corporation
170 South Main, Suite 500
Salt Lake City, Utah 84101

Operator:

Same as owner information above.

Official Representative:

Dr. Laura Nelson, VP, Government and Regulatory Affairs

3.0 Facility Classification

The Project is a new facility.

4.0 Type of Facility

The Project is a mining and processing operation.

5.0 SIC/NAICS Code

The Project is classified under SIC code 1474 and NAICS code 212391.

6.0 Project Facility Life

Mining is anticipated to occur for 24 years with ore processing anticipated to occur for 40 years. As the operation progresses additional reserves may be discovered which could extend the life of the Project.

7.0 Mine Operation and Processing Description

The Project consists of a mining operation, processing plant, and tailings area. Figure 2 presents an overview of the planned mining, process, loadout, and tailings facilities for the proposed operations.

7.1 Mining Plan

Mining operations at the Project envisions using conventional truck/shovel techniques to remove ore and waste material from the mining areas (Areas 1 and 2) (see Figure 2). Ore will be processed to produce sulfate of potash (SOP) and sulfuric acid.

7.1.1 Mine Construction Plan

Mining operations at the Project will begin in Area 1. When the targeted ore has been removed from this area, mining will begin in Area 2. Before mining operations commence, sediment control measures will be constructed to control runoff from the disturbed area. Once sediment control measures are in place and prior to any mining-related disturbance, plant growth material (PGM) will be removed and temporarily stored on-site until reclamation can occur. PGM will be temporarily stored in one of two designated stockpiles presented on Figure 2.

Ore and waste material will be removed using area and bench mining techniques. Operations will begin at the top of the ridges and move downward utilizing multiple 20 to 40ft vertical benches. Multiple mining faces will be utilized throughout the mine life to assist with ore blending efforts. Conventional truck/shovel mining techniques will be employed using a mid-sized hydraulic excavator and front-end-loader (FEL) to load end-dump mining trucks. Prior to ore and waste removal, the material must be drilled and blasted.

An initial evaluation of slope stability for the proposed surface mine was performed in January 2013. This analysis was based on data collected from the site and core from two holes drilled on the property and recommended utilizing mine slopes with overall angles of 45°. These constraints were utilized in mine planning and design.

7.1.2 Methods and Equipment

The mining schedule is driven by the capacities of the processing equipment chosen (four calcining units) which established the run-of-mine (ROM) ore schedule at approximately 10.6Mtpy. The anticipated mine life is approximately 40 years. Mining will occur in Area 1 for approximately 8 years and mining in Area 2 will continue for an additional 17 years. Processing of low-grade ore stockpile material ensues once Area 2 is mined out and continues for roughly 15 years.

The production schedule and mining sequence uses an equipment fleet that adequately meets the needs of the mining operation. Two spreads of mining equipment are envisioned to remove ore and waste material from the mine. Table 7.1 illustrates the type, size and quantity of the major mining equipment planned for use at maximum production levels. The quantity of end-dump trucks varies throughout the mine life as haul distances and mining areas change. This equipment will remove both ore and waste material from the mine. This equipment was selected as it provides flexibility to support the various tasks encountered during mining operations. This equipment fleet is mobile, which will allow for easier relocation to support the mining schedule and will assist with the various site conditions encountered during mining.

Table 7.1 Major Mining Equipment

Primary Equipment		
Excavator	22yd^3	1
FEL	16yd^3	1
End-Dump Truck	148t	19
Support Equipment		
Water Truck	16,000gal	2
Grader	297Hp	2
Dozer	580Hp	5
Drill	50,000lb	1

A fleet of smaller support equipment including pumps, light plants, lube and fuel trucks, mechanics trucks, pick-up trucks, etc. will support the major mining equipment

7.1.3 Ore Handling

Multiple mining faces will be utilized throughout the mine life to assist with ore blending and mine sequencing efforts. The mine plan utilizes 3.5% K_2O ore grade cut-off for Area 1 and a 3.25% K_2O cut-off for Area 2. During active mining operations a significant portion of low grade ore (ore not meeting the cut-off criteria mentioned above) will be stockpiled in one of four low grade ore stockpiles. These stockpiles will be segregated by grade increments to assist with later stockpile recovery and processing. The four low grade ore stockpiles are envisioned as being segregated by approximate quarter percent grade increments ranging from 3.50% K_2O to 2.50% K_2O. Once mining operations cease and the targeted ore is removed from Areas 1 and 2, stockpiled low grade ore will be transported to the processing facility and processed. Active mining is expected to occur for roughly 25 years; processing of the low grade ore from stockpiles will occur for an additional 15 years.

7.1.4 Waste Rock Handling

Overburden and waste rock material will be encountered during mining operations. Prior to removal, waste rock material will be drilled and blasted. Waste material generated during mining will be handled and stored in different ways. Waste produced in the first couple years of mining will be used to assist in construction of stockpile areas, access roads and haul roads. The majority of the waste material encountered after this will be disposed of in an out-of-pit waste storage pile and also in-pit as soon as practical. The area available for in-pit backfilling is limited during the early years of mining, but becomes more prevalent as mining continues and pit size expands.

7.1.5 Haul Roads and Ramps

Access ramps and haul roads will be constructed to safely support the mining operations. In most cases, haul roads and ramps will be constructed 100 feet wide with grades not exceeding 10 percent (%). As with most mining operations, locations of roads and ramps will likely change frequently as operations change and expand.

7.1.6 Mine Area Water Handling

The Project is located near the head of two ephemeral drainages. Therefore, the runoff potential for these drainages is limited. Surface runoff will be collected by the mining pits and will flow over and through the waste rock, ore, and low-grade ore stock piles. These water occurrences are considered incidental contact and are expected to be of limited volume which will quickly evaporate and are not expected to infiltrate.

The majority of surface water within the disturbed area will be controlled with a series of adequately sized channels that will direct water from the areas within the Project related disturbance. Two zones of control are planned. For the area inside of Areas 1 and 2, the runoff water will be collected by interior ditches and conveyed to the tailings collection pond and allowed time for sediment to settle. This captured mine water is expected to be limited in volume. A portion of the captured mine water may be used for mine haul road watering instead of transporting it to the tailings collection pond. For the areas outside of Areas 1 and 2, the surface water will be collected in sediment ponds and collection ditches.

A series of groundwater monitoring wells were installed around the mine area. The zones monitored generally included the volcanic tuffs and rhyolite flows, the upper formations in the mountain block surrounding the alunite deposit. As discussed in Section 7.5.2, these wells show that limited groundwater is found in these zones. The groundwater flows in the rhyolite flows are in the range of 5 to 10gpm. The flows in the tuff deposits are in the range of 0 to 0.5gpm. The zones are at approximately the maximum depths of proposed mining pits. Therefore, pit intercepted groundwater is not significant and should not be a hindrance to mining. For the majority of mining activities, it is not expected that groundwater will be encountered. Groundwater is only expected as the bottom of the anticipated mining pit is approached. Any groundwater encountered during mining will be collected, as needed, in sumps in the pit floor. This water will then be pumped for in-pit use and dust control.

7.2 Processing Plant

The processing facility used to process the ROM ore is comprised of several areas including:

- Primary crusher
- Ore stockpiling and reclaiming
- Grinding and classification circuit
- Solid / Liquid separation area
- Calcining and roasting
- Sulfuric acid plant
- Leaching
- Crystallization
- Product drying, compaction, and sizing
- Product storage and shipping

7.2.1 Process Plant Area

ROM ore is delivered from the mine to the ore stockpile pad, where it is fed to the primary crusher. The primary crusher reduces the size of the material to a minus 6-inch product. The crushed ore is then delivered to the ore stockpile and reclaim area. From this point, the crushed ore is conveyed to the grinding and cyclone classification circuit where it is reduced to a target size for processing. The ground material is thickened and then dewatered in a series of belt filters to produce filter cake, which is sent as feed to calcining and roasting units. The calcining and roasting process decomposes the alunite into potassium sulfate, alumina, and silica and releases off gases containing sulfur dioxide, which are collected and processed in the acid plant to produce sulfuric acid. The roasted ore is leached using a hot water leaching system where the potassium sulfate (SOP) is dissolved. The leach slurry is thickened and filtered and the resulting brine solution goes through a crystallization process where the SOP is crystallized. The crystals are dried and prepared for final shipment. The residual washed solid materials from the water leach are repulped in a mix tank with reclaimed tailing water and pumped to the tailings area for placement.

SOP crystals and sulfuric acid will be transported from the processing plant to a rail loadout system connecting to a short rail line, which is planned to be constructed, owned and operated by a third-party (see Figure 2).

Other than hot water and flocculent, no other chemicals are used in the process.

7.2.2 SOP Load-out and Handling

SOP will be conveyed from the process plant area to a nearby concrete storage warehouse consisting of a concrete pad and dome cover structure. This dome will provide approximately 20,000t of storage. A storage reclaim system will directly feed the rail loadout equipment. Based on anticipated production rates, it is estimated that one unit train for SOP will be required every 4.5 days.

7.2.3 Acid Load-out and Handling

A short acid pipeline will be used to transfer acid from the acid plant to on-site acid storage and then to a rail loading area adjacent to the processing plant. The acid handling includes 2.5Mgal of acid storage in four 625,000gal storage tanks, dual pumping systems, schedule 60 stainless steel 316L double walled pipe with leak detection, secondary containment for the tanks with leak detection, and four rail loading systems. The foundations for the acid tanks are designed on fully concreted bases. The tanks are equipped with floating domed roofs and venting to ensure pressure remains constant. The four 625,000gal storage tanks are contained within a lined concrete containment sump capable of holding 110% of the potential volume of one tank since the four tanks operate independently. Acid production will fill a unit train every 2.5 days.

7.3 Tailings Area

7.3.1 Tailings Materials

Tailings will be comprised of different materials, based upon the nature of the host rock. Tailings will be coarse-grained sand-sized particles that are remnants of the host rock containing the alunite ore after the ore has been processed. The host rock is an altered rhyolite that is enriched in quartz, alunite, and alumina.

7.3.2 Tailings Handling

The processing plant waste stream will consist of tailings slurry, which will be conveyed via steel pipeline to the tailings area (see Figures 2 and 3). The tailings at the processing plant will be mixed with water and pumped from the processing plant to the tailings area. Tailings deposition and tailings water handling are discussed below.

7.3.3 Tailings Deposition

As ore is processed, tailings are produced requiring storage. Tailings from the processing plant will be conveyed to the tailings area for final placement.

Based on ore processing rates, approximately 184.7Myd^3 of tailings will be produced over the life of the project requiring approximately 863 acres for placement. This results in an average annual pumped tailings volume of roughly 4.6Myd^3. The consistency of the tailings as it leaves the processing plant will be approximately 55% solids. Tailings will be deposited via an outflow line in the southwest area of the tailings area and will expand to the northeast. Tailings are planned to flow from a manifold pipe system with lateral conveyance lines along the front of the active deposition area. As the tailings deposition expands, the tailings pipelines will be advanced.

Based on the gradation of the materials, the tailings are expected to be free-draining, coarse-grained sands. Therefore, the sands will quickly settle and create slope deposits that will resemble beach areas. The ultimate percent solids following settlement, after the tailings are drained, are anticipated to be

85%. The gradation of the tailings materials will be approximately 80 percent passing 1.0 mm and will be crystalline solids that do not contain significant amounts of clay. The result is that the tailings are expected to fully dewater and will not require impounding.

The majority of the tailings area is planned to be reclaimed concurrently as placement operations progress. Prior to construction of the tailings area, all PGM will be removed from the initial disturbance area and stockpiled for use during reclamation. Prior to tailings area expansion, PGM will be removed and direct hauled to a graded area behind the tailings pipelines. This process will be repeated until the full development of the tailings area is completed.

7.3.4 Tailings Water Handling

The plant process design results in tailings material that drains freely without requiring impoundment. Due to the free-draining nature of the tailings sands, the outflow will form a stockpile with a beach slope. The water draining from the pile will flow to a downstream collection pond.

The water from the deposited tails will drain within the natural drainage basin to a channelized flow. A combination of collection and settlement ponds will be constructed downstream of the anticipated maximum extent of the tailing deposition area to collect the drainage from the tailings as well as the runoff from the site and process facilities, mine haul roads and associated areas (see Figure 2). This water will be allowed to settle and then be reclaimed via pumps and pipeline back to the processing facility to minimize the volume of water needed in the facility.

The collection and settlement pond dams will be constructed before tailings are produced from the processing plant. The material used to construct the dam will come from a borrow area within the footprint of the tailings area. Based on the current preliminary design, the collection pond dam will require a permit with the Utah State Engineer, Dam Safety Division. The structure will be designed to meet these criteria. In addition to holding the anticipated drained water from the tailings and drainage from the mine and processing plant areas, the collection pond is capable of holding and passing, in a controlled fashion, the runoff from the probable maximum precipitation (PMP) event. Due to the size of the structure, the collection pond dam is required to have an emergency spillway that is located off of the dam, which is cut into native non-erosive materials, which can safely pass this flow. If necessary, flow from the spillway will be conveyed by lined channel around the toe of the dam and released to the natural channel below the structure.

Figures 4 & 5 present the typical cross-sections and profiles of the collection pond and settlement pond dams. As shown on these figures, the area underlying the proposed pond dams will be excavated to bedrock and a key way will be cut into the bedrock which will be filled with a compacted clay core. The clay core will extend to an elevation above the anticipated standing water level in the collection pond, about 10 feet and will be surrounded by a silty-sandy fill capped with a rock cover.

The water collected in the collection pond will be conveyed via a dewatering tower and a gravity drainage line running over the collection pond dam to a point above the high water line in the settlement pond. This line will be sized to release the collected water at a rate equal to the reclaim rate from the settlement pond with 10 feet of head in the collection pond. Thus, allowing a stilling pool to be created in the collection pond.

The proposed settlement pond is located off channel, downstream of the collection pond. The settlement pond has capacity to contain the anticipated maximum drainage flow from the collection pond decant for a period of approximately 10 days without pumping. This storage will accommodate down periods for maintenance of pumps and pipeline for the tailings reclaim facilities, as well as plant and water supply system maintenance. To maximize the water re-use, the settlement pond will allow further clarification of the drainage water. Once the water is clarified, it will then be pumped back to the process water storage tank for reuse in the tailings circuit.

The existing strata under the tailings area consists of low permeability clay/tuff materials. This is further discussed in Part B, Section 3.2.1.

7.4 Reclamation

Following completion of mining activities, drainage controls will remain in place until the upstream areas are reclaimed and meet reclamation standards. Once the upstream areas are adequately reclaimed, the diversion ditches and ponds for those areas will be filled in and regraded to a stable condition, covered with PGM, and be reseeded.

With the exception of the main access road into the mine site (which is an upgraded existing county road), the constructed by-pass road (utilized by the public during the life of the project), all project related roads including haul roads will be reclaimed. The pit highwalls will be constructed at a maximum overall slope of 45° and will meet DOGM requirements for stable configuration. Waste rock stockpiles will be graded to slopes of 2H:1V or less.

Following completion of the ore processing activities, the processing plant and support and ancillary facilities will be removed. Cement foundations will be fractured and covered with at least four feet of material. It is currently anticipated that no drainage control structures will remain following the cessation of operations and stabilization of the site.

The majority of the tailings area is anticipated to be reclaimed concurrently as operations progress. Prior to the use of the tailings area, PGM from the initial disturbance area will be removed and stockpiled for use during reclamation. Tailings deposition will be from the southwest to the northeast. As the tailings deposition expands, the tailings pipelines will be advanced. The area behind the pipelines will be graded to the rough final surface. Prior to tailings area expansion, PGM in the expansion area will be removed and direct hauled to the rough graded area behind the tailings pipelines. The PGM will be redistributed and reclaimed as described below. This process will be repeated until the full development of the tailings area is completed. As this area is very flat (0.5%), no additional erosion control protection is planned.

Final reclamation of the tailings area will include the removal of the collection and settlement pond dams and reestablishment of the drainage channels. The dam materials will be pushed into the pond areas. The collection pond materials will be spread over the outslope of the tailings area. The tailings area outslope will be graded to achieve an undulating surface (3H:1V or shallower) in order to provide a diversified final slope and minimize erosion. The settlement pond materials will be spread within the upstream drainage area of the pond. PGM that was collected from the initial excavation of tailings area and stockpiled adjacent to tailings area, will be placed and redistributed on the outslope and channel side slopes. Additional surface manipulation of the slopes will occur (pitting or pocking) to give the face of the outslope and the channel side slopes some natural roughness to prevent erosion and promote vegetation.

Salvaged PGM will be appropriately redistributed. Redistribution depths vary by location. The reclamation plan calls for 1.5ft of PGM to be placed on the tailings area, waste rock pile and some portions of Area 2 that have experienced in-pit backfilling as shown on Figure 6. The remaining areas (haul roads, access roads, facilities areas, etc.) will receive approximately 1ft of PGM.

To minimize equipment compaction, PGM will be scarified, if necessary, using a typical agricultural disk or with ripper shanks on a dozer or grader. A rangeland seeder will be used to seed the area after being adjusted to accommodate different sizes of seed in the diverse seed mix.

Two seed mixes have been developed for the project: a temporary mix and a final reclamation mix. As a result of the combination of the ability of pinyon-juniper to re-colonize the area over time as well as the ongoing efforts to reduce pinyon-juniper extent throughout the Great Basin, the reclamation plan for this project seeks to achieve a reclamation target appropriate for the black and mountain big sagebrush communities to improve grazing and wildlife habitat. The final reclamation seed mix will be applied on all disturbed areas except for the pit highwalls. Disturbed areas will be seeded with a rangeland seeder. The seed mix will be aerial seeded on the pit floors at the end of mining, where the application of PGM is not practical, to encourage plant growth.

8.0 Issued and Pending Permits

8.1 Permit History

Permitted activities include mineral drilling and site exploration activities completed under Exploration Permit E/001/0171 issued by DOGM to UAC.

8.2 Pending Permits

A Notice of Intention to Commence Large Mining Operations (NOI) was filed with DOGM on December 20, 2013. DOGM is currently reviewing the NOI.

Nationwide permits for storm water runoff under the state's National Pollutant Discharge Elimination System (NPDES) will be obtained from DWQ for both construction of the project and operations. Storm

Water Pollution Prevention Plans (SWPPPs) will be prepared and will be kept current. Plans will be available on site prior to commencement of construction or mining activities.

UAC is in the process of preparing a Notice of Intent for an air quality approval order (AO) through the Division of Air Quality. In addition, UAC will subsequently obtain Title V air permit.

A Spill Prevention, Control and Countermeasures (SPCC) Plan will be developed for the Project.

UAC will obtain all the necessary permits to properly store, transport, and dispose of chemicals and wastes prior to project start-up in coordination with local and state agencies.

UAC anticipates that a water treatment plant permit and a wastewater treatment plant permit will be required prior to project start-up. UAC will work with the DWQ and the Division of Drinking Water to obtain these permits.

Prior to project start-up UAC will obtain a county conditional use permit from Beaver County, along with other ancillary county approvals required.

Solid waste will be collected and taken to a municipal landfill.

9.0 Water Information

9.1 Well and Spring Identification

Water sources within a one-mile radius of the Project are identified on Figure 7, Water Source Locations. No drinking water wells within a one-mile radius have been identified. The hydrogeology report, in Part B, Section 7 below, further discusses these water sources.

9.2 Surface Water Body Identification

No bodies of surface water have been identified within a one-mile radius of the mine operation.

9.3 Drainage Identification

The geographic area surrounding and including the site is dissected by numerous ephemeral drainages typical of high-desert landscapes, and does not contain any perennial surface water sources.

9.4 Well-head Protection Area Identification

No well-head protection areas have been identified within a one-mile radius of the Project.

9.5 Drinking Water Source Identification

No drinking water sources are located within a one-mile radius of the Project. No protection zones or drinking water sources subject to the protection of Utah Administrative Code 309-600 have been identified within a one-mile radius of the Project.

9.6 Man Made Structures

There are no man made drinking water structures within a one mile radius of the project.

9.7 Well Logs

A series of 10 wells drilled and completed by UAC for water monitoring purposes are located in the area. These wells are owned by UAC. The UAC well are permitted for monitoring purposes only. Well logs and area hydrogeology are discussed in the hydrogeology report, below.

PART B – GENERAL DISCHARGE INFORMATION

1.0 Discharge Point Locations

Figure 2 presents an overall layout of the planned facilities. The mine/processing operation is designed to minimize discharges. No uncontrolled discharges are planned from the facility.

2.0 Planned and Potential Discharges

The mine operations will use water for dust control and therefore will be applying water to the ground surface. However, the water will be used at a controlled rate allowing all water to evaporate and will not be a discharge to the groundwater system.

The process plant will be a closed-loop system, resulting in zero discharge.

The tailings area will have an outflow to the ground surface that will be collected and reclaimed for re-use in the processing plant area. It is understood that there is a potential for some seepage from the bottom of the tailings area, however, this is anticipated to be very minimal (discussed in Section 3.2.1) and quite variable in flux rate.

2.1 Planned Discharges

As discussed above, there are no planned discharges of wastewater or any other fluids from this operation.

2.2 Potential Discharges

Potential discharges are limited to potential seepage from the tailings area, incidental precipitation runoff from stockpiles, major storm events (greater than 100-year storms), and material failure of pipelines and structures.

UAC will have a tailings outflow stream which will be a combination of water and tailings. The tailings will quickly settle and the water will drain to collection and settling ponds. This collected water will be reclaimed and pumped to the process facility.

This ponded water in the collection and settlement ponds is source of potential discharge via seepage to groundwater from this operation. These locations have the greatest potential for seepage as the tailings drainage water will stand in these ponds for the greatest period of time.

However, as discussed in the geology section below, the facilities are underlain in part by volcanic tuff strata which acts as a natural earthen clay-tuff liner. The tuff layer consists of tight clay/tuff strata 50 to 75 ft thick. The natural low-permeability earthen material underlying the tailings area, collection pond, and settlement pond has been shown to have very low hydraulic conductivities (see Part B, Section 7: "Hydrogeology"), resulting in minimal infiltration and seepage.

In addition to natural low-permeability clay material, the planned operation activities of the tailings area will also have limited potential for infiltration/seepage from the tailings. First, the tailings outflow will not occur in the same area continuously, but will be released in differing locations of the tailings area over time. Second, the water in the tailings will not be a standing pool of water in the area of the outflow, but will be released on a slope, so the water will drain away laterally downslope. Third, only a limited area of the overall tailings area will be receiving tailings deposition at any one time. Outflow of the tailings will be via a piped manifold system with lateral pipes that will spread the outflow over a face length of between 1,500 and 3,000 feet. The active area of tailings placement will thus be spread over an area estimated to be about 50 acres in size (rough estimate of width: 3,000 feet by slope length: 800 feet). Outflows along the length of this area will be intermittent and continually shifting as the slope builds out. The shifting release locations will minimize the potential for infiltration/seepage providing various wet and dry areas with shifting areas of horizontal drainage across the exposed clay/tuff surface. The tailings materials will not remain saturated, but quickly drain to a damp condition and therefore will not be a source of standing or constant water for potential infiltration. As the tailings are deposited in the tailings area and reach final grade, earlier deposited tailings will have fully drained, been rough graded, and reclaimed. No additional tailings water will be added to these upper areas of the reclaimed tailings, limiting potential infiltration, and enhancing evapotranspiration.

As part of the mining operations, waste rock, ore, and low-grade ore will be stockpiled within the permitted area. Many mining operations have issues with weathering and precipitation runoff from these piles picking up minerals and lowering the pH of the water to degrade water quality. Therefore, the potential for a similar discharge from this operation will be managed.

Heavy rainstorms and flash flooding events have the potential to produce discharge in the form of drainage water overflow from the sediment, collection, and settlement ponds. However, the sediment ponds are designed to hold enough water that a 10-year event will not overflow and the collection and settlement ponds will hold the 100-year storm event without overflow. For larger than design events, an emergency spillway is provided to ensure that the structures are protected and the storm flows can be released in a controlled fashion.

Within the process plant, there are no planned underground tanks, pipes, or other structures. Though much less likely than infiltration and overflow, there is the potential for tailings water to flow from a leak or break in the aboveground metal transfer pipes and/or the facilities themselves. Routine inspections of the mine/process plant infrastructure will be conducted to determine condition of equipment and to identify any potential issues before they become problems. Additionally, as the water systems act as closed-loop systems, the exact volume of water passing through the system at any given time will be known. On-going monitoring will result in any reduction in the water volume/rates being readily identified to minimize water loss.

3.0 Discharge Volumes

3.1 Actual Discharges

As this is a proposed operation, there are no actual discharges at this time.

3.2 Potential Discharge Volumes

As discussed above, potential discharges may come in the form of infiltration/seepage, pond overflow due to major precipitation events, material failure, and incidental precipitation contact.

3.2.1 Seepage Estimate

Based on the planned processing plant throughput, the tailings outflow stream will require a steady state flow rate estimated at 3,030gal/min of water released to the tailings area. The drainage from the tails flowing through the tailings area to the collection and settlement ponds will be the difference of the inflow minus the water held in the tails, the seepage loss, and the evaporation loss. A worst case maximum of 650gal/min was estimated to be lost prior to recycling about 2,300gal/min. This loss is through a combination of retention, evaporation, and infiltration/seepage. Based on the gradation of the materials, it is estimated about 10% of the water will be initially held in the tails. Over time this volume will be further reduced to 5% as gravity drainage continues. Thus, it is estimated that about 200gpm will be held in the tails long term.

The evaporation loss will be variable and is likely to be quite high, due to the wind and heat for the Project Area, during the summer months, though it mainly affects the upper 3-4ft of the tailings fill. During the winter period, the evaporation loss will be considerably lower. The evaporation loss is estimated to be about 400 to 450 gpm from the active tailings placement zone and from the surface of standing water in the collection and settling ponds.

The infiltration/seepage loss will also be variable based on the area that is saturated and duration of exposure. As discussed above, the likely area of seepage would be from under the collection and settling ponds. The other portions of the tailings area will not have a constant supply of water or would only be wet for short periods and therefore, are not considered significant sources of potential discharge. Further, due to the low permeability of the underlying bedrock, this loss is also likely to be very limited. An estimate of the seepage loss was determined, using McWhorter and Nelson (1974) method for estimating seepage from under tailings ponds. Appendix A presents the assumptions and conclusions of the seepage loss study. Based on this seepage modeling, infiltration/seepage was estimated to have a maximum 10 gal/min loss from the collection and settling pond areas. Initially, this loss will be in the vertical direction as operations commence and will be controlled by the free-surface seepage of water from the ponds. The longer the ponds operate this seepage rate will drop due to fines build up and the strata underlying the ponds becoming saturated. The seepage rate will then be driven by the slower lateral movement of the water mound from under the collection and settling ponds. Based on the hydraulic characteristics of the tuff/clay this will be extremely slow. Using an estimate of average linear velocity, in the anticipated life of the facility the water would move about 6 to 8 feet, a movement of 200 feet would take over 1000 years.

3.2.2 Storm Discharge

The release volume produced from pond overflow would be dependent upon the size and holding capacity of the pond, the volume of water produced from the storm event, and the duration of the event. The collection pond has been designed to retain a 100-year precipitation event. In addition, an emergency spillway that is capable of conveying the peak flow during the Probable Maximum Flood storm event with at least 3-feet of freeboard has been included in the dam design (Appendix B-Drainage Control). In the event of a larger than design storm, major precipitation events in the western desert area of Utah are typically short-lived. This means that in the exceedingly rare event of a pond overflow, the overflow event would also be short-lived, limiting the total volume released. Finally, even if there is a pond overflow, the actual volume of overflow water that becomes groundwater discharge would be limited due to both the limited infiltration through the natural low-permeability earthen material and the drainage of flow down channel.

3.2.3 Material Breach

The tailings system will utilize approximately 3,030gal/min of water. In the event of a complete material breach, the maximum volume of water lost from such an occurrence would be 3,030gal/min. However, as stated above, due to the nature of the subsurface material, infiltration resulting in actual groundwater discharge would be very minor. Additionally, the volume of tailings water released in such an event would be highly variable, as a function of the size of the leak/break and the duration in which the leakage occurred.

3.2.4 Incidental Precipitation Contact

The waste rock, low-grade ore and ore stockpiles will be exposed to precipitation and weathering. Many mining operations have issues with these piles being a source for precipitation to pick up minerals and lower the pH of the runoff water to degrade water quality. The potential for similar discharge for this operation is limited.

Due to the low precipitation that occurs in the area, with annual precipitation ranging from 10 to 16 inches per year, the volume of water that would be exposed to the stockpiles is quite limited. Further, the ore for the alunite deposit is exposed at the surface over most of the Area 1 and Area 2 mining areas. If there were any impact to water quality in the area, it would be expected to be reflected in the results of the baseline/backgroundwater sampling results. As discussed in the Part B, Section 7 "Hydrogeology", other than the elevated TDS values for the springs and seeps and other groundwater samples, no significant water quality concerns were identified.

4.0 Discharge or Potential Discharge Methods

As discussed above, no groundwater discharges are planned from this mining/processing operation. The potential discharge methods are by way of infiltration/seepage beneath the tailings area and stockpiles, pond overflow, and material breach. Due to the limited water supply, UAC has attempted to minimize the water requirements and to attempt to recycle as much water as possible.

5.0 Flows, Sources of Pollution, and Treatment Technology

Water use within the proposed operation will be distributed to dust control from mining and hauling, administration offices and the processing plant.

Mining water use is generally a continuous loss of water as the water will be used for dust control. This entails a controlled release at a rate that will not result in infiltration of excess water to the groundwater.

Within the processing plant, water will be provided to the grinding circuit, the leaching circuit, the tailings circuit, cooling towers and boiler. The grinding, leaching, cooling, and boiler circuits are within closed-loop systems. As described above, the tailings circuit has the potential for a variable loss, due to evaporation and infiltration/seepage, so it is a relatively closed system. In each case, once the circuit is filled and the operations commence, the systems will only require relatively limited amounts of make-up water to maintain the system. A water treatment plant will provide for potable water to the administrative offices and water to the boiler and cooling tower circuits.

Tailings will be produced by the processing facility. As described in Part A, Section 7.2, the leach brine will be removed from the leached ore, leaving a filter cake. To economically move the volume of tailings produced, this cake will be mixed with water to create a tailings stream which will be pumped downslope via an aboveground metal pipe to the tailings area. The tailings water will freely drain and flow to the collection and settlement ponds where it will be pumped back upslope to the facilities as part of a multi-pipe system (Figure 3). The water and tailings will be within either a natural or man-made (pipe, dam, etc.) containment at all times.

The tailings and tailings water are not considered potential sources of contamination (see "Discharge Effluent Characteristics" and "Hydrogeology" sections below) to either surface or groundwater. Additionally, the mountain block receiving groundwater is known to be of poorer quality than the product water (see "Hydrogeology" section). Thus, both storm water and tailings water passing through the unconsolidated tailings will not be degraded by picking up significant contaminants or of contaminating the underlying groundwater.

The water quality in the tailings loop has the potential to decrease with time. This may be caused by both an increase in TDS due to concentration of the salts from evaporation loss over time and repeated mixing and contact with tailing materials. This will be partially offset by the injection of make-up water in the form of 500mg/l TDS groundwater. This mixing will help to regulate the water quality of the tailings loop. UAC will monitor the quality of the reclaim flow stream and if the TDS level rise above 2,000 mg/l, will implement the use of a polishing treatment incorporated into the reclaimed stream to reduce TDS concentrations to maintain the stream with an upper limit of 2,500 mg/l TDS.

6.0 Discharge Effluent Characteristics

As described above, the process plant will process the ore by grinding, roasting and leaching the ore. The only active materials used in the process are hot water for leaching and flocculent to aid in settling out materials in the thickeners. Thus, a small amount of this flocculent will remain in the tailings cake after the leachate is removed. This small amount of flocculent will then be diluted by the make-up and reclaim water in the mixing process before the tails are pumped to the tailings pond. Therefore, a small amount of the flocculent will be included in the outflow to the tailings area.

The flocculent that is planned to be used is HYPERFLOC® AF 300, an anionic water soluble polymer, supplied by:

HYCHEM, INC.
10014 N. Dale Mabry Highway, Suite 213
Tampa, FL 33618

These materials do not contain significant chemicals of concern. MSDS sheets for this material are presented in Appendix C.

The mining operations are not anticipated to produce significant groundwater discharges. The activities of waste rock, low-grade ore, and tailings placement have a potential to expose rocks to weathering allowing precipitation to leach chemicals that may result in discharges that could affect the groundwater. To determine the characteristics of these materials, UAC conducted sampling and material testing to characterize the tailings, waste rock, low-grade ore, and ore. The testing procedures included Synthetic Precipitation Leach Procedure (SPLP) on the tailings and Meteoric Water Mobility Procedure (MWMP) was done on the ore, low-grade ore, and waste rock. The results of these analyses were used to determine if water passing through these materials would adversely affect the environment and are summarized in Appendix D, Material Characterization Study.

The sampling and analysis program included both geochemistry and water quality analyses. The geochemical analyses of ore, low-grade ore, waste rock and tails demonstrated that the leachate from SPLP and MWMP has a near neutral pH range, and does not contain elevated levels of metals or other constituents above background concentrations. The water quality analyses demonstrate that tailings water will be of equal or better quality than the existing groundwater in the area. The conclusions found in Appendix D are supported by the results of a humidity cell test study conducted on an analogical alunite deposit in Nevada. These results confirmed a lack of acid generation and elevated metals from the alunite deposit, even over a 16 month testing period.

These analyses demonstrate that both rock and water chemistry are well known and conclude that water quality associated with the mining of alunite and flows through the waste rock and low-grade ore piles, and tailings are not deleterious or acid-forming. Therefore, demonstrating that harmful metals will not be leached from the rock and tailings and discharged into the groundwater from this mining operation.

These geologic conditions are a result of the hydrothermal alteration that occurred when the minerals were formed and rock geochemistry that evolved over time from the production of alunite. Based on the results of the Material Characterization Study coupled with the detailed geologic mineralogical investigation, there is no adverse geochemistry associated with the tailings water to adversely impact the environment.

7.0 Hydrogeology Report

7.1 Climate and Topography

The Blawn Mountain area (Figure 1) is semi-arid with hot, dry sunny summers of low humidity and cold winters. Based on climate data from the closest long-term weather station at Milford, UT, the area receives approximately 8.4 inches of annual precipitation. Snow does not generally persist in the valleys, but can blanket the mountains through the winter season (US BLM, 1977).

Topographically, the Project is situated in a typical Basin and Range setting. The ranges, consisting of north-south trending mountains, are generally steep and rugged with mountaintop elevations of up to 8,700ft above sea level. The ranges are separated by fault graben basins with deeply incised drainages, resulting in relief as great as 2,800ft. Pine Valley lies to the west of the Wah Wah Range and Wah Wah Valley lies to the east. The Project is located at the south end of the Wah Wah Range.

Recharge occurs in the highlands of the ranges in the form of both rain and snow. Seasonal runoff is channeled away from the Blawn Mountain alunite deposits by two main drainages. Blawn Wash drainage carries runoff to the southeast toward Escalante Valley and Willow Creek drainage carries runoff into Wah Wah Valley to the northeast. Due to the nature of the topography in the area, the valleys are prone to flash flooding as a product of summer thunderstorms. There is currently no defined 100-year flood plain area delineated for these washes. Given the topographic relief, it is likely to include the bottoms of the local washes and include a major portion of the Wah Wah and Escalante Valleys.

The Blawn Mountain alunite deposits occupy four of the smaller ridges in the southern Wah Wah Range.

7.2 Regional Geology and Landform

7.2.1 General Geologic Background

The Project is located in the southern Wah Wah Mountains of the eastern Basin and Range province, in an area characterized by a thick Paleozoic sedimentary section that was:

- Thrust faulted during the Sevier Orogeny
- Buried under a thick layer of regionally distributed Oligocene volcanic rocks and locally-derived volcanic rocks
- Altered by H_2S rich hydrothermal alteration related to a postulated shallow laccolithic intrusive which domed and altered the overlying calc-alkaline volcanic rock (Hofstra, 1984)
- Extended to the west by the Basin and Range event
- Affected by continual erosion of the ranges contributing to colluvial and alluvial deposition in the valleys.

7.2.2 Structural Geology

Blawn Mountain is located along the east/west-trending Blue Ribbon lineament (Rowley and others, 1978) within the east/northeast-trending Pioche mineral belt (Shawe and Stewart, 1976), a tectonic, structural, and igneous zone that contains a large number of metallic mineral mining districts with almost two dozen associated alunite vein and replacement deposits.

During the Late Cretaceous Sevier Orogeny the Paleozoic carbonate rocks of the region were subjected to thrust faulting and folding. Major regional thrust faults include the Wah Wah, Teton, Dry Canyon and Blue Mountain (Figure 8). The Wah Wah thrust emplaced upper Proterozoic and overlying Cambrian strata over Ordovician to Pennsylvanian strata. The Teton thrust emplaced Ordovician and Silurian strata over Silurian and Devonian carbonates, while the Dry Canyon thrust emplaced Silurian and Devonian carbonates over Pennsylvanian and Mississippian strata. The Blue Mountain thrust emplaced Cambrian and younger age carbonates over Jurassic strata. These thrust faults generally trend northeast/southwest. Of these major thrust faults, the Blue Mountain and Wah Wah thrusts are the closest to the Project, located at approximately 6 miles to the southeast and 8 miles to the northwest, respectively.

The area of the Blawn Mountain Project experienced Basin and Range extensional events beginning in the Miocene Epoch which have created much of the current topography of the area by stretching the region about 40 miles westward. Basin and Range extension is characterized by mountains with intervening valleys separated by range-bounding, normal faults that rotate at depth into a regional decollement. Regionally there are four sets of normal faults that relate to Basin and Range block faulting. These faults generally trend west-northwest, northeast, northwest and north-south. The Blawn Wash area is a graben bounded by west-northwest and northeast-trending faults and the bounding volcanic ridges that host the alunite mineralization.

Within the Permit Boundary are several minor normal faults that offset the alunite deposits. Figure 9 depicts the location of these local normal faults as well as the mapped surface geology. The presence of multiple kaolinite mines in the area indicates the propensity of the ignimbrites to decompose to clays. Thus, it is likely that the faults and fractures present in the Permit Boundary have been self-healed with a clay infilling, derived from the decomposition of the ash-flow tuffs themselves.

7.2.3 Regional Stratigraphy

Regional rock strata underlying the Wah Wah and Blawn Mountain areas are Proterozoic to Cenozoic Era in geologic age. The structural complexity of the subsurface, combined with episodic volcanism, have resulted in a heterogeneous mixture of strata consisting of volcanic tuffs, rhyolites, mafic lava flows, basalts, quartzites, limestones, dolomites, sandstones and shales. Also present are brecciated zones associated with volcanic and faulting activity, which are commonly filled with clay and fault gouge.

The sedimentary and volcanic stratigraphy of the region is summarized in Table 7.2.

The Wah Wah Mountains north, west and south of Blawn Mountain represent a generally conformable miogeosynclinal sequence of Paleozoic sedimentary rocks (Miller, 1966). The Paleozoic rocks were folded about a north trending axis and thrust eastward during the Sevier Orogeny, emplacing older basement rocks over younger rocks along both the Wah Wah and Blue Mountain thrusts. Following a period of uplift and erosion, the Paleozoic rocks were covered by several sequences of volcanic tuffs and flows during the Oligocene and Miocene epochs along with localized volcanic activity. The ignimbrites at Blawn Mountain belong to the Blawn Formation and Lund and Wah Wah Springs Tuffs of the Needles Group. Localized volcanic activity is represented by three rhyolite plugs of the Blawn Formation. The sedimentary and volcanic stratigraphy of Blawn Mountain is summarized in Table 7.3 below.

In the Basin and Range valleys, thick deposits of unconsolidated alluvial sediments are prevalent. These unconsolidated sediments are comprised of an interlayered mixture of clay, silt, sand, and gravel that can be hundreds to over several thousand feet thick. According to the Unified Soil Classification System, these soils would largely be classified as SM, SC, and SP sands, with occasional GM and GC gravels and ML and CL silts and clays. Earth Science (1975) drilled several holes in the middle of the Wah Wah Valley to depths of 1400 to 1500 feet in unconsolidated and semi-consolidated sands, gravels, and clays.

7.3 Permit Boundary and Local Geology

7.3.1 Agricultural Description

The area surrounding the Project is completely undeveloped. The arid climate and distance from perennial sources of water restrict agricultural land use to an open range for grazing cattle and sheep. A grazing allotment map (US BLM, 2011) shows boundaries of cattle and sheep grazing allotments and boundaries of wild horse herd management areas (HMA) on the federal lands surrounding the Project. The entire Project is within grazing allotments administered by SITLA. The Project is not within an HMA but the Four Mile HMA adjoins the south boundary of the Project and covers more than 100 square miles.

Table 7.2 Regional Stratigraphy

Eras	Periods	Epochs	Groups	Formations	Members
Cenozoic	Quarternary				Alluvium And Colluvium
	Tertiary	Pliocene		Steamboat Mountain	Basalt
		Miocene	Quichapa	Blawn	Rhyolite
					Tuff
					Bauers Tuff
					Mafic Flow
					Garnet Tuff
		Oligocene		Isom	Bald Hills Tuff
				Bullion Canyon Volcanics	Three Forks Tuff
			Needles Range	Lund	
				Wah Wah Springs	
				Cottonwood Wash Tuff	
				Escalante Desert	
			Tuff Of Towers Point, Volcanic Breccia		Conglomerate
		Paleocene - Eocene		Claron	
Mesozoic	Jurassic			Temple Cap	
				Navajo Sandstone	
	Triassic			Chinle	Petrified Forest
					Shinarump
				Moenkopi	
Paleozoic	Permian			Gerster Limestone	
				Pympton Limestone	
			Oquirrh	Kaibab Limestone	
				Ely Limestone	
	Pennsylvanian			Callville Limestone	
				Woodman	
	Mississippian			Gardison Limestone	
				Fitchville	
	Devonian			Pinyon Peak Limestone	
				Simonson Dolomite	
				Sevy Dolomite	
				Laketowm Dolomite	
	Silurian			Ely Springs Dolomite	
	Ordovician			Eureks Quartzite	
				Kanosh Shale	
				Juab Limestone	
				Wah Wah Limestone	
				Fillmore Limestone	
				House Limestone	
				Notch Peak	
	Cambrian			Orr	
				Wah Wah Summit	
				Trippe Limestone	
				Pierson Cove	
				Eye Of Needle Limestone	
				Swasey Limestone	
				Whirlwind	
				Dome Limestone	
				Peasley Limestone	
				Chisholm Shale	
				Howell Limestone	
				Pioche	
				Prospect Mountain Quarzite	
Proterozoic	Precambrian			Mutual	

Table 7.3 Stratigraphy of the Blawn Mountain Area from Krahulec (2007) as Modified From Hofstra (1984) and Abbott and Others (1983)

Eras		Periods	Epochs	Groups	Formations	Members
Cenozoic		Quaternary				Alluvium And Colluvium
		Tertiary	Pliocene		Steamboat Mountain	Basalt
			Miocene	Quichapa	Blawn	Rhyolite Tuff Bauers Tuff Mafic Flow Garnet Tuff
			Oligocene		Isom Bullion Canyon Volcanics	Bald Hills Tuff Three Creeks Tuff
				Needles Range	Lund Wah Wah Springs Cottonwood Wash Tuff Escalante Desert	
						Conglomerate
Paleozoic	Upper Plate of Wah Wah Thrust	Cambrian			Orr Wah Wah Summit Trippe Limestone Pierson Cove Eye Of Needle Limestone Swasey Limestone Whirlwind Dome Limestone Peasley Limestone Chisholm Shale Howell Limestone Pioche Prospect Mountain Quartzite	
Proterozoic					Mutual	
Paleozoic	Lower Plate of Wah Wah Thrust	Pennsylvanian			Callville Limestone	
		Mississippian			Woodman Gardison Limestone	
		Devonian			Fitchville Pinyon Peak Limestone Simonson Dolomite Sevy Dolomite	
		Silurian			Laketown Dolomite	
		Ordovician			Ely Springs Dolomite Eureka Quartzite Kanosh Shale Juab Limestone	

7.3.2 Property Stratigraphy

The geologic characterization of the ore deposit is essentially that of an altered volcanic tuff. The host tuff deposit ranges in thickness from several hundred to one thousand feet at its thickest point. The area is moderately faulted with normal faults related to Basin and Range extensional block faulting. The ore deposit is controlled by its original alteration geometry, block faulting, and by erosion.

The Blawn Mountain alunite deposit occurs along four ridges. The Blawn Mountain alunite deposits are developed in calc-alkaline volcanic rocks. Mining of both ore and waste rock will be in calc-alkaline ignimbrites that have a predominantly rhyolitic composition and from rhyolite porphyry.

The rhyolite porphyry and ignimbrites from the tuff units have very similar characteristics. Rhyolite ranges from white to a light brown color with tonal variations of light gray, cream, buff and pink. Texture in the ignimbrites range from a vitric-crystal, densely welded tuff to a moderately welded crystal-lithic tuff. Sanidine, quartz, and biotite phenocrysts are common in both the ignimbrites and rhyolite porphyry.

Surficial outcrops in the highlands of the Permit Boundary consist of thick ignimbrite and rhyolite flow packages. Bedrock in the form of Paleozoic and late Proterozoic carbonates and quartzites underlies the volcanics. These bedrock units collectively span several thousands of feet thick, and are underlain by crystalline metamorphic basement rocks. In the highland areas, soils are thin except in areas where the rhyolite has been altered to hematite and clay.

In the Permit Boundary valleys, thick deposits of unconsolidated alluvial sediments are prevalent in the low lying area. These unconsolidated sediments are comprised of an interlayered mixture of clay, silt, sand, and gravel. No formal Natural Resources Conservation Service soils investigations have been conducted of the Permit Boundary. UAC conducted an Order 2 soils survey of the Permit Boundary (Terra West, 2013). The soils were found to generally be classified as silty-clayey loam soils. This soil texture typically is rated as a C hydrologic soil type.

The valley alluvium is underlain by the same volcanic, volcaniclastic, and Paleozoic strata as the highlands. Faults that have cut through the bedrock, volcanic, and volcaniclastic units have been covered and are likely filled in by the alluvium/weather tuff materials. The presence of multiple kaolinite mines in the area indicates the propensity of the ignimbrites to decompose to clays. Thus, it is likely that the faults and fractures present in the Permit Boundary have been self-healed with a clay infilling, derived from the decomposition of the ash-flow tuffs themselves.

The stratigraphic complexity found within the property is a combination of the topographic relief, intrusive and extrusive volcanism, and faulting causing variability in the depth to bedrock and soil development in the area.

7.3.3 Alunite Occurrences

Hofstra (1984) postulates the presence of a relatively shallow laccolithic intrusion as the source of the hydrothermal fluids that created the alunite deposits, based on radial doming of the extrusive Miocene and Oligocene volcanic strata over an area of 6 miles north-south and 3 miles east-west. The laccolith may have intruded along a zone of weakness, such as the Blue Mountain thrust fault. The high temperature H_2S rich fluid associated with the laccolith rose along the fracture zones created in the overlaying strata by the intrusion. The fluid then penetrated into the Miocene and Oligocene volcanic layers where it encountered and boiled the groundwater. With the presence of oxygen that was transported in the groundwater, the H_2S was oxidized into super-heated aqueous solutions of H_2SO_4 and the resulting solution altered the volcanic rock along fracture zones associated with normal faulting and in zones of higher porosity/permeability. The more porous the fracture zones and strata, the more mineralization occurred. The alunite alteration has been K-Ar age dated at 22.5M years ago (Hofstra, 1984).

Alunite mineralization is found on four ridges that occur within the area of the Project. Acid sulfate alteration associated with a shallow, possibly laccolithic intrusion altered the silicic-alkalic rhyolite porphyries, flows and tuffs belonging to the Miocene Blawn Formation and the Oligocene Needles Range Group. Alteration tends to be in linear bodies reflecting the role of normal faults in controlling the mineralization. Alteration is zoned away from the point of hydrothermal fluid upwelling. The mineralized ridges are erosional remnants of a once larger altered area.

7.4 Area Surface Water

Two main water courses drain the Permit area, which is located near the head of drainages flowing into Willow Creek and Blawn Wash. To the north, the Willow Creek drainage conveys water to the Wah Wah Valley. To the south, the Blawn Wash conveys water to the Escalante Valley.

The drainage geomorphology for both Willow Creek and Blawn Wash consists of ephemeral channels eroded into the underlying bedrock creating narrow valleys that hold the streams, and does not contain any perennial surface water sources. Photo 7.1 shows a typical section of the upper Willow Creek drainage. Channels are incised in some reaches and essentially undefined in others, riparian vegetation is lacking, and bed/bank sediment movement is evident. In areas where the channels are incised, the channels are filled with alluvial sediments of varying thickness, which are described as generally dry with highly mobile beds of sands and fine gravels. Typically, the sediments hold a normal flow channel about 15 to 20ft wide that meanders through the valley fill. Within this normal channel, a shallowly incised low flow channel typically exists. The runoff regime of these channels is controlled primarily by local summer thunderstorms that generate infrequent and short-lived, but often intense, flash floods.

Photo 7.1 Typical Drainage Conditions

Surface water is very limited in the Permit Boundary. No continuous flow in these channels has been reported or identified. Norwest (2013a) conducted a spring and seep inventory that found very limited water sources within the Permit Boundary with many of the springs and seeps limited mainly to the drainage channels. Many "springs" were repeated occurrences of up gradient spring/seep water that percolated into alluvial fill within the valley. This water is often exposed subsequently further down drainage in areas where the alluvial fill thins and more resistant bedrock forces water back to the surface.

Annual rainfall is generally low for this region ranging from 10 to 16 inches per year increasing with elevation. The 10-year 24-hour storm event for the Permit Boundary is 2.50 inches, while the 100-year 24-hour storm event is 3.75 inches (NOAA, 2013).

There are no USGS gaging stations in the areas of either the Wah Wah or Pine Valleys.

UAC conducted surface water flow monitoring in the Permit Boundary during 2013 (Norwest, 2013b). The drainages were found to be ephemeral in nature. Flow periods were during spring runoff and following summer/fall storm events. The maximum flow rate during the year was 1,817 cfs in Blawn Wash on August 15, 2013 and 316 cfs in Willow Creek on September 5, 2013; while for most of the year the channels were dry with no flow, demonstrating the "flashy" nature of the drainages.

State-designated beneficial uses for the Sevier River and its tributaries are 2B (secondary contact recreation), 3A (cold water fish and aquatic life), 3B (warm water fish and aquatic life), and 4 (agriculture). The latest 305(b) report to Congress (DWQ 2010) finds that the Sevier River fully supports its designated 3A (for upper reaches where resources exist), 3B (for lower reaches where resources exist), and 4 beneficial uses (2B was not assessed), and thus its water quality is not considered to be impaired. The water resources in Sevier Lake drainage are not classified as the streams are only ephemeral in nature.

7.5 Regional Groundwater

The State of Utah defines an aquifer as "a geologic formation, group of geologic formations or part of a geologic formation that contains sufficiently saturated permeable material to yield usable quantities of water to wells and springs" (UAC R317-6-1). Therefore, geologic zones with very limited quantities of saturated strata are not considered aquifers.

The Permit Boundary is located in the southern end of the Wah Wah Valley. The Utah State Water Plan (UDWR 1999) refers to the Wah Wah Valley as part of the Sevier River Basin. There are locally important water sources, but there is no large volume water use in the Wah Wah Valley.

USGS (Heilweil and Brooks, 2011) refers to the Great Basin Carbonate and Alluvial aquifer as the potential regional aquifer locally within the Wah Wah Basin. However, no significant water development has been developed in this zone. The major water resources for the area are generally considered to be the mountain block area outflows via springs and the valley fill aquifers. There are several springs along the edges of the mountains/valley fill and several small wells developed for stock watering purposes toward the northern end of the Wah Wah Valley. The agricultural use consists of one ranch/farm that has a well that supplements water from springs for crop irrigation. While there is water in the valley fill, it is generally considered too deep for local agricultural development.

Groundwater underlies the area of the Project at both near surface and at depth (Stephens, 1974). As discussed in the regional geology section, Paleozoic-age rock underlies much of the Great Basin. Locally, these carbonates are overlain by younger (Cenozoic age) sedimentary and volcanic rocks. The USGS has identified the deeper carbonate zone underlying most of the basin in connection with the valley alluvial fills as the regional aquifer (Heilweil and Brooks, 2011). This is based on a conceptual model of the portions of eastern Nevada and western Utah that connects all of the carbonate based aquifers together into one continuous aquifer. Within the Great Basin, the saturated thickness associated with this aquifer often well exceeds 2,000 to 3,000 feet (Heilweil and Brooks, 2011).

Regionally, the direction of groundwater movement in this part of the Great Basin is toward the north and the Great Salt Lake Desert. Water quality in the Carbonate/Alluvial aquifer ranges from relatively good to briny, with a range between 500 mg/L and 3,000 mg/L TDS expected in the aquifer in the Permit Boundary (Stephens, 1974).

State and federal publications (Stephens, 1974; Heilweil and Brooks, 2010) describe the Carbonate aquifer as limestones and dolomite, with permeabilities ranging from very low to moderate. The alluvial portion of the aquifer is the valley fills within the Basin and Range area. These aquifers consist of sands and gravels with interbedded silts and clays that were eroded off of the surrounding highlands and deposited in the valleys between the mountains. Permeablities range from moderate to very high (Heilweil and Brooks, 2011).

7.6 Permit Boundary Hydrogeology

The Permit Boundary is located on the mountain block in the southwestern portion of the Wah Wah basin. As described in the geology section, locally within the Permit Boundary, the deeper carbonate bedrock is overlain by a combination of volcanic rocks consisting of rhyolite flows and tuff deposits. Thicknesses of these strata are variable, but range from very thin along the fringes of the volcanic deposits to over 300 feet.

According to records on file with the Utah Division of Water Rights (2013), the only historic groundwater drilling in the vicinity of the Permit Boundary was from a bore drilled to a 500 foot depth in the 1970's by Earth Sciences. The bore encountered water and was pumped at a rate of about 10gpm, very similar to the UAC data (see Section 7.6.2). This bore was later abandoned.

No other local groundwater data were available. To help to identify the groundwater resources, UAC conducted a series of studies. These included, spring and seep inventories, surface water flow and water quality study, and groundwater well installations for aquifer testing and water quality.

7.6.1 Spring and Seep Inventory

UAC conducted Spring and Fall spring and seep inventories of the Permit Boundary to ascertain the groundwater/surface water interface and an estimate of the groundwater contribution to the surface water regime (Norwest, 2013a). Based on the inventory efforts, a total of 15 spring locations with measurable flow) were identified during the Spring period of the study. In addition, 16 seeps were identified that had no flowing water, but had moist or alkaline stained soil areas. During the Fall period of the study, a total of 12 spring locations with measurable flow were identified. In addition, 18 seeps were identified by moist or alkaline areas that had no flowing water.

Six sites were identified in both Spring and Fall periods that had concentrated stands of phyreatophytic vegetation, such as willows, tamarisk, and other water loving vegetation. These vegetation stands are indications of areas of hydric soils (water at an accessible depth by plant roots), and, due to evapotranspiration, the water may not have a surface expression.

Of the flowing sites in Willow Creek and Blawn Wash drainages, there were locations where repeated flows occurred within the alluvial channels. There were 11 sites where new springs associated with the original occurrence appeared, below the initial spring occurrence. In many cases, spring flows would occur at the surface for a short distance and then percolate into the alluvium, only to reappear a short distance downstream. This occurred in several places over a channel distance of 0.25 to 0.50 mile depending on the channel configuration.

The spring and seep flows during the Spring period were generally low. The flows ranged from a low of 0 to a high of 1.49 gallons per minute (gpm). The mean flow from the springs was 0.54 gpm. Several standing water pools were identified where no inflow or outflow from the pool were discernible (WS1, Seeps 02, 04, 07, 08, and 15). In all likelihood, there was flow into and out of the pools, albeit at a slow rate through the alluvium and not on the surface. During the Fall period, the flows ranged from a low of 0 to a high of 0.99 gpm.

7.6.2 Monitoring Well Programs

UAC conducted two drilling and well installation programs to assess the groundwater resources of the Permit Boundary (Norwest, 2013c). Ten monitoring wells were drilled around the periphery and through the anticipated project related disturbance area to provide an assessment of the groundwater conditions in the Permit Boundary (see Figure 10). The wells were advanced to depths roughly equal to the approximate elevation of the anticipated mining pit floor to characterize the mining block.

The strata encountered in the well bores consisted of varying volcanics – tuff and rhyolite. As the wells were drilled with rotary methods with air and foam-water fluids, the tuff deposits appeared as ground-up lumpy clay. Field logging generally recorded clay as the materials encountered for this zone. Appendix E presents the lithologic logs of the monitoring wells drilled in the surrounding area.

Lithology between the holes was generally different with only two holes drilled near the tailings area having similar lithologic sequences. In the tailings area, the lithology consists of 2 to 20 feet of colluvium overlying between 60 to 70 feet of volcanic tuff overlying rhyolite flows. The rhyolite has differing thicknesses depending on location. In several of the holes the underlying Paleozoic carbonate bedrock was encountered. The surficial weathered zone consists of 0.5 to 20 feet of alluvium/colluvium over much of the tailings area. The thicker zones exist in low lying areas, along the drainage channel and in topographic depressions, where sediment has been deposited over time. On the upland slopes, the weathered zone is considerably thinner, due to on-going hydrologic processes. The lithologic logs identify the rhyolite and tuff occurrences prevalent in the area.

Table 7.4 presents a complete summary of the well completion details.

Following the completion and development of the wells, each well was tested to measure hydraulic properties and sampled for water quality characterization. Two wells were dry following the completion. These were wells MW-2 and MW-11. No development efforts were made on these wells.

Table 7.4 Well Completion Details

Completion Details	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-9	MW-10	MW-11	MW-13
Date Drilled	10/4/2012	10/2/2012	10/7/2012	10/3/2012	10/6/2012	6/17/2013	6/18/2013	6/24/2013	7/20/2013	7/8/2013
Hole Diameter	9-3/8"	9-3/8"	9-3/8"	9-3/8"	9-3/8"	9-3/8"	9-3/8"	9-3/8"	9-3/8"	9-3/8"
Hole Diameter, in	9.375	9.375	9.375	9.375	9.375	9.375	9.375	9.375	9.375	9.375
Total Depth-BGS	240	196	240	260	250	320	60	260	280	230
PVC Elevation	6961.55	6549.51	6356.52	6772.86	6653.59	6922.00	6728.00	6821.00	6185.00	6086.00
Surface Elevation	6959.32	6548.50	6354.76	6771.29	6651.57	6920.00	6726.00	6819.00	6183.00	6084.00
Casing Diameter-In	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Top of Casing-AGS	2.23	1.01	1.76	1.57	2.02	2.00	2.00	2.00	2.00	3.00
Top of Screen-BGS	125	150	140	235	120	275	40	235	260	210
Screen Length	20	20	20	20	20	20	20	20	20	20
Top of Rat Hole-BGS	145	170	160	255	140	295	60	255	280	230
Bottom of Casing-BGS	150	175	165	260	145	300	60	260	280	230
Bottom of Casing-Elev	6809.32	6373.50	6189.76	6511.29	6506.57	6620.00	6666.00	6559.00	5903.00	5854.00
Top of Grout-BGS	0	0	0	0	0	0	0	0	0	0
Top of Bentonite-BGS	30	30	30	30	30	30	16	30	30	30
Top of Coarse Sand-BGS	90	130	138.5	175	100	100	16	105	56	61
Top of Hole Backfill-BGS	150	175	165	260	145	300	60	260	280	230
Completion Date	10/6/2012	10/4/2012	10/8/2012	10/5/2012	10/7/2012	6/18/2013	7/3/2013	7/2/2013	7/23/2013	7/19/2013
Proposed Pump Depth	145	170	160	255	140	140	140	140	140	140
Dates of:										
Well Development	4/11/2013	DRY	4/10/2013	4/11/2013	4/12/2013	8/6/2013	8/6/2013	8/7/2013	DRY	8/8/2013

Table 7.5 presents a summary of the calculated transmissivity and hydraulic conductivity values for both the pumping and recovery phases. Pumping values for some of the wells were suspect due to the limited duration of pumping. Recovery data were felt to be more representative of site conditions. These values indicate relatively tight strata which will not readily accept seepage or pass and convey water. It is important to note that MW-3 within the area of the tailings had a hydraulic conductivity of 3.3E-07 and that all other holes had low hydraulic conductivities. This is consistent with the limited numbers water occurrences and flow rates of the springs and seeps in the Permit Boundary identified by Norwest (2013a).

Table 7.5 Well Hydraulics Details

Well ID	Transmissivity (ft^2/day)		Hydraulic Conductivity	
	Pumping Values	Recovery Values	(ft/day)	(cm/sec)
MW-1	15.54	19.75	0.0890	3.14E-05
MW-2	N/A	N/A	N/A	N/A
MW-3	2.20	0.17	0.0009	3.30E-07
MW-4	2.49	3.15	0.0129	4.56E-06
MW-5	5.01	0.90	0.0075	2.64E-06
MW-6	0.70	0.18	0.0006	2.20E-07
MW-9	126.10	12.93	0.5759	2.03E-04
MW-10	28.95	1.76	0.1132	3.99E-05
MW-11	N/A	N/A	N/A	N/A
MW-13	33.90	32.67	0.1496	5.28E-05

Due to the lack of data (dry holes) in the middle of the Permit Boundary, it was not possible to develop a water table or potentiometric surface. Further, water appeared to be occurring from different strata in the individual wells and not one continuous zone or strata.

7.7 Surface and Groundwater Quality

There are no published water quality data for the Permit Boundary. Stephens (1974) provided selected water quality data for select sites within the Wah Wah Valley. These data were reviewed to obtain a preliminary assessment of water quality in the area. To provide a more thorough understanding of the existing water quality in the Permit Boundary, UAC conducted both surface and groundwater sampling programs.

7.7.1 Surface Water Quality

UAC conducted surface water monitoring during 2013 to determine the surface water flow and quality characteristics (Norwest, 2013b). Sampling stations were installed in Willow Creek and Blawn Wash and on two side tributaries below the proposed mining and process operation at location presented in Table 7.6. Figure 10 presents a graphical location for these sampling points. A series of four events were documented during the monitoring period. Water quality samples were obtained from two of the sample events. The other two events were large flows that damaged or destroyed the sampling stations.

Table 7.6 Summary of Surface Water Station Locations

Point ID	Latitude*	Longitude*	Northing**	Easting **	Occurrence Description
SW-1	38.318883	-113.475897	607595.6	1433528.6	Main channel of Willow Creek below Confluence with side tributary from mining area
SW-2	38.273830	-113.512478	591894.3	1424305.9	Side tributary to Willow Creek containing the mining area – site located below the mining area
SW-3	38.256152	-113.525652	585628.6	1418909.4	Side tributary to Blawn Wash below process plant area
SW-4	38.249211	-113.512316	582579.9	1422249.8	Main channel of Blawn Wash below confluence with side tributary from plant area

* WGS84 geoid
** UT SP NAD27ft

The field data collected for pH, specific conductance, and temperature provided a preliminary assessment of the water quality in the Permit Boundary.

Surface water sources had pH values that ranged from 7.0 to 8.4. These values indicate that the waters are generally neutral to slightly alkaline.

Temperature ranged from 17.60 to 20.20°C. The higher temperature values occurred in samples collected later in the day.

Table 7.7 presents a summary of the surface water quality data collected. The water samples collected from the flow events reflected relatively good water quality. TDS values of the water samples ranged from 156 to 504mg/l. This is indicative of high quality water and the water quality analyses show that the metals and cation-anion concentrations were quite low. The surface water quality is similar to the groundwater quality found in the valley fill of the Wah Wah Valley by Earth Sciences (1975).

The total suspended solids (TSS) load in all of the samples was quite high, as expected from a sample in a mobile bed channel. TSS concentrations ranged from 14,299 to 76,499mg/l. The sampling ports were set about 0.1 feet above the channel bottom, so the sample collection avoids significant bed load. While the interaction of the water with the bed and sediment load particles was quite high, the water quality was not significantly degraded by this process.

In contrast, Norwest (2013a and c) found the groundwater and springs from the Permit Boundary to be marginal water quality in the range of 1,100 to 2,500mg/l.

Table 7.7A Surface Water Quality Parameter Results Summary

SW-1						
Water Quality Parameters	**5/7/2013**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Hardness as CaCO3	6270	6270	6270	6270		
Acidity	ND	ND	ND	ND		
Alkalinity - Bicarbonate (HCO3)	201	201	201	201		
Alkalinity - Carbonate (CO3)	ND	ND	ND	ND		
Alkalinity - CO2	151	151	151	151		
Alkalinity - Hydroxide (OH)	ND	ND	ND	ND		
Alkalinity - Total (as CaCO3)	165	165	165	165		
Ammonia as N	ND	ND	ND	ND	1	
Chloride	10	10	10	10		250
Conductivity	300	300	300	300		
Fluoride	0.7	0.7	0.7	0.7		500
Nitrate + Nitrite, Total	ND	ND	ND	ND		6.5-8.5
pH	8.4	8.4	8.4	8.4		
Sulfate	45	45	45	45		
Total Dissolved Solids (TDS)	160	160	160	160		
Total Suspended Solids (TSS)	39700	39700	39700	39700		
Aluminum, Total	195	195	195	195		
Antimony, Total	ND	ND	ND	ND		.05 -.2
Arsenic, Total	ND	ND	ND	ND	0.006	
Boron, Total	0.53	0.53	0.53	0.53	none	
Barium, Total	5.15	5.15	5.15	5.15	2	
Beryllium, Total	ND	ND	ND	ND	0.004	
Calcium, Total	1940	1940	1940	1940		
Cadmium, Total	ND	ND	ND	ND	0.005	
Cobalt, Total	0.289	0.289	0.289	0.289		
Chromium, Total	0.126	0.126	0.126	0.126	0.01	
Copper, Total	0.636	0.636	0.636	0.636		
Iron, Total	54.8	54.8	54.8	54.8	1.3	1
Lead, Total	0.438	0.438	0.438	0.438	4	2
Mercury, Total	ND	ND	ND	ND		0.3
Magnesium, Total	346	346	346	346	0	
Manganese, Total	27.1	27.1	27.1	27.1		
Molybdenum, Total	ND	ND	ND	ND		0.05
Nickel, Total	0.526	0.526	0.526	0.526	0.002	
Phosphorus, Total as P	13	13	13	13		
Potassium, Total	55	55	55	55		
Selenium, Total	ND	ND	ND	ND		
Silver, Total	ND	ND	ND	ND		
Sodium, Total	43.7	43.7	43.7	43.7	0.05	
Thallium, Total	ND	ND	ND	ND		0.1
Vanadium, Total	0.153	0.153	0.153	0.153	0.0005	
Zinc, Total	0.53	0.53	0.53	**0.53**		

Table 7.7B Surface Water Quality Parameter Results Summary

SW-2							
Water Quality Parameters	**8/152013**	**9/5/2013**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Hardness as CaCO3	506	742	742	506	624		
Acidity	ND	ND			ND		
Alkalinity - Bicarbonate (HCO3)	154	133	154	133	143.5		
Alkalinity - Carbonate (CO3)	ND	ND			ND		
Alkalinity - CO2	112	98	112	98	105		
Alkalinity - Hydroxide (OH)	ND	ND			ND		
Alkalinity - Total (as CaCO3)	126	109	126	109	117.5		
Ammonia as N	2.7	0.7	2.7	0.7	1.7	1	
Chloride	ND	ND			ND		250
Conductivity	186	2220	2220	186	1203		
Fluoride	ND	0.2	0.2	0.2	0.2		500
Nitrate + Nitrite, Total	0.1	ND	0.1	0.1	0.1		6.5-8.5
pH	7	7.5	7.5	7	7.25		
Sulfate	ND	2	2	2	2		
Total Dissolved Solids (TDS)	236	288	288	236	262		
Total Suspended Solids (TSS)	19800	18700	19800	18700	19250		
Aluminum, Total	119	120	120	119	119.5		
Antimony, Total	ND	ND			ND		.05 -.2
Arsenic, Total	ND	ND			ND	0.006	
Boron, Total	0.09	0.07	0.09	0.07	0.08	none	
Barium, Total	2.33	3.04	3.04	2.33	2.685	2	
Beryllium, Total	ND	ND			ND	0.004	
Calcium, Total	103	190	190	103	146.5		
Cadmium, Total	ND	ND			ND	0.005	
Cobalt, Total	0.14	0.18	0.18	0.14	0.16		
Chromium, Total	0.077	0.0786	0.0786	0.077	0.0778	0.01	
Copper, Total	0.264	0.255	0.264	0.255	0.2595		
Iron, Total	126	110	126	110	118	1.3	1
Lead, Total	0.19	0.166	0.19	0.166	0.178	4	2
Mercury, Total	0.0003	0.0011	0.0011	0.0003	0.0007		0.3
Magnesium, Total	60.3	65.3	65.3	60.3	62.8	0	
Manganese, Total	10.6	13.7	13.7	10.6	12.15		
Molybdenum, Total	ND	ND			ND		0.05
Nickel, Total	0.141	0.164	0.164	0.141	0.1525	0.002	
Phosphorus, Total as P	6.7	6.5	6.7	6.5	6.6		
Potassium, Total	39.6	42	42	39.6	40.8		
Selenium, Total	ND	ND			ND		
Silver, Total	ND	ND			ND		
Sodium, Total	2	2	2	2	2	0.05	
Thallium, Total	ND	ND			ND		0.1
Vanadium, Total	0.165	0.168	0.168	0.165	0.1665	0.0005	
Zinc, Total	0.57	0.51	0.57	0.51	0.54		

Table 7.7C Surface Water Quality Parameter Results Summary

SW-3								
Water Quality Parameters	**7/25/2013**	**8/15/2013**	**9/6/2013**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Hardness as CaCO3	3290	3010	1760	3290	1760	2686.667		
Acidity	ND	ND	ND			ND		
Alkalinity - Bicarbonate (HCO3)	166	413	420	420	166	333		
Alkalinity - Carbonate (CO3)	ND	ND	ND			ND		
Alkalinity - CO2	120	315	312	315	120	249		
Alkalinity - Hydroxide (OH)	ND	ND	ND			ND		
Alkalinity - Total (as CaCO3)	136	339	345	345	136	273.3333		
Ammonia as N	ND	4.3	0.9	4.3	0.9	2.6	1	
Chloride	15	3	11			ND		250
Conductivity	1060	533	775	1060	533	789.3333		
Fluoride	0.3	0.2	0.4	0.4	0.2	0.3		500
Nitrate + Nitrite, Total	ND	0.2	ND	0.2	0.2	0.2		6.5-8.5
pH	7.6	7.4	7.4	7.6	7.4	7.466667		
Sulfate	510	89	220	510	89	273		
Total Dissolved Solids (TDS)	252	464	504	504	252	406.6667		
Total Suspended Solids (TSS)	43100	76400	14200	76400	14200	44566.67		
Aluminum, Total	265	307	196	307	196	256		
Antimony, Total	ND	ND	ND			ND		.05 -.2
Arsenic, Total	ND	ND	0.0526			ND	0.006	
Boron, Total	0.33	0.21	0.15	0.33	0.15	0.23	none	
Barium, Total	3.65	9.43	4.43	9.43	3.65	5.836667	2	
Beryllium, Total	ND	ND	ND			ND	0.004	
Calcium, Total	1060	908	529	1060	529	832.3333		
Cadmium, Total	ND	ND	ND			ND	0.005	
Cobalt, Total	0.248	0.395	0.187	0.395	0.187	0.276667		
Chromium, Total	0.134	0.135	0.0866	0.135	0.0866	0.118533	0.01	
Copper, Total	0.582	0.553	0.328	0.582	0.328	0.487667		
Iron, Total	130	247	176	247	130	184.3333	1.3	1
Lead, Total	0.164	0.555	0.239	0.555	0.164	0.319333	4	2
Mercury, Total	ND	0.0016	0.001	0.0016	0.001	0.0013		0.3
Magnesium, Total	156	182	106	182	106	148	0	
Manganese, Total	17.7	33.7	14	33.7	14	21.8		
Molybdenum, Total	ND	ND	ND			ND		0.05
Nickel, Total	0.361	0.455	0.231	0.455	0.231	0.349	0.002	
Phosphorus, Total as P	9.7	15.6	7.6	15.6	7.6	10.96667		
Potassium, Total	71.1	85.5	58.1	85.5	58.1	71.56667		
Selenium, Total	ND	ND	ND			ND		
Silver, Total	ND	ND	ND			ND		
Sodium, Total	20.6	8.9	11.9	20.6	8.9	13.8	0.05	
Thallium, Total	ND	ND	ND			ND		0.1
Vanadium, Total	0.158	0.2	0.178	0.2	0.158	0.178667	0.0005	
Zinc, Total	0.78	1.4	0.67	1.4	0.67	0.95		

Table 7.7D Surface Water Quality Parameter Results Summary

SW-4						
Water Quality Parameters	**7/25/2013**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Hardness as CaCO3	4460	4460	4460	4460		
Acidity	ND			ND		
Alkalinity - Bicarbonate (HCO3)	240	240	240	240		
Alkalinity - Carbonate (CO3)	ND			ND		
Alkalinity - CO2	174	174	174	174		
Alkalinity - Hydroxide (OH)	ND			ND		
Alkalinity - Total (as CaCO3)	197	197	197	197		
Ammonia as N	ND			ND	1	
Chloride	10			ND		250
Conductivity	549	549	549	549		
Fluoride	0.3	0.3	0.3	0.3		500
Nitrate + Nitrite, Total	ND			ND		6.5-8.5
pH	7.5	7.5	7.5	7.5		
Sulfate	148	148	148	148		
Total Dissolved Solids (TDS)	156	156	156	156		
Total Suspended Solids (TSS)	48700	48700	48700	48700		
Aluminum, Total	314	314	314	314		
Antimony, Total	ND			ND		.05 -.2
Arsenic, Total	ND			ND	0.006	
Boron, Total	0.23	0.23	0.23	0.23	none	
Barium, Total	7.68	7.68	7.68	7.68	2	
Beryllium, Total	ND			ND	0.004	
Calcium, Total	1290	1290	1290	1290		
Cadmium, Total	ND			ND	0.005	
Cobalt, Total	0.269	0.269	0.269	0.269		
Chromium, Total	0.106	0.106	0.106	0.106	0.01	
Copper, Total	0.387	0.387	0.387	0.387		
Iron, Total	161	161	161	161	1.3	1
Lead, Total	0.333	0.333	0.333	0.333	4	2
Mercury, Total	ND			ND		0.3
Magnesium, Total	303	303	303	303	0	
Manganese, Total	24.1	24.1	24.1	24.1		
Molybdenum, Total	ND			ND		0.05
Nickel, Total	0.357	0.357	0.357	0.357	0.002	
Phosphorus, Total as P	11.2	11.2	11.2	11.2		
Potassium, Total	76	76	76	76		
Selenium, Total	ND			ND		
Silver, Total	ND			ND		
Sodium, Total	14	14	14	14	0.05	
Thallium, Total	ND			ND		0.1
Vanadium, Total	0.331	0.331	0.331	0.331	0.0005	
Zinc, Total	0.95	0.95	0.95	0.95		

To aid in characterization of the type of waters that are encountered, the water quality data were plotted on Piper diagrams (see Figure 11). Stations SW-1 and SW-2 are a calcium-bicarbonate water type. SW-1 is a strong calcium-bicarbonate water while SW-2 has a mix of calcium and magnesium-bicarbonate. The water type for station SW-3 changes between the various samples. The cation values stay the same as a calcium- magnesium mix, but the anion values change with increasing amounts of sulfate or bicarbonate. This is likely caused by changes in the storm intensity affecting the areas from which runoff is occurring. For gentle rains, the runoff is from the local area of the station where volcanic tuff is exposed at the surface. With heavy rains, flows from more distant upstream watershed areas where rhyolite is exposed reach the collecting station. For this location, these different strata effect the water chemistry changes with the different source areas. Station SW-4 is a calcium, magnesium-bicarbonate and sulfate mix. This is likely due to runoff occurring across two different rock types and the water mixing in the channel.

Within the Permit Boundary surface water quality was different from the water quality in the groundwater system. The surface water system had high quality water, while the groundwater system had marginal water quality. This indicates that groundwater was not the major contributor to the surface water flows.

The surface water quality within the Permit Boundary was similar to the water quality of the groundwater in the Wah Wah Valley. This similarity of waters is an indication that the surface water system may be a contributor to the water in the Wah Wah Valley. If the mountain block groundwater within the Permit Boundary were a significant source of water, the water in the Wah Wah Valley fill would likely have similar, more saline chemistry.

7.7.2 Groundwater Quality Sampling

UAC conducted groundwater quality sampling in the Permit Boundary to determine baseline conditions (Norwest, 2013a and c). This sampling consisted of two evaluations. First, Spring and Fall season spring and seep evaluations were conducted to determine the character of the natural groundwater outflows. Second, quarterly groundwater sampling of the monitoring wells around the Permit Boundary were conducted to determine detailed quality baseline data.

7.7.2.1 Spring and Seep Field Data

As discussed previously (Section 7.5.1), the spring and seep evaluations identified a number of small springs and seeps in the Permit Boundary. Field parameters were collected for pH, specific conductance, and temperature of the flowing springs and seeps.

Water sources located in the Spring period survey (see Figure 12) showed pH values that ranged from 6.86 to 8.20, with a mean of 7.56. These values indicate that the waters are generally neutral to slightly basic.

Specific conductance values ranged from 1.97 to 11.36 milli-Siemens (mS), with a mean of 3.43mS. These results indicate that the water present in springs and seeps in the area of the Project have a relatively high conductance, indicating a higher concentration of dissolved solids. Using a standard relationship of specific conductance to TDS, the above results would likely result in TDS values of between 900 to 5,650mg/l.

Temperature ranged from 10.30 to 26.50°C, with an average of 16.44°C. The higher temperature values were identified in those seeps with little to no flow.

For the Fall period identified water sources (see Figure 13) the pH values ranged from 6.87 to 8.38, with a mean of 7.56. As with the Spring period data, these values indicate that the waters are generally neutral to slightly basic.

Specific conductance values ranged from 0.58 to 4.04mS, with a mean of 2.16mS. As found in the Spring survey, these values indicate that the water present in springs and seeps in the area of the Project have a relatively high conductance, indicating that they contain a higher concentration of dissolved solids. Using a standard relationship of specific conductance to TDS, the above results would likely result in TDS values of between 790 to 2,000mg/l.

Temperature ranged from 14.30 to 24.70°C, with an average of 18.04°C. The higher temperature values were identified in those seeps with little to no flow.

In reviewing this data, the low TDS values for water quality occurred during periods immediately following rainfall events. Thus, the low TDS rainfall would mix with the groundwater outflow and result in lower values.

7.7.2.2 Monitoring Well Sampling

Sampling of the groundwater monitoring wells was conducted for three quarters in 2013 (Norwest, 2013c) (see Figure 10 for well locations).

Samples were collected in bottles provided by the laboratory in accordance with standard sampling procedures. The metal samples were acidified to preserve the samples. The samples were then stored in iced coolers and delivered to the laboratory and analyzed for the parameters shown in Table 7.8.

Table 7.8 Water Quality Analytes

Analytes		
Acidity	Hardness	Total Suspended Solids
Alkalinity	Hydroxide	Total Dissolved Solids
Bicarbonate	Nitrate + Nitrite	pH
Carbonate	Phosphorous	Specific Conductance
Chloride	Sulfate	
Metals		
Aluminum	Copper	Selenium
Antimony	Fluoride	Silver
Arsenic	Iron	Sodium
Barium	Lead	Thallium
Beryllium	Magnesium	Vanadium
Boron	Manganese	Zinc
Cadmium	Mercury	
Calcium	Molybdenum	
Chromium	Nickel	
Cobalt	Potassium	

Water samples were collected for three quarters in 2013 to determine if any seasonal changes in quality occurred. Table 7.9 presents a summary of the water quality parameter results for the various sampling. As shown in Table 7.9, the water quality results show no elevated levels of metals or other constituents of concern. No significant changes in water quality were identified between the various sampling rounds.

The major cations and anions in the samples were calcium, magnesium, sulfate, and bicarbonate. TDS values of the water samples ranged from about 1,100 to 2,500mg/l. This is indicative of marginal quality water that is moving slowly through the strata and picking up significant salts from the formation, rather than a high quality groundwater resource. The well water quality matches the water quality found during the spring and seep inventory discussed above (Norwest, 2013a). The varying water quality is indicative of springs and seeps originating from different isolated zones of groundwater.

The cation-anion values of the water quality results of each well were determined and used in Piper diagrams to determine the water types. The Piper diagrams are presented in Figure 14 and 15. These data show that the water types of the various wells are different.

Wells MW-1, MW-4, MW-6, and MW-9 are calcium sulfate waters. Wells MW-3 and MW-5 are calcium chloride waters. Well MW-10 is a magnesium and calcium bicarbonate water, while well MW-13 is a magnesium and calcium sulfate water. These water type differences are also indicative of isolated, perched water bearing zones from different strata; further indicating that the wells are completed in independent sources that are not part of a continuous aquifer.

Table 7.9A Groundwater Quality Parameter Results Summary

MW-1										
Water Quality Parameters	**5/7/2013**	**6/27/2013**	**8/8/2013**	**9/6/2013**	**11/5/2013**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Acidity	nd	nd		nd	nd			**nd**		
Ammonia as N	nd	nd		nd	nd			**nd**		
Total alkalinity as CaCO3	165	186		185	191	191	165	**182**		
Bicarbonate as HCO3	202	227		225	233	202		**222**		
Carbonate as CaCO3	nd	nd		nd	nd			**nd**		
Total Hardness as CaCO3	1000	907		890	873	873	1000	**918**		
Hydroxide	nd	nd		nd	nd					
Nitrate and and Nitrite	nd	nd		nd	nd			**nd**	1	
Sulfate	630	676		668	657	630	676	**658**		250
Total suspended Solids	33	nd		nd		33	33	**33**		
Total dissolved Solids	1390	1340		1220	1250	1220	1390	**1300**		500
pH	7.3	7.2		7.2	7.2	7.2	7.3	**7.2**		6.5-8.5
color	nt	nt		nt	nt					
corrosivity	nt	nt		nt	nt					
Odor	nt	nt		nt	nt					
Specific Conductivity	1690	1380		1680	1760	1380	1760	**1628**		
SPLP preparation										
Aluminum	0.4	nd		nd	nd	0.4	0.4	**0.4**		.05 -.2
Antimony	nd	nd		nd	nd				0.006	
Arsenic	0.0012	0.0009		0.0011	0.0011	0.0009	0.0012	**0.0011**	none	
Barium	0.022	0.013		0.023	0.022	0.013	0.023	**0.02**	2	
Beryllium	nd	nd		nd	nd			**nd**	0.004	
Boron	0.1	0.07		0.08	0.08	0.07	0.1	**0.08**		
Cadmium	nd	nd		nd	nd			**nd**	0.005	
Calcium	290	266		257	253	253	290	**267**		
Chromium	nd	0.001		nd	0.0008	0.0008	0.001	**0.0009**	0.01	
Cobalt	0.0054	0.0045		0.0053	0.0055	0.0045	0.0055	**0.0052**		
Copper	nd	nd		0.001	0.0015	0.001	0.0015	**0.0013**	1.3	1
Fluoride	0.8	0.8		0.8	0.8	0.8	0.8	**0.8**	4	2
Iron	3.27	2.63		1.84	2.23	1.84	3.27	**2.49**		0.3
Lead	0.0006	nd		nd	nd	0.0006	0.0006	**0.0006**	0	
Magnesium	67.2	59		60	58.8	58.8	67.2	**61.3**		
Manganese	1.19	1.17		1.29	1.59	1.17	1.59	**1.31**		0.05
Mercury	nd	nd		nd	nd			**nd**	0.002	
Molybdenum	0.0008	0.001		0.0011	0.0008	0.0008	0.0011	**0.0009**		
Nickel	0.0166	0.0112		0.012	0.0109	0.0109	0.0166	**0.0127**		
Potassium	6.2	5.3		5.2	5.3	5.2	6.2	**5.5**		
Phosporous	0.2	nd		nd	nd	0.2	0.2	**0.2**		
Selenium	0.0024	0.002		0.0017	0.0018	0.0017	0.0024	**0.0020**	0.05	
Silver	0.0005	nd		nd	nd	0.0005	0.0005	**0.0005**		0.1
Thallium	nd	nd		nd	nd			**nd**	0.0005	
Vanadium	nd	nd		nd	nd			**nd**		
Zinc	nd	nd		nd	nd			**nd**		5
sodium	54.8	47.7		46.7	50.3	46.7	54.8	**49.9**		
chloride	141	149		148	146	141	149	**146**		
Cation sum	22.5	20.34		19.92	19.79	19.79	22.5	**20.64**		
Anion Sum	20.4	21.99		21.77	21.94	20.4	21.99	**21.53**		
Cation-Anion Balance	4.98	-3.92		-4.42	-5.17	-5.17	4.98	**-2.13**		

Table 7.9B Groundwater Quality Parameter Results Summary

MW-3										
Water Quality Parameters	**5/7/2013**	**6/27/2013**	**8/8/2013**	**9/6/2013**	**11/5/2013**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Acidity	nt	nt		nt	nt					
Ammonia as N	nd	nd		nd	nd					
Total alkalinity as CaCO3	165	242		167	175	242	165	**187**		
Bicarbonate as HCO3	201	295		203	213	295	201	**228**		
Carbonate as CaCO3	nd	nd		nd	nd					
Total Hardness as CaCO3	165	811		546	531	811	165	**513**		
Hydroxide	nd	nd		nd	nd					
Nitrate and and Nitrite	nd	nd		nd	nd				1	
Sulfate	310	646		296	285	646	285	**384**		250
Total suspended Solids	798	14		29	11	798	11	**213**		
Total dissolved Solids	1020	1340		908	864	1340	864	**1033**		500
pH	7.6	7.3		7.4	7.4	7.6	7.3	**7.425**		6.5-8.5
color	nt	nt		nt	nt	nt				
corrosivity	nt	nt		nt	nt	nt				
Odor	nt	nt		nt	nt	nt				
Specific Conductivity	1350	1380		1370	1390	1390	1350	**1373**		
SPLP preparation										
Aluminum	11.9	0.2		0.6	0.2	11.9	0.2	**3.225**		.05 -.2
Antimony	0.0055	nt		0.0005	nd	0.0055	0.0005	**0.0055**	0.006	
Arsenic	0.003	0.0012		0.0023	nd	0.003	0.0012	**0.0022**	none	
Barium	0.258	0.024		0.08	0.085	0.258	0.024	**0.112**	2	
Beryllium	0.0006	nd		nd	nd	0.0006	0.0006	**0.0006**	0.004	
Boron	0.39	0.12		0.35	0.34	0.39	0.12	**0.3**		
Cadmium	nd	nd		nd	nd				0.005	
Calcium	178	205		144	nd	205	144	**176**		
Chromium	0.0112	0.0025		0.001	nd	0.0112	0.001	**0.0049**	0.01	
Cobalt	0.0049	0.0006		0.0008	nd	0.0049	0.0006	**0.0021**		
Copper	0.0094	0.0012		0.0099	nd	0.0099	0.0012	**0.0068**	1.3	1
Fluoride	0.6	0.2		0.5	0.5	0.6	0.2	**0.45**	4	2
Iron	12.8	0.42		1.22	1.16	12.8	0.42	**3.9**		0.3
Lead	0.0048	nd		nd	nd	0.0048	0.0048	**0.0048**	0	
Magnesium	56.1	72.8		45.1	44.1	72.8	44.1	**54.5**		
Manganese	0.434	0.126		0.383	0.622	0.622	0.126	**0.391**		0.05
Mercury	nd	nd		nd	nd				0.002	
Molybdenum	0.0086	0.0021		0.0032	nd	0.0086	0.0021	**0.0046**		
Nickel	0.0192	0.0087		0.009	0.0075	0.0192	0.0075	**0.0111**		
Potassium	7.9	2.3		4	3.9	7.9	2.3	**4.525**		
Phosporous	0.6	0.2		nd	nd	0.6	0.2	**0.4**		
Selenium	0.0033	0.0016		0.0023	nd	0.0033	0.0016	**0.0024**	0.05	
Silver	nd	nd		nd	nd					0.1
Thallium	nd	nd		nd	nd				0.0005	
Vanadium	0.0212	0.0048		0.001	0.005	0.0212	0.001	**0.008**		
Zinc	0.03	nd		nd	nd	0.03	0.03	**0.03**		5
sodium	116	94.2		84.4	84.4	116	84.4	**94.8**		
chloride	209	141		201	197	209	141	**187**		
Cation sum	18.75	15.37		14.67	14.39	18.75	14.39	**15.80**		
Anion Sum	15.64	16.08		15.16	14.98	16.08	14.98	**15.47**		
Cation-Anion Balance	9.02	-2.25		-1.64	-2.03	9.02	-2.25	**0.78**		

Table 7.9C Groundwater Quality Parameter Results Summary

MW-4										
Water Quality Parameters	**5/7/2013**	**6/27/2013**	**8/8/2013**	**9/6/2013**	**11/5/2013**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Acidity	nd	nd		nd	nd					
Ammonia as N	nd	nd		nd	nd					
Total alkalinity as CaCO3	221	242		242	245	245	221	**238**		
Bicarbonate as HCO3	269	295		295	299	299	269	**290**		
Carbonate as CaCO3	nd	nd		nd	nd					
Total Hardness as CaCO3	886	811		795	744	886	744	**809**		
Hydroxide	nd	nd		nd	nd					
Nitrate and and Nitrite	nd	nd		nd	nd				1	
Sulfate	590	646		640	620	646	590	**624**		250
Total suspended Solids	326	14		nd	nd	326	14	**170**		
Total dissolved Solids	1320	1340		1260	1230	1340	1230	**1288**		500
pH	7.5	7.3		7.3	7.3	7.5	7.3	**7.35**		6.5-8.5
color	nt	nt		nt	nt					
corrosivity	nt	nt		nt	nt					
Odor	nt	nt		nt	nt					
Specific Conductivity	1530	1380		1620	1650	1650	1380	**1545**		
SPLP preparation										
Aluminum	3.7	0.2		nd	nd	3.7	0.2	**1.95**		.05 -.2
Antimony	0.0258	nd		nd	nd	0.0258	0.0258	**0.0258**	0.006	
Arsenic	0.0021	0.0012		0.0015	nd	0.0021	0.0012	**0.0016**	none	
Barium	0.078	0.024		0.022	0.021	0.078	0.021	**0.036**	2	
Beryllium	nd	nd		nd	nd				0.004	
Boron	0.13	0.12		0.13	0.11	0.13	0.11	**0.12**		
Cadmium	0.0002	nd		nd	nd	0.0002	0.0002	**0.0002**	0.005	
Calcium	220	205		200	188	220	188	**203**		
Chromium	0.0056	nd		0.0057	nd	0.0057	0.0056	**0.0057**	0.01	
Cobalt	0.0025	0.0006		0.0006	nd	0.0025	0.0006	**0.0012**		
Copper	0.0021	0.0012		0.0014	nd	0.0021	0.0012	**0.0016**	1.3	1
Fluoride	0.2	0.2		0.2	0.2	0.2	0.2	**0.2**	4	2
Iron	2.88	0.42		0.31	0.41	2.88	0.31	**1.01**		0.3
Lead	0.0021	nd		nd	nd	0.0021	0.0021	**0.0021**	0	
Magnesium	81.4	72.8		71.4	66.9	81.4	66.9	**73.1**		
Manganese	0.215	0.126		0.168	0.188	0.215	0.126	**0.174**		0.05
Mercury	nd	nd		nd	nd				0.002	
Molybdenum	0.0031	0.0021		0.0016	nd	0.0031	0.0016	**0.0023**		
Nickel	0.0152	0.0087		0.0089	0.0071	0.0152	0.0071	**0.0100**		
Potassium	3.5	2.3		2.1	2	3.5	2	**2.5**		
Phosporous	0.4	0.2		nd	nd	0.4	0.2	**0.3**		
Selenium	0.0016	0.0016		0.0016	nd	0.0016	0.0016	**0.0016**	0.05	
Silver	nd	nd		nd	nd					0.1
Thallium	nd	nd		nd	nd				0.0005	
Vanadium	0.0086	nd		0.0014	nd	0.0086	0.0014	**0.005**		
Zinc	0.01	nd		nd	nd	0.01	0.01	**0.01**		5
sodium	79.2	69.9		70.8	70	79.2	69.9	**72.5**		
chloride	95	99		94	90	99	90	**94.5**		
Cation sum	21.21	19.32		18.99	17.98	21.21	17.98	**19.38**		
Anion Sum	19.37	21.08		20.81	20.35	21.08	19.37	**20.40**		
Cation-Anion Balance	4.53	-4.35		-4.58	-6.17	4.53	-6.17	**-2.64**		

Table 7.9D Groundwater Quality Parameter Results Summary

MW-5										
Water Quality Parameters	**5/7/2013**	**6/27/2013**	**8/8/2013**	**9/6/2013**	**11/5/2013**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Acidity										
Ammonia as N	nd	nd		nd	nd					
Total alkalinity as CaCO3	204	239		223	191	239	191	**214**		
Bicarbonate as HCO3	248	292		272	233	292	233	**261**		
Carbonate as CaCO3	nd	nd		nd	nd					
Total Hardness as CaCO3	737	560		603	873	873	560	**693**		
Hydroxide	nd	nd		nd	nd					
Nitrate and and Nitrite	nd	nd		nd	nd				1	
Sulfate	99	99		85	657	657	85	**235**		250
Total suspended Solids	1030	400		111	6	1030	6	**387**		
Total dissolved Solids	1160	1230		964	1250	1250	964	**1151**		500
pH	7.4	7.3		7.4	7.2	7.4	7.2	**7.3**		6.5-8.5
color	nt	nt		nt	nt					
corrosivity	nt	nt		nt	nt					
Odor	nt	nt		nt	nt					
Specific Conductivity	1610	1410		1660	1760	1760	1410	**1610**		
SPLP preparation										
Aluminum	19.1	0.6		9.2	nd	19.1	0.6	**9.6**		.05 -.2
Antimony	0.0029	nd		nd	nd	0.0029	0.0029	**0.0029**	0.006	
Arsenic	0.0051	0.00042		0.0031	0.0011	0.0051	0.00042	**0.002**	none	
Barium	0.295	0.096		0.11	0.022	0.295	0.022	**0.131**	2	
Beryllium	0.001	nd		nd	nd	0.001	0.001	**0.001**	0.004	
Boron	0.27	0.21		0.24	0.08	0.27	0.08	**0.20**		
Cadmium	0.0002	nd		nd	nd	0.0002	0.0002	**0.0002**	0.005	
Calcium	201	153		165	253	253	153	**193**		
Chromium	0.0055	0.0007		0.0013	0.0008	0.0055	0.0007	**0.0021**	0.01	
Cobalt	0.0044	0.0031		0.0018	0.0055	0.0055	0.0018	**0.0037**		
Copper	0.0104	0.0023		0.004	0.0015	0.0104	0.0015	**0.0046**	1.3	1
Fluoride	0.4	0.3		0.3	0.8	0.8	0.3	**0.45**	4	2
Iron	7.53	1.09		2.55	2.23	7.53	1.09	**3.35**		0.3
Lead	0.0149	0.0005		0.0021	nd	0.0149	0.0005	**0.0058**	0	
Magnesium	56.9	42.9		46.6	58.8	58.8	42.9	**51.3**		
Manganese	0.804	0.945		0.494	1.59	1.59	0.494	**0.96**		0.05
Mercury	0.0002	nd		nd	nd	0.0002	0.0002	**0.0002**	0.002	
Molybdenum	0.0032	0.0069		0.0029	0.0008	0.0069	0.0008	**0.0035**		
Nickel	0.0146	0.0095		0.0077	0.0109	0.0146	0.0077	**0.0107**		
Potassium	12.4	5.4		7.5	5.3	12.4	5.3	**7.7**		
Phosporous	0.5	0.2		nd	nd	0.5	0.2	**0.35**		
Selenium	0.004	0.0052		0.0047	0.0018	0.0052	0.0018	**0.0039**	0.05	
Silver	nd	nd		nd	nd					0.1
Thallium	0.0002	nd		nd	nd	0.0002	0.0002	**0.0002**	0.0005	
Vanadium	0.0068	nd		0.0014	nd	0.0068	0.0014	**0.0041**		
Zinc	0.02	nd		0.02	nd	0.02	0.02	**0.02**		5
sodium	146	126		119	50.3	146	50.3	**110.3**		
chloride	391	399		403	146	403	146	**334.75**		
Cation sum	21.38	16.78		17.44	17.12	21.38	16.78	**18.18**		
Anion Sum	17.15	18.1		17.59	17.1	18.1	17.1	**17.49**		
Cation-Anion Balance	10.97	-3.78		-0.45	0.05	10.97	-3.78	**1.70**		

Table 7.9E Groundwater Quality Parameter Results Summary

MW-6								
Water Quality Parameters	**8/8/2014**	**9/6/2014**	**11/5/2014**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Acidity	nd	nd	nd					
Ammonia as N	nd	nd	nd					
Total alkalinity as CaCO3	333	332	191	333	191	**285**		
Bicarbonate as HCO3	406	404	233	406	233	**348**		
Carbonate as CaCO3	nd	nd	nd					
Total Hardness as CaCO3	2400	332	873	2400	332	**1202**		
Hydroxide	nd	nd	nd					
Nitrate and and Nitrite	nd	nd	nd				1	
Sulfate	1830	1700	657	1830	657	**1396**		250
Total suspended Solids	8	1120	6	1120	6	**378**		
Total dissolved Solids	3480	2960	1250	3480	1250	**2563**		500
pH	6.6	6.9	7.2	7.2	6.6	**6.9**		6.5-8.5
color	nt	nt	nt					
corrosivity	nt	nt	nt					
Odor	nt	nt	nt					
Specific Conductivity	3670	3620	1760	3670	1760	**3017**		
SPLP preparation								
Aluminum	0.05	6.1	nd	6.1	0.05	**3.08**		.05 -.2
Antimony	nt	0.0006	nd	0.0006	0.0006	**0.0006**	0.006	
Arsenic	nd	0.0028	0.0011	0.0028	0.0011	**0.002**	none	
Barium	0.046	0.078	0.022	0.078	0.022	**0.05**	2	
Beryllium	nd	0.0008	nd	0.0008	0.0008	**0.00**	0.004	
Boron	0.15	0.13	0.08	0.15	0.08	**0.12**		
Cadmium	nd	nd	nd				0.005	
Calcium	704	762	253	762	253	**573**		
Chromium	nd	0.0038	0.0008	0.0038	0.0008	**0.0023**	0.01	
Cobalt	0.0063	0.0084	0.0055	0.0084	0.0055	**0.0067**		
Copper	0.0306	0.007	0.0015	0.0306	0.0015	**0.0130**	1.3	1
Fluoride	0.4	0.4	0.8	0.8	0.4	**0.5**	4	2
Iron	1.48	1.15	2.23	2.23	1.15	**1.62**		0.3
Lead	nd	0.0084	nd	0.0084	0.0084	**0**	0	
Magnesium	157	168	58.8	168	58.8	**127.9**		
Manganese	4.03	2.88	1.59	4.03	1.59	**2.83**		0.05
Mercury	nd	nd	nd				0.002	
Molybdenum	nd	0.0012	0.0008	0.0012	0.0008	**0.0010**		
Nickel	0.0641	0.0298	0.0109	0.0641	0.0109	**0.0349**		
Potassium	12.9	3.8	5.3	12.9	3.8			
Phosporous	nd	0.3	nd	0.3	0.3	**0.3**		
Selenium	0.008	0.0044	0.0018	0.008	0.0018	**0.0047**	0.05	
Silver	nd	nd	nd					0.1
Thallium	nd	nd	nd				0.0005	
Vanadium	nd	0.0107	nd	0.0107	0.0107			
Zinc	0.01	nd	nd	0.01	0.01	**0**		5
sodium	60.5	84.7	50.3	84.7	50.3	**65.2**		
chloride	400	394	1760	1760	394	**851**		
Cation Sum	51.01	55.63	47.21	55.63	47.21	**51.28**		
Anion Sum	56.04	53.13	53.74	56.04	53.13	**54.30**		
Cation-Anion Balance	-4.69	2.3	-6.46	2.3	-6.46	**-2.95**		

Table 7.9F Groundwater Quality Parameter Results Summary

MW-9								
Water Quality Parameters	**8/8/2014**	**9/5/2014**	**11/5/2014**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Acidity	nd	nd	nd					
Ammonia as N	nd	nd	nd					
Total Alkalinity as CaCO3	168	150	179	179	150	**166**		
Bicarbonate as HCO3	204	183	218	218	183	**202**		
Carbonate as CaCO3	nd	nd	nd					
Total Hardness as CaCO3	1950	2080	1780	2080	1780	**1937**		
Hydroxide	nd							
Nitrate and and Nitrite	nd						1	
Sulfate	1150	1340	1200	1340	1150	**1230**		250
Total suspended Solids	10	nd	nd	10	10	**10**		
Total dissolved Solids	2760	2770	2650	2770	2650	**2727**		500
pH	6.9	6.9	7.3	7.3	6.9	**7.0**		6.5-8.5
color	nt	nt	nt					
corrosivity	nt	nt	nt					
Odor	nt	nt	nt					
Specific Conductivity	3280	3610	3570	3610	3280	**3487**		
Aluminum	0.1	nd	nd	0.1	0.1	**0.1**		.05 -.2
Antimony	nd	nd	nd				0.006	
Arsenic	nd	0.0033	0.0057	0.0057	0.0033	**0.0045**	none	
Barium	0.041	0.021	0.024	0.041	0.021	**0.029**	2	
Beryllium	nd	nd	nd				0.004	
Boron	0.15	0.12	0.13	0.15	0.12	**0.13**		
Cadmium	nd	nd	nd				0.005	
Calcium	585	617	530	617	530	**577**		
Chromium	nd	0.0047	0.0008	0.0047	0.0008	**0.0028**	0.01	
Cobalt	nd	nd	0.0013	0.0013	0.0013	**0.0013**		
Copper	nd	nd	0.0025	0.0025	0.0025	**0.0025**	1.3	1
Fluoride	0.6	0.4	0.6	0.6	0.4	**0.5**	4	2
Iron	0.12	0.22	0.11	0.22	0.11	**0.15**		0.3
Lead	nd	nd	0.0006	0.0006	0.0006	**0.0006**	0	
Magnesium	119	131	112	131	112	**121**		
Manganese	0.275	0.365	0.404	0.404	0.275	**0.3480**		0.05
Mercury	nd	nd	nd				0.002	
Molybdenum	nd	nd	0.0016	0.0016	0.0016	**0.0016**		
Nickel	0.0469	0.033	0.0198	0.0469	0.0198	**0.0332**		
Potassium	5.8	6.1	5.4	6.1	5.4	**5.8**		
Phosporous	nd	nd	nd					
Selenium	0.0116	0.0091	0.0057	0.0116	0.0057	**0.0088**	0.05	
Silver	nd	nd	nd					0.1
Thallium	nd	nd	nd				0.0005	
Vanadium	nd	nd	0.0007	0.0007	0.0007	**0.0007**		
Zinc	nd	nd	nd					5
sodium	143	84.9	127	143	84.9	**118**		
chloride	570	640	600	640	570	**603**		
Cation Sum	45.35	45.42	41.33	45.42	41.33	**44.03**		
Anion Sum	43.36	48.95	45.48	48.95	43.36	**45.93**		
Cation-Anion Balance	2.24	-3.74	-4.78	2.24	-4.78	**-2.09**		

Table 7.9G Groundwater Quality Parameter Results Summary

MW-10								
Water Quality Parameters	**8/8/2014**	**9/5/2014**	**11/5/2014**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Acidity	nd	nd	nd					
Ammonia as N	nd	nd	nd					
Total Alkalinity as CaCO3	396	391	392	396	391	**393**		
Bicarbonate as HCO3	482	477	477	482	477	**479**		
Carbonate as CaCO3	nd	nd	nd					
Total Hardness as CaCO3	795	473	501	795	473	**590**		
Hydroxide	nd	nd	nd					
Nitrate and and Nitrite	nd	nd	nd				1	
Sulfate	108	77	119	119	77	**101**		250
Total suspended Solids	1030	26	4	1030	4	**353**		
Total dissolved Solids	1100	636	672	1100	636	**803**		500
pH	7.9	7.6	7.3	7.9	7.3	**7.6**		6.5-8.5
color	nt	nt	nt					
corrosivity	nt	nt	nt					
Odor	nt	nt	nt					
Specific Conductivity	1170	1040	1020	1170	1020	**1077**		
Aluminum	4.9	3.1	nd	4.9	3.1	**4.0**		.05 -.2
Antimony	0.0171	0.0114	0.0035	0.0171	0.0035		0.006	
Arsenic	0.0176	0.0042	0.0053	0.0176	0.0042	**0.0090**	none	
Barium	0.087	0.058	0.095	0.095	0.058	**0.080**	2	
Beryllium	nd	nd	nd				0.004	
Boron	0.13	0.14	0.13	0.14	0.13	**0.13**		
Cadmium	nd	0.0003	nd	0.0003	0.0003	**0.0003**	0.005	
Calcium	170	96.1	107	170	96.1	**124**		
Chromium	0.0174	0.0031	0.0013	0.0174	0.0013	**0.0073**	0.01	
Cobalt	0.0071	0.0026	0.0008	0.0071	0.0008	**0.0035**		
Copper	0.0514	0.0105	0.0028	0.0514	0.0028	**0.0216**	1.3	1
Fluoride	0.9	0.6	0.9	0.9	0.6	**0.8**	4	2
Iron	9	1.33	1.28	9	1.28	**3.87**		0.3
Lead	0.012	0.0028	nd	0.012	0.0028	**0.0074**	0	
Magnesium	90.1	56.5	56.7	90.1	56.5	**68**		
Manganese	0.319	0.0965	0.203	0.319	0.0965	**0.2062**		0.05
Mercury	nd	nd	nd				0.002	
Molybdenum	0.0257	0.0131	0.0046	0.0257	0.0046	**0.0145**		
Nickel	0.0529	0.0162	0.0074	0.0529	0.0074	**0.0255**		
Potassium	12.4	8.6	5.3	12.4	5.3	**8.8**		
Phosporous	0.5	nd	nd	0.5	0.5	**0.5**		
Selenium	0.0055	0.004	0.0015	0.0055	0.0015	**0.0037**	0.05	
Silver	nd	nd	nd					0.1
Thallium	0.002	0.0012	nd	0.002	0.0012	**0.0016**	0.0005	
Vanadium	0.0141	0.0022	0.0008	0.0141	0.0008	**0.0057**		
Zinc	0.05	0.14	0.02	0.14	0.02	**0.07**		5
sodium	88.4	69.4	74.2	88.4	69.4	**77**		
chloride	79	70	69	79	69	**73**		
Cation sum	20.06	12.68	13.37	20.06	12.68	**15.37**		
Anion Sum	12.37	11.4	12.24	12.37	11.4	**12.00**		
Cation-Anion Balance	23.69	5.35	4.4	23.69	4.4	**11.15**		

Table 7.9H Groundwater Quality Parameter Results Summary

MW-13								
Water Quality Parameters	**8/8/2014**	**9/5/2014**	**11/5/2014**	**MAX**	**MIN**	**AVG**	**Limit for Drinking Water**	**Secondary Standards**
Acidity	nd	nd	nd					
Ammonia as N	nd	nd	nd					
Total Alkalinity as CaCO3	133	151	149	151	133	**144**		
Bicarbonate as HCO3	162	184	181	184	162	**176**		
Carbonate as CaCO3	nd	nd	nd					
Total Hardness as CaCO3	839	1330	1130	1330	839	**1100**		
Hydroxide	nd	nd	nd					
Nitrate and and Nitrite	nd	nd	nd				1	
Sulfate	680	1000	930	1000	680	**870**		250
Total suspended Solids	46	43	13	46	13	**34**		
Total dissolved Solids	1730	2180	1980	2180	1730	**1963**		500
pH	7.6	7.4	7.4	7.6	7.4	**7.5**		6.5-8.5
color	nt	nt	nt					
corrosivity	nt	nt	nt					
Odor	nt	nt	nt					
Specific Conductivity	2250	3100	3010	3100	2250	**2787**		
Aluminum	0.7	0.4	0.1	0.7	0.1	**0.4**		.05 -.2
Antimony	nd	nd	nd				0.006	
Arsenic	nd	0.0026	0.002	0.0026	0.002	**0.0023**	none	
Barium	0.074	0.086	0.081	0.086	0.074	**0.080**	2	
Beryllium	nd	nd	nd				0.004	
Boron	0.2	0.21	0.21	0.21	0.2	**0.21**		
Cadmium	nd	nd	nd				0.005	
Calcium	191	306	258	306	191	**252**		
Chromium	nd	0.0006	0.0007	0.0007	0.0006	**0.00065**	0.01	
Cobalt	nd	0.0009	0.0009	0.0009	0.0009	**0.0009**		
Copper	nd	0.0121	0.0047	0.0121	0.0047	**0.0084**	1.3	1
Fluoride	0.4	0.4	0.4	0.4	0.4	**0.4**	4	2
Iron	0.35	0.43	0.33	0.43	0.33	**0.37**		0.3
Lead	0.0052	nd	nd	0.0052	0.0052	**0.0052**	0	
Magnesium	88	136	119	136	88	**114**		
Manganese	0.0935	0.128	0.141	0.141	0.0935	**0.1208**		0.05
Mercury	nd	nd	nd				0.002	
Molybdenum	nd	0.0012	0.0012	0.0012	0.0012	**0.0012**		
Nickel	0.273	0.016	0.0097	0.273	0.0097	**0.0996**		
Potassium	2.3	2.4	2.3	2.4	2.3	**2.3**		
Phosporous	nd	nd	nd					
Selenium	0.0061	0.0069	0.0045	0.0069	0.0045	**0.0058**	0.05	
Silver	nd	0.001	nd	0.001	0.001	**0.001**		0.1
Thallium	nd	nd	nd				0.0005	
Vanadium	nd	nd	0.0005	0.0005	0.0005	**0.0005**		
Zinc	nd	nd	nd					5
sodium	197	235	229	235	197	**220**		
chloride	370	540	490	540	370	**467**		
Cation sum	25.4	36.74	32.69	36.74	25.4	**31.61**		
Anion Sum	27.25	39.07	36.15	39.07	27.25	**34.16**		
Cation-Anion Balance	-3.51	-3.06	-5.03	-3.06	-5.03	**-3.87**		

8.0 Groundwater Discharge Control Plan

8.1 Release Mechanisms

Based on the evaluations conducted, the potential release mechanisms for fluids to groundwater include:

- Incidental precipitation exposure
- Seepage from tailings area, collection and settling ponds
- Storm runoff
- Material failure release

Even with these concerns, the water quality of the materials and water used in the process has been determined to be non-toxic and non-hazardous.

8.1.1 Incidental Precipitation Exposure

The waste rock, low-grade ore and ore stockpiles will be exposed to precipitation and weathering. Due to the limited precipitation that occurs in the Permit Boundary, annual precipitation ranges from 10 to 16 inches per year, the volume of water that would be exposed to the stockpiles is quite limited. Further, the ore for the alunite deposit is exposed at the surface over most of the Area 1 and Area 2 mining areas. If there were any impact to water quality in the area, there would be evidence reflected in the results of the baseline/backgroundwater sampling results. As discussed in the Part B, Section 7 "Hydrogeology", other than the elevated TDS values for the springs and seeps and other groundwater samples, no significant water quality concerns were identified.

8.1.2 Seepage from Tailings Area, Collection and Settling Ponds

Based on the planned processing plant throughput, the tailings stream will require a steady state flow rate estimated at 3,030gal/min of tailings/water outflow to the tailings area. The drainage from the tails flowing through the tailings area to the collection and settlement ponds will be the difference of the inflow minus the water held in the tails, the seepage loss, and the evaporation loss. A worst case maximum of 650gal/min was estimated to be lost prior to recycling about 2,300gal/min. This loss is through a combination of retention, evaporation, and infiltration/seepage. Based on the gradation of the materials, it is estimated about 10% of the water will be initially held in the tails. Over time this volume will be further reduced to 5% as gravity drainage occurs. Thus, it is estimated that about 200gpm will be held log-term in the tails.

The evaporation loss will be quite variable and is likely to be quite high, due to the wind and heat for the area, during the summer months, though it only affects the upper 3-4ft of the tailings fill. During the winter period, the evaporation loss will be considerably lower. The evaporation loss is estimated to be about 400 to 450 gpm from the active tailings placement zone and from the surface of standing water in the collection and settling ponds.

The infiltration/seepage loss will also be variable based on the area that is saturated and duration of exposure. As discussed above, the likely area of seepage would be from under the collection and settling ponds which is the only location that water is stored. The other portions of the tailings area will not have a constant supply of water or would only be wet for short periods and therefore, were not considered significant sources of potential discharge. Further, due to the low permeability of the underlying bedrock, this loss is also likely to be very limited. An estimate of the seepage loss was determined, using McWhorter and Nelson (1974) method for estimating seepage from under tailings ponds. Appendix A presents the assumptions and study of the seepage loss. Based on this seepage modeling, infiltration/seepage was estimated to have a maximum 10 gal/min loss from the collection and settling pond areas. Initially, this loss will be in the vertical direction as operation commence and will be controlled by the free-surface seepage of water from the ponds. The longer the ponds operate this seepage rate will drop due to fines build up and the strata underlying the ponds becoming wet/saturated. The seepage rate will then be driven by the slower lateral movement of the water mound from under the collection and settling ponds.

8.1.3 Storm Runoff

Heavy rainstorms and flash flooding events have the potential to produce significant flows. In the event of one of these storms, overflow from the sediment, collection, and settlement ponds is possible. However, the sediment ponds are designed to hold enough water that a 10-year event will not overflow and the collection and settlement ponds will hold the 100-year storm event without overflow (Appendix B-Drainage Control). For larger than design events, an emergency spillway is provided to ensure that the structures are protected and the storm flows can be released in a controlled fashion.

In addition, an emergency spillway that is capable of conveying the peak flow during the Probable Maximum Flood storm event with at least 3-feet of freeboard has been included in the dam design. In the event of a larger than design storm, major precipitation events in the western desert area of Utah are typically short-lived. This means that in the exceedingly rare event of a pond overflow, the overflow event would also be short-lived, limiting the total volume released. Finally, even if there is a pond overflow, the actual volume of overflow water that becomes groundwater discharge would be limited due to both the limited infiltration/seepage through the natural earthen liner and the drainage of flow down channel.

8.1.4 Material Failure Release

The tailings system outflow will utilize approximately 3,030gal/min of water. In the event of a complete material breach, the maximum volume of water lost from such an occurrence would be 3,030gal/min. It should be pointed out that even if such a failure occurred, the materials and water from such a breach would still be contained by the tailings area structures. It would just result in some deposition in an unintended area.

In addition, as stated previously, due to the nature of the subsurface material, infiltration/seepage resulting in actual groundwater discharge would be very minor. Additionally, the volume of tailings water discharged in such an event would realistically be highly variable, as a function of the size of the leak/break and the duration in which the leakage occurred. It is not something that would be allowed to continue for an extended period, but would be repaired in a reasonable timeframe.

8.2 Description of Groundwater Control Methods

Given the background water quality for the groundwater in the area of the site, the water quality class is determined to be Class II. This characterization is based on failure to consistently meet standards for sulfate, TDS, iron, manganese concentrations for sites surrounding the facilities and tailings area.

Table 8.1 Select Average Groundwater Parameters in Tailings and Facilities Area

Well ID	TDS (mg/l)	Sulfate (mg/l)	Iron (mg/l)	Manganese (mg/l)
MW-3	1,033	213	3.90	0.39
MW-4	1,288	624	1.01	0.17
MW-6	2,563	1396	1.62	2.83
MW-9	2,727	1230	0.15	0.35

While there are no significant metals or acid or toxic concerns, the waters are of marginal quality. Also the flow rates are very limited.

Given the areas of concern listed above in Section 8.1, the only issue that is not readily addressed is the function of the seepage from the tailings area. Except for seepage, there would be no other potential mechanism for water to discharge to the groundwater system. The seepage from the collection and settlement ponds is also estimated to be a minor flow (less than 10gpm), but is a relatively significantly greater volume than the other potential sources.

Based on these conclusions, only tailings water from the alunite ore processing operation should be considered as a potential discharge.

The tailings area is located mainly over the outcrop of the Blawn Formation and Lund and Wah Wah Springs Tuffs of the Needles Group, a series of formations with generally low permeability which contains sulfates and other soluble salts.

Tailings water from the ore processing will have better quality than existing groundwater in the tuff/clays. Because of the limited flow capacity characteristics of the subsurface materials, and because of the limited size of the collection and settlement ponds, it is UAC opinion that a man-made lining is not warranted.

UAC proposes to utilize an earthen containment structure as the control method to ensure that these issues are minimized. As shown on Figures 2 and 3, the tailings area is located downstream of the facilities area. A set of collection/settlement dams will be constructed across the drainage to impound water draining from the deposited tailings. These structures will act as a containment structures for any potential discharges. Also, the naturally occurring tuff/clay underlying the tailings area will minimize any infiltration/seepage. As shown in Appendix A, the volcanic tuff/clay will act as an aquiclude inhibiting movement of water to the underlying horizons in the Permit Boundary.

Figures 4 and 5 present cross-sections and profiles of the containment dams. During the construction of the dams, the alluvial/colluvial fill under the dam footprint will be excavated down to the underlying bedrock. These excavations will shape the underlying bedrock to ensure that a competent contact for the dam fills will be achieved. The dam structures will have a compacted clay core minimizing the movement of water through the dams. The clay cores will extend vertically to a point above the designed standing water level in the pool behind the dam.

To aid in the seal to contain and water, these clay cores will be keyed a minimum of 6 feet into the underlying tuff/clay layer. The width of the keyway will be at least 10 feet in width along the entire length of the clay core. The keyway will be sloped outward at a 2H:1V slope along the edges of the keyway. The clay core will extend over the clay/tuff bedrock outside of the keyway to provide a firm foundation for the placement of the clay. The clay will be placed in controlled lifts and buttressed on the outer edge with granular fill during the building of the dam.

The exterior slopes of the dam will be covered with between 2 and 3 feet of rock to protect the dam structure. The rock will be run-of-mine waste rock which will be sized as needed for the dam. Additionally, the rock cover will provide erosion protection on both the inslope and outslope from rilling and gullying due to precipitation runoff. On the inslope, it will also protect against wave action from the standing water in the ponds.

The ponds created by these dams will hold the water collected from the tailings drainage for settlement and reclaim to the tailings circuit. The dams will work in series. The collection dam will divert all downstream flows within the drainage and create a standing pool. This initial pool will allow the coarse tailings materials to be deposited. An overflow decant riser will be installed along with a pipe over the dam that will transport the collected waters and convey them to the second pond in the series, the settlement pond. This pond will allow the water to stand for a period to allow the finer materials to be deposited. After a settlement time, the water will be reclaimed and pumped via a metal pipe to the tailings circuit to hydrate the tailings materials released from the process plant. If any excess tailings reclaim water occurs, this water will be pumped to the process water tank and used as make-up water for the grinding and leaching circuits.

9.0 Compliance Monitoring Plan

Based on the seepage modeling conducted, seepage from under the ponds will be extremely limited. If the seepage is on the order of the 10 gpm estimated, then the flux of water flow through the tuff/clay layer will be extremely slow. Water quality of the tailings water is projected to be cleaner than the naturally occurring groundwater based on the results of the Materials Characterization Study and the data collected from the surface and groundwater monitoring programs.

The seepage calculations indicate that the seepage front will take over 2 years to reach the estimated depth to the underlying water zone. Then it will take a longer time to build a mound that would reach the bottom of the pond/clay interface. After this occurs, there would be time required for enough head to build up for the seepage flow to push the water in the mound out from under the ponds. Assuming that the seepage can build a mound in 5 to 7 years, it would be 7 to 9 years before the mound starts moving laterally away from under the ponds. Based on the average linear velocity of the strata, the time for water to move down a 10% gradient a distance of 200 feet with the porosity of 0.40 and a hydraulic conductivity of 0.00165 ft/day would take over 1,000 years.

As part of the operational requirements, UAC will test the re-use water quality in the collection and seepage ponds to confirm that it meets processing and operating requirements. Background monitoring of the existing wells will be continued per DOGM requirements.

9.1 Target Monitoring Limits

The mountain block uppermost aquifer has a background TDS value of approximately 1,900 mg/l, based on the average of wells MW-3, MW-4, MW-6, and MW-9. Re-use water quality from the tailings circuit will target 2,400 mg/l (1.25 times 1,900) TDS as an operating water quality limit for the tailings circuit. However, depending on the particular constituents of the water, higher TDS concentrations may be acceptable for use in the process.

10.0 Reclamation and Closure Evaluation

Following the completion of mining and processing activities, the operation will be reclaimed per the requirements of DOGM. The post reclamation configuration of the tailings facility is shown on the reclamation map (Figure 6). The top of the tailings will slope gently toward the downstream edge and the outslope of the tailings will be graded at a minimum slope of 3H:1V.

Once the site is determined reclaimed and sediment control is no longer required, the collection and settlement pond dams will be removed and the materials used to fill in the pond areas and the topography configured in a free draining configuration.

Based on the free-draining nature of the tailings material, it is likely, that by the time the reclamation is determined complete, the major portion of the gravity drainage of water held in the tails will be complete. Thus, the drainage of excess tailings water will have reduced to a minimal flow.

Based on the seepage modeling, the seepage water released from the ponds will have moved a minimal distance and will not be a significant concern due to the slightly better water quality of the seepage water than the natural groundwater.

11.0 Contingency and Corrective Action Plan

In the event that compliance monitoring identifies exceedences of tailings water above the upper limits of the target parameter, UAC will work with the DWQ to develop a corrective action plan for the issue identified. Initially, the focus of the efforts is identification of how the exceedence is occurring and what steps can be taken to correct the issue. A program will then be prepared to control and correct the problem.

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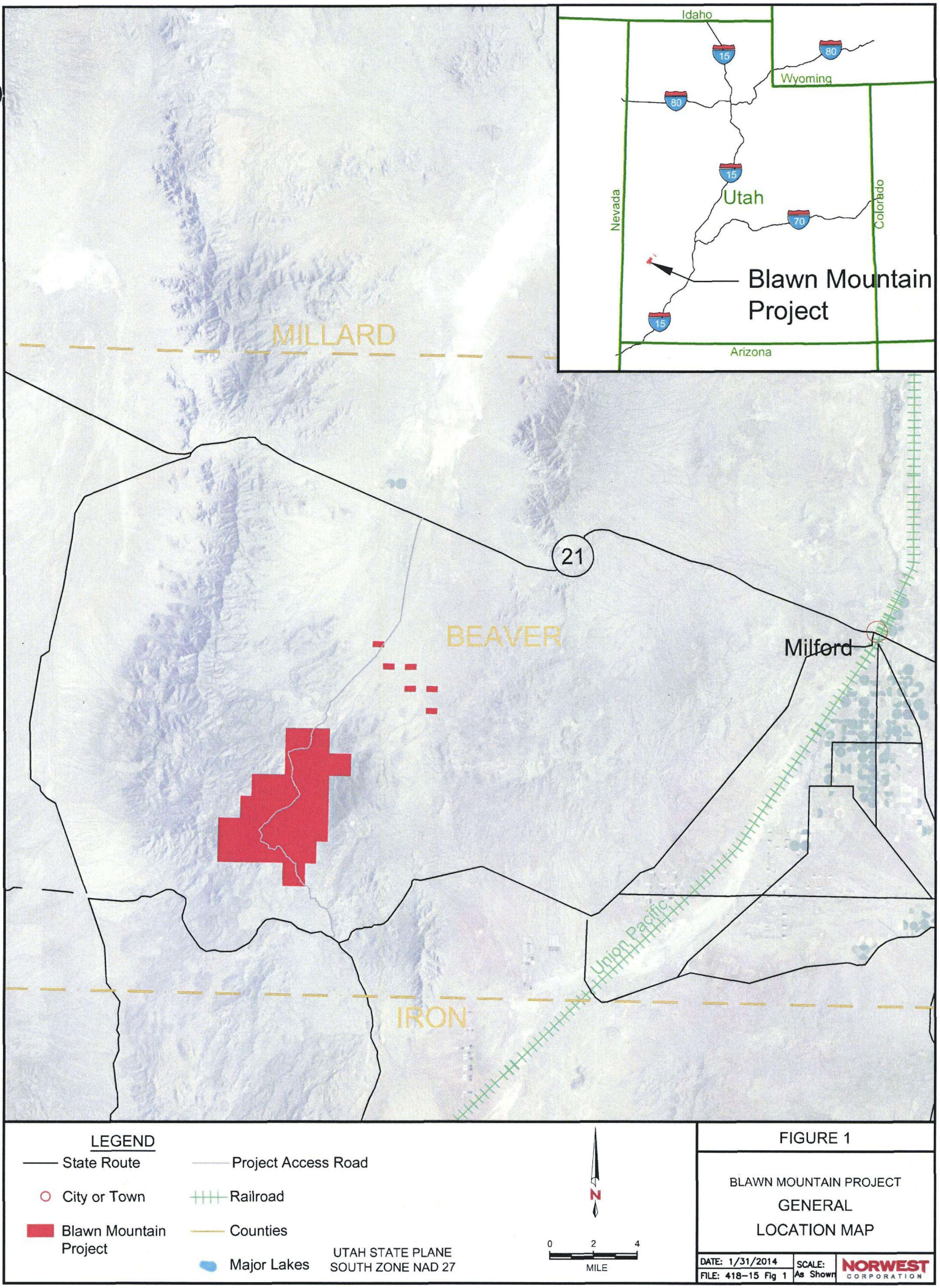


FIGURE 1

BLAWN MOUNTAIN PROJECT
GENERAL
LOCATION MAP

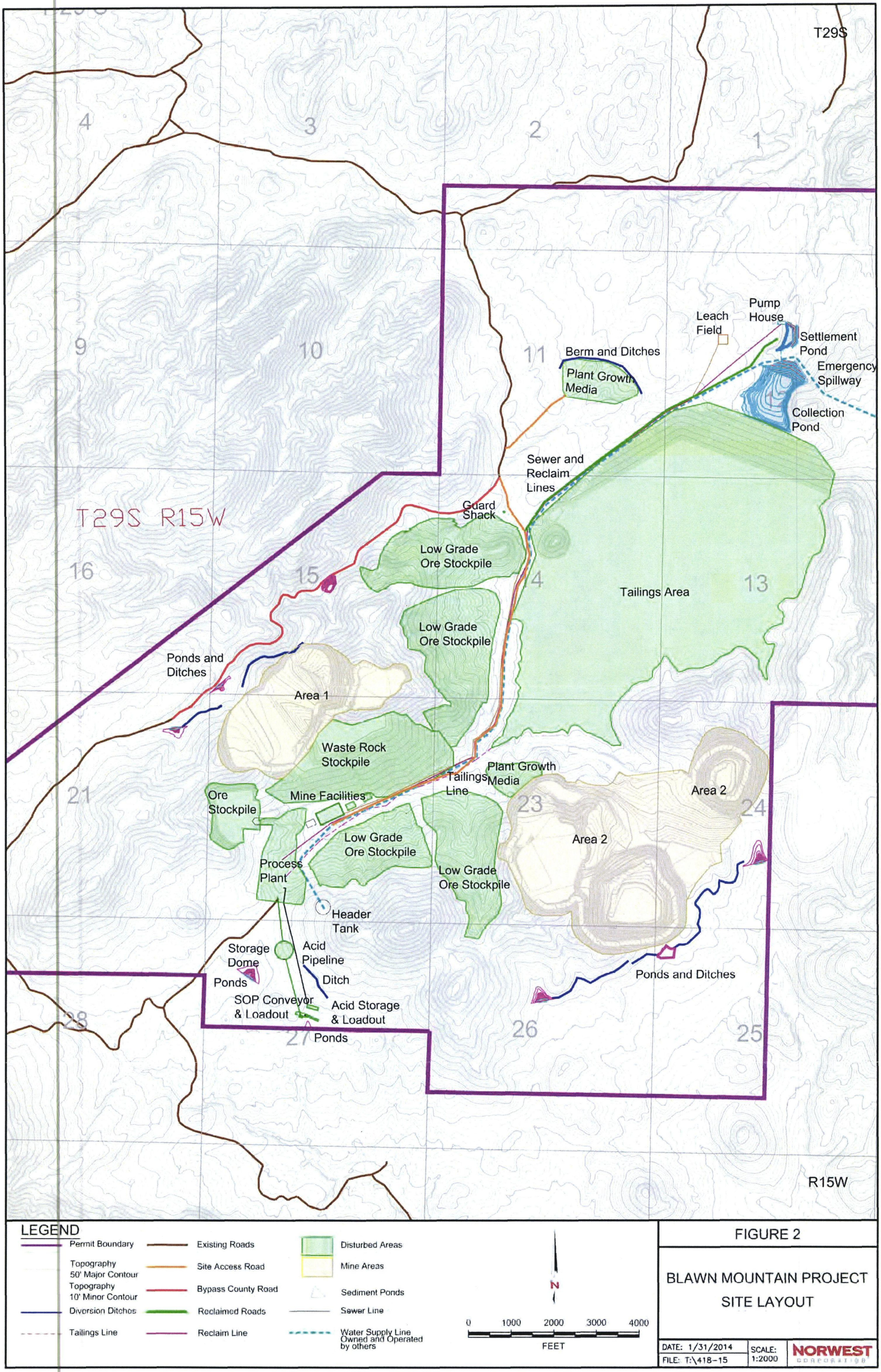


FIGURE 2

BLAWN MOUNTAIN PROJECT
SITE LAYOUT

DATE: 1/31/2014
FILE: T:\418-15
SCALE: 1:2000
NORWEST CORPORATION

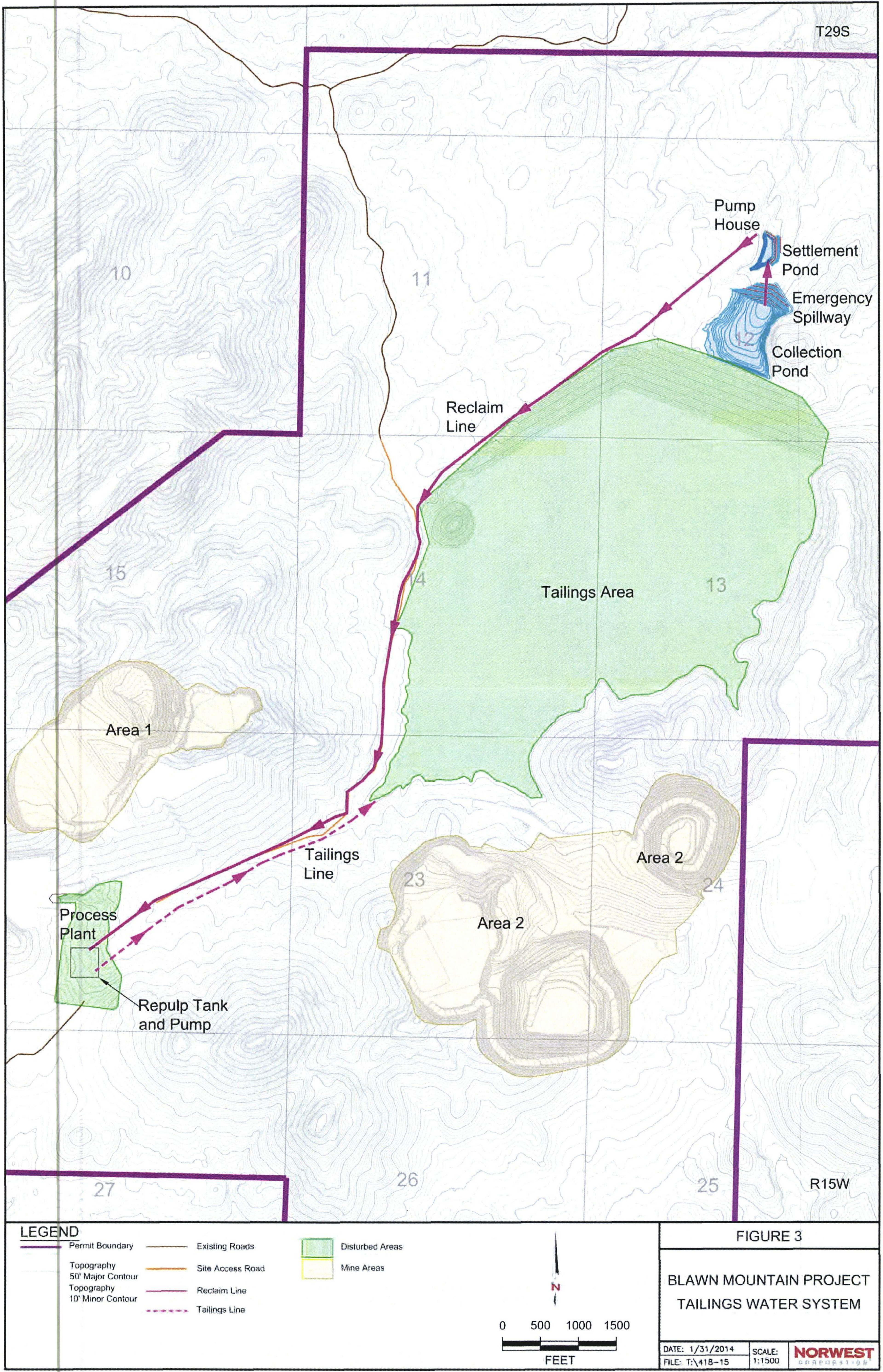


FIGURE 3

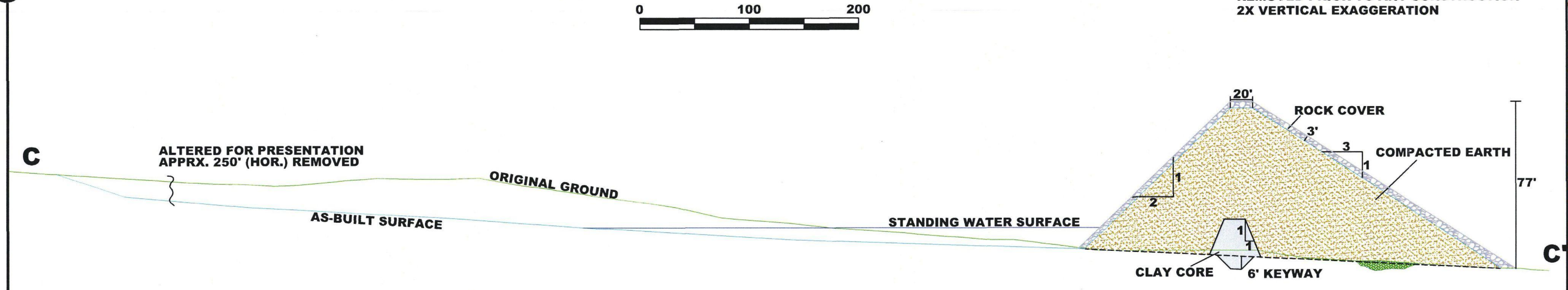
BLAWN MOUNTAIN PROJECT
TAILINGS WATER SYSTEM

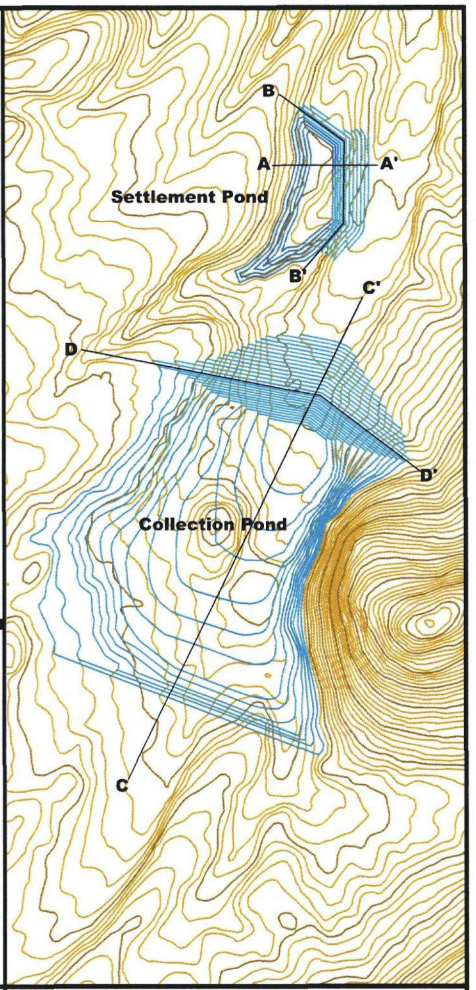
DATE: 1/31/2014
FILE: T:\418-15
SCALE: 1:1500

SECTION C - C'
(CROSS-SECTION OF DAM)

NOTES:

NATURAL GROUND EXCAVATED TO CONSTRUCT EMBANKMENT
ALL VEGETATION AND ORGANIC MATTER REMOVED PRIOR TO ANY CONSTRUCTION
2X VERTICAL EXAGGERATION

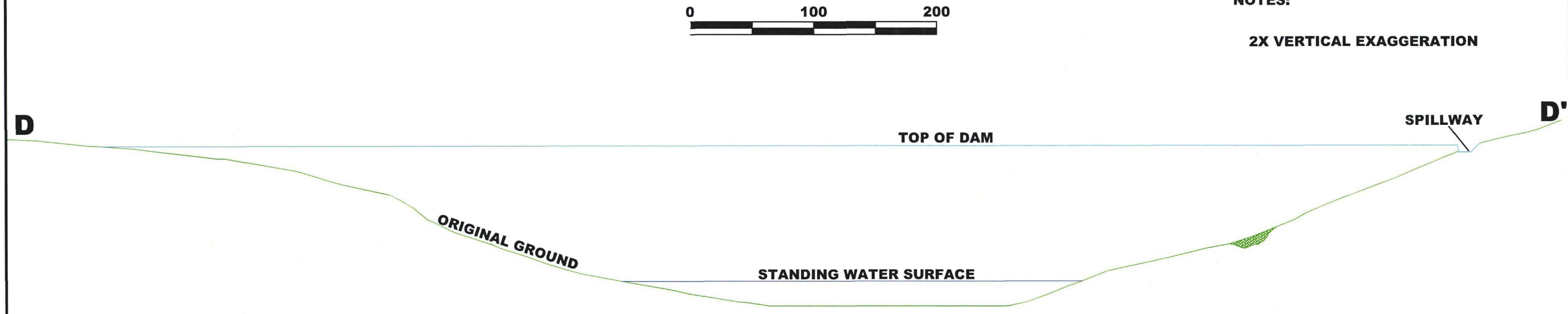




SECTION D - D'
(PROFILE OF DAM)

NOTES:

2X VERTICAL EXAGGERATION



N

SCALE: AS SHOWN

FIGURE 4

BLAWN MOUNTAIN PROJECT
COLLECTION POND
CROSS SECTIONS

DATE: 01/31/2014
PROJECT: 418-15

NORWEST
CORPORATION

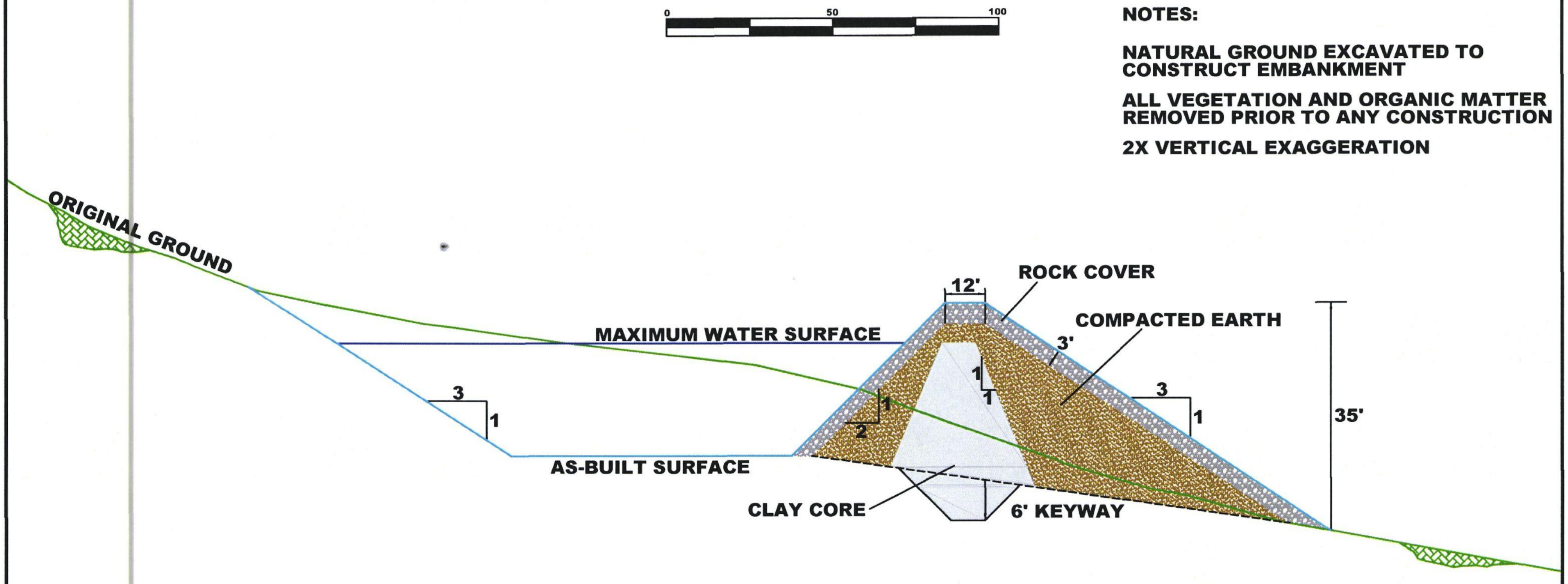
SECTION A - A'
(CROSS-SECTION OF DAM)

NOTES:

NATURAL GROUND EXCAVATED TO CONSTRUCT EMBANKMENT

ALL VEGETATION AND ORGANIC MATTER REMOVED PRIOR TO ANY CONSTRUCTION

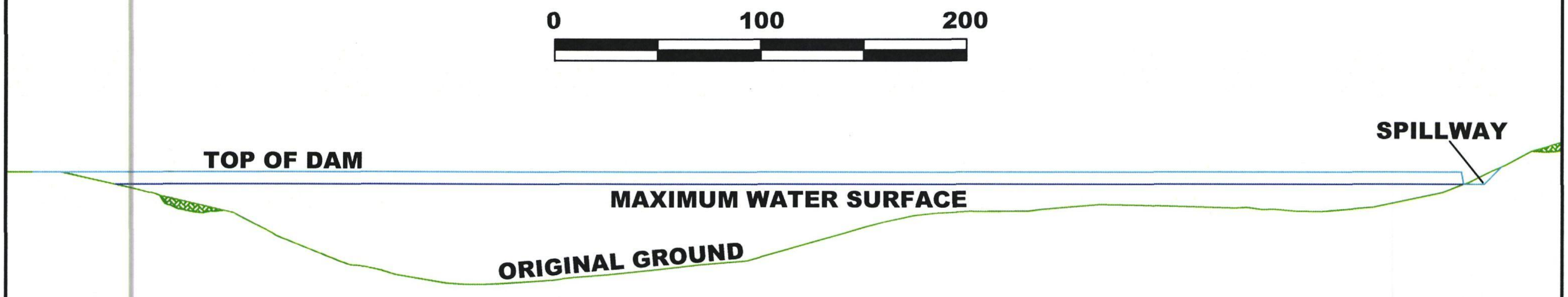
2X VERTICAL EXAGGERATION

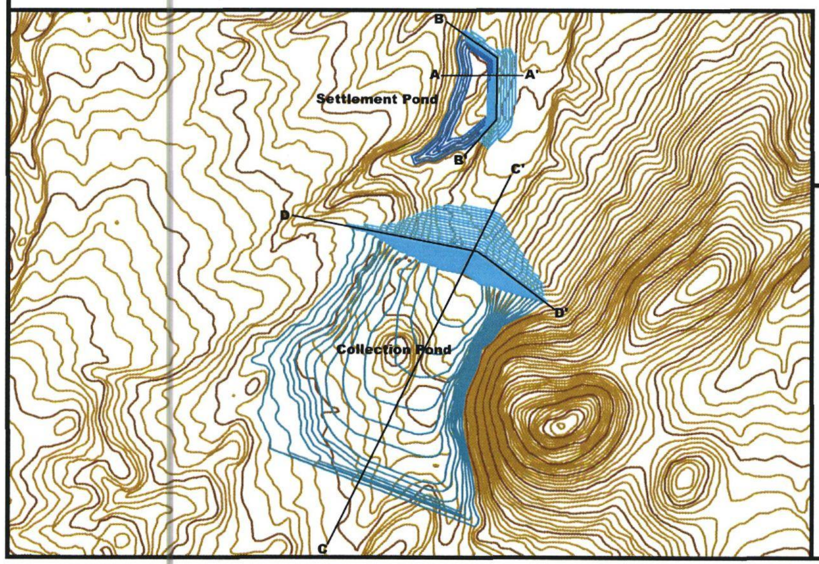


NOTES:

2X VERTICAL EXAGGERATION

SECTION B - B'
(PROFILE OF DAM)





SCALE: AS SHOWN

FIGURE 5

BLAWN MOUNTAIN PROJECT
SETTLEMENT POND
CROSS SECTIONS

DATE: 01/31/2014
PROJECT: 418-15

NORWEST CORPORATION

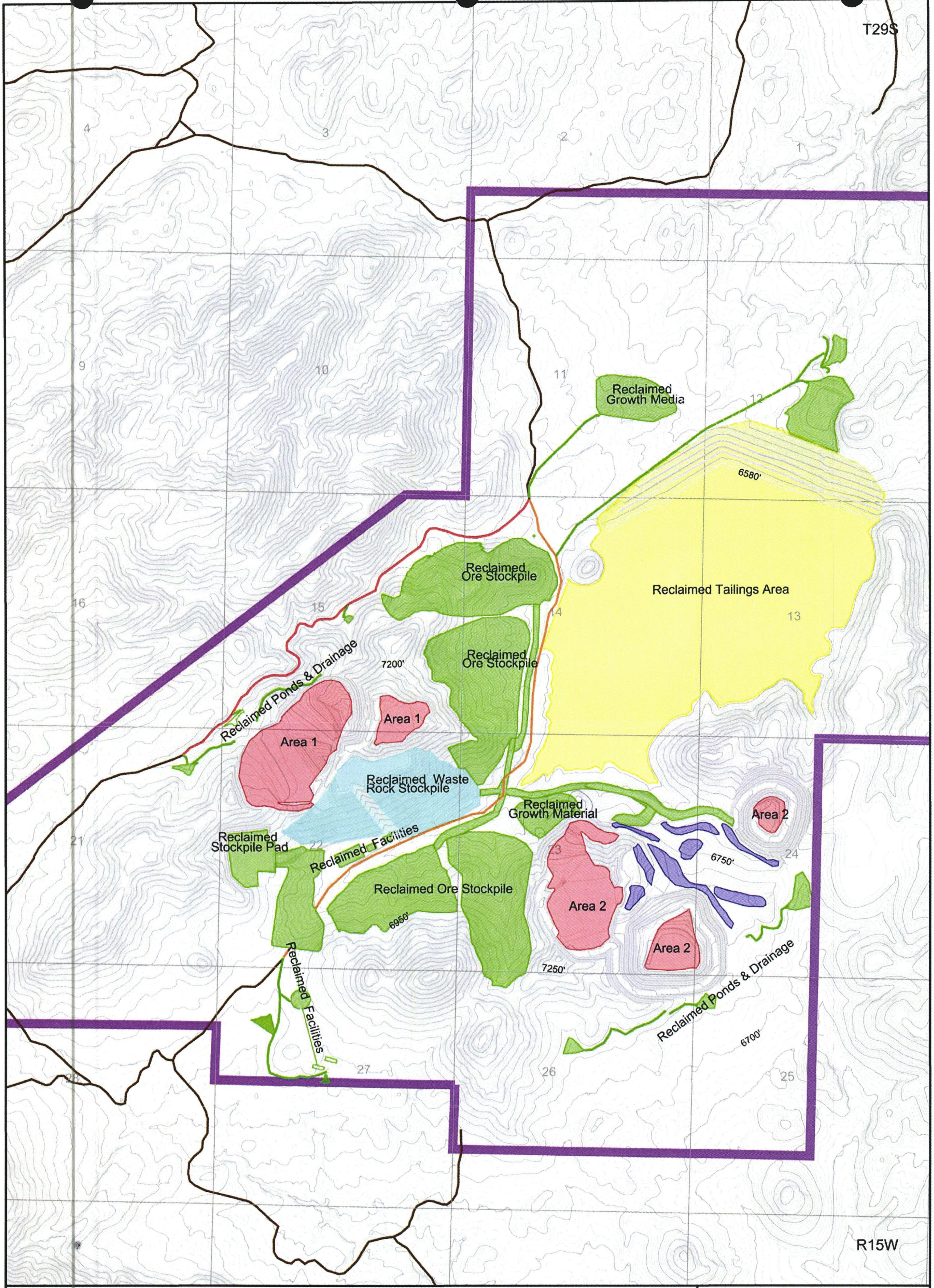


FIGURE 6

BLAWN MOUNTAIN PROJECT
RECLAMATION TREATMENT

DATE: 1/31/2014
FILE: T:\418-15
SCALE: 1:2000
NORWEST CORPORATION

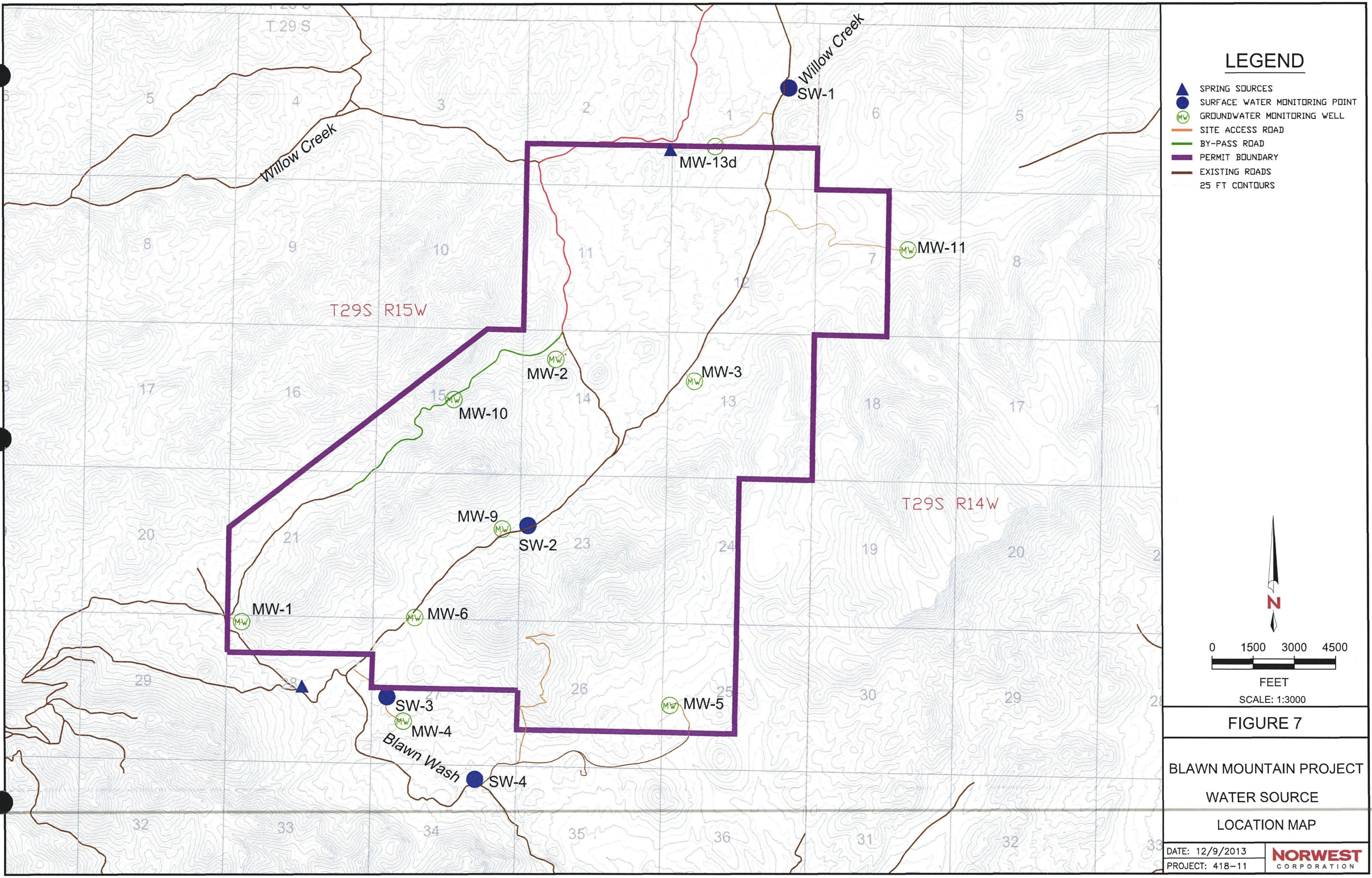


FIGURE 7

BLAWN MOUNTAIN PROJECT

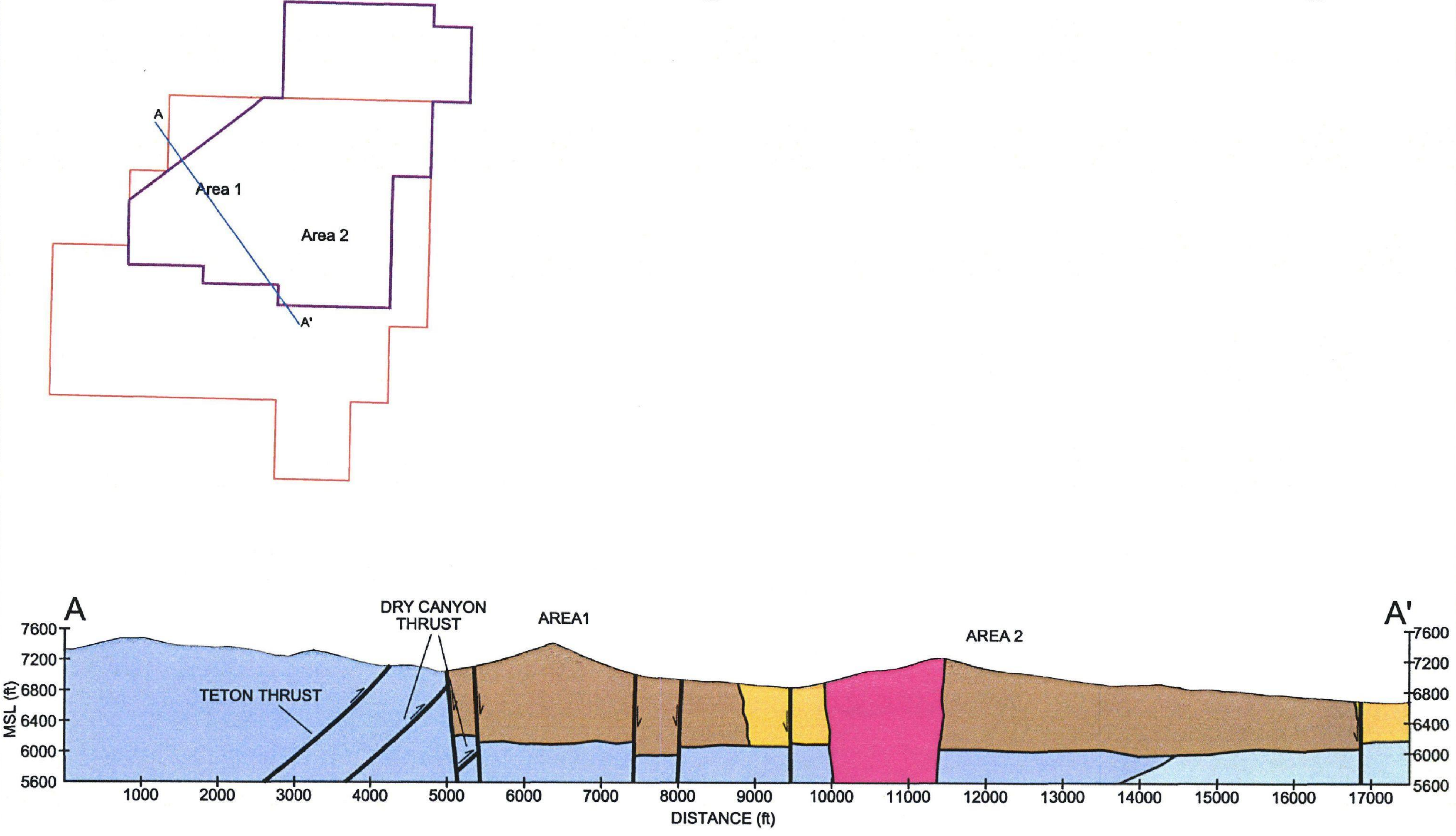
WATER SOURCE

LOCATION MAP

DATE: 12/9/2013

PROJECT: 418–11

NORWEST CORPORATION



VOLCANIC ROCKS

🟥	Trp	RHYOLITE PORPHYRY
🟫	Tva	ALTERED IGNIMBRITES
🟨	Tvu	UNDIFFERENTIATED VOLCANICS

SEDIMENTARY ROCKS

🟦	Mzu	MESOZOIC SANDSTONE AND SHALE
🟦	Pzu	PALEOZOIC CARBONATES AND QUARTZITES

FAULT - ARROW INDICATES RELATIVE DIRECTION OF MOVEMENT

CONTACT

Modified from Abbott and others (1983)

FIGURE 8

BLAWN MOUNTAIN PROJECT

THEMATIC CROSS SECTION

DATE: 02/25/2014
FILE: FIGURE–1.3REV
PROJECT: 418–14

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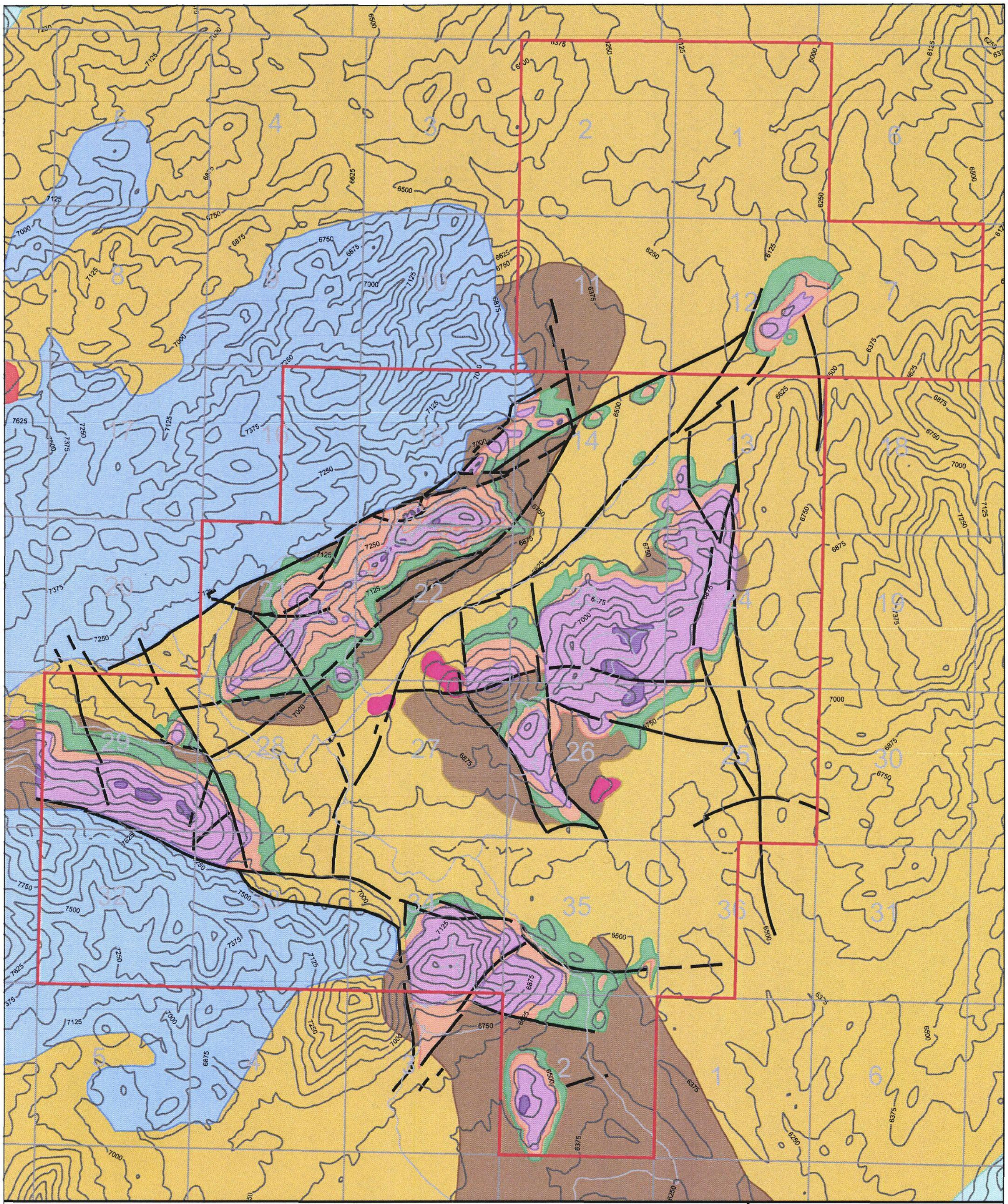
CORPORATION



LEGEND

VOLCANIC ROCKS

Trp	RHYOLITE PORPHYRY
Tva	ALTERED IGNIMBRITES
Tvu	UNDIFFERENTIATED VOLCANICS

SEDIMENTARY ROCKS

Tcg	CONGLOMERATE
Mzu	MESOZOIC SANDSTONE AND SHALE
Pzu	PALEOZOIC CARBONATES AND QUARTZITES

ROADS
LEASE BOUNDARY
NORMAL FAULTS
THRUST FAULTS

0 2000 4000 6000
FEET

FIGURE 9

UTAH ALUNITE CORPORATION
BLAWN MOUNTAIN PROJECT

GEOLOGIC MAP
WITH FAULTS

N

DATE: 1/31/2014
FILE: 418-15

SCALE:
1:55,000

NORWEST
CORPORATION

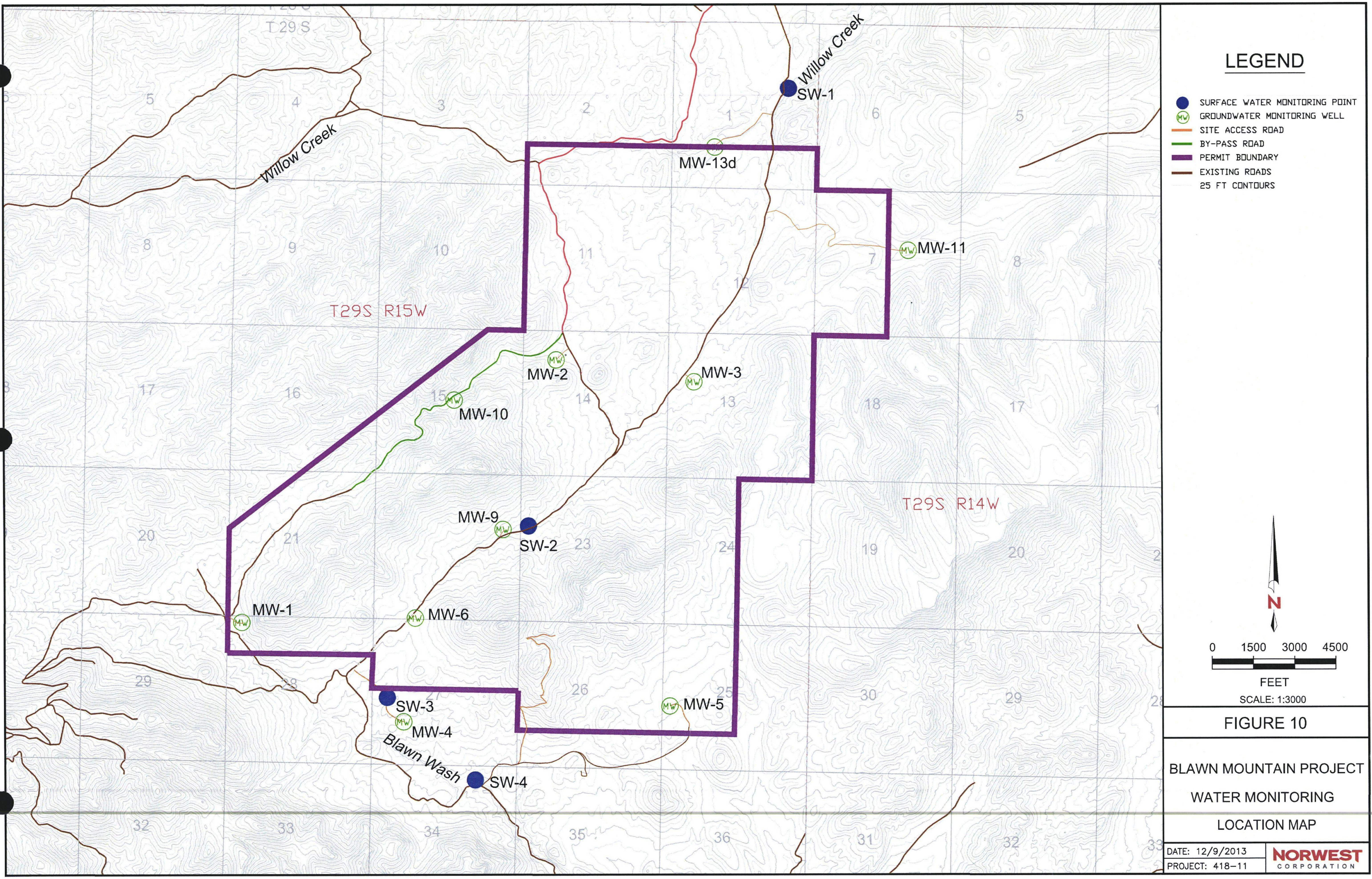


FIGURE 10

BLAWN MOUNTAIN PROJECT

WATER MONITORING

LOCATION MAP

DATE: 12/9/2013

PROJECT: 418-11

NORWEST CORPORATION

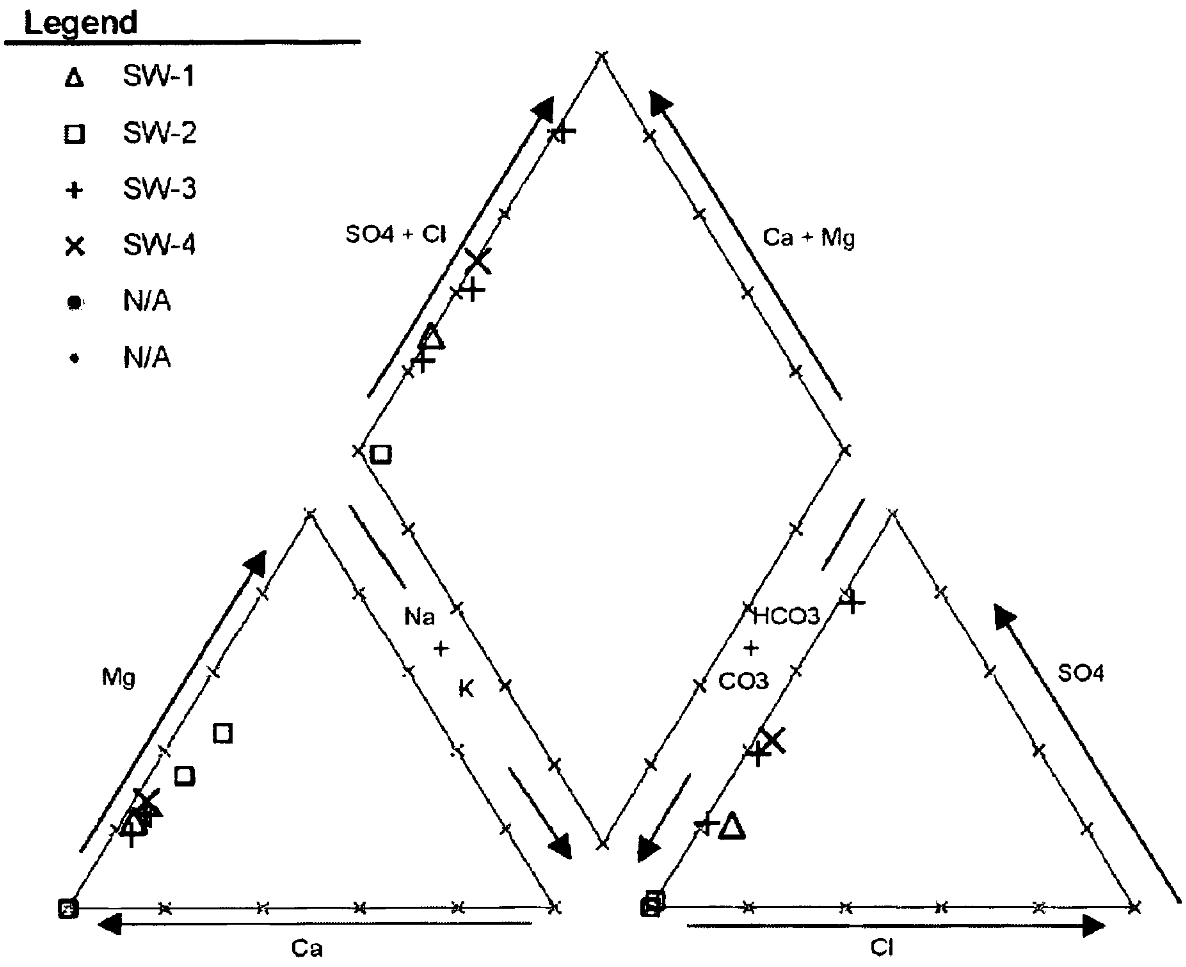
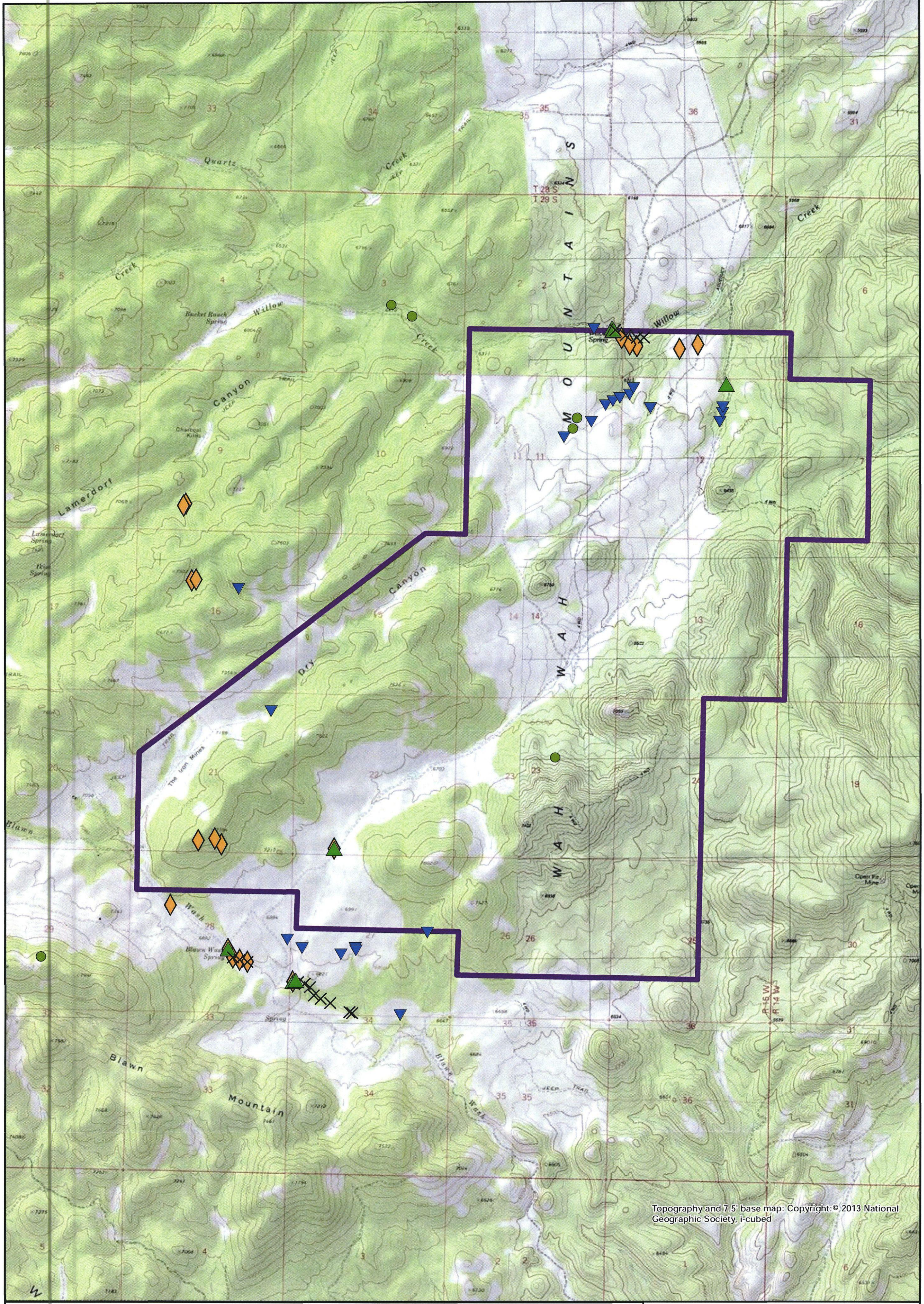


FIGURE 11

POTASH RIDGE CORPORATION
BLAWN MOUNTAIN PROJECT

SURFACE WATER
PIPER DIAGRAM PLOT

DATE: 1/31/2014
FILE: 418-15
SCALE: NA
NORWEST CORPORATION



Topography and 7.5' base map: Copyright: © 2013 National Geographic Society, i-cubed

Legend

Permit Boundary

◆ Historic Water Sources

Survey Point

- ▲ Spring
- ▼ Seep
- × Observtion Point
- ● Notable Vegetation

N

0 0.5 1 Miles

FIGURE 12

BLAWN MOUNTAIN PROJECT
SPRING AND SEEP SURVEY
APRIL-MAY 2013

Date: 1/31/2014
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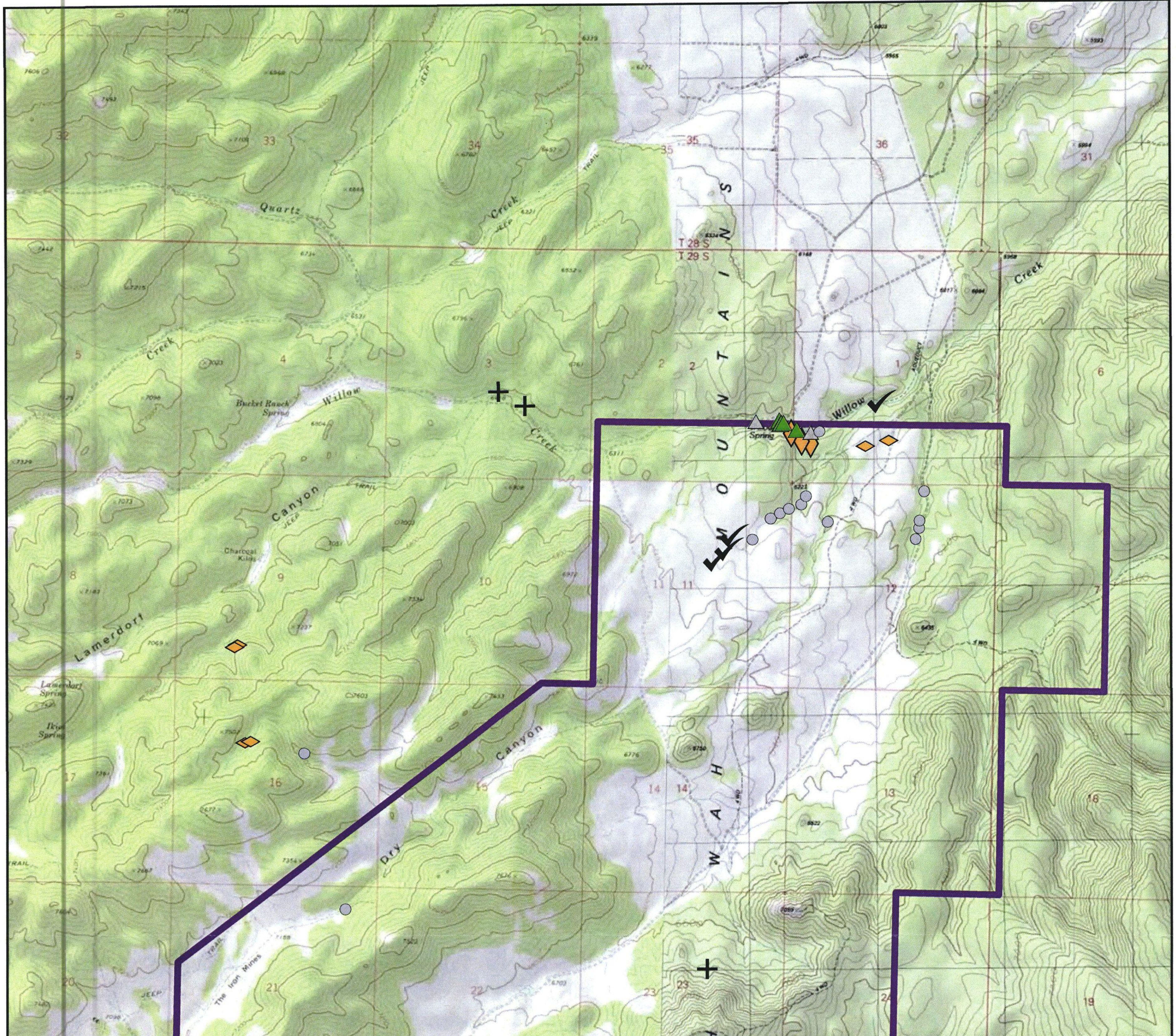
Fig 2-1_S&S_April-May2013.mxd

NORWEST
CORPORATION



Legend

Permit Boundary

Historic Water Source

- Source located
- Source not located

Survey Point

- Running Water
- Standing Pools
- Damp Area
- ✓ Dry
- \+ Did not revisit

N

0 0.5 1 Miles

FIGURE 13

BLAWN MOUNTAIN PROJECT
SPRING AND SEEP SURVEY
SEPTEMBER 2013

Date: 1/31/2014
T:\PotashRidge_S_418\418-15
Fig 15_S&S_September2013.mxd

NORWEST
CORPORATION

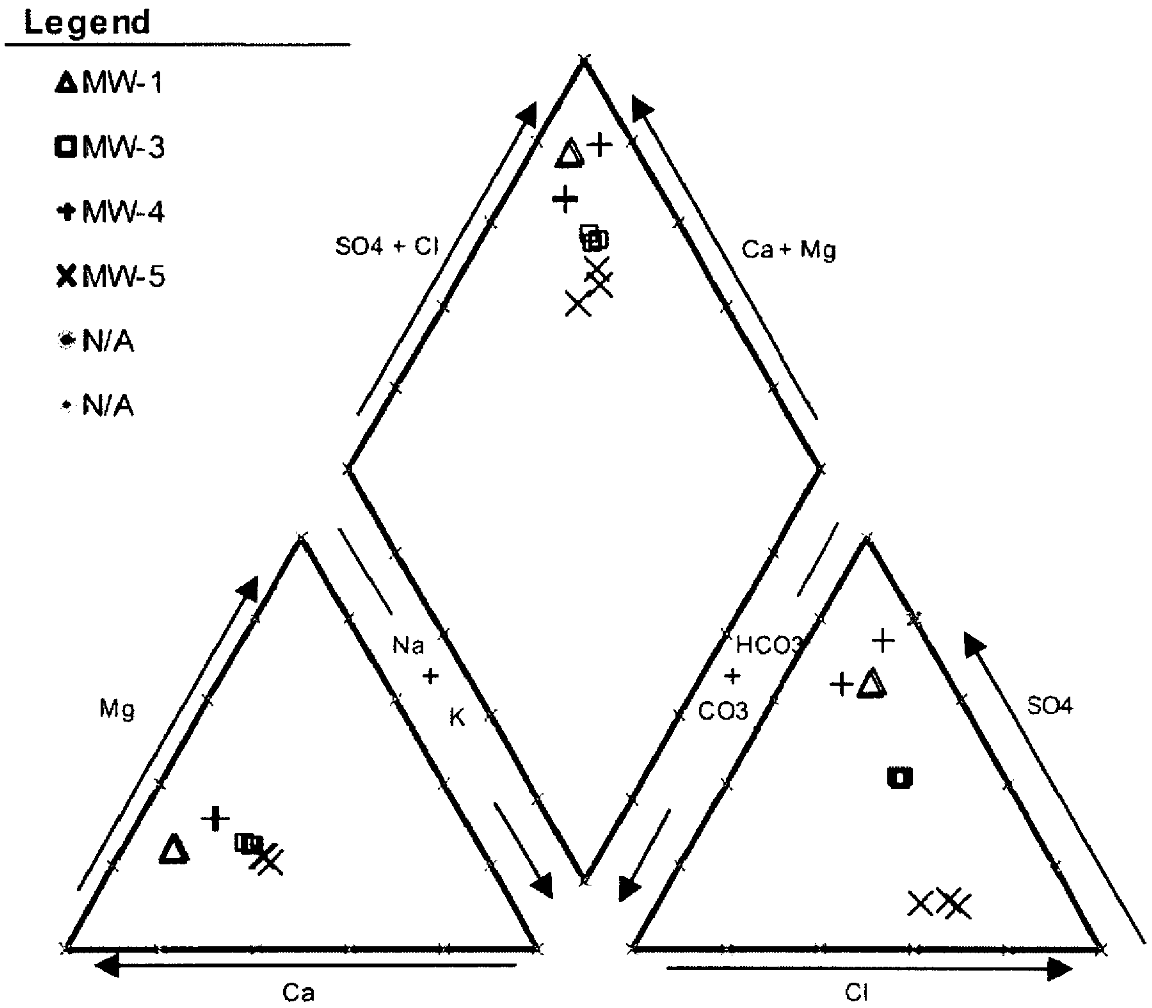


FIGURE 14

UTAH ALUNITE CORPORATION
BLAWN MOUNTAIN PROJECT

GROUNDWATER WATER
PIPER DIAGRAM PLOT

DATE: 1/31/2014	SCALE:	NORWEST CORPORATION
FILE: 418-15	NA	

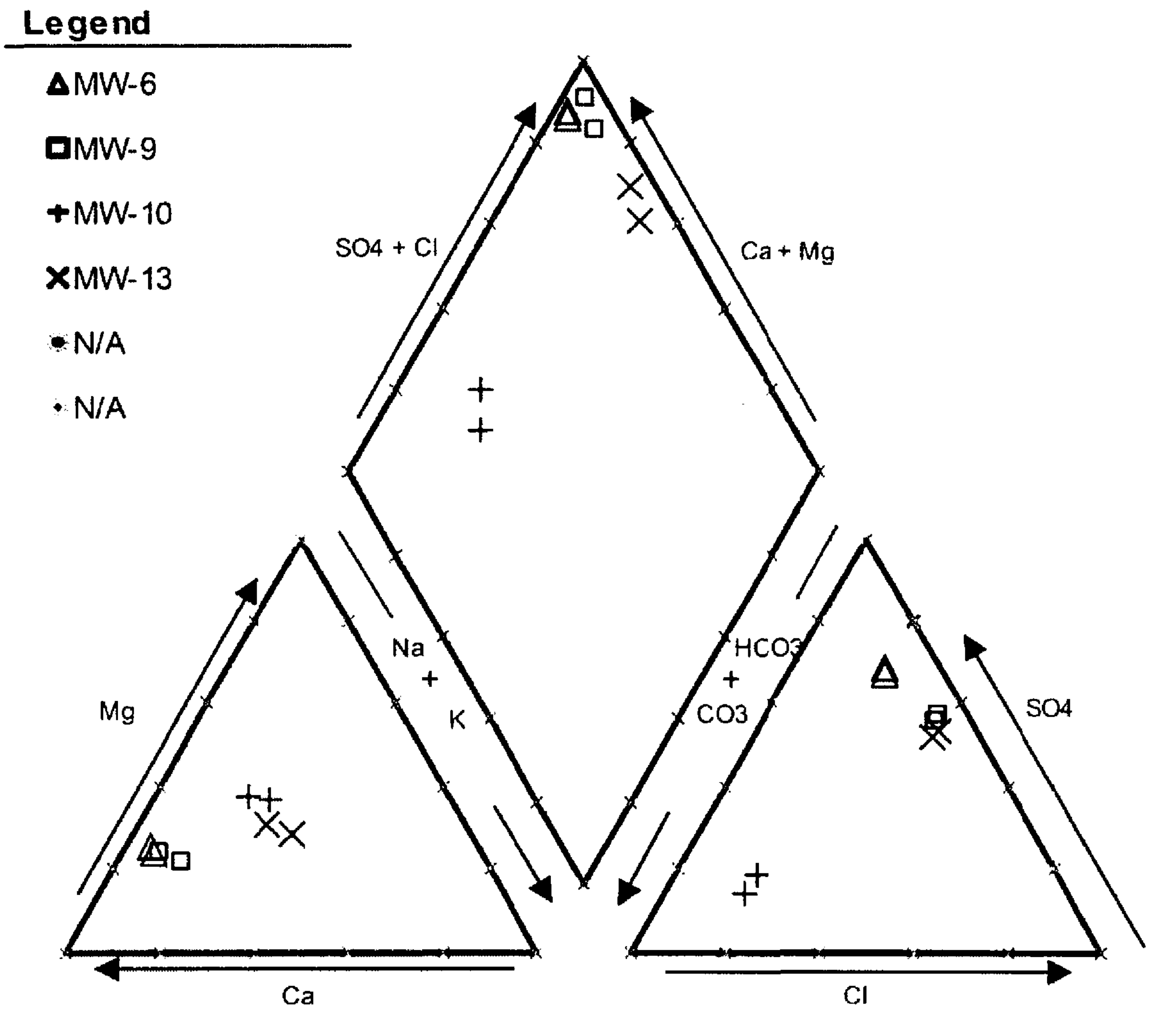


FIGURE 15

UTAH ALUNITE CORPORATION
BLAWN MOUNTAIN PROJECT

GROUNDWATER WATER
PIPER DIAGRAM PLOT

DATE: 1/31/2014
FILE: 418-15
SCALE: NA

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CORPORATION

Appendix A

Seepage Evaluation

Appendix A

Seepage Evaluation

Introduction

Norwest performed calculations to provide estimates of potential seepage rates from the tailings facility Collection and Settling Ponds. These ponds are designed to facilitate recycling of water from the tailings facility.

Conceptual Seepage Model

Conceptual pond seepage models have been developed for each pond based on the available site hydrogeologic information and plans for the two pond sites. The two ponds will be located down gradient of the tailings deposition area as shown in Figure 3 in the permit. The pond sites are underlain by alluvium. The Collection Pond will be established by construction of a clay core embankment across the ephemeral stream channel as shown in Figure 3. Topsoil, alluvium and clay embankment will be excavated from the embankment and pond areas. Some of the alluvium will remain within the pond area but not within the embankment area. The settling pond will be established on a small tributary adjacent to the ephemeral stream channel. The required capacity for this pond will be developed by both excavation and embankment construction as shown in Figure 3.

The conceptual model incorporates the major factors controlling the rate of seepage from the ponds. The seepage at the pond sites is governed by geology (structure and hydraulic properties), pond dimensions, deposits of sediment at the base of the ponds, and the expected operating heads or water elevations in the ponds (Figure 1). The depth of water in the Collection Pond is expected to average 10 feet during normal operations. The surface area of Collection Pond at this depth is approximately 4.9 acres. The depth of water in the Settling Pond is expected to average 15 feet during normal operations. The surface area of the Settling Pond at this depth is approximately 1.9 acres. Pond sediment is assumed to include 5 feet of fine sand over a 1-foot thick layer of fine/silt sediment (Figure 1). These thicknesses will vary depending on the actual amount of sediment retained in the ponds and the maintenance schedules.

The geologic and hydrologic properties at each site are based on the drilling log for monitoring well MW-3, which is located within the tailings area up valley from the Collection Pond and Settling Pond as shown in Map 1. Both ponds will be constructed by excavating into or through the alluvium. The alluvial layer thickness varies at the site from zero to at least 25 feet. The conceptual model assumes that 10 feet of alluvium remains below the base of each pond. A tuff/clay with a thickness of approximately 50-feet exists below the alluvium from 25 to 75 feet below original ground surface. Monitoring well MW-3 is completed in the rhyolite and limestone below the tuff/clay, and the water level in this well is approximately 58 feet beneath the ground surface or 33 feet below the base of the alluvium. No water was identified in the tuff/clay while drilling, but the depth to the water table is assumed to be 58 feet based on water in tuff/clay at equilibrium with the water in the underlying rhyolite. The conceptual seepage model assumes one-dimensional vertical flow from the pond through the pond sediments, alluvium, and tuff/clay to the water table.

Analytical Model Summary

An analytical method for estimating vertical seepage rates from tailings ponds was developed by McWhorter and Nelson (1979). This analytical method was developed to estimate seepage rates when the floor of the pond is several meters or more above the water table or above an impervious layer. The method relies on technologies from soil physics for analysis of one-dimensional flow through partially saturated porous media. This method describes the following three stages for pond seepage and develops engineering solutions for estimating seepage during the first two stages:

1. Stage 1 occurs when the wetting front moves downward through the underlying strata to the water table.
2. Stage 2 begins when the wetting front reaches the water table and a groundwater mound starts to build up towards the pond.
3. Stage 3 begins when the groundwater mound reaches the base of the pond and the groundwater mound starts to expand laterally.

The seepage rates during Stage 1 and 2 are controlled by the vertical gradients and the hydraulic conductivity of the pond sediments and underlying materials. Seepage rates during Stage 3 are controlled by resistance to lateral flow and reduced gradients, which results in lower seepage rates compared to Stage 1 and 2. McWhorter and Nelson (1979) indicate that flow during Stage 3 is complex. Engineering solutions for Stage 3 seepage were not developed as the purpose of the method is to provide upper bound estimates of seepage rates.

The Stage 1 and Stage 2 seepage rates are calculated using the expected range in the parameter values in the McWhorter and Nelson (1979) analytical model of seepage from tailings ponds. Typical hydraulic conductivities for the fine sand, silt, and alluvial layers were selected from published values (McWhorter and Sunada, 1977).

Hydraulic conductivity of the underlying bedrock was estimated from the aquifer test performed on monitoring well MW-3. As discussed, this monitoring well is completed in the rhyolite and limestone beneath the tuff/clay. The hydraulic conductivity for the tuff/clay is likely one or two orders of magnitude lower than the formations tested based on the fine grain size of the tuff/clay and expected anisotropy, but the aquifer test results were used without corrections to be conservative. An estimate of the porosity of the geologic strata underlying the pond is required. The tuff/clay is estimated to have a porosity of 0.4 (McWhorter and Sunada, 1977). Estimates for the initial and residual moisture contents are also required. Using best professional judgment, the residual moisture content is assumed to be 0.05, and the initial moisture content is assumed to be 0.1. The analytical method of McWhorter and Nelson (1979) assumes an average homogeneous vertical permeability within the foundation layer beneath the pond and can account for layering conditions above the foundation where the thickness and vertical permeability varies among pond sediments or tailings, any compacted liner materials and alluvium. The input parameters for each layer are listed in Table 1.

Table 1
Analytical Model Parameters

Layer	**Thickness (ft)**	**K (ft/day)**
Ponded Water	10 for Collection Pond 15 for Settling Pond	na
Fine Sand Sediment	5	8.51
Fine/Silt Sediment	1	0.0851
Alluvium	10	0.0851
Tuff/clay	33 to water table	0.00165

Notes:
ft.= feet
ft/day = feet per day
K =hydraulic conductivity
na = not applicable

Results

The McWhorter and Nelson (1979) seepage model was applied to estimate seepage rates for Stage 1 and Stage 2. Due to the constant operating head assumed for the two ponds, the highest rate of seepage occurs during Stage 1. The rate of seepage from the ponds will decline over time. Attachment 1 contains the Stage 1 and Stage 2 calculations of seepage rate based on McWhorter and Nelson (1979) method.

Stage 1 occurs until the pond seepage fluids reach the groundwater table residing at an elevation of 58 feet or more below the original ground surface prior to placement of fluids in the pond. The seepage rate for both ponds is approximately 0.007 feet per day during Stage 1. Assuming this vertical seepage rate occurs over the entire extent of the ponds, approximately 1420 cubic feet per day seeps from the Collection Pond and approximately 570 cubic feet per day seeps from the Settling Pond. The wetting front is estimated to reach the water table below the Collection Pond after 820 days of use and the Settling Pond after 780 days of use.

Stage 2 occurs when the groundwater mound begins to build up from the water table and extends until the mound reaches the base of the pond. However, saturation or near saturation conditions will occur above the wetting front that moves down during Stage 1 because seepage is limited by the vertical hydraulic conductivity of the tuff/clay and not by the unconsolidated sediments at the base of the pond. Consequently, Stage 2 will be very brief, before the groundwater mound begins to expand laterally and Stage 3 begins. The seepage rate at the end of Stage 2 is approximately 0.0013 feet per day for the Collection Pond and 0.0015 feet per day for the Settling Pond. This seepage rate is expected to continue to decrease in Stage 3 as the groundwater mound expands and the resistance to lateral flow increases.

Sensitivity Analysis

Norwest performed a sensitivity analysis to determine the effects of the various assumptions. The other input parameters of thickness and hydraulic conductivity for the sediment and alluvium, porosity, pond depth, and moisture content have minimal influence on the seepage rate calculated for the end of Phase 1 at the Collection Pond, as shown in Table 2. Each parameter was individually modified by a significant amount to determine worst-case seepage rates. Also included are alternative values for the tuff/clay hydraulic conductivity and thickness. The alternative tuff/clay hydraulic conductivity is a best professional estimate value considering grain size and anisotropy. The depth to the water table below the base of the alluvium was increased to 50 feet to match the full thickness of the tuff/clay unit in the log from well MW-3.

Table 2

Sensitivity Analysis Parameters and Results

Parameter	**q (ft/day)**
Base Case	0.00667
No sediment (Dt=0, Ds=0)	0.00637
Sediment depth doubled (Dt=10, Ds=2)	0.00696
Increase sediment hydraulic conductivity 10x (Kt=85.1, Ks=0.851)	0.00667
No alluvium (Da=0)	0.00621
Alluvium depth doubled (Da=20)	0.00712
Increase alluvium hydraulic conductivity 10x (Ka=0.851)	0.00670
Decrease porosity (n=0.3)	0.00620
Increase porosity (n=0.5)	0.00707
Increase residual moisture content (Θr=0.1)	0.00644
Decrease residual moisture content (Θr=0.01)	0.00683
Increase pond depth (y=20)	0.00717
Decrease tuff/clay hydraulic conductivity 10x (Kf=0.00017)	0.00124
Increase tuff/clay thickness (Df=50)	0.00497

Notes:
ft/day = feet per day
Ka =hydraulic conductivity of alluvium
Ks =hydraulic conductivity of fine silt
Kt =hydraulic conductivity of fine sand
Kf =hydraulic conductivity of tuff/clay
n = porosity
Θr = residual moisture content
Da= thickness of alluvium
Ds= thickness of fine silt
Dt= thickness of fine sand
Df= thickness of tuff/clay
y=pond depth

The seepage rate is almost entirely dependent on the tuff/clay hydraulic conductivity. Decreasing the tuff/clay hydraulic conductivity reduces seepage by 81%. The depth to the water table influences the seepage rate and the duration of Stage 1. With a shallower water table, Stage 1 ends sooner. Increasing the depth to water table to 50 feet decreases the seepage rate by 25% and results in slightly more than a two fold increase in the duration of Stage 1. The sensitivity analysis of all the other parameters shows that the seepage rates changed by less than 7% from the base case, suggesting that assumptions made for these parameters, while typical values, do not have a significant impact on the results.

Conclusions

Seepage from the tailings facility ponds is expected to occur at rates limited by the hydraulic conductivity of the tuff/clay bedrock material. Analysis of the seepage from the Collection Pond and Settling Pond uses a simplified methodology that assumes one-dimensional vertical seepage between the pond and the groundwater table at 58 feet below the original ground surface. The rate of seepage from the ponds will decline over time. Based on the upper bound estimate of the vertical hydraulic conductivity of the tuff/clay, the seepage rate estimate is approximately 0.007 feet per day (2.6 ft per year) during Stage 1 and 0.0013 to 0.0015 feet per day (0.5 ft per year) at the end of Stage 2. With these estimates maximum seepage rates are determined to be approximately 1420 cubic feet per day from the Collection Pond and approximately 570 cubic feet per day from the Settling Pond However, maximum seepage rates are more likely to be 80% lower than these estimates if a hydraulic conductivity more representative of tuff/clay strata is used in the calculations.

References:

McWhorter, D. and Nelson, J. (1979). "Unsaturated flow beneath tailings impoundments", ASCE Journal of the Geotechnical Engineering Division, Vol. 105, No. GT11, pp. 1317-1333.

McWhorter, D. and Sunada, D.K. (1977). Ground-Water Hydrology and Hydraulics. Water Resources Publications, Littleton, Colorado.

Table 3

Groundwater Average Linear Flow Velocity

Formation:
Hydraulic Conductivity: 0.011 gpd/ft2~ 0.0016537 ft/d

Gradient: 0.1 ft/ft

Porosity: 0.4

Therefore,

v=-k/n*gradient

v= 0.000413 ft/d

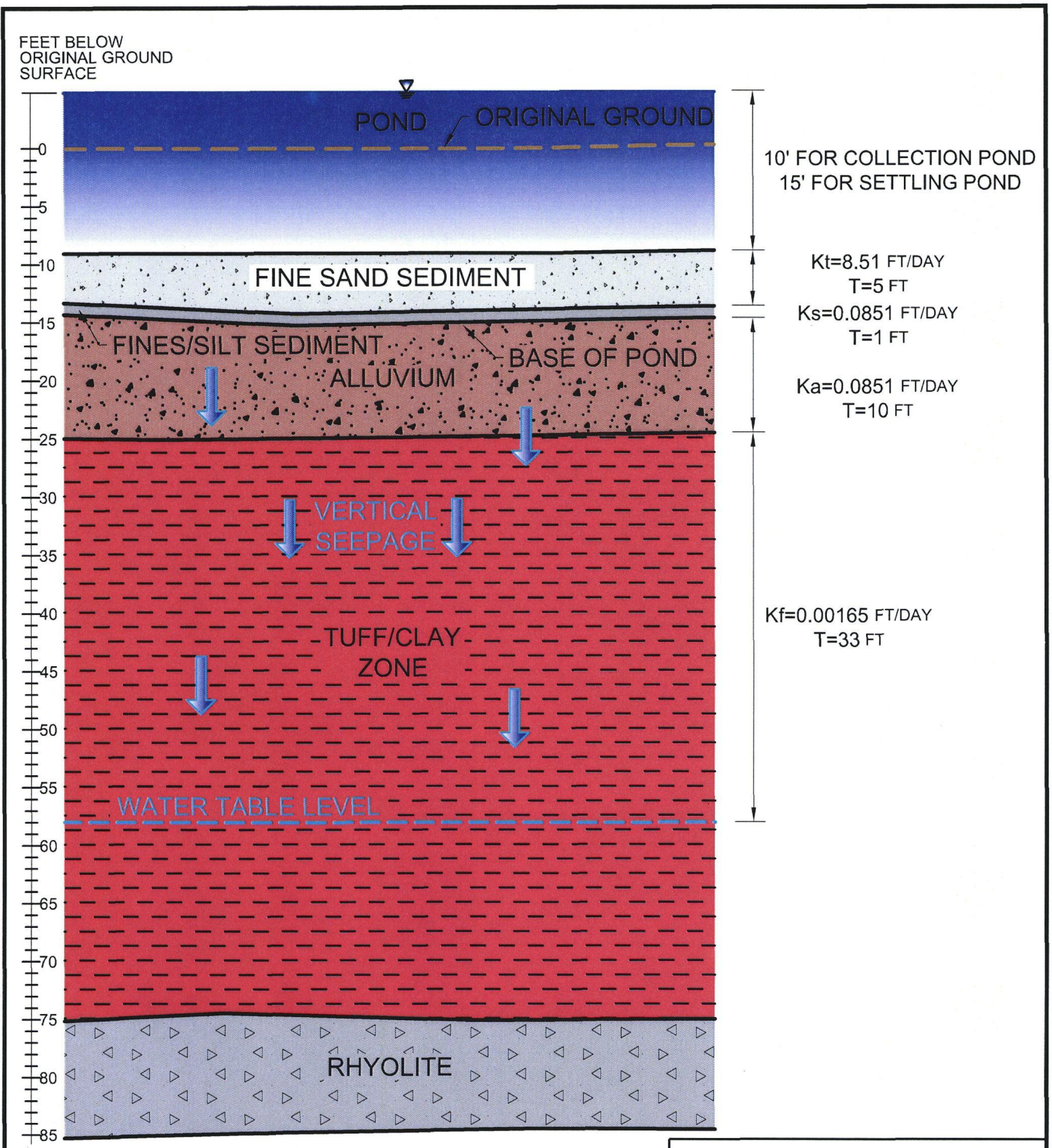
Based on a flow distance of:

Min: 6 ft

Travel Time: 14512.95 days~ 40 years

Max: 200 ft

Travel Time: 483764.9 days~ 1325 years



NOTES:
1. Lithology from MW-3
2. Kt, Ks, and Ka from published values
3. Kf from MW-3 pumping test

FIGURE 1

POTASH RIDGE
POND CONCEPTUAL
SEEPAGE MODEL

NORWEST
CORPORATION

DESIGN: PJK	DATE: 1/21/14	Layer Manager: --
DRAWN: JLS	SCALE: NTS	PROJECT NO. 418-15
DRAWING: Seepage Model Section2.dwg		

Jan 29, 2014 - 2:40pmT:\PotashRidge_S_418\418-15_GW Disch Permit\Disc\Water\Site Info\Seepage Model Section2.dwg

Appendix B

Storm Drainage Report

OPERATIONS AND RECLAMATION DRAINAGE CONTROL PLAN

BLAWN MOUNTAIN PROJECT

December 16, 2013

ENERGY, MINING, AND ENVIRONMENTAL CONSULTANTS

NORWEST
CORPORATION

OPERATIONS AND RECLAMATION DRAINAGE CONTROL PLAN

BLAWN MOUNTAIN PROJECT

Submitted to:
UTAH ALUNITE CORPORATION

December 16, 2013

NORWEST CORPORATION

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NORWEST
CORPORATION

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INTRODUCTION

The Blawn Mountain Mining Project is located in the south end of the Wah Wah Mountains in Beaver County, Utah. The operation will mine the alunite mineral from volcanic deposits in the area. The mining/processing consists of the standard open pit mining of the ore from two pit locations and the subsequent processing in a calciner/water leach process for the production of sulfur of potash (SOP) and sulfuric acid. The processing plant will be located in the tributary valley of Willow Creek between the two mining areas.

Tailings from the process plant will be discharged and stored in a tailings pile located down gradient from the process plant. Water will be reclaimed from the tailings by the use of collection/settlement ponds located downstream of the tailings pile. The collected water will be pumped back up to the process plant for reuse and potential treatment.

For the proposed operation, stormwater controls will be installed prior to any major disturbance. These controls will consist of sediment ponds and diversion/collection ditches and berms to ensure that drainage from the areas proposed to be mined and disturbed will be collected and treated. Then, topsoil will be salvaged and stockpiled to be used during the reclamation phase.

The disturbances for the operation will be staged based on the mining development and process plant construction. During the first five years of operation, mining will occur in Area 1. Ore from this area will be stored temporarily on the crusher pad, while the process plant is constructed and tested.

Concurrently, the collection and settlement ponds will be constructed, along with the reclaim water pipeline and the storage tanks.

Once the process plant is on-line, the processing of ore will commence and the products will be temporarily stored and then loaded to the rail line for shipment. Tailings from the plant will be discharged to the tailings area for final placement. Due to the anticipated gradation of the materials, the tailings are expected to be free draining, coarse grained sands. Therefore, they will create piles and beach areas that will be able to be contemporaneously reclaimed.

This report presents the proposed drainage control plan for the mining operations and reclamation activities. The sections of this report include a description of the study area, the methods of investigation, and the design and calculations.

STUDY AREA CONDITIONS

The Blawn Mountain site is located in Beaver County, about 35 miles west-southwest of Milford, Utah. Access to the site is via State Highway 21 west from Milford, then south on the Revenue Basin Road to the project site. Figure 2.1 presents the location of the project area.

SOILS AND VEGETATION

No formal NRCS soils investigations have been conducted of the study area. UAC conducted an Order 2 soils survey of the study area (Terra West, 2013). The soils were found to generally be classified as silty-clayey loam soils. This soil texture typically is rated as a C hydrologic soil type.

Based on the vegetation surveys performed at the site, there is typically 35% vegetation cover consisting of pinion and juniper (73%) or big or mountain big sagebrush and grass (27%) vegetation (WP Natural Resource Consulting, 2013).

This combination of soils and vegetation type and density results in curve numbers of 75 for pre-mine watersheds and 90 for barren or disturbed lands where mining, topsoil salvage, or reclamation has occurred.

DESIGN STORM EVENTS

A 10-year 24-hour storm event was used to size the ditches and the sediment ponds. The precipitation depths for the various return periods were determined using the on-line NOAA Precipitation frequency data server (PFDS) (Bonnin, 2006). The precipitation data for the site are presented in Appendix A. Based on the PFDS report, a 10-year 24-hour storm depth of 2.50 inches was used in the calculations. As the site is located at the headwaters of the drainages, no clean water diversions were used. All drainage from the site will be collected and retained to reduce sediment. The 100-year 24-hour event is 3.75 inches.

Figure 2.1 Blawn Mountain Project Area

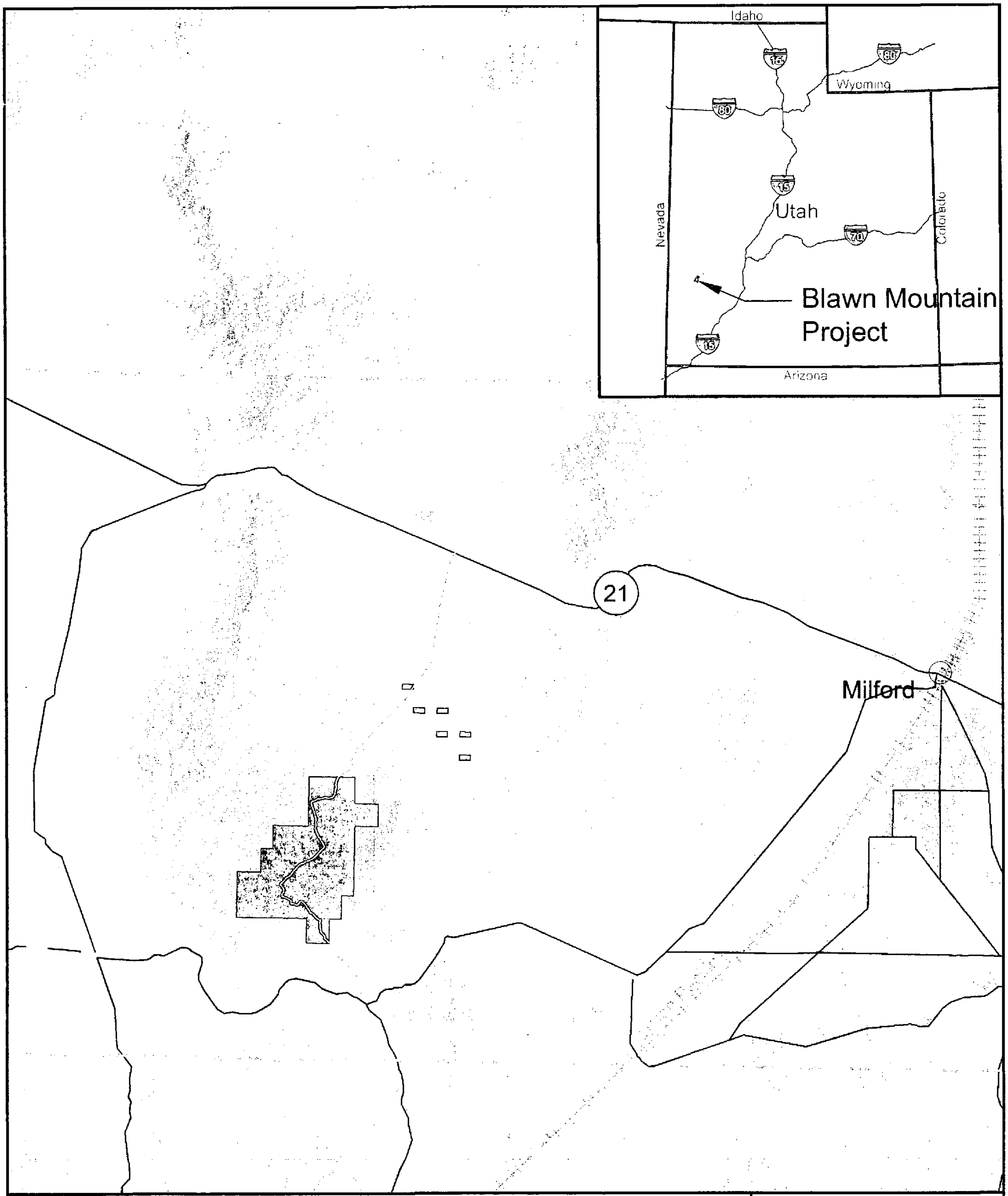

FIGURE 2.1

BLAWN MOUNTAIN PROJECT
GENERAL
LOCATION MAP

DATE: 1/31/2014
FILE: 418-15 Fig 1
SCALE: As Shown
NORWEST CORPORATION

While many methods are available to simulate the time varied distribution of rainfall from a storm event, the NOAA type II rainfall distribution was selected for this study. While there are other distributions, applicable to the area, the type II was selected as being representative of the storms in the area, while providing a conservative estimate of precipitation distribution for the watersheds.

GROUNDWATER

Two previous studies by Norwest Corporation (2013a & b) indicated that groundwater in the area is limited. No significant springs were found in the mining area (Norwest, 2013a). The formations in the site area are relatively tight and do not readily contribute water (Norwest, 2013b). During the mining operations, groundwater interception volumes by the pits are not expected to be significant; therefore, groundwater discharge was not factored into the calculations and design of the drainage control.

METHODS OF INVESTIGATION

CALCULATION METHODS

The runoff volume and peak flows from the various watersheds were determined using the SEDCAD computer software, Version 4.5. This software uses the NRCS/SCS curve number method to calculate the runoff volume resulting from a specific rainfall event.

Time of concentration for the runoff events was determined for each watershed using a modified SCS method which better predicts conditions for disturbed and reclaimed lands. These calculations are included in the SEDCAD program and results are presented in the model output.

DESIGN AND CALCULATIONS

OPERATIONS DRAINAGE PLAN

Figure 4.1 shows the overall plan for the life of mine. Water diversion ditches and sediment ponds are located around the exterior of the proposed mining areas. Excavation is planned to first occur in Area 1 to the northwest of the process plant area. Subsequent mining will be developed in Area 2 to the east-south east of the process area. The diversions and ponds necessary to protect each mining area will be constructed prior to any disturbance of that mining area. Ponds NW, N, and NE along with Ditches NW-1, NE-1, and CP-1 will be constructed prior to mining in Area 1. The Collection/Settlement ponds and the PGM berm will be constructed prior to disturbance in the tailings/process area. Ponds SW1 and SW2 and Ditch SW-1 will be constructed prior to construction of the rail load out. Ponds SE1, SE2, and S and Ditches SE1-1, SE1-2, SE2-1, and S1 will be constructed prior to disturbance in mining Area 2.

The water diversion ditch locations are shown on Figure 4.1, and the drainage characteristics are summarized in Table 4.1. The design details for the diversions are presented in Table 4.2 and shown on Figure 4.2. The diversions are planned to be trapezoidal in shape with 3H:1V side slopes, 10-foot bottom widths, and 3-foot channel depths. The channel depth includes adequate freeboard above peak flow design depths. The channel geometry is necessary to keep flow velocities below the limiting velocity of 5 feet per second. Only two diversions have conditions where the channel slope and flow rate results in velocities greater than 5 feet per second. The reaches of these channels, which are not excavated in bedrock, may require armoring with angular rock if significant erosion occurs.

Due to the site topography, the diversions collect all the runoff that flows from the mining phases and conveys it to a low point. These low points will have sediment ponds, which are sized according to the area of contributing watersheds for the 10-year 24-hour storm event. The pond locations are shown on Figure 4.1, and design details are listed in Table 4.3. The ponds are typically on-channel structures and will resemble a typical stock reservoir. The maximum capacity of any of the sediment pond embankments will be 20 acre-feet. An emergency spillway that is capable of conveying the peak flow during the 100-year, 24-hour storm with at least 1-foot of freeboard has been included in the design. The minimum spillway depth is 3 feet.

Details of the pond design and ditch design are presented in Appendix B.

Table 4.1 Drainage Control Ditch Flow Summary

Ditch	Drainage Area (ac)	Hydraulic Length (ft)	Top Elevation (ft)	Bottom Elevation (ft)	Elevation Change (ft)	Slope (%)	Peak Flow (cfs)
NE-1	26.6	1,995	7,125	7,100	25	1.25	34.70
NW-1	18.7	1,110	7,110	7,100	10	0.90	18.05
SW-1	17.2	980	6,950	6,940	10	1.02	7.83
S-1	48.1	2,190	6,850	6,830	20	0.91	42.45
SE1-1	15.6	690	6,800	6,775	25	3.62	10.40
SE1-2	138.5	1,860	6,790	6,775	15	0.81	73.22
SE2-1	20.8	1,600	6,790	6,760	30	1.88	9.24
CP-1	151.5	9,620	6,825	6,300	525	5.46	49.00

Table 4.2 Drainage Control Ditch Design Summary

Ditch	Slope (%)	Peak Flow (cfs)	Shape	Bottom Width (ft)	Side Slopes	Flow Depth (ft)	Channel Depth (ft)	Freeboard (ft)	Velocity (fps)
NE-1	1.25	34.70	Trap	10	3:1	0.65	3	2.35	4.47
NW-1	0.90	18.05	Trap	10	3:1	0.47	3	2.53	3.33
SW-1	1.02	7.83	Trap	10	3:1	0.29	3	2.71	2.47
S-1	0.91	42.45	Trap	10	3:1	0.78	3	2.22	4.44
SE1-1	3.62	10.40	Trap	10	3:1	0.24	3	2.76	4.12
SE1-2	0.81	73.22	Trap	10	3:1	1.05	3	1.95	5.28
SE2-1	1.88	9.24	Trap	10	3:1	0.32	3	2.68	2.63
CP-1	5.46	49.00	Trap	10	3:1	0.49	3	2.51	6.07

Table 4.3 Drainage Control Pond Sizing Summary

Structure Name	SW Area (ac)	Runoff Volume (ac-ft)	Slopes		Height (ft)	Location	Elev.	Area (ac)	Capacity (ac-ft)
			Up slope	Down slope					
Pond NE	98.9	9.16	2:1	3:1	18.0	Top	6845	1.05	14.28
						HWL	6839.88	0.95	9.16
						Bottom	6827	0.00	0.00
Pond N	25.5	2.83	3:1	2:1	18.0	Top	7050	0.89	5.22
						HWL	7046.66	0.56	2.83
						Bottom	7032	0.00	0.00
Pond NW	62.9	3.82	3:1	2:1	15.0	Top	7108	1.69	8.25
						HWL	7104.2	0.86	3.82
						Bottom	7093	0.00	0.00
Pond SW1	64.2	4.49	3:1	2:1	11.5	Top	6879.5	2.63	12.02
						HWL	6876.2	1.40	4.49
						Bottom	6868	0.00	0.00
Pond SW2	19.3	1.98	3:1	2:1	13.0	Top	6863	0.36	2.86
						HWL	6860.3	0.30	1.98
						Bottom	6850	0.00	0.00
Pond S	114.8	6.85	3:1	2:1	18.0	Top	6828	2.28	19.21
						HWL	6822.8	1.22	6.86
						Bottom	6810	0.00	0.00
Pond SE1	166.3	16.55	3:1	2:1	15.0	Top	6775	2.37	25.72
						HWL	6770.77	1.97	16.56
						Bottom	6760	0.00	0.00
Pond SE2	173.8	13.5	3:1	2:1	20.0	Top	6750	3.16	23.35
						HWL	6746.28	2.18	13.50
						Bottom	6730	0.00	0.00
Collection Pond	2782.1	339.58	2:1	3:1	60.0	Top	6235	27.53	808.30
						HWL	6214.71	19.09	339.40
						Bottom	6175	0.00	0.00
Settlement Pond	50.4	7.71	2:1	3:1	20.0	Top	6180	2.99	39.05
						HWL	6165.75	1.52	7.71
						Bottom	6160	0.00	0.00
PGM Berm	70.9	2.87	2:1	3:1	10.0	Top	6330	2.00	11.10
						HWL	6325	1.00	3.67
						Bottom	6320	0.00	0.00

Table 4.4 Drainage Control Spillway Sizing Summary

Structure Name	100yr 24hr Peak Flow (cfs)	Crest Elevation (ft)	Spillway							
			Type	Left	Right	Elevation (ft)	Bottom Width (ft)	Crest Length (ft)	Flow Depth (ft)	Free-board (ft)
Pond NE	203.36	6845.00	Emergency	3:1	3:1	6841.00	10	34	6843.82	1.18
Pond N	59.84	7050.00	Emergency	3:1	3:1	7047.00	5	27	7048.82	1.18
Pond NW	108.82	7108.00	Emergency	3:1	3:1	7104.25	5	27	7106.46	1.54
Pond SW1	114.26	6880.00	Emergency	3:1	3:1	6876.50	5	26	6878.36	1.64
Pond SW2	35.29	6863.00	Emergency	3:1	3:1	6860.30	5	27	6861.75	1.25
Pond S	195.68	6830.00	Emergency	3:1	3:1	6822.80	5	27	6825.68	4.32
Pond SE1	158.69	6775.00	Emergency	3:1	3:1	6770.80	5	27	6772.99	2.01
Pond SE2	95.67	6750.00	Emergency	3:1	3:1	6746.50	5	27	6748.58	1.42
Collection Pond	1262.66	6235.00	Emergency	3:1	3:1	6230.00	100	130	6232.65	2.35
Settlement Pond	98.34	6180.00	Emergency	3:1	3:1	6175.00	25	55	6175.96	4.04
PGM Berm	58.94	6330.00	Emergency	3:1	3:1	6325.00	5	34	6326.51	3.49

Figure 4.1 Drainage Control Plan

Figure 4.2 Typical Diversion Design Details

Figure 4.3 Typical Pond Design Details

RECLAMATION DRAINAGE PLAN

When mining is completed in different areas of the mine, grading and reclamation will begin. Contemporaneous reclamation of small areas of the disturbance will occur during on-going operations (i.e., sections of the tailings pile surface).

Control measures including existing ponds and ditches will remain in place to control and contain runoff from the site after operations cease until the upstream areas are reclaimed. The overall post-mine reclamation drainage plan will be essentially the same as the operational plan (see Figure 3.1). The area of the pits will no longer contribute runoff outside of the pit area. Therefore, the designs for the existing structures collecting runoff from the mining areas will be slightly overdesigned. Thus, the design details for the ponds will be left the same as listed in Table 3.2. The collection ditches will also be left in place to collect runoff from the reclaimed areas and route it to the sediment ponds. A brief discussion of the reclamation phases are presented below.

Once reclamation is finished in particular areas of the mine (Area 1, Area 2) and the conditions required for bond release are reached, the drainage control structures downstream from these areas, which are no longer needed, will be reclaimed.

Final reclamation will commence at the end of active operations. This will occur at the end of processing of the low grade ore stockpiles and will consist of the removal of the processing plant and loadout facilities, abandonment of the tailings pile, removal of the collection and settlement ponds, removal of the reclaim pump house and pipeline, and the mine administration warehouse and shop buildings.

Control measures will not be removed until the Division concurs that the reclamation objectives have been met.

REFERENCES

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National Oceanic and Atmospheric Administration (NOAA) 2013. NOAA Atlas 14, Version 5, Point Precipitation Frequency Estimates for Blawn Mountain area, Utah. Retrieved 11/7/13 from http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ut

Norwest. Technical Report, Survey of Springs and Seeps in Watersheds of Potash Ridge Blawn Mountain Project Fall 2013, Beaver County, Utah. 31p, 2013a.

Norwest. Technical Report, Groundwater Investigation of Utah Alunite Blawn Mountain Project Beaver County, Utah. 32p, 2013b.

Terra West Consulting. 2013. Soil Baseline Survey for the Blawn Mountain Project Area. Norwest Corporation.

WP Natural Resource Consulting. 2013. Vegetation Baseline Survey for the Blawn Mountain Project Area, Norwest Corporation.

APPENDIX A

SITE PRECIPITATION DATA

APPENDIX B

DESIGN SUMMARIES

Due to volume, the output is included as PDF files on the attached CD.

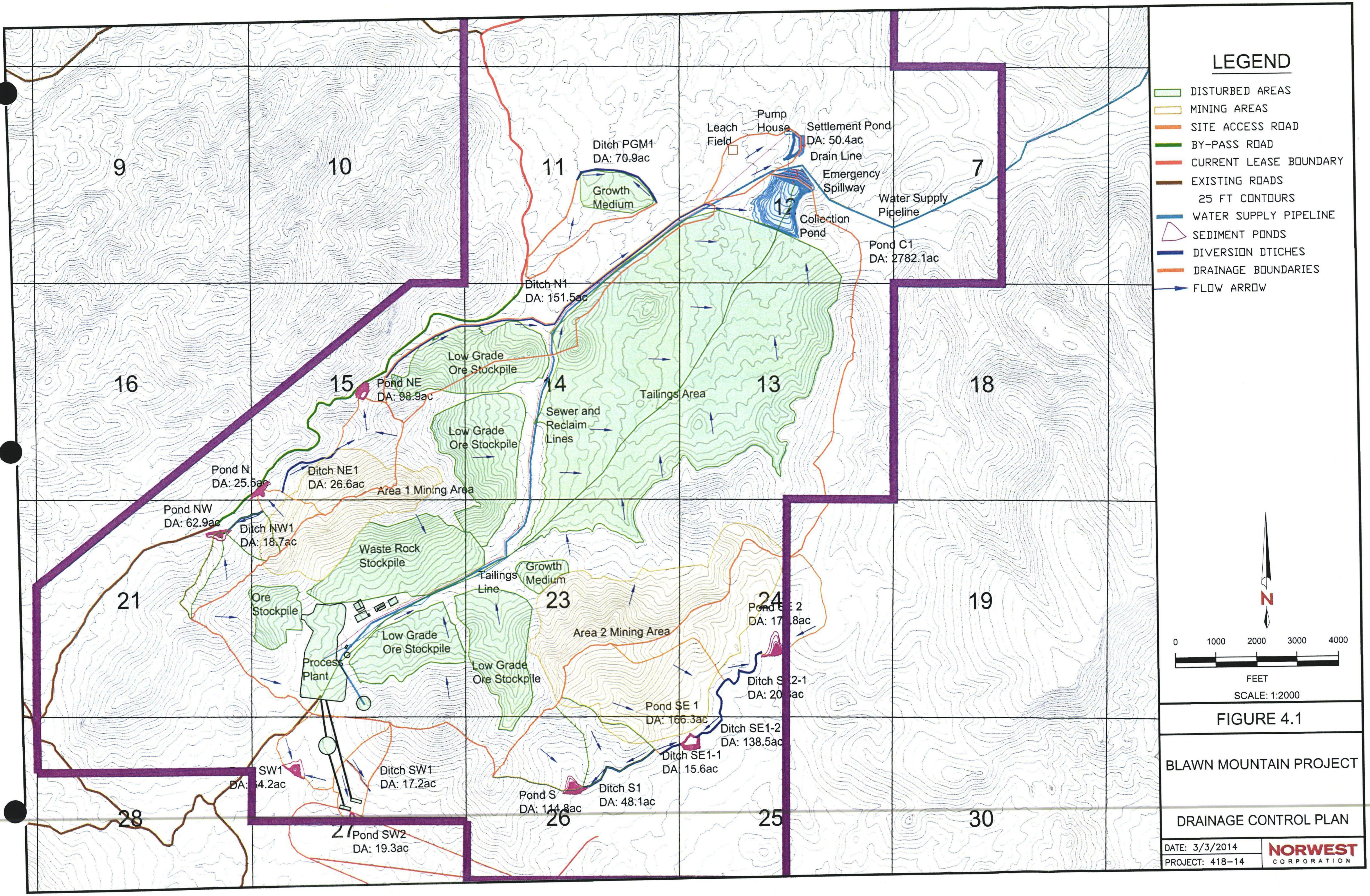

FIGURE 4.1

BLAWN MOUNTAIN PROJECT

DRAINAGE CONTROL PLAN

DATE: 3/3/2014
PROJECT: 418-14

Appendix C

Flocculent MSDS Sheet

hychem, inc.

MATERIAL SAFETY
DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product: **HYPERFLOC® AF 300, AF 300 H, AF 300-HH Series, AF 300 G, AF 300 H G, AF 300-HH G Se**

Supplier:
HYCHEM, INC.
10014 N. Dale Mabry Highway, Suite 213
Tampa, FL 33618

Current Revision Date: 1/25/13 **Last Revision Date:** 1/27/10

Emergency Telephone Numbers:
(800) 327-2998 - Hychem, Inc. (weekdays)
(800) 424-9300 - Chemtrec (24 Hours)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Appearance and Odor:

Form: Granular Solid
Color: White
Odor: None

Aqueous solutions or powders that become wet render surfaces extremely slippery

3. HAZARDOUS IDENTIFICATION

Chemical Family: Anionic water soluble polymer.

4. FIRST AID MEASURES

Inhalation: No hazards which require special first aid measures.

Skin Contact: Wash with water and soap as a precaution. In case of skin irritation, consult a physician.

Eye Contact: Rinse thoroughly with plenty of water. In case of persistent eye irritation, consult a physician.

Ingestion: No hazards which requiere first aid measures. The product is not considered toxic based on studies on laboraroty animals.

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5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Water, water spray, foam, dry powder, carbon dioxide (CO_2).

Special Fire-Fighting Precautions: Aqueous solutions or powders that become wet render surfaces extremely slippery.

Special Protective Equipment for Firefighters: No special protective equipment required.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: No special precautions required.

Environmental Precautions: Avoid contaminating water.

Methods for Cleaning Up: Do not flush with water. Clean up promptly by scoop or vacuum. Keep in suitable and closed containers for disposal. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Handling: Avoid contact with skin and eyes. Do not breathe dust. Natural ventilation is adequate in absence of dusts.

Storage: Keep in a dry, cool place (0 - 35°C).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: Use local exhaust if dusting occurs. Natural ventilation is adequate in absence of dusts.

Personal Protection Equipment

- **Respiratory Protection:** Dust safety masks are recommended where concentration of total dust is more than 10 mg/m^3.
- **Hand Protection:** Rubber gloves
- **Eye Protection:** Safety glasses with side shields. Do not wear contact lenses.
- **Skin and Body Protection:** Chemical resistant apron or protective suit if splashing or repeated contact with solution is likely.

Hygiene Measures: Wash hands before breaks and immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form:	Granular solid
Color:	White
Odor:	None
pH:	4 - 9 @ 5 g/l for product series. See Technical Bulletin for specific value.
Melting Point (°C):	Not applicable
Flash Point (°C):	Not applicable
Autoignition Point (°C):	Not applicable
Vapor Pressure (mm Hg):	Not applicable
Approx Bulk Density:	.80
Water Solubility:	Completely miscible
Viscosity (mPa s):	See Technical Bulletin

10. STABILITY AND REACTIVITY

Stability:	Product is stable, no hazardous polymerization will occur.
Materials to Avoid:	Oxidizing agents may cause exothermic reactions.
Hazardous Decomposition Products:	Thermal decomposition may produce: carbon oxides and nitrogen oxides (NOx).

11. TOXICOLOGICAL INFORMATION

Acute toxicity:	
- Oral:	LD50/oral/rat > 5000 mg/kg
- Dermal:	The results of testing on rabbits showed this material to be non-toxic even at high dose levels.
- Inhalation:	The product is not expected to be toxic by inhalation.
Irritation	
- Skin	The results of testing on rabbits showed this material to be non-irritating to the skin.
- Eyes:	Testing conducted according to the Draize technique showed the material produces no corneal or iridial effects and only slight transitory conjunctival effects similar to those which all granular materials have on conjunctivae.
Sensitization:	The results of testing on guinea pigs showed this material to be non-sensitizing.
Chronic Toxicity:	A two-year feeding study on rats did not reveal adverse health effects. A one-year feeding study on dogs did not reveal adverse health effects.

12. ECOLOGICAL INFORMATION

- **Fish:** LC50/Danio rerio/96 hours > 100 mg/l (OECD 203)
- **Algae:** IC50/Scenedesmus subspicatus/72 hours > 100 mg/l (OECD 201)
- **Daphnia:** LC50/Daphnia magna/48 hr > 100 mg/L (OECD 202)

Environmental fate:
LogP ow: 0

Bioaccumulation: The product is not expected to bioaccumulate.

Persistence / Degradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products: In accordance with federal, state, and local regulations

Contaminated Packaging: Rinse empty containers with water and use the rinse water to prepare the working solution. Can be landfilled or incinerated, when in compliance with local regulations.

14. TRANSPORT INFORMATION

Not regulated by the Department of Transportation

15. REGULATORY INFORMATION

All components of this product are on TSCA and DSL inventories.

RCRA status: Not a hazardous waste.

Hazardous Waste Number: Not applicable.

Reportable Quantity (40 CFR 302): Not applicable.

Threshold Planning Quantity (40 CFR 355): Not applicable.

California Proposition 65 Information: The following statement is made in order to comply with the California Safe Drinking Water and Toxic Enforcement Act of 1986: This product contains a chemical(s) known to the State of California to cause cancer: acrylamide.

European Union (EINECS/ELINCS): All components of this product are either listed on the inventory or are exempt from listing.

USA (TSCA): All components of this product are either listed on the inventory or are exempt from listing.

Canada (DSL): All components of this product are either listed on the inventory or are exempt from listing.

Australia (AICS): All components of this product are either listed on the inventory or are exempt from listing.

Japan (ENCS): All components of this product are either listed on the inventory or are exempt from listing.

China (IECSC): All components of this product are either listed on the inventory or are exempt from listing.

Korea (ECL): All components of this product are either listed on the inventory or are exempt from listing.

Philippines (PICCS): All components of this product are either listed on the inventory or are exempt from listing.

16. OTHER INFORMATION

Person to Contact: A. Sands

Appendix D

Material Characterization of Tailings, Waste Rock, Low Grade Ore, and Ore

Appendix D: Material Characterization of Tailings, Waste rock, Low Grade Ore, and Ore

I. Introduction

A program was initiated in conjunction with the project's groundwater and surface water characterization program to characterize any potentially deleterious materials that might be exposed, handled, or left on site. The extensive sampling and analysis program validated that no deleterious material will be left on site or stored in a manner that could be potentially hazardous to the environment. The outcome of test results, the geologic and mineralogical interpretations of the tailings, waste rock, low grade ore, and ore (TWLO) and the conclusions reached by this program are summarized in this report.

II. Sample Selection

The testing effort involved characterizing sixteen representive samples of our TWLO for potential acid generation and their potential to leach salts or dissolved metals into the groundwater. A comparison was made of our sample data with an extensive long-term Acid Base Accounting(ABA) geochemical program carried out by the Hycroft Mine in Nevada. The Hycroft Mine mined alunite within a similar geologic environment and a similar mineralogy. This provided a large geochemical data set from which we could generate results related to our TWLO.

III. Geologic and Mineralogical Interpretation of Alunite

Geologic Description

The Blawn Mountain alunite deposits are developed in calc-alkaline volcanic rocks. Mining both ore and waste rock will be in calc-alkaline ignimbrites that have a predominantly rhyolitic composition and form rhyolite porphyry.

Mineralization

Alunite ($KAl_3(SO_4)_2(OH)_6$), potassium aluminum sulfate, is the ore mineral for the Blawn Mountain Project. Alunite is a mineral formed through the alteration of potassium feldspar (sanidine and orthoclase) ($KAlSi_3O_8$) through reaction with H_2SO_4. H_2S-bearing fluids rose above the local groundwater table where boiling ensued. The H_2S was oxidized to H_2SO_4 resulting in acid leaching of volcanic rocks to form broad areas of advanced quartz-alunite alteration. Alunite mineralization is associated with one of these types of alteration.

Based on research by Hofstra (1984), the alunite deposits are believed to have resulted from localized upwelling of hydrothermal fluids derived from a shallowly emplaced felsic intrusion. The intrusion is likely associated with the rhyolite porphyry of the Blawn Formation. H_2S-bearing fluids rose above the local groundwater table, boiling ensued, H_2S was oxidized to H_2SO_4 resulting in acid leaching of volcanic rocks to form broad areas of advanced quartz-alunite alteration. In localized zones, alunite-rich alteration occurs in funnel-shaped bodies that appear oriented to a few of the faults and fractures. The funnel-shaped bodies likely represent the main conduits for ascension for H_2S -bearing fluids. Other areas of alunite alteration are broad tabular masses in the ignimbrites. The tabular bodies are postulated as horizons where steam heating above the paleo-groundwater surface led to acid leaching of the ignimbrites and alunite alteration.

Figure 1 provides a diagrammatic representation for the hydrothermal mineralization that occurs at Blawn Mountain. Table 1 summarizes the mineral content of each of the four alteration types based on X-ray diffraction analyses collected by PRC on 245 core samples from 2012 drilling. These drill holes are represented in our 2012 exploration permit filed with the DOGM. The X-Ray diffraction analyses were completed by DCM Science in Denver, CO. The table presents the mean and median concentrations for each mineral along with the minimum and maximum values determined in the XRD analyses for each alteration group. Alteration in the Silica Cap and Quartz-Alunite zones involves introduction and recrystallization of silica (quartz) which leads to both types of alteration forming hard resistive rocks that preserves the morphology of the ridges. The Hematite-Clay horizon is much less resistant and is usually only preserved on very steep hillsides and more commonly preserved as a band of red-brown staining in the soil on hillsides below the Quartz-Alunite. Propylitic alteration is weak and often difficult to discern from unaltered rhyolite and is pervasive over most of the project area below and distal to the Quartz-Alunite and Hematite-Clay zones.

- Silica Cap
    - Zone of intense silicification representing the primary conduits of hydrothermal fluid migration and an overlying cap to the hydrothermal alteration. Original rock textures have largely been destroyed by silicification
- Quartz (Alunite Zone)
    - Alteration is typically composed of white to cream to gray to pink, fine-grained, punky to dense rock composed primarily of quartz and alunite. Alunite occurs both interstitially within the rock mass and as veins through the rock mass. Quartz (Alunite) is the source for alunite ore to be mined at Blawn Mountain.
- Hematite (Clay)
    - Alteration is less intense with original rock textures preserved. Hematite, kaolinite, illite, and montmorillonite occur as disseminations and bands within the rhyolite with minor amounts of alunite.
- Propylitic Zone
    - Rhyolite is weakly altered with varying amounts of chlorite, illite, kaolinite, montmorillonite, epidote, calcite and quartz. Trace amounts of pyrite, biotite, and other Fe-Mg silicates may be present. The Propylitic Zone is distinguished from the overlying Hematite-Clay zone by a decrease in clay minerals and lack of iron leaching from the Fe-Mg minerals.

Appendix D: Material Characterization of Tailings, Waste rock, Low Grade Ore, and Ore

Table 1 Summary of Mineral Analyses, Blawn Mountain Project
(all values listed are in percent%)

Silica Cap - 8 Samples

Mineral	Detected Values	Mean %	Median%	Standard Deviation	Minimum	Maximum
Quartz	8	97.88	99	3.18	90	99
Mica	7	1.00	1	0.00	1	1
Kaolin	1	6.00	6			
Unaccounted	1	4.00	4			

Quartz-Alunite - 151 Samples

Mineral	Detected	Mean	Median	Deviation	Minimum	Maximum
Quartz	153	53.37	54	9.54	7	74
Alunite	153	37.67	38	9.07	20	57
K Feldspar	16	3.63	3	2.94	1	10
Bassanite	2	30.00	30	0.00	30	30
Jarosite	153	2.85	3	1.25	0	9
Mica	32	1.38	1	0.87	1	4
Opal	12	10.75	10	6.20	3	23
Kaolinite	52	7.99	7	4.96	0.5	25
Hematite	87	1.42	1.0	1.94	0.0	10.0
Unaccounted	87	2.50	2	1.98	0.5	10

Hematite-Clay - 32 Samples

Mineral	Detected	Mean	Median	Deviation	Minimum	Maximum
Quartz	32	53.06	54.5	11.63	31	74
Alunite	17	10.00	12	5.33	1	17
K Feldspar	23	13.13	13	5.62	2	24
Mica	15	6.67	4	5.07	1	17
Illite	9	10.44	12	3.40	6	16
Smectite	15	10.87	10	6.72	1	30
Kaolin	29	12.62	12	6.41	4	27
Jarosite	32	3.22	3	0.91	1	5
Hematite	32	6.31	5.5	2.57	4.0	15.0
Unaccounted	32	6.31	5.5	2.57	4	15

Propylitic - 45 Samples

Mineral	Detected	Mean	Median	Deviation	Minimum	Maximum
Quartz	45	57.40	56	8.35	37	72
Alunite	9	2.00	1	2.00	1	6
K Feldspar	37	13.92	13	6.39	2	29
jarosite	45	3.58	4	1.10	0	5
Mica	17	4.76	5	1.68	1	8
Illite	18	9.44	9.5	2.97	3	18
Smectite	30	8.43	9	4.83	0	22
Kaolin	41	14.37	11	10.34	2	39
Calcite	3	5.00	5	3.00	2	8
Dolomite	3	11.00	14	8.89	1	18
Hematite	32	1.29	1.0	1.12	0.0	3.0
Pyrite	3	2.33	2	0.58	2	3
Unaccounted	32	1.81	1.5	0.90	1	3

Unaltered Rhyolite - 7 Samples

Mineral	Detected	Mean	Median	Deviation	Minimum	Maximum
Quartz	7	60.86	64	7.80	45	68

Alunite	2	4.50	4.5	4.95	1	8
K Feldspar	6	15.50	17	5.01	8	21
Bassanite	1	24.00	24			
Mica	7	6.43	9	3.95	0	10
Smectite	2	2.00	2	1.41	1	3
Kaolin	3	8.33	8	0.58	8	9
Calcite	1	18.00	18			
Dolomite	2	10.00	10	4.24	7	13
Hematite	7	3.14	3	0.90	2	4
Pyrite	2	4.00	4	0.00	4	4
Unaccounted	5	1.20	1	1.10	0	3

- Ore and Waste Rock
    - Ore to be mined for SOP production will come exclusively from rock occurring in the Quartz-Alunite Zone. Waste rock will be a combination of all four alteration types. Volumetrically, waste rock will be proportioned in relatively equal amounts between Quart-Alunite, Hematite-Clay, and Propylitic altered rocks. The Silica Zone rocks constitute a very small portion of the overall rock volumes of the deposit or mine plan.
    - The four types of hydrothermal alteration that occur at Blawn Mountain represent oxide mineral phases. As with most hydrothermal alteration systems, there is likely a sulfide mineral phase present at greater depths, but this is well below the Quartz-Alunite Zone to be mined and has not been detected by any of the drilling completed to date on the project. Alunite is a mineral formed through acid-leaching. It is not a mineral that will form acid products. None of the minerals present in the four alteration types are expected to have deleterious effects on the environment from weathering in the natural environment and all four types of alteration are currently present and exposed to weathering. Mining will not be exposing any new minerals or alteration types that are not already present in the natural environs of the project area.

PRC has completed 1,847 trace element analyses on drill core samples from its exploration drilling programs. Trace element analyses were completed using ICP multi-element spectrometry with a four acid, near total, digestion. Other than sulfur analyses, none of the trace element data shows significant concentrations or enrichment that can be clearly attributed to hydrothermal alteration. The most notable trace element concentrations occur in Barium (Ba), Manganese (Mn), Phosphorous (P), and Strontium (Sr). These are all common accessory elements in volcanic rocks. Furthermore, comparison of trace elements to trace elements reported in the MWMP and SPLP water quality data, Table A-5, would indicate there is no significant leaching of metals in the groundwater. There is significant enrichment in sulfur attributed to the hydrothermal alteration. Nearly all sulfur is attributed to hydrothermal alteration and is present as sulfate in the mineral alunite, with minor amounts in calcium sulfate (bassanite). Only five samples out of the 245 samples recorded detectable amounts of pyrite. Three samples from the propylitic alteration zone recorded pyrite amounts ranging from 2.0% to 3.0%.

Likewise, two samples in unaltered rhyolite both recorded 4% pyrite. Pyrite does not appear to be part of the hydrothermal alteration associated with alunite, but rather as a minor accessory mineral naturally occurring in the unaltered or weakly altered rocks. Pyrite occurrence is limited to 2% of the overall mineral analyses.

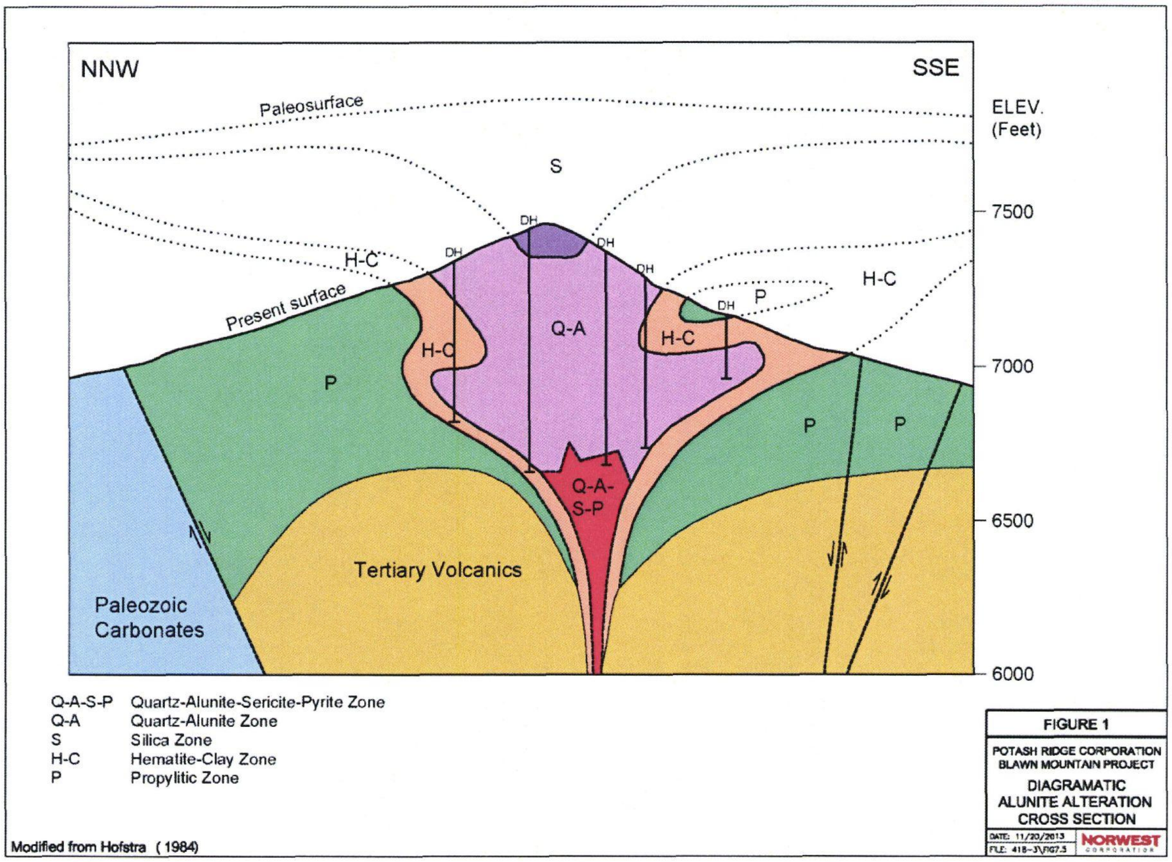

FIGURE 1

POTASH RIDGE CORPORATION
BLAWN MOUNTAIN PROJECT

DIAGRAMATIC
ALUNITE ALTERATION
CROSS SECTION

Modified from Hofstra (1984)

IV. Geochemical Test Results

The results from three important tests were utilized to demonstrate the lack of deleterious or acid-forming materials associated with TWLO: Two sets of results relied on static tests: (1) The Meteoric Water Mobility Procedure (MWMP) was run on WLO; (2) The Synthetic Precipitation Leach Procedure (SPLP) was run on Tailings. Data from a third test, the Humidity cells test (HCT) run on Alunite at the Hycroft Mine, was used to provide an assessment from kinetic testing of TWLO. These tests were chosen as the most representive tests to accurately describe the geochemical characteristics related to TWLO in our environment. The water quality results from MWMP and SPLP are shown in Table A-5.

It was also noted that Jarosite was found within our deposit and based on literature review of the attached references it was confirmed that Jarosite like Alunite was best represented by using representative static and kinetic tests that are considered the best predictors of acid generation for these sulfate minerals. The results from our static tests are presented in our water quality table and the results from the HCTs presented in our discussion of the Hycroft Mine.

Summaries of the results are as follows:

1. pH values range from 5.8 - 9.8 s.u. with an average pH of 7.4 s.u.
2. Total Dissolved Solids range from 10 to 630 mg/l, averaging 239 mg/l. The results showed trace amounts of Sulfate, Calcium, Magnesium, Potassium, and Sodium.
3. Only trace amounts of dissolved metals were found. These consisted of D. Aluminum, D. Barium, D. Boron, D. Copper, D. Iron, and D. Manganese. All other metals were non-detect.
4. Tests demonstrate that leachate from the static tests, SPLP and MWMP for the TWLO will meet or exceed the quality of receiving waters.
5. No metals of concern were detected in the leachate that will enter the surface or groundwater.

V. Hycroft Mine Case Study

Data generated by the Hycroft Mine case study is very important to the conclusion that alunite is not acid forming. These data encompasses both the mineralogical and humidity cell data SRK consultants collected and presented in the 2013 paper by Amy Prestia et al., titled, " Environmental geochemistry of the Hycroft Mine: a case study on the limitations of Sobeck-style acid-generation predictions."

The Hycroft Mine has a similar geologic setting to the Blawn Mountain alunite deposit. Like Blawn Mountain, the Hycroft Mine is situated in late Tertiary volcanic rocks that were subjected to hydrothermal alteration. A drop in the water table allowed for boiling of H2S solutions, forming H2SO4. H2SO4 subsequently leached the volcanic rocks to form broad seams of alunite mineralization. Unlike the Blawn Mountain deposit, the Hycroft Mine has experienced multiple phases of alteration, which also led to gold and silver mineralization. Blawn Mountain appears to have been subjected to a single episode of hydrothermal alteration with zonal alteration. With both deposits, alunite represents an oxidized phase of mineralization.

This case study supports the fact that alunite is not acid forming and will not become acid forming over time. The study concluded that Sobeck style acid-generation tests do not accurately predict acid generation for alunite. The Nevada Department of Environmental Quality requested that the Hycroft Mine run 15 samples that represented the range of ABA and NAG results for alunite among other alteration types. The five cells that contained alunite, quartz, feldspar, kaolinite, or natroalunite were run for 54-74 weeks.

For the humidity cells that contained these minerals, the leachate values start at or above pH of 5 s.u. The leachate values generally remain stable throughout the test. Based on the assessment that the samples containing alunite are generally not consistent with the prediction of acid generation based on Sobeck style ABA tests, UAC has chosen not to present false positive results from ABA, SAP, or sodium carbonate leach, but rely on this case study and mineralogy to document the acid forming potential of the TWLO.

The Blawn Mountain project's mineralogy supports a lack of sulfides in the alteration types and the water quality below confirms the leachability of alunite based on the results of our static tests for SPLP and MWMP. The table below represents the data from six drill holes and ten drill hole intervals from those six drill holes. Four of the holes were from Area 1 and two drill holes were from Area 2. These drill holes were selected from a more extensive data set that examined for acid production, ph and potential pyrite. This data set involved 14 holes and 98 drill hole intervals that encompassed 7 holes from Area 1 and 7 holes from Area 2. This data set represented that certain holes could be potentially acid forming and the selection would encompass the variety of waste rock and ore from Area 1 and 2. The holes selected can be located on Figure 2.

The tailings samples were taken from pilot studies at Hazen Research Labs. Six samples from three batch runs were analyzed. Each batch run represented similar set up and testing procedures. A sample from the first half of the batch and the end of the batch run were chosen for each of the three batch runs to provide representative samples. The physical characteristics were analyzed at Pocock Labratories for settling and filtration characteristics. The results of this extensive study demonstrated that the tailing exhibited high settling and filtration results, as well as, exhibited mostly crystalline properties with no clays. The average size fraction is 1 mm.

Appendix D: Material Characterization of Tailings, Waste rock, Low Grade Ore, and Ore

Table A-5 Water Quality Data for Tailings, Waste, Low Grade Ore and Ore

Sample ID	Sample Type	Sampled	pH	Total Dissolved Solids (180)	Total Alkalinity (as CaCO3)	WAD Cyanide	Bicarbonate as HCO3	Chloride	Fluoride	Nitrate-Nitrite Nitrogen (as N)	Sulfate	Calcium	Magnesium	Potassium	Sodium	Cation Sum	Anion Sum	Cation-Anion Balance	Cation-Anion Difference
			s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	meq/L
PDH-05 270-280	Low grade alunite	10/27/13	6.9	<10	<5	<0.02	<5	<1	<0.1	<0.1	2	1	<1	<1	2	0.12	0.04		0.08
PDH1-11 350-360	Waste unaltered	10/28/13	7.0	80	<5	<0.02	6	7	<0.1	0.3	19	8	3	3	3	0.80	0.63		0.17
PDH1-11 370-380	Waste unaltered	10/28/13	7.5	200	31	<0.02	37	17	0.2	1.0	36	17	7	11	8	2.07	1.93		0.13
BM-14B 550-560	High Grade Alunite	10/27/13	5.9	30	<5	<0.02	<5	2	<0.1	<0.1	4	2	<1	<1	2	0.16	0.13		0.03
BM-14B 570-580	High Grade Alunite	10/28/13	5.8	40	<5	<0.02	<5	2	<0.1	<0.1	6	2	<1	<1	2	0.20	0.18		0.02
PDH1-14 340-350	waste altered	10/27/13	6.3	130	<5	<0.02	<5	3	<0.1	<0.1	58	16	3	2	6	1.33	1.35		0.01
PDH2-36 180-190	waste altered	10/28/13	7.4	340	28	<0.02	35	90	0.2	0.9	142	65	15	8	43	6.57	5.39	1.43	
A2-16B 560-570	waste altered	10/27/13	7.0	100	<5	<0.02	6	8	0.1	0.2	37	13	3	4	7	1.29	1.01		0.28
PDH1-14 290-300	waste altered	10/27/13	7.4	140	9	<0.02	11	8	0.2	0.2	82	15	4	4	20	2.01	2.15		0.14
A2-16B 570-580	waste altered	10/27/13	7.3	150	11	<0.02	13	12	0.1	0.3	57	13	3	3	23	1.93	1.77		0.16
BK41-BK42 Comp 1	Tailings Material	10/29/13	7.2	630	8	<0.02	9	<1	0.2	<0.1	349	8	<1	138	38	5.23	7.42	13.72	
BK43-BK44 Comp 2	Tailings Material	10/29/13	7.4	370	14	<0.02	17	<1	0.3	<0.1	220	8	<1	95	26	3.23	4.95	12.78	
BK46-BK47 Comp 3	Tailings Material	10/29/13	9.8	310	81	<0.02	47	<1	0.5	<0.1	130	4	<1	82	52	4.04	4.40	4.31	
BK48-BK49 Comp 4	Tailings Material	10/29/13	7.6	220	16	<0.02	19	<1	0.4	<0.1	120	3	<1	62	17	2.50	2.84		0.34
BK51-BK52 Comp 5	Tailings Material	10/29/13	8.7	310	36	<0.02	36	3	0.3	<0.1	167	10	<1	69	25	3.62	4.27	8.15	
BK53-BK54 Comp 6	Tailings Material	10/29/13	8.8	220	35	<0.02	38	<1	0.3	<0.1	150	12	<1	64	23	3.23	3.83	8.43	
BK46-BK47 Comp 3 Dup		10/29/13	9.5	280	65	<0.02	40	<1	0.5	<0.1	128	4	<1	59	43	3.59	4.01	5.44	

Sample ID	Sample Type	D. Aluminum	D. Antimony	D. Arsenic	D. Barium	D. Beryllium	D. Boron	D. Cadmium	D. Chromium	D. Copper	D. Iron	D. Lead	D. Manganese	D. Mercury	D. Nickel	D. Selenium	D. Silver	D. Thallium	D. Zinc
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
PDH-05 270-280	Low grade alunite	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	<0.01	<0.05	<0.02	<0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
PDH1-11 350-360	Waste unaltered	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	<0.01	<0.05	<0.02	<0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
PDH1-11 370-380	Waste unaltered	1.1	<0.005	<0.005	0.4	<0.01	<0.1	<0.001	<0.01	<0.01	0.17	<0.02	<0.02	0.001	<0.01	<0.005	<0.003	<0.001	<0.01
BM-14B 550-560	High Grade Alunite	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	<0.01	<0.05	<0.02	<0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
BM-14B 570-580	High Grade Alunite	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	0.03	<0.05	<0.02	<0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
PDH1-14 340-350	waste altered	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	0.02	<0.05	<0.02	0.24	<0.001	0.03	<0.005	<0.003	<0.001	<0.01
PDH2-36 180-190	waste altered	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	<0.01	<0.05	<0.02	<0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
A2-16B 560-570	waste altered	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	<0.01	<0.05	<0.02	<0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
PDH1-14 290-300	waste altered	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	<0.01	<0.05	<0.02	0.10	<0.001	0.01	<0.005	<0.003	<0.001	<0.01
A2-16B 570-580	waste altered	<0.1	<0.005	<0.005	<0.1	<0.01	<0.1	<0.001	<0.01	<0.01	<0.05	<0.02	0.04	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
BK41-BK42 Comp 1	Tailings Material	<0.1	<0.005	<0.005	<0.1	<0.01	0.4	<0.001	<0.01	<0.01	0.08	<0.02	0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
BK43-BK44 Comp 2	Tailings Material	<0.1	<0.005	<0.005	<0.1	<0.01	0.3	<0.001	<0.01	<0.01	0.05	<0.02	0.02	<0.001	0.01	<0.005	<0.003	<0.001	<0.01
BK46-BK47 Comp 3	Tailings Material	0.3	<0.005	<0.005	<0.1	<0.01	0.4	<0.001	<0.01	<0.01	<0.05	<0.02	<0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
BK48-BK49 Comp 4	Tailings Material	0.3	<0.005	<0.005	<0.1	<0.01	0.3	<0.001	<0.01	<0.01	<0.05	<0.02	0.05	<0.001	0.01	<0.005	<0.003	<0.001	<0.01
BK51-BK52 Comp 5	Tailings Material	0.1	<0.005	<0.005	<0.1	<0.01	0.3	<0.001	<0.01	<0.01	<0.05	<0.02	0.16	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
BK53-BK54 Comp 6	Tailings Material	0.1	<0.005	<0.005	<0.1	<0.01	0.3	<0.001	<0.01	<0.01	<0.05	<0.02	0.15	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01
BK46-BK47 Comp 3 Dup		0.8	<0.005	<0.005	<0.1	<0.01	0.4	<0.001	<0.01	<0.01	<0.05	<0.02	0.02	<0.001	<0.01	<0.005	<0.003	<0.001	<0.01

* Lab Sheets for this data are attached to this appendix

VI. Conclusion

Alunite is a difficult sulfate mineral to accurately determine geochemical properties with traditional Sobeck style ABA methods. Research results from numerous articles, expert references, and consultation with renowned experts[1] familiar with ABA and mine wastes guided the test programs undertaken to conscientiously speciate the sulphur components and determine the acid potential related to sulfides potentially found within the TWOL. The outcome of test work demonstrated the following conclusions.

1. The static test results associated with MWMP and SPLP show that water quality leachate associated with TWLO is not deleterious or acid forming and would not be detrimental to the environment. These tests do not show any deleterious metals available to be leached into the environment.

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[1] Ms. Amy Prestia, SRK Consultants, Mr. Stuart R. Jennings, KCHarvey Environmental, LLC, Mr. Kim Lappoko , Minnesota Department of Mines

2. Kinetic HCTs are considered the ultimate predictor for acid production. The five HCTs run on alunite by the Hycroft Mine for 54-74 weeks showed no sign of acid production, confirming that Alunite is not acid-forming or detrimental to the environment.
3. Results clearly demonstrate that alunite is not an acid producing mineral. The exhaustive investigation carried out by UAC supports this conclusion.
4. Mineralogy indicates Pyrite does not appear to be part of the hydrothermal alteration associated with alunite, but rather as a minor accessory mineral naturally occurring in the unaltered or weakly altered rock.
5. The geology of the Hycroft mine is similar to the Alunite formation at the Blawn Mountain project and therefore supports our conclusions that TWLO will not be acid forming

Therefore, the Blawn Mountain Project will not result in creation of acid producing materials that could impact local ground or surface waters, Moreover, the mine is planned to fully contain all runoff and sediment from any stockpiles related to TWOL.

VII. References

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Inter-Mountain Labs
Your Environmental Monitoring Partner
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Date: 11/6/2013

CLIENT: Stoel Rives LLP
Project: Potash Ridge MWMP Profile 1
Lab Order: S1310421

CASE NARRATIVE

Report ID: S1310421001

Rock samples PDH1-05 270-280, PDH1-11 350-360, PDH1-11 370-380, BM-14B 550-560, BM-14B 570-580, PDH1-14 340-350, PDH2-36 180-190, A2-16B 560-570, PDH1-14 290-300, and A2-16B 570-580 were extracted on October 27, 2013 and analyzed using the methods outlined in the following references:

ASTM E2442-12 for Meteoric Water Mobility Procedure (MWMP)

U.S.E.P.A. 600 "Methods for Chemical Analysis of Water and Wastes", 1993
"Standard Methods For The Examination of Water and Wastewater", 20th ed., 1998
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

These samples were received and analyzed within the EPA recommended holding times, except as noted in this case narrative and the attached data report. In addition, all Quality Control parameters met the acceptance criteria defined by the EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

As noted below, due to the quantity of material received, the MWMP procedure for all of the samples was conducted using approximately 2500 grams (dry weight), rather than the 5 kilograms (dry weight) the method designates. The approximate volume of effluent collected for these samples was 2500 milliliters, and therefore the 1:1 ratio of sample to extracting solution [illegible] maintained.

MWMP extraction data was as follows:

Extraction fluid pH = 6.1
Total dry weight of rock sample (kg) = PDH1-05 270-280, PDH1-11 350-360, PDH1-11 370-380, BM-14B 550-560, BM-14B 570-580, PDH1-14 340-350, PDH2-36 180-190, A2-16B 560-570, PDH1-14 290-300, and A2-16B 570-580: 2.5
Volume of effluent collected (L) = PDH1-05 270-280, PDH1-11 350-360, PDH1-11 370-380, BM-14B 550-560, BM-14B 570-580, PDH1-14 340-350, PDH2-36 180-190, A2-16B 560-570, PDH1-14 290-300, and A2-16B 570-580: 2.5
Contact time in the extraction device (hours) = PDH1-05 270-280: 24, PDH1-11 350-360: 43.5, PDH1-11 370-380: 43.5, BM-14B 550-560: 24, BM-14B 570-580: 43.5, PDH1-14 340-350: 24, PDH2-36 180-190: 43.5, A2-16B 560-570: 24, PDH1-14 290-300: 24, and A2-16B 570-580: 24
Feed moisture content (%) = PDH1-05 270-280: 0.3, PDH1-11 350-360: 2.4, PDH1-11 370-380: 2.2, BM-14B 550-560: 0, BM-14B 570-580: 0, PDH1-14 340-350: 0, PDH2-36 180-190: 3.9, A2-16B 560-570: 0, PDH1-14 290-300: 0, and A2-16B 570-580: 0.7
Retained moisture content (%) = PDH1-05 270-280: 2.0, PDH1-11 350-360: 13.7, PDH1-11 370-380: 13.6, BM-14B 550-560: 3.6, BM-14B 570-580: 4.1, PDH1-14 340-350: 13.1, PDH2-36 180-190: 7.1, A2-16B 560-570: 18.0, PDH1-14 290-300: 12.1, and A2-16B 570-580: 18.2

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Inter-Mountain Labs

INTER-MOUNTAIN LABS

Your Environmental Monitoring Partner

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

ENT:	Stoel Rives LLP 201 S. Main Street, Suite #1100 Salt Lake City, UT 84111	**Date Reported:**	11/6/2013
		Report ID:	S1310421001
		Work Order:	S1310421
Project:	Potash Ridge MWMP Profile 1	**Collection Date:**	10/27/2013 11:00:00 AM
Lab ID:	S1310421-001	**Date Received:**	10/28/2013 8:20:00 AM
Client Sample ID:	PDHI-05 270-280	**Sampler:**	KO
COC:	151454	**Matrix:**	Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	6.9	0.1		s.u.	10/28/2013 2319 KV	SM 4500 H B
Total Dissolved Solids (180)	ND	10		mg/L	10/28/2013 1051 EC	SM 2540
Alkalinity, Total (As CaCO3)	ND	5		mg/L	10/28/2013 2319 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1101 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	ND	5		mg/L	10/28/2013 2319 KV	SM 2320B
Chloride	ND	1		mg/L	10/28/2013 2021 AMB	EPA 300.0
Fluoride	ND	0.1		mg/L	10/28/2013 2319 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	10/29/2013 0958 RH	EPA 353.2
Sulfate	2	1		mg/L	10/28/2013 2021 AMB	EPA 300.0
Cations						
Calcium	1	1		mg/L	10/28/2013 2143 DG	EPA 200.7
Magnesium	ND	1		mg/L	10/28/2013 2143 DG	EPA 200.7
Potassium	ND	1		mg/L	10/28/2013 2143 DG	EPA 200.7
dium	2	1		mg/L	10/28/2013 2143 DG	EPA 200.7
on/Anion-Milliequivalents						
Bicarbonate as HCO3	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	0.04	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.05	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.07	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	0.12	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	0.04	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.08	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor

Inter-Mountain Labs

Your Environmental Monitoring Partner

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/27/2013 11:00:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-001
Client Sample ID: PDHI-05 270-280
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2143 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2056 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2056 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2056 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2143 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2143 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2056 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2143 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/28/2013 2056 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2143 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2056 MS	EPA 200.8
Manganese	ND	0.02		mg/L	10/28/2013 2143 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1103 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/28/2013 2143 DG	EPA 200.7
[illegible]elenium	ND	0.005		mg/L	10/28/2013 2056 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/28/2013 2056 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2056 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2143 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/28/2013 6:30:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-002
Client Sample ID: PDH1-11 350-360
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.0	0.1		s.u.	10/28/2013 2331 KV	SM 4500 H B
Total Dissolved Solids (180)	80	10		mg/L	10/28/2013 1052 EC	SM 2540
Alkalinity, Total (As CaCO3)	ND	5		mg/L	10/28/2013 2331 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1102 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	6	5		mg/L	10/28/2013 2331 KV	SM 2320B
Chloride	7	1		mg/L	10/28/2013 2033 AMB	EPA 300.0
Fluoride	ND	0.1		mg/L	10/28/2013 2331 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	0.3	0.1		mg/L	10/29/2013 0959 RH	EPA 353.2
Sulfate	19	1		mg/L	10/28/2013 2033 AMB	EPA 300.0
Cations						
Calcium	8	1		mg/L	10/28/2013 2148 DG	EPA 200.7
Magnesium	3	1		mg/L	10/28/2013 2148 DG	EPA 200.7
Potassium	3	1		mg/L	10/28/2013 2148 DG	EPA 200.7
[illegible]dium	3	1		mg/L	10/28/2013 2148 DG	EPA 200.7
[illegible]on/Anion-Milliequivalents						
Bicarbonate as HCO3	0.09	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	0.20	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	0.02	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	0.40	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.39	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	0.22	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	0.08	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.11	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	0.80	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	0.63	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.17	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/28/2013 6:30:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-002
Client Sample ID: PDH1-11 350-360
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2148 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2113 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2113 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2113 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2148 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2148 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2113 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2148 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/28/2013 2113 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2148 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2113 MS	EPA 200.8
Manganese	ND	0.02		mg/L	10/28/2013 2148 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1105 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/28/2013 2148 DG	EPA 200.7
[illegible]lenium	ND	0.005		mg/L	10/28/2013 2113 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/28/2013 2113 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2113 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2148 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Project: Potash Ridge MWMP Profile 1
Collection Date: 10/28/2013 6:30:00 AM
Lab ID: S1310421-003
Date Received: 10/28/2013 8:20:00 AM
Client Sample ID: PDH1-11 370-380
Sampler: KO
COC: 151454
Matrix: Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.5	0.1		s.u.	10/28/2013 2343 KV	SM 4500 H B
Total Dissolved Solids (180)	200	10		mg/L	10/28/2013 1053 EC	SM 2540
Alkalinity, Total (As CaCO3)	31	5		mg/L	10/31/2013 1720 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1103 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	37	5		mg/L	10/31/2013 1720 KV	SM 2320B
Chloride	17	1		mg/L	10/31/2013 2358 AMB	EPA 300.0
Fluoride	0.2	0.1		mg/L	10/28/2013 2343 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	1.0	0.1		mg/L	10/29/2013 1001 RH	EPA 353.2
Sulfate	36	1		mg/L	10/31/2013 2358 AMB	EPA 300.0
Cations						
Calcium	17	1		mg/L	11/01/2013 1107 DG	EPA 200.7
Magnesium	7	1		mg/L	11/01/2013 1107 DG	EPA 200.7
Potassium	11	1		mg/L	11/01/2013 1107 DG	EPA 200.7
[illegible]dium	8	1		mg/L	11/01/2013 1107 DG	EPA 200.7
[illegible]tion/Anion-Milliequivalents						
Bicarbonate as HCO3	0.61	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	0.48	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	0.07	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	0.75	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.86	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	0.58	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	0.26	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.35	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	2.07	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	1.93	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.13	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/28/2013 6:30:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-003
Client Sample ID: PDH1-11 370-380
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	1.1	0.1		mg/L	10/28/2013 2201 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2118 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2118 MS	EPA 200.8
Barium	0.4	0.1		mg/L	10/28/2013 2118 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2201 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2201 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2118 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2201 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/28/2013 2118 MS	EPA 200.8
Iron	0.17	0.05		mg/L	10/28/2013 2201 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2118 MS	EPA 200.8
Manganese	ND	0.02		mg/L	10/28/2013 2201 DG	EPA 200.7
Mercury	0.001	0.001		mg/L	11/05/2013 1111 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/28/2013 2201 DG	EPA 200.7
[illegible]lenium	ND	0.005		mg/L	10/28/2013 2118 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/28/2013 2118 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2118 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2201 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Project: Potash Ridge MWMP Profile 1
Collection Date: 10/27/2013 11:00:00 AM
Lab ID: S1310421-004
Date Received: 10/28/2013 8:20:00 AM
Client Sample ID: BM-14B 550-560
Sampler: KO
COC: 151454
Matrix: Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	5.9	0.1		s.u.	10/28/2013 2355 KV	SM 4500 H B
Total Dissolved Solids (180)	30	10		mg/L	10/28/2013 1055 EC	SM 2540
Alkalinity, Total (As CaCO3)	ND	5		mg/L	10/28/2013 2355 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1104 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	ND	5		mg/L	10/28/2013 2355 KV	SM 2320B
Chloride	2	1		mg/L	10/28/2013 2202 AMB	EPA 300.0
Fluoride	ND	0.1		mg/L	10/28/2013 2355 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	10/29/2013 1002 RH	EPA 353.2
Sulfate	4	1		mg/L	10/28/2013 2202 AMB	EPA 300.0
Cations						
Calcium	2	1		mg/L	10/28/2013 2204 DG	EPA 200.7
Magnesium	ND	1		mg/L	10/28/2013 2204 DG	EPA 200.7
Potassium	ND	1		mg/L	10/28/2013 2204 DG	EPA 200.7
[illegible]dium	2	1		mg/L	10/28/2013 2204 DG	EPA 200.7
[illegible]ion/Anion-Milliequivalents						
Bicarbonate as HCO3	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	0.04	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	0.08	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.07	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.09	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	0.16	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	0.13	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.03	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

IML INTER-MOUNTAIN LABS Inter-Mountain Labs

Your Environmental Monitoring Partner

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/27/2013 11:00:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-004
Client Sample ID: BM-14B 550-560
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2204 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2124 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2124 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2124 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2204 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2204 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2124 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2204 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/28/2013 2124 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2204 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2124 MS	EPA 200.8
Manganese	ND	0.02		mg/L	10/28/2013 2204 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1119 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/28/2013 2204 DG	EPA 200.7
[illegible]lenium	ND	0.005		mg/L	10/28/2013 2124 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/28/2013 2124 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2124 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2204 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Project: Potash Ridge MWMP Profile 1
Collection Date: 10/28/2013 6:30:00 AM
Lab ID: S1310421-005
Date Received: 10/28/2013 8:20:00 AM
Client Sample ID: BM-14B 570-580
Sampler: KO
COC: 151454
Matrix: Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	5.8	0.1		s.u.	10/29/2013 0007 KV	SM 4500 H B
Total Dissolved Solids (180)	40	10		mg/L	10/28/2013 1056 EC	SM 2540
Alkalinity, Total (As CaCO3)	ND	5		mg/L	10/29/2013 0007 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1105 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	ND	5		mg/L	10/29/2013 0007 KV	SM 2320B
Chloride	2	1		mg/L	10/28/2013 2214 AMB	EPA 300.0
Fluoride	ND	0.1		mg/L	10/29/2013 0007 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	10/29/2013 1003 RH	EPA 353.2
Sulfate	6	1		mg/L	10/28/2013 2214 AMB	EPA 300.0
Cations						
Calcium	2	1		mg/L	10/28/2013 2206 DG	EPA 200.7
Magnesium	ND	1		mg/L	10/28/2013 2206 DG	EPA 200.7
Potassium	ND	1		mg/L	10/28/2013 2206 DG	EPA 200.7
[illegible]dium	2	1		mg/L	10/28/2013 2206 DG	EPA 200.7
[illegible]n/Anion-Milliequivalents						
Bicarbonate as HCO3	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	0.06	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	0.12	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.10	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.10	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	0.20	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	0.18	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.02	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Project: Potash Ridge MWMP Profile 1
Collection Date: 10/28/2013 6:30:00 AM
Lab ID: S1310421-005
Date Received: 10/28/2013 8:20:00 AM
Client Sample ID: BM-14B 570-580
Sampler: KO
COC: 151454
Matrix: Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2206 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2129 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2129 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2129 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2206 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2206 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2129 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2206 DG	EPA 200.7
Copper	0.03	0.01		mg/L	10/28/2013 2129 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2206 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2129 MS	EPA 200.8
Manganese	ND	0.02		mg/L	10/28/2013 2206 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1121 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/28/2013 2206 DG	EPA 200.7
[illegible]lenium	ND	0.005		mg/L	10/28/2013 2129 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/28/2013 2129 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2129 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2206 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Inter-Mountain Labs Your Environmental Monitoring Partner
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/27/2013 11:00:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-006
Client Sample ID: PDH1-14 340-350
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	6.8	0.1		s.u.	10/29/2013 0018 KV	SM 4500 H B
Total Dissolved Solids (180)	130	10		mg/L	10/28/2013 1057 EC	SM 2540
Alkalinity, Total (As CaCO3)	ND	5		mg/L	10/29/2013 0018 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1106 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	ND	5		mg/L	10/29/2013 0018 KV	SM 2320B
Chloride	5	1		mg/L	10/28/2013 2227 AMB	EPA 300.0
Fluoride	ND	0.1		mg/L	10/29/2013 0018 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	10/29/2013 1004 RH	EPA 353.2
Sulfate	58	1		mg/L	10/28/2013 2227 AMB	EPA 300.0
Cations						
Calcium	15	1		mg/L	10/28/2013 2208 DG	EPA 200.7
Magnesium	3	1		mg/L	10/28/2013 2208 DG	EPA 200.7
Potassium	2	1		mg/L	10/28/2013 2208 DG	EPA 200.7
[illegible]dium	6	1		mg/L	10/28/2013 2208 DG	EPA 200.7
[illegible]ion/Anion-Milliequivalents						
Bicarbonate as HCO3	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	0.15	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	1.19	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.74	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	0.25	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	0.05	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.28	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	1.33	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	1.35	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.01	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Inter-Mountain Labs

Your Environmental Monitoring Partner

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/27/2013 11:00:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-006
Client Sample ID: PDH1-14 340-350
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2208 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2135 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2135 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2135 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2208 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2208 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2135 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2208 DG	EPA 200.7
Copper	0.02	0.01		mg/L	10/28/2013 2135 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2208 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2135 MS	EPA 200.8
Manganese	0.24	0.02		mg/L	10/28/2013 2208 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1123 CS	EPA 245.1
Nickel	0.03	0.01		mg/L	10/28/2013 2208 DG	EPA 200.7
elenium	ND	0.005		mg/L	10/28/2013 2135 MS	EPA 200.8
lver	ND	0.003		mg/L	10/28/2013 2135 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2135 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2208 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 2/19/2014
Report ID: S1310421002
(Replaces S1310421001)
Work Order: S1310421
Collection Date: 10/28/2013 6:30:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-007
Client Sample ID: PDH2-36 480-490
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.4	0.1		s.u.	10/29/2013 0030 KV	SM 4500 H B
Total Dissolved Solids (180)	540	10		mg/L	10/28/2013 1058 EC	SM 2540
Alkalinity, Total (As CaCO3)	28	5		mg/L	10/31/2013 1730 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1342 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	35	5		mg/L	10/31/2013 1730 KV	SM 2320B
Chloride	99	1		mg/L	11/01/2013 0011 AMB	EPA 300.0
Fluoride	0.2	0.1		mg/L	10/29/2013 0030 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	0.9	0.1		mg/L	10/29/2013 1012 RH	EPA 353.2
Sulfate	142	1		mg/L	11/01/2013 0011 AMB	EPA 300.0
Cations						
Calcium	69	1		mg/L	10/28/2013 2210 DG	EPA 200.7
Magnesium	13	1		mg/L	11/01/2013 1109 DG	EPA 200.7
Potassium	8	1		mg/L	11/01/2013 1109 DG	EPA 200.7
dium	43	1		mg/L	11/01/2013 1109 DG	EPA 200.7
Cation/Anion-Milliequivalents						
Bicarbonate as HCO3	0.56	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	2.80	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	0.01	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	0.06	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	2.94	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	3.42	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	1.06	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	0.20	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	1.87	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	6.57	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	6.39	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Balance	1.43	0.01		%	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/28/2013 6:30:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-007
Client Sample ID: PDH2-36 180-190
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2210 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2140 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2140 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2140 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2210 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2210 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2140 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2210 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/28/2013 2140 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2210 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2140 MS	EPA 200.8
Manganese	ND	0.02		mg/L	10/28/2013 2210 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1125 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/28/2013 2210 DG	EPA 200.7
[illegible]lenium	ND	0.005		mg/L	10/28/2013 2140 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/28/2013 2140 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2140 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2210 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

INTER-MOUNTAIN LABS Inter-Mountain Labs

Your Environmental Monitoring Partner

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

CLIENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/27/2013 11:00:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-008
Client Sample ID: A2-16B 560-570
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.0	0.1		s.u.	10/29/2013 0054 KV	SM 4500 H B
Total Dissolved Solids (180)	100	10		mg/L	10/28/2013 1059 EC	SM 2540
Alkalinity, Total (As CaCO3)	ND	5		mg/L	10/29/2013 0054 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1343 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	6	5		mg/L	10/29/2013 0054 KV	SM 2320B
Chloride	8	1		mg/L	10/28/2013 2252 AMB	EPA 300.0
Fluoride	0.1	0.1		mg/L	10/29/2013 0054 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	0.2	0.1		mg/L	10/29/2013 1013 RH	EPA 353.2
Sulfate	37	1		mg/L	10/28/2013 2252 AMB	EPA 300.0
Cations						
Calcium	13	1		mg/L	10/28/2013 2213 DG	EPA 200.7
Magnesium	3	1		mg/L	10/28/2013 2213 DG	EPA 200.7
Potassium	4	1		mg/L	10/28/2013 2213 DG	EPA 200.7
Sodium	7	1		mg/L	10/28/2013 2213 DG	EPA 200.7
[illegible]on/Anion-Milliequivalents						
Bicarbonate as HCO3	0.09	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	0.23	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	0.01	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	0.75	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.62	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	0.24	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	0.11	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.31	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	1.29	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	1.01	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.28	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor

Sample Analysis Report

ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Project: Potash Ridge MWMP Profile 1
Collection Date: 10/27/2013 11:00:00 AM
Lab ID: S1310421-008
Date Received: 10/28/2013 8:20:00 AM
Client Sample ID: A2-16B 560-570
Sampler: KO
COC: 151454
Matrix: Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2213 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2202 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2202 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2202 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2213 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2213 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2202 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2213 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/28/2013 2202 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2213 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2202 MS	EPA 200.8
Manganese	ND	0.02		mg/L	10/28/2013 2213 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1127 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/28/2013 2213 DG	EPA 200.7
lenium	ND	0.005		mg/L	10/28/2013 2202 MS	EPA 200.8
ver	ND	0.003		mg/L	10/28/2013 2202 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2202 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2213 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]IENT:	Stoel Rives LLP 201 S. Main Street, Suite #1100 Salt Lake City, UT 84111	**Date Reported:**	11/6/2013
		Report ID:	S1310421001
		Work Order:	S1310421
Project:	Potash Ridge MWMP Profile 1	**Collection Date:**	10/27/2013 11:00:00 AM
Lab ID:	S1310421-009	**Date Received:**	10/28/2013 8:20:00 AM
Client Sample ID:	PDH1-14 290-300	**Sampler:**	KO
COC:	151454	**Matrix:**	Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.4	0.1		s.u.	10/29/2013 0107 KV	SM 4500 H B
Total Dissolved Solids (180)	140	10		mg/L	10/28/2013 1100 EC	SM 2540
Alkalinity, Total (As CaCO3)	9	5		mg/L	10/29/2013 0107 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1344 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	11	5		mg/L	10/29/2013 0107 KV	SM 2320B
Chloride	8	1		mg/L	11/01/2013 0025 AMB	EPA 300.0
Fluoride	0.2	0.1		mg/L	10/29/2013 0107 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	0.2	0.1		mg/L	10/29/2013 1015 RH	EPA 353.2
Sulfate	82	1		mg/L	11/01/2013 0025 AMB	EPA 300.0
Cations						
Calcium	15	1		mg/L	10/28/2013 2217 DG	EPA 200.7
Magnesium	4	1		mg/L	10/28/2013 2217 DG	EPA 200.7
Potassium	4	1		mg/L	10/28/2013 2217 DG	EPA 200.7
[illegible]dium	20	1		mg/L	10/28/2013 2217 DG	EPA 200.7
[illegible]ion/Anion-Milliequivalents						
Bicarbonate as HCO3	0.17	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	0.23	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	0.01	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	1.71	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.73	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	0.32	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	0.09	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.86	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	2.01	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	2.15	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.14	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]IENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/27/2013 11:00:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-009
Client Sample ID: PDH1-14 290-300
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2217 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2218 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2218 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2218 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2217 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2217 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2218 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2217 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/28/2013 2218 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2217 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2218 MS	EPA 200.8
Manganese	0.10	0.02		mg/L	10/28/2013 2217 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1129 CS	EPA 245.1
Nickel	0.01	0.01		mg/L	10/28/2013 2217 DG	EPA 200.7
[illegible]elenium	ND	0.005		mg/L	10/28/2013 2218 MS	EPA 200.8
[illegible]lver	ND	0.003		mg/L	10/28/2013 2218 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2218 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2217 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

IML INTER-MOUNTAIN LABS Inter-Mountain Labs
Your Environmental Monitoring Partner
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

IENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/27/2013 11:00:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-010
Client Sample ID: A2-16B 570-580
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.3	0.1		s.u.	10/29/2013 0119 KV	SM 4500 H B
Total Dissolved Solids (180)	150	10		mg/L	10/28/2013 1101 EC	SM 2540
Alkalinity, Total (As CaCO3)	11	5		mg/L	10/29/2013 0119 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1345 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	13	5		mg/L	10/29/2013 0119 KV	SM 2320B
Chloride	12	1		mg/L	10/29/2013 1715 AMB	EPA 300.0
Fluoride	0.1	0.1		mg/L	10/29/2013 0119 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	0.3	0.1		mg/L	10/29/2013 1016 RH	EPA 353.2
Sulfate	57	1		mg/L	10/28/2013 2317 AMB	EPA 300.0
Cations						
Calcium	13	1		mg/L	10/28/2013 2231 DG	EPA 200.7
Magnesium	3	1		mg/L	10/28/2013 2231 DG	EPA 200.7
Potassium	3	1		mg/L	10/28/2013 2231 DG	EPA 200.7
dium	23	1		mg/L	10/28/2013 2231 DG	EPA 200.7
ion/Anion-Milliequivalents						
Bicarbonate as HCO3	0.21	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Chloride	0.33	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Fluoride	ND	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Nitrate + Nitrite as N	0.02	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sulfate	1.18	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Calcium	0.62	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Magnesium	0.22	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Potassium	0.08	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Sodium	0.99	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation / Anion Balance						
Cation Sum	1.93	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Anion Sum	1.77	0.01		meq/L	11/04/2013 1114 KO	SM 1030E
Cation-Anion Difference	0.16	0.01		meq/L	11/04/2013 1114 KO	SM 1030E

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310421001

Work Order: S1310421
Collection Date: 10/27/2013 11:00:00 AM
Date Received: 10/28/2013 8:20:00 AM
Sampler: KO
Matrix: Leachate

Project: Potash Ridge MWMP Profile 1
Lab ID: S1310421-010
Client Sample ID: A2-16B 570-580
COC: 151454

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/28/2013 2231 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/28/2013 2224 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/28/2013 2224 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/28/2013 2224 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/28/2013 2231 DG	EPA 200.7
Boron	ND	0.1		mg/L	10/28/2013 2231 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/28/2013 2224 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/28/2013 2231 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/28/2013 2224 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/28/2013 2231 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/28/2013 2224 MS	EPA 200.8
Manganese	0.02	0.02		mg/L	10/28/2013 2231 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1131 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/28/2013 2231 DG	EPA 200.7
[illegible]lenium	ND	0.005		mg/L	10/28/2013 2224 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/28/2013 2224 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/28/2013 2224 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/28/2013 2231 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Inter-Mountain Labs
Sheridan, WY and Gillette, WY

- CHAIN OF CUSTODY RECORD -

All shaded fields must be completed.
This is a legal document; any misrepresentation may be construed as fraud.

Client Name: STOEL RIVES LLP

Project Identification: POTASH RIDGE

Sampler (Signature/Attestation of Authenticity): x Erin Zinger

Report Address:
C/o RICH HALL
201 S. MAIN ST., # 1100
SLC, UTAH 84111

Contact Name: RICH HALL

Email: RRHALL@STOEL.COM

Phone: 208-387-4211

Invoice Address:
NORWEST CORPORATION
C/O ALETA BROWN
136 E. SOUTH TEMPLE, 12 Fl
SLC, UTAH 84111

Purchase Order #:

Quote #:

ITEM	LAB ID (Lab Use Only)	DATE SAMPLED	TIME SAMPLED	SAMPLE IDENTIFICATION	Matrix	# of Containers	ANALYSES / PARAMET
1	S1310272	10/15	2:00pm	PDH 1-05 270-280			MWMP / PROFILE I w/ ABP
2				PDH 1-11 350-360			
3				PDH 1-11 370-380			
4				BM-14B 550-560			
5				BM-14B 570-580			
6				E.T. ~~PDH 1-10 580-590~~			
7				PDH 1-14 340-350			
8				PDH 2-36 480-490			
9				E.T. ~~A2-16B 550-560~~			
10				A2-16B 560-570			
11				PDH1-14 290 [illegible]			
12				A2-16B 570-[illegible]			
13							
14							

LAB COMMENTS	Relinquished By (Signature/Printed)	DATE	TIME	Received By (Signature/Printed)
	x Erin Zinafer	10/15	[redacted]	Kane A Secor

SHIPPING INFO
- ☐ UPS
- ☐ Fed Express
- ☐ US Mail
- ☐ Hand Carried
- ☐ Other______

MATRIX CODES

Water	WT
Soil	SL
Solid	SD
Filter	FT
Other	OT

TURN AROUND TIMES

Check desired service
- ☐ Standard turnaround
- ☐ RUSH - 5 Working Days
- ☐ URGENT - < 2 Working Days

Rush & Urgent Surcharges will be applied

COMPLIANCE INFORMATION

Compliance Monitoring ? Y / N
Program (SDWA, NPDES,...)
PWSID / Permit #
Chlorinated? Y / N
Sample Disposal: Lab Client

Inter-Mountain Labs

Your Environmental Monitoring Partner

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-001
Client Sample ID: BK41-BK42 Comp 1
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.2	0.1		s.u.	10/30/2013 1804 KV	SM 4500 H B
Total Dissolved Solids (180)	630	10		mg/L	10/30/2013 0900 EC	SM 2540
Alkalinity, Total (As CaCO3)	8	5		mg/L	11/01/2013 1533 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 0958 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	9	5		mg/L	11/01/2013 1533 KV	SM 2320B
Chloride	ND	1		mg/L	11/04/2013 1056 AMB	EPA 300.0
Fluoride	0.2	0.1		mg/L	10/30/2013 1804 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	11/01/2013 1108 RH	EPA 353.2
Sulfate	349	1		mg/L	11/04/2013 1056 AMB	EPA 300.0
Cations						
Calcium	8	1		mg/L	11/04/2013 1855 DG	EPA 200.7
Magnesium	ND	1		mg/L	10/31/2013 1304 DG	EPA 200.7
Potassium	138	1		mg/L	10/31/2013 1304 DG	EPA 200.7
[illegible]dium	38	1		mg/L	10/31/2013 1304 DG	EPA 200.7
[illegible]n/Anion-Milliequivalents						
Bicarbonate as HCO3	0.15	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Chloride	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Fluoride	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sulfate	7.29	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Calcium	0.40	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Magnesium	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Potassium	3.54	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sodium	1.58	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation / Anion Balance						
Cation Sum	5.63	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Anion Sum	7.42	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation-Anion Balance	13.72	0.01		%	11/06/2013 0814 KS	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

IENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-001
Client Sample ID: BK41-BK42 Comp 1
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/31/2013 1304 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/29/2013 1939 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/29/2013 1939 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/29/2013 1939 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/31/2013 1304 DG	EPA 200.7
Boron	0.4	0.1		mg/L	10/31/2013 1304 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/29/2013 1939 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/31/2013 1304 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/29/2013 1939 MS	EPA 200.8
Iron	0.08	0.05		mg/L	10/31/2013 1304 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/29/2013 1939 MS	EPA 200.8
Manganese	0.02	0.02		mg/L	10/31/2013 1304 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1225 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/31/2013 1304 DG	EPA 200.7
elenium	ND	0.005		mg/L	10/29/2013 1939 MS	EPA 200.8
lver	ND	0.003		mg/L	10/29/2013 1939 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/29/2013 1939 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/31/2013 1304 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-002
Client Sample ID: BK43-BK44 Comp 2
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.4	0.1		s.u.	10/30/2013 1814 KV	SM 4500 H B
Total Dissolved Solids (180)	370	10		mg/L	10/30/2013 0901 EC	SM 2540
Alkalinity, Total (As CaCO3)	14	5		mg/L	11/01/2013 1541 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 0959 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	17	5		mg/L	11/01/2013 1541 KV	SM 2320B
Chloride	ND	1		mg/L	11/04/2013 1110 AMB	EPA 300.0
Fluoride	0.3	0.1		mg/L	10/30/2013 1814 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	11/01/2013 1109 RH	EPA 353.2
Sulfate	224	1		mg/L	10/30/2013 1444 AMB	EPA 300.0
Cations						
Calcium	6	1		mg/L	11/04/2013 1857 DG	EPA 200.7
Magnesium	ND	1		mg/L	11/04/2013 1857 DG	EPA 200.7
Potassium	95	1		mg/L	10/31/2013 1309 DG	EPA 200.7
[illegible]dium	26	1		mg/L	10/31/2013 1309 DG	EPA 200.7
[illegible]ion/Anion-Milliequivalents						
Bicarbonate as HCO3	0.28	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Chloride	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Fluoride	0.01	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sulfate	4.67	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Calcium	0.27	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Magnesium	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Potassium	1.97	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sodium	1.12	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation / Anion Balance						
Cation Sum	3.83	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Anion Sum	4.95	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation-Anion Balance	12.78	0.01		%	11/06/2013 0814 KS	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-002
Client Sample ID: BK43-BK44 Comp 2
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	0.1		mg/L	10/31/2013 1309 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/29/2013 2000 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/29/2013 2000 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/29/2013 2000 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/31/2013 1309 DG	EPA 200.7
Boron	0.3	0.1		mg/L	10/31/2013 1309 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/29/2013 2000 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/31/2013 1309 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/29/2013 2000 MS	EPA 200.8
Iron	0.05	0.05		mg/L	10/31/2013 1309 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/29/2013 2000 MS	EPA 200.8
Manganese	0.02	0.02		mg/L	10/31/2013 1309 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1227 CS	EPA 245.1
Nickel	0.01	0.01		mg/L	10/31/2013 1309 DG	EPA 200.7
[illegible]lenium	ND	0.005		mg/L	10/29/2013 2000 MS	EPA 200.8
[illegible]lver	ND	0.003		mg/L	10/29/2013 2000 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/29/2013 2000 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/31/2013 1309 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]IENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Project: Potash Ridge SPLP Profile 1
Collection Date: 10/29/2013
Lab ID: S1310456-003
Date Received: 10/29/2013 1:09:00 PM
Client Sample ID: BK46-BK47 Comp 3
Sampler:
COC: 147980
Matrix: Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	9.8	0.1		s.u.	10/30/2013 1841 KV	SM 4500 H B
Total Dissolved Solids (180)	310	10		mg/L	10/30/2013 0902 EC	SM 2540
Alkalinity, Total (As CaCO3)	81	5		mg/L	11/01/2013 1549 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1000 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	47	5		mg/L	11/01/2013 1549 KV	SM 2320B
Chloride	ND	1		mg/L	11/04/2013 1123 AMB	EPA 300.0
Fluoride	0.5	0.1		mg/L	10/30/2013 1841 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	11/01/2013 1111 RH	EPA 353.2
Sulfate	133	1		mg/L	11/04/2013 1123 AMB	EPA 300.0
Cations						
Calcium	4	1		mg/L	11/04/2013 1900 DG	EPA 200.7
Magnesium	ND	1		mg/L	10/31/2013 1323 DG	EPA 200.7
Potassium	62	1		mg/L	10/31/2013 1323 DG	EPA 200.7
[illegible]dium	52	1		mg/L	11/04/2013 1900 DG	EPA 200.7
[illegible]on/Anion-Milliequivalents						
Bicarbonate as HCO3	0.78	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Chloride	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Fluoride	0.02	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sulfate	2.83	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Calcium	0.20	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Magnesium	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Potassium	1.58	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sodium	2.21	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation / Anion Balance						
Cation Sum	4.04	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Anion Sum	4.40	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation-Anion Balance	4.31	0.01		%	11/06/2013 0814 KS	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

INTER-MOUNTAIN LABS Inter-Mountain Labs

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1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-003
Client Sample ID: BK46-BK47 Comp 3
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	0.3	0.1		mg/L	10/31/2013 1323 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/29/2013 2005 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/29/2013 2005 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/29/2013 2005 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/31/2013 1323 DG	EPA 200.7
Boron	0.4	0.1		mg/L	10/31/2013 1323 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/29/2013 2005 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/31/2013 1323 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/29/2013 2005 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/31/2013 1323 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/29/2013 2005 MS	EPA 200.8
Manganese	ND	0.02		mg/L	10/31/2013 1323 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1229 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/31/2013 1323 DG	EPA 200.7
[illegible]lenium	ND	0.005		mg/L	10/29/2013 2005 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/29/2013 2005 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/29/2013 2005 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/31/2013 1323 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-004
Client Sample ID: BK48-BK49 Comp 4
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	7.6	0.1		s.u.	10/30/2013 1850 KV	SM 4500 H B
Total Dissolved Solids (180)	220	10		mg/L	10/30/2013 0903 EC	SM 2540
Alkalinity, Total (As CaCO3)	16	5		mg/L	11/01/2013 1556 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1001 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	19	5		mg/L	11/01/2013 1556 KV	SM 2320B
Chloride	ND	1		mg/L	11/04/2013 1136 AMB	EPA 300.0
Fluoride	0.4	0.1		mg/L	10/30/2013 1850 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	11/01/2013 1112 RH	EPA 353.2
Sulfate	120	1		mg/L	11/04/2013 1136 AMB	EPA 300.0
Cations						
Calcium	3	1		mg/L	11/04/2013 1902 DG	EPA 200.7
Magnesium	ND	1		mg/L	10/31/2013 1325 DG	EPA 200.7
Potassium	62	1		mg/L	10/31/2013 1325 DG	EPA 200.7
[illegible]dium	17	1		mg/L	10/31/2013 1325 DG	EPA 200.7
[illegible]on/Anion-Milliequivalents						
Bicarbonate as HCO3	0.31	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Chloride	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Fluoride	0.01	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sulfate	2.56	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Calcium	0.16	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Magnesium	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Potassium	1.52	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sodium	0.75	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation / Anion Balance						
Cation Sum	2.50	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Anion Sum	2.84	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation-Anion Difference	0.34	0.01		meq/L	11/06/2013 0814 KS	SM 1030E

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT:	Stoel Rives LLP 201 S. Main Street, Suite #1100 Salt Lake City, UT 84111	**Date Reported:**	11/6/2013
		Report ID:	S1310456001
		Work Order:	S1310456
Project:	Potash Ridge SPLP Profile 1	**Collection Date:**	10/29/2013
Lab ID:	S1310456-004	**Date Received:**	10/29/2013 1:09:00 PM
Client Sample ID:	BK48-BK49 Comp 4	**Sampler:**	
COC:	147980	**Matrix:**	Leachate

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	0.3	0.1		mg/L	10/31/2013 1325 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/29/2013 2011 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/29/2013 2011 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/29/2013 2011 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/31/2013 1325 DG	EPA 200.7
Boron	0.3	0.1		mg/L	10/31/2013 1325 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/29/2013 2011 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/31/2013 1325 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/29/2013 2011 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/31/2013 1325 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/29/2013 2011 MS	EPA 200.8
Manganese	0.05	0.02		mg/L	10/31/2013 1325 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1231 CS	EPA 245.1
Nickel	0.01	0.01		mg/L	10/31/2013 1325 DG	EPA 200.7
[illegible]elenium	ND	0.005		mg/L	10/29/2013 2011 MS	EPA 200.8
[illegible]lver	ND	0.003		mg/L	10/29/2013 2011 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/29/2013 2011 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/31/2013 1325 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]IENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-005
Client Sample ID: BK51-BK52 Comp 5
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	8.7	0.1		s.u.	10/30/2013 1901 KV	SM 4500 H B
Total Dissolved Solids (180)	310	10		mg/L	10/30/2013 0904 EC	SM 2540
Alkalinity, Total (As CaCO3)	36	5		mg/L	11/01/2013 1604 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1002 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	39	5		mg/L	11/01/2013 1604 KV	SM 2320B
Chloride	3	1		mg/L	11/04/2013 1150 AMB	EPA 300.0
Fluoride	0.3	0.1		mg/L	10/30/2013 1901 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	11/01/2013 1113 RH	EPA 353.2
Sulfate	167	1		mg/L	11/04/2013 1150 AMB	EPA 300.0
Cations						
Calcium	16	1		mg/L	11/04/2013 1904 DG	EPA 200.7
Magnesium	ND	1		mg/L	11/04/2013 1904 DG	EPA 200.7
Potassium	69	1		mg/L	10/31/2013 1327 DG	EPA 200.7
[illegible]dium	25	1		mg/L	10/31/2013 1327 DG	EPA 200.7
[illegible]ion/Anion-Milliequivalents						
Bicarbonate as HCO3	0.63	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Chloride	0.07	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Fluoride	0.01	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sulfate	3.46	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Calcium	0.76	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Magnesium	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Potassium	1.67	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sodium	1.06	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation / Anion Balance						
Cation Sum	3.62	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Anion Sum	4.27	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation-Anion Balance	8.15	0.01		%	11/06/2013 0814 KS	SM 1030E

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

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Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-005
Client Sample ID: BK51-BK52 Comp 5
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	0.1	0.1		mg/L	10/31/2013 1327 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/29/2013 2016 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/29/2013 2016 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/29/2013 2016 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/31/2013 1327 DG	EPA 200.7
Boron	0.3	0.1		mg/L	10/31/2013 1327 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/29/2013 2016 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/31/2013 1327 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/29/2013 2016 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/31/2013 1327 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/29/2013 2016 MS	EPA 200.8
Manganese	0.16	0.02		mg/L	10/31/2013 1327 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1233 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/31/2013 1327 DG	EPA 200.7
[illegible]elenium	ND	0.005		mg/L	10/29/2013 2016 MS	EPA 200.8
[illegible]lver	ND	0.003		mg/L	10/29/2013 2016 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/29/2013 2016 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/31/2013 1327 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

IML INTER-MOUNTAIN LABS Inter-Mountain Labs

Your Environmental Monitoring Partner

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-006
Client Sample ID: BK53-BK54 Comp 6
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	8.8	0.1		s.u.	10/30/2013 1911 KV	SM 4500 H B
Total Dissolved Solids (180)	280	10		mg/L	10/30/2013 0905 EC	SM 2540
Alkalinity, Total (As CaCO3)	35	5		mg/L	10/30/2013 1911 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1003 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	36	5		mg/L	10/30/2013 1911 KV	SM 2320B
Chloride	ND	1		mg/L	10/30/2013 1535 AMB	EPA 300.0
Fluoride	0.3	0.1		mg/L	10/30/2013 1911 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	11/01/2013 1114 RH	EPA 353.2
Sulfate	150	1		mg/L	10/31/2013 1357 AMB	EPA 300.0
Cations						
Calcium	12	1		mg/L	11/04/2013 1906 DG	EPA 200.7
Magnesium	ND	1		mg/L	10/31/2013 1330 DG	EPA 200.7
Potassium	64	1		mg/L	10/31/2013 1330 DG	EPA 200.7
[illegible]dium	23	1		mg/L	10/31/2013 1330 DG	EPA 200.7
[illegible]on/Anion-Milliequivalents						
Bicarbonate as HCO3	0.58	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Chloride	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Fluoride	0.01	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sulfate	3.17	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Calcium	0.58	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Magnesium	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Potassium	1.64	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sodium	0.99	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation / Anion Balance						
Cation Sum	3.23	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Anion Sum	3.83	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation-Anion Balance	8.43	0.01		%	11/06/2013 0814 KS	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

[illegible]ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-006
Client Sample ID: BK53-BK54 Comp 6
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	0.1	0.1		mg/L	10/31/2013 1330 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/29/2013 2022 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/29/2013 2022 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/29/2013 2022 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/31/2013 1330 DG	EPA 200.7
Boron	0.3	0.1		mg/L	10/31/2013 1330 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/29/2013 2022 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/31/2013 1330 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/29/2013 2022 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/31/2013 1330 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/29/2013 2022 MS	EPA 200.8
Manganese	0.15	0.02		mg/L	10/31/2013 1330 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1243 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/31/2013 1330 DG	EPA 200.7
Selenium	ND	0.005		mg/L	10/29/2013 2022 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/29/2013 2022 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/29/2013 2022 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/31/2013 1330 DG	EPA 200.7

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

ENT: Stoel Rives LLP
201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-007
Client Sample ID: BK46-BK47 Comp 3 Dup
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
pH	9.5	0.1		s.u.	10/30/2013 1923 KV	SM 4500 H B
Total Dissolved Solids (180)	280	10		mg/L	10/30/2013 0906 EC	SM 2540
Alkalinity, Total (As CaCO3)	66	5		mg/L	11/01/2013 1621 KV	SM 2320B
Cyanide, WAD	ND	0.02		mg/L	11/05/2013 1004 RH	SM4500 CN I
Anions						
Alkalinity, Bicarbonate as HCO3	48	5		mg/L	11/01/2013 1621 KV	SM 2320B
Chloride	ND	1		mg/L	11/04/2013 1217 AMB	EPA 300.0
Fluoride	0.5	0.1		mg/L	10/30/2013 1923 KV	SM 4500FC
Nitrogen, Nitrate-Nitrite (as N)	ND	0.1		mg/L	11/01/2013 1115 RH	EPA 353.2
Sulfate	128	1		mg/L	11/04/2013 1217 AMB	EPA 300.0
Cations						
Calcium	4	1		mg/L	11/04/2013 1908 DG	EPA 200.7
Magnesium	ND	1		mg/L	10/31/2013 1332 DG	EPA 200.7
Potassium	59	1		mg/L	10/31/2013 1332 DG	EPA 200.7
dium	43	1		mg/L	10/31/2013 1332 DG	EPA 200.7
on/Anion-Milliequivalents						
Bicarbonate as HCO3	0.83	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Chloride	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Fluoride	0.02	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Nitrate + Nitrite as N	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sulfate	2.66	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Calcium	0.18	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Magnesium	ND	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Potassium	1.40	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Sodium	1.88	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation / Anion Balance						
Cation Sum	3.59	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Anion Sum	4.01	0.01		meq/L	11/06/2013 0814 KS	SM 1030E
Cation-Anion Balance	5.44	0.01		%	11/06/2013 0814 KS	SM 1030E

These results apply only to the samples tested. **RL - Reporting Limit**

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Sample Analysis Report

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201 S. Main Street, Suite #1100
Salt Lake City, UT 84111

Date Reported: 11/6/2013
Report ID: S1310456001

Work Order: S1310456
Collection Date: 10/29/2013
Date Received: 10/29/2013 1:09:00 PM
Sampler:
Matrix: Leachate

Project: Potash Ridge SPLP Profile 1
Lab ID: S1310456-007
Client Sample ID: BK46-BK47 Comp 3 Dup
COC: 147980

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	0.6	0.1		mg/L	10/31/2013 1332 DG	EPA 200.7
Antimony	ND	0.005		mg/L	10/29/2013 2027 MS	EPA 200.8
Arsenic	ND	0.005		mg/L	10/29/2013 2027 MS	EPA 200.8
Barium	ND	0.1		mg/L	10/29/2013 2027 MS	EPA 200.8
Beryllium	ND	0.01		mg/L	10/31/2013 1332 DG	EPA 200.7
Boron	0.4	0.1		mg/L	10/31/2013 1332 DG	EPA 200.7
Cadmium	ND	0.001		mg/L	10/29/2013 2027 MS	EPA 200.8
Chromium	ND	0.01		mg/L	10/31/2013 1332 DG	EPA 200.7
Copper	ND	0.01		mg/L	10/29/2013 2027 MS	EPA 200.8
Iron	ND	0.05		mg/L	10/31/2013 1332 DG	EPA 200.7
Lead	ND	0.02		mg/L	10/29/2013 2027 MS	EPA 200.8
Manganese	0.02	0.02		mg/L	10/31/2013 1332 DG	EPA 200.7
Mercury	ND	0.001		mg/L	11/05/2013 1251 CS	EPA 245.1
Nickel	ND	0.01		mg/L	10/31/2013 1332 DG	EPA 200.7
[illegible]elenium	ND	0.005		mg/L	10/29/2013 2027 MS	EPA 200.8
[illegible]ver	ND	0.003		mg/L	10/29/2013 2027 MS	EPA 200.8
Thallium	ND	0.001		mg/L	10/29/2013 2027 MS	EPA 200.8
Zinc	ND	0.01		mg/L	10/31/2013 1332 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

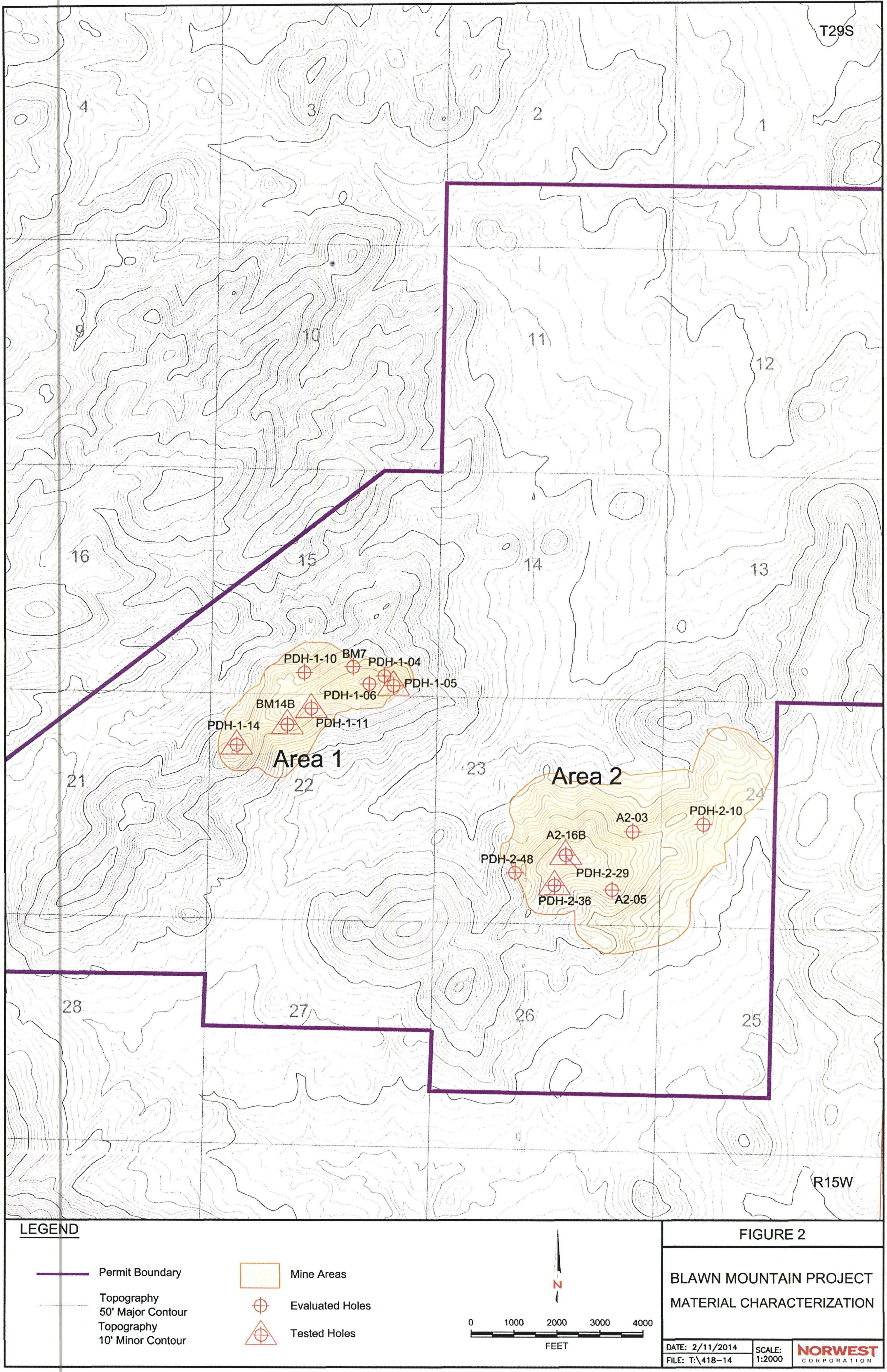


FIGURE 2

BLAWN MOUNTAIN PROJECT
MATERIAL CHARACTERIZATION

DATE: 2/11/2014
FILE: T:\418-14
SCALE: 1:2000
NORWEST CORPORATION

Appendix E

Lithologic Logs for Monitoring Wells

POTASH RIDGE

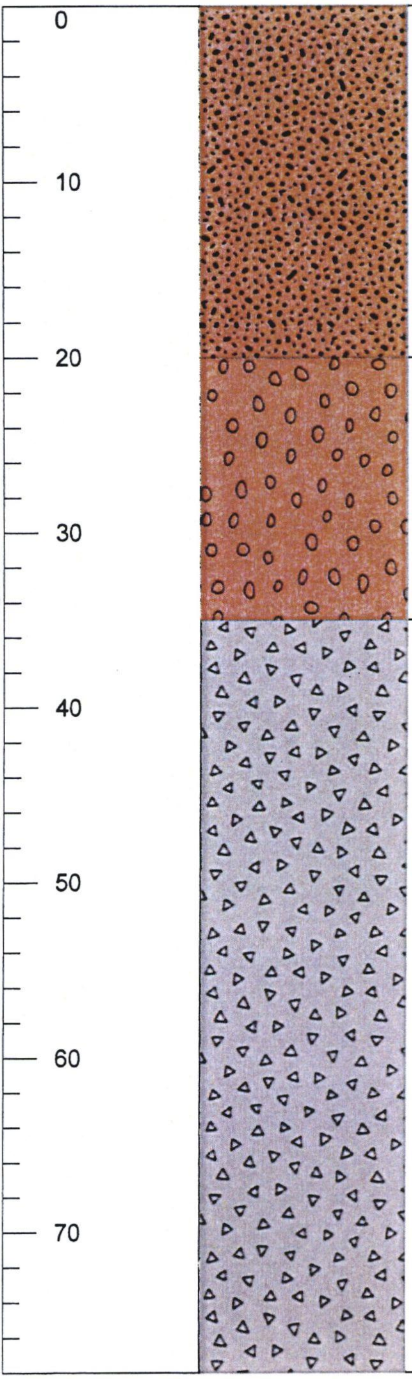
MW-1:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 21 (500' North, 520' East of SW corner)
GL Elev: 6,962'

Described By: T. Suchoski
Date(s): 10/4/12-10/6/12

Depth (ft)	Graphic Log	Lithologic Description
0-20		(0-20) Rotary cuttings, Alluvium/Colluvium, sandy gravel, brown
20-35		(20-35) Gravelly sand, brown
35-85		(35-85) Rhyolite, hard, purple with white crystaline veins



Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

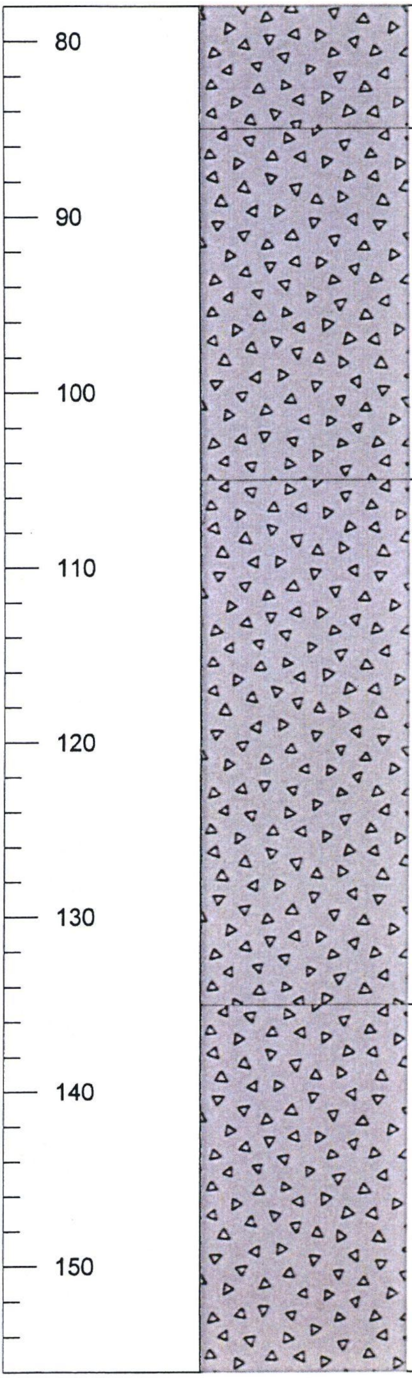
MW-1:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 21 (500' North, 520' East of SW corner)
GL Elev: 6,962'

Described By: T. Suchoski
Date(s): 10/4/12-10/6/12

Depth (ft) | Graphic Log | Lithologic Description



(85-105) Rhyolite, medium hard, purple with green clasts

(105-135) Rhyolite, hard, purple with many green clasts - water - 2gpm at 105' - 10gpm at 115'

(135-160) Rhyolite, hard, purple with green clasts, fine-grained

Lithology

- Colluvium/Alluvium
- Sandy Gravel
- Rhyolite
- Andesite
- Dolomite
- Limestone
- Mudstone
- Clay
- Alunite

POTASH RIDGE

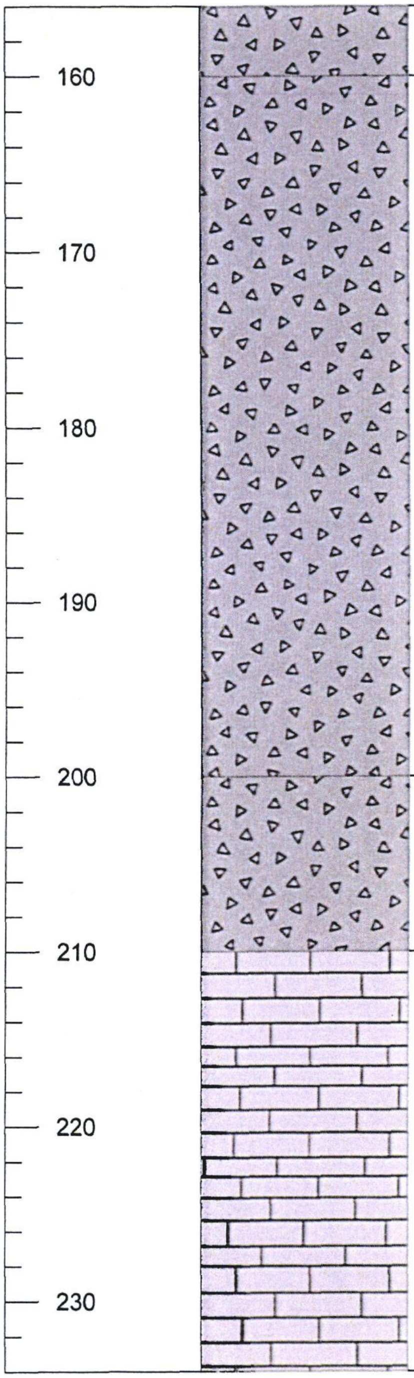
MW-1:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 21 (500' North, 520' East of SW corner)
GL Elev: 6,962'

Described By: T. Suchoski
Date(s): 10/4/12-10/6/12

Depth (ft)	Graphic Log	Lithologic Description
160–200	Rhyolite	(160-200) Rhyolite, hard, grey, some green clasts, softer with depth
200–210	Rhyolite	(200-210) Rhyolite, hard, grey, fine-grained
210–240	Limestone	(210-240) Limestone, grey fine-grained



Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

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Geologic Log

NORWEST CORPORATION

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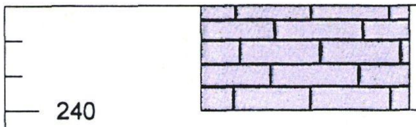
Described By: T. Suchoski
Date(s): 10/4/12-10/6/12

Depth (ft) | Graphic Log | Lithologic Description



Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

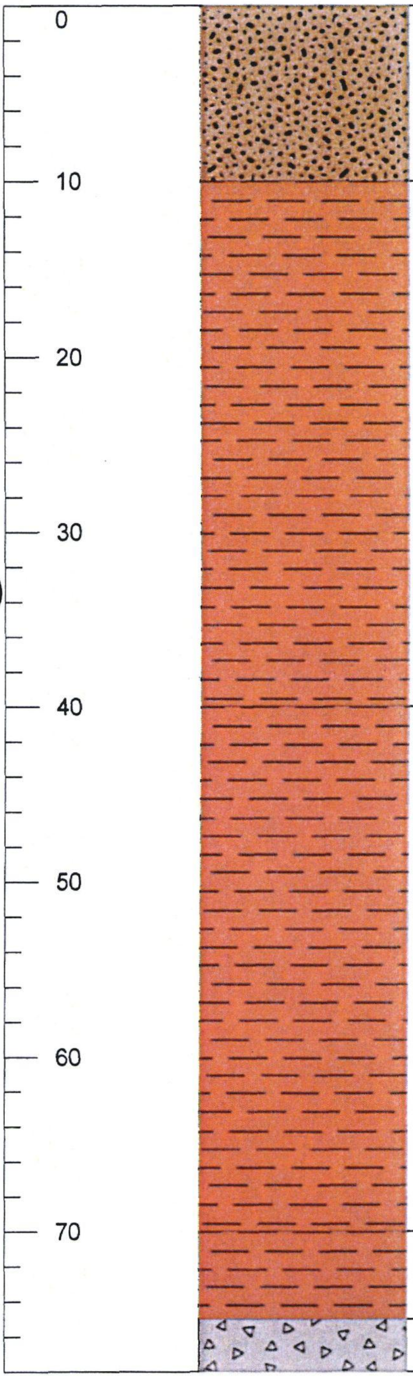
MW-2:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 24 (300' South, 1270' East of NW corner)
GL Elev: 6,548'

Described By: T. Suchoski
Date(s): 10/2/12-10/4/12

Depth (ft) | Graphic Log | Lithologic Description



(0-10) Rotary cuttings, Alluvium, Clayey Sand, lt brown to lt grey

(10-40) Clay with some sand, soft, lt grey to grey

(40-70) Clay, soft to medium hard, lt grey to grey

(70-75) Clay, soft to medium, lt brown

Lithology

- ▨ Colluvium/Alluvium
- ▨ Sandy Gravel
- ▨ Rhyolite
- ▨ Andesite
- ▨ Dolomite
- ▨ Limestone
- ▨ Mudstone
- ▨ Clay
- ▨ Alunite

POTASH RIDGE

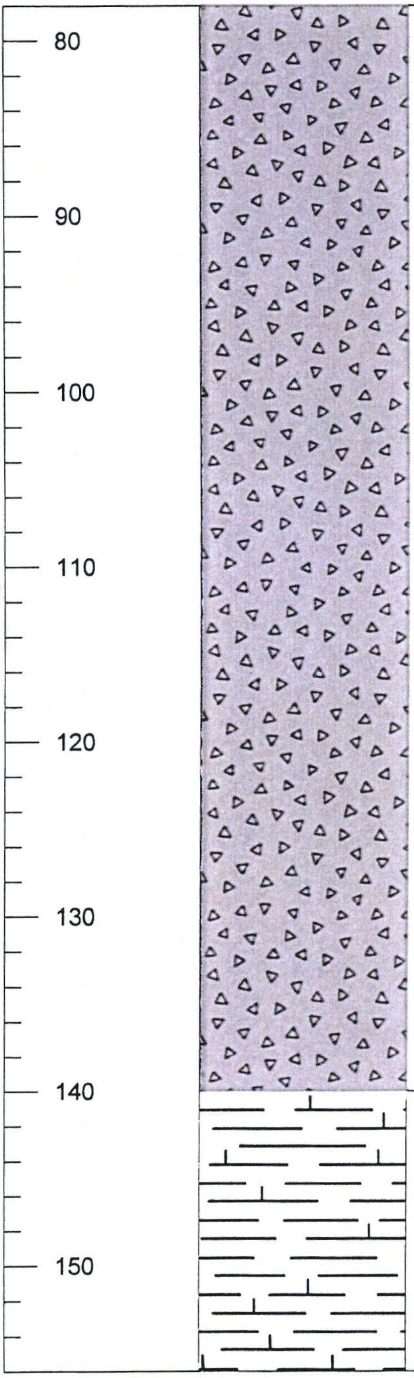
MW-2:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 24 (300' South, 1270' East of NW corner)
GL Elev: 6,548'

Described By: T. Suchoski
Date(s): 10/2/12-10/4/12

Depth (ft)	Graphic Log	Lithologic Description



(75-140) Rhyolite, medium to hard, grey

(140-160) Alunite, tan to lt brown

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

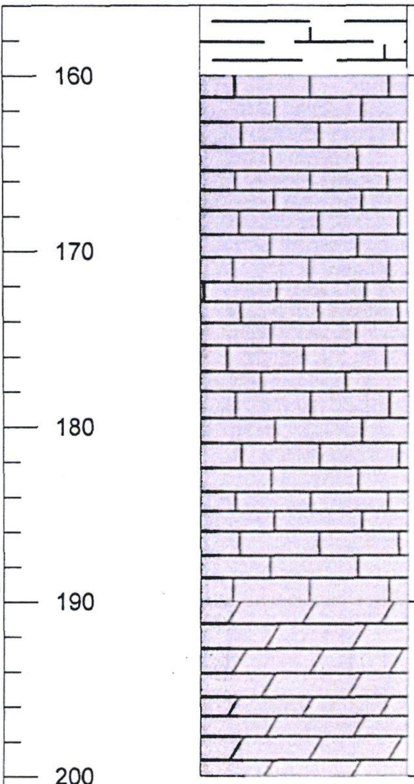
NORWEST
CORPORATION

MW-2:
Geologic Log

Township: 29 South
Range: 15 West
Section: 24 (300' South, 1270' East of NW corner)
GL Elev: 6,548'

Described By: T. Suchoski
Date(s): 10/2/12-10/4/12

Depth (ft) Graphic Log Lithologic Description



(160-190) Limestone, grey with brown and red chips

(190-200) Dolomite, black with brown and red chips

Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

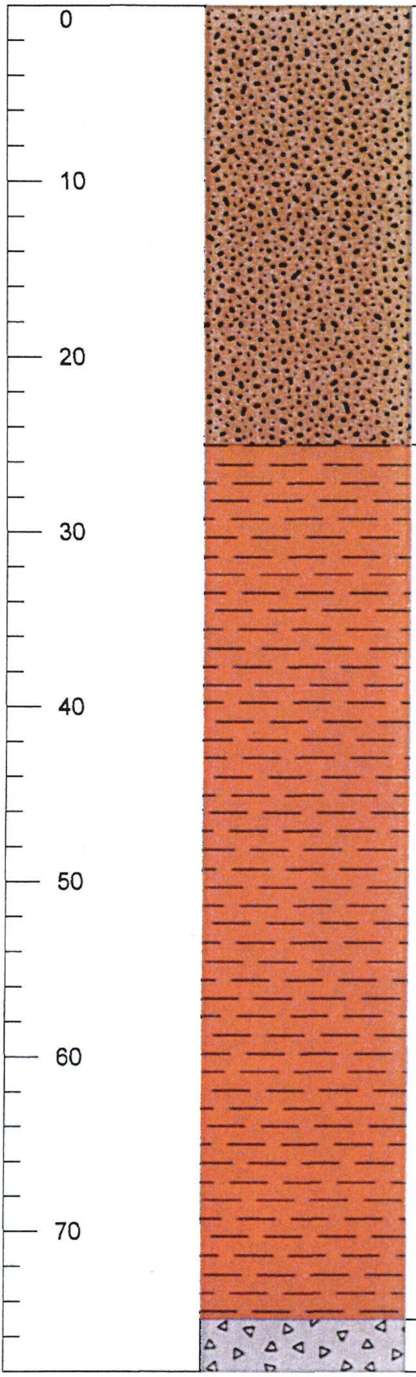
NORWEST CORPORATION

MW-3: Geologic Log

Township: 29 South
Range: 15 West
Section: 13 (1370' South, 500' East of NW corner)
GL Elev: 6,355'

Described By: M. Johnson
Date(s): 10/7/12-10/8/12

Depth (ft)	Graphic Log	Lithologic Description



(0-25) Rotary cuttings, Colluvium, Sandy Silty Clay, brown

(25-75) Claystone fractured, green to brown, with some green to yellow clay in fractures, more clay and sand with depth

Lithology

- ▨ Colluvium/Alluvium
- ▨ Sandy Gravel
- ▨ Rhyolite
- ▨ Andesite
- ▨ Dolomite
- ▨ Limestone
- ▨ Mudstone
- ▨ Clay
- ▨ Alunite

POTASH RIDGE

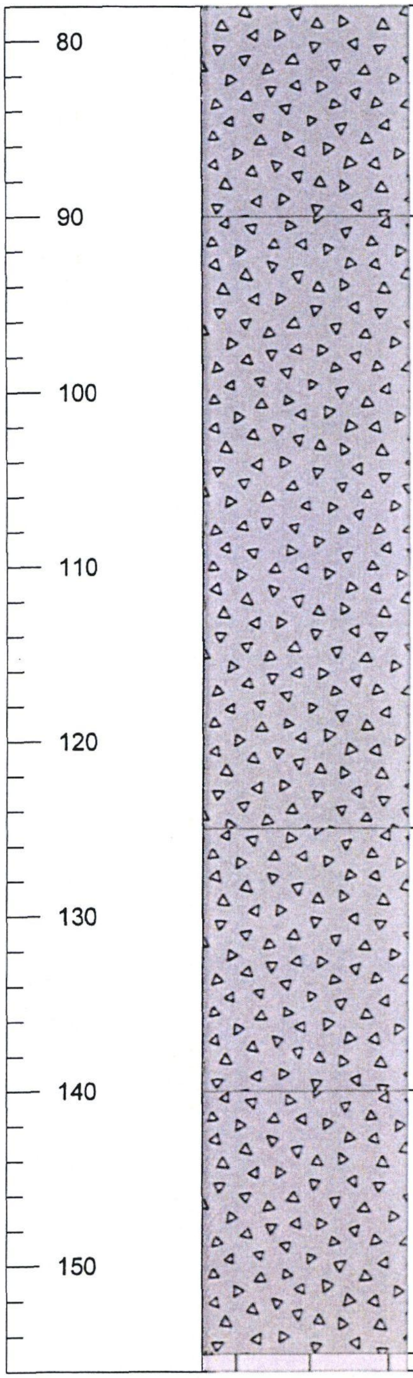
NORWEST
CORPORATION

MW-3:
Geologic Log

Township: 29 South
Range: 15 West
Section: 13 (1370' South, 500' East of NW corner)
GL Elev: 6,355'

Described By: M. Johnson
Date(s): 10/7/12-10/8/12

Depth (ft)	Graphic Log	Lithologic Description



(75-90) Rhyolite, soft to medium, dark grey

(90-125) Rhyolite, soft to medium, dark grey to purple, harder with depth

(125-140) Rhyolite, medium hard, grey with green clasts

(140-155) Rhyolite, hard, dark grey

Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite

▨ Andesite
▨ Dolomite
▨ Limestone

▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

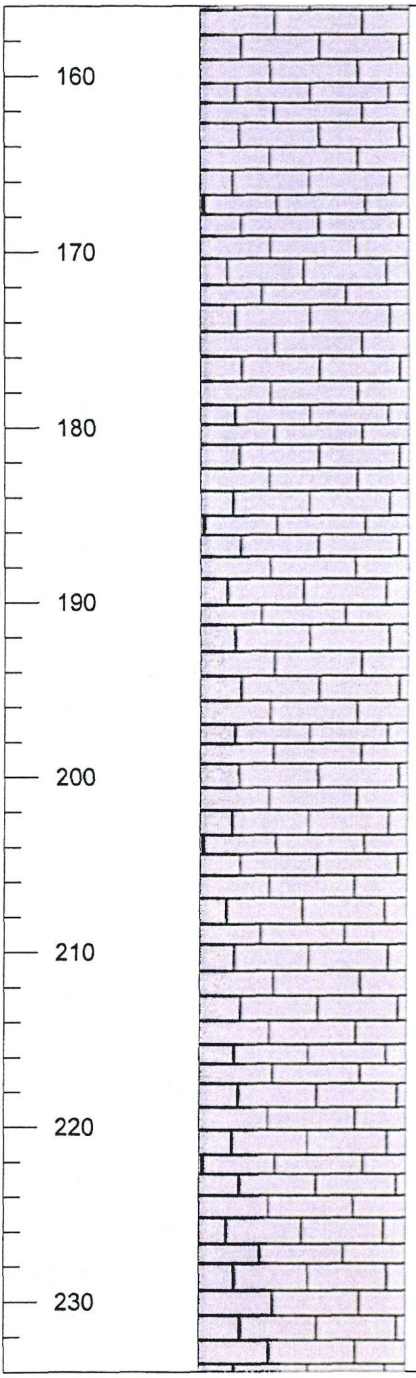
NORWEST CORPORATION

MW-3: Geologic Log

Township: 29 South
Range: 15 West
Section: 13 (1370' South, 500' East of NW corner)
GL Elev: 6,355'

Described By: M. Johnson
Date(s): 10/7/12-10/8/12

Depth (ft) | Graphic Log | Lithologic Description



(155-240) Limestone, medium hard, white to light grey

Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

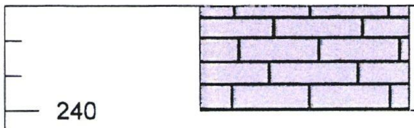
POTASH RIDGE

NORWEST CORPORATION

MW-3:
Geologic Log

Township: 29 South
Range: 15 West
Section: 13 (1370' South, 500' East of NW corner)
GL Elev: 6,355'

Described By: M. Johnson
Date(s): 10/7/12-10/8/12

Depth (ft)	Graphic Log	Lithologic Description
240		

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

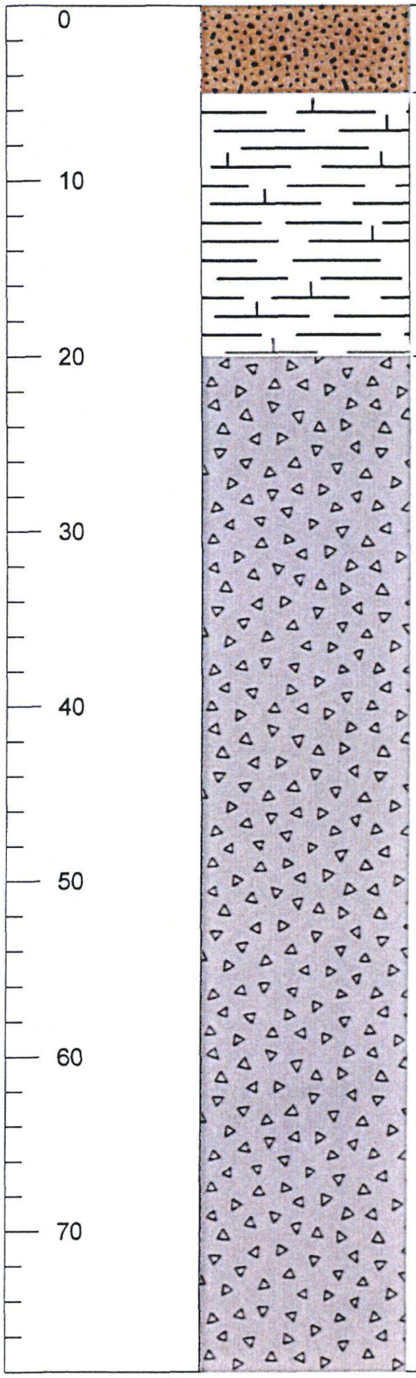
NORWEST
CORPORATION

MW-4:
Geologic Log

Township: 29 South
Range: 15 West
Section: 27 (2550' North, 1840' East of SW corner)
GL Elev: 6,771'

Described By: T. Suchoski
Date(s): 10/3/12-10/5/12

Depth (ft) | Graphic Log | Lithologic Description



(0-5) Rotary cuttings, Colluvium, Sandy Silty Clay, light brown

(5-20) Alunite, tan to light brown

(20-80) Rhyolite, medium hard, dark grey

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

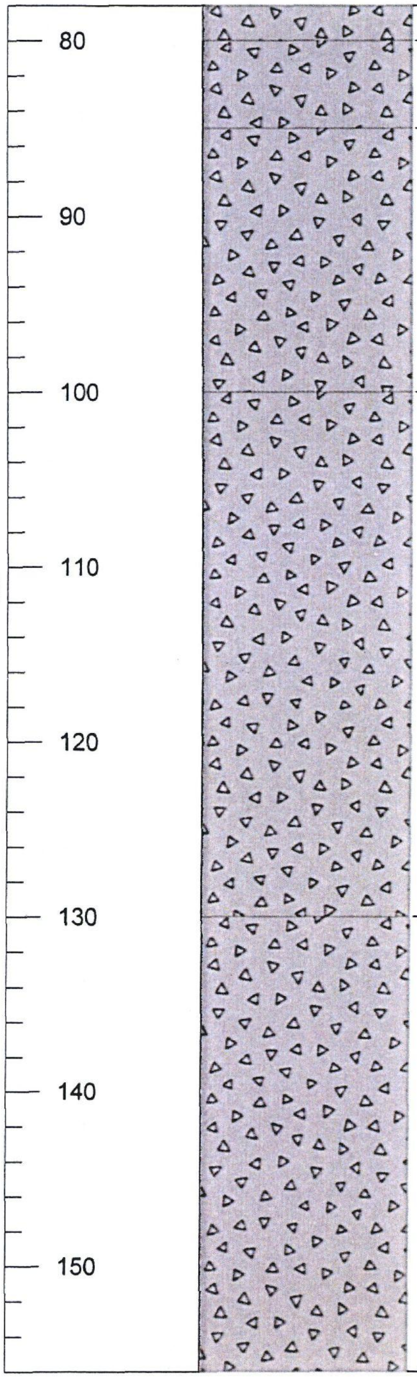
MW-4:
Geologic Log

NORWEST CORPORATION

Township: 29 South
Range: 15 West
Section: 27 (2550' North, 1840' East of SW corner)
GL Elev: 6,771'

Described By: T. Suchoski
Date(s): 10/3/12-10/5/12

Depth (ft)	Graphic Log	Lithologic Description



(80-85) Rhyolite, soft to medium, dark grey, some white crystal veining

(85-100) Rhyolite, medium hard, grey, no veins, fair amount of chatter at 95 feet - possible fracture zone

(100-130) Rhyolite, soft, light grey

(130-160) Rhyolite, soft to medium, dark grey, some white crystal veining

Lithology

- ▨ Colluvium/Alluvium
- ▨ Sandy Gravel
- ▨ Rhyolite
- ▨ Andesite
- ▨ Dolomite
- ▨ Limestone
- ▨ Mudstone
- ▨ Clay
- ▨ Alunite

POTASH RIDGE

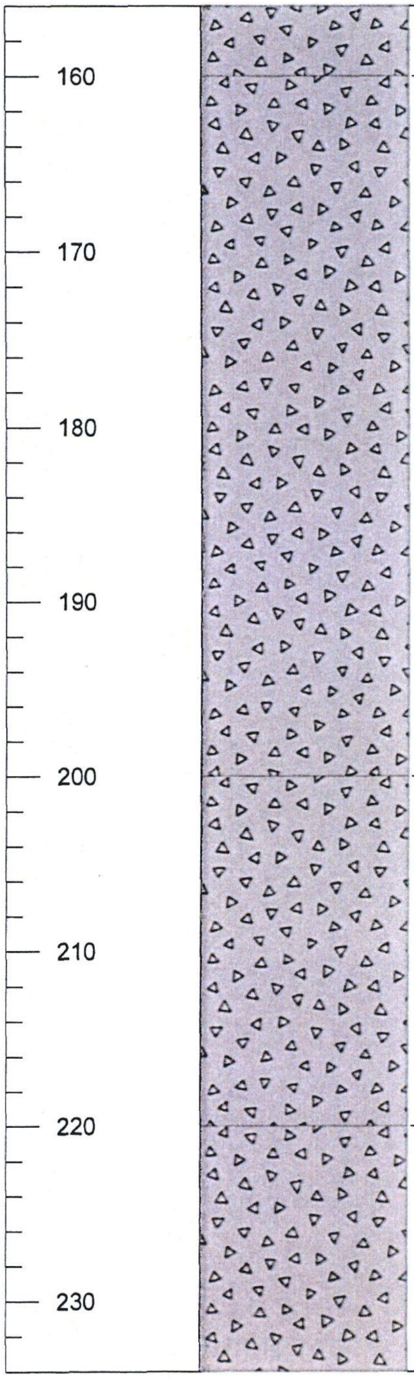
MW-4:
Geologic Log

NORWEST CORPORATION

Township: 29 South
Range: 15 West
Section: 27 (2550' North, 1840' East of SW corner)
GL Elev: 6,771'

Described By: T. Suchoski
Date(s): 10/3/12-10/5/12

Depth (ft)	Graphic Log	Lithologic Description
160-200		(160-200) Rhyolite, very hard, dark grey, no veins, water at 180 feet - about 2 gpm
200-220		(200-220) Rhyolite, soft to medium, grey, softer with depth



Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

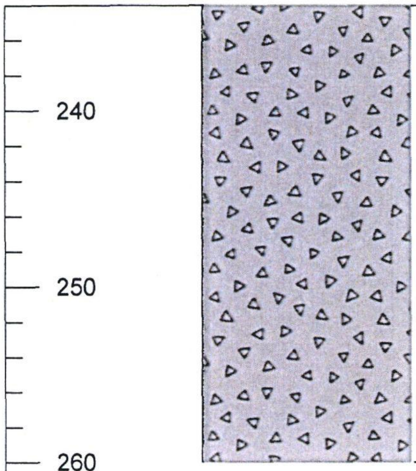
POTASH RIDGE

MW-4:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 27 (2550' North, 1840' East of SW corner)
GL Elev: 6,771'

Described By: T. Suchoski
Date(s): 10/3/12-10/5/12

Depth (ft)	Graphic Log	Lithologic Description
240 250 260		(220-260) Rhyolite, soft to medium, grey, softer with depth, encountered water at 225' - about 5 gpm

Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

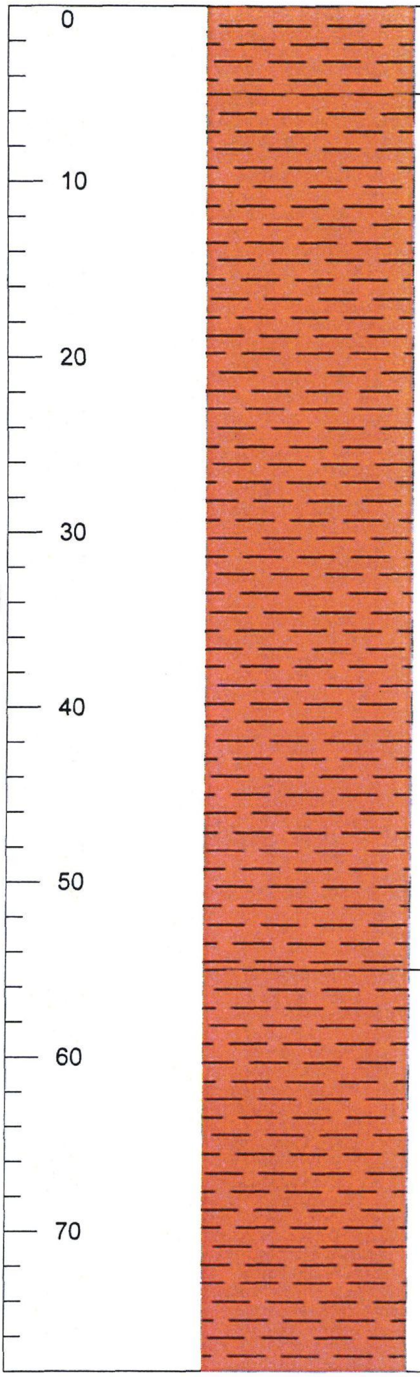
NORWEST
CORPORATION

MW-5:
Geologic Log

Township: 29 South
Range: 15 West
Section: 25 (2560' North, 445' East of SW corner)
GL Elev: 6,652'

Described By: Suchoski/Johnson
Date(s): 10/6/12-10/7/12

Depth (ft) Graphic Log Lithologic Description



(0-5) Rotary cuttings, Clay, soft, lt brown to white

(5-55) Clay, soft, white to tan some pinkish

(55-80) Clay, medium hard, white to tan

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

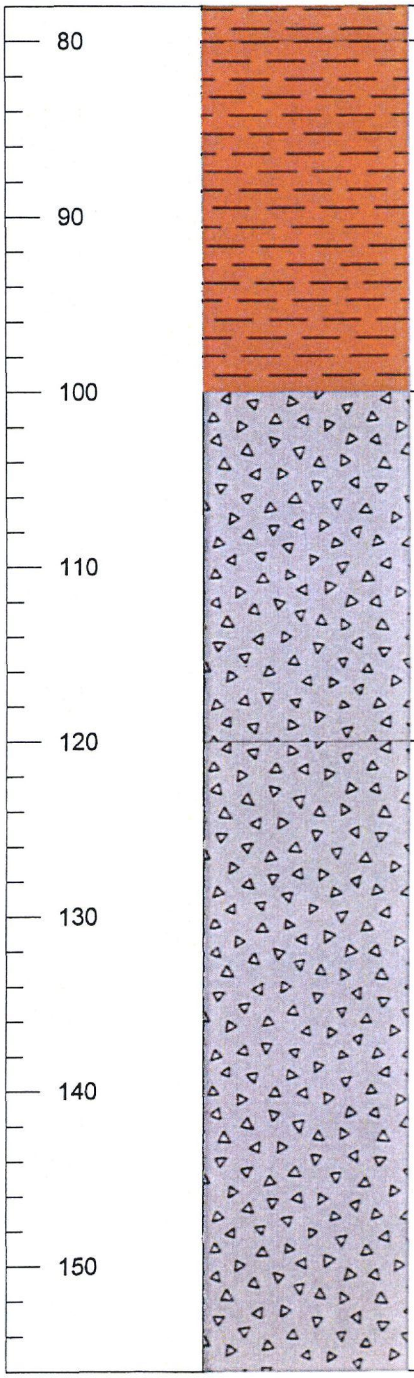
NORWEST
CORPORATION

MW-5:
Geologic Log

Township: 29 South
Range: 15 West
Section: 25 (2560' North, 445' East of SW corner)
GL Elev: 6,652'

Described By: Suchoski/Johnson
Date(s): 10/6/12-10/7/12

Depth (ft) | Graphic Log | Lithologic Description



(80-100) Clay, hard, white to pink with some red chips

(100-120) Rhyolite, dark red to brown

(120-160) Rhyolite, hard, light grey with white crystaline veins

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

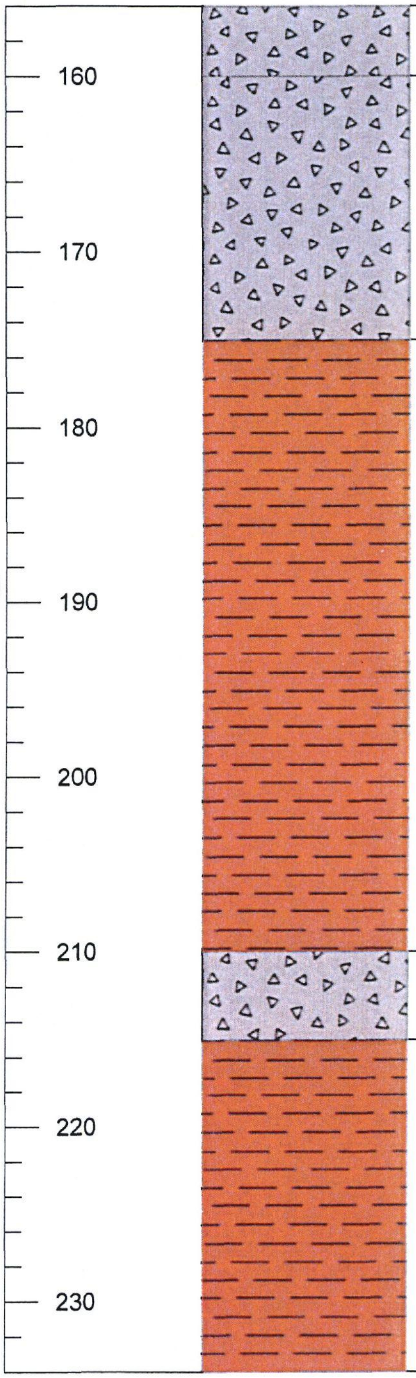
NORWEST
CORPORATION

MW-5:
Geologic Log

Township: 29 South
Range: 15 West
Section: 25 (2560' North, 445' East of SW corner)
GL Elev: 6,652'

Described By: Suchoski/Johnson
Date(s): 10/6/12-10/7/12

Depth (ft)	Graphic Log	Lithologic Description



(160-175) Rhyolite, soft to medium, dark grey, some white crystal veining

(175-210) Clay, medium hard, white to tan

(210-215) Rhyolite, soft to medium, red to brown, softer with depth

(215-240) Clay, soft, white to pink

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

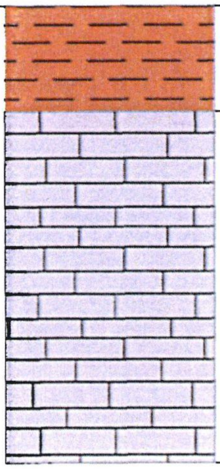
POTASH RIDGE

MW-5:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 25 (2560' North, 445' East of SW corner)
GL Elev: 6,652'

Described By: Suchoski/Johnson
Date(s): 10/6/12-10/7/12

Depth (ft)	Graphic Log	Lithologic Description
240		(240-260) Limestone, medium hard, white
250		
260		

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

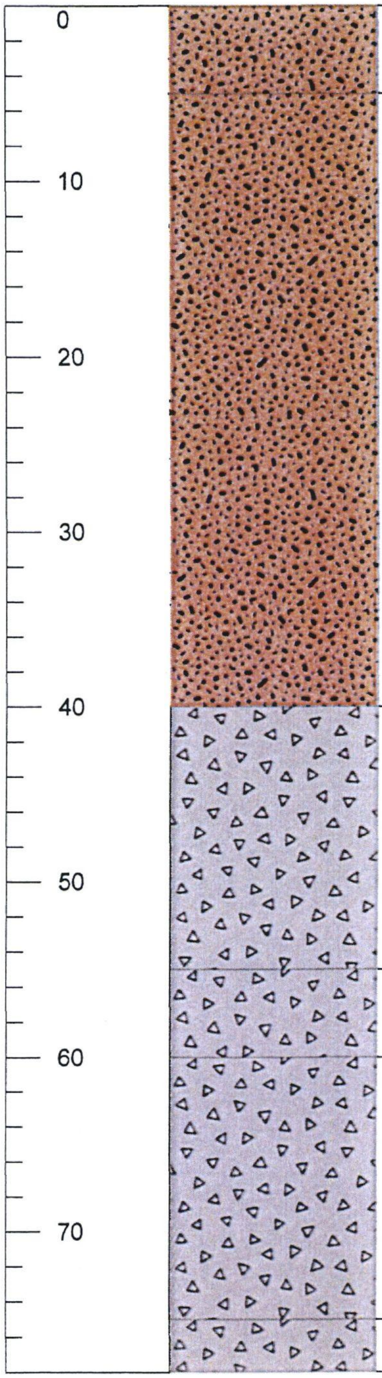
MW-6:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 22 (11' North, 1510' East of SW corner)
GL Elev: 6,988'

Described By: Alger/Leppert
Date(s): 6/17/13-6/18/13

Depth (ft) Graphic Log Lithologic Description



(0-5) Alluvium, brown soil, clayey-sandy

(5-40) Colluvium, abundant quartz, heavy iron staining, suspect may be mostly colluvial, trace alunite

(40-55) Rhyolite, coarse, light grey, abundant quartz, trace pyrite with possible alunite

(55-60) Same as above with quartz "eyes" and feldspar alteration

(60-75) Rhyolite, coarse, light grey, abundant quartz, trace pyrite with possible alunite

(75-80) Same as above, drilling speed has slowed

Lithology

- ▨ Colluvium/Alluvium
- ▨ Sandy Gravel
- ▨ Rhyolite
- ▨ Andesite
- ▨ Dolomite
- ▨ Limestone
- ▨ Mudstone
- ▨ Clay
- ▨ Alunite

POTASH RIDGE

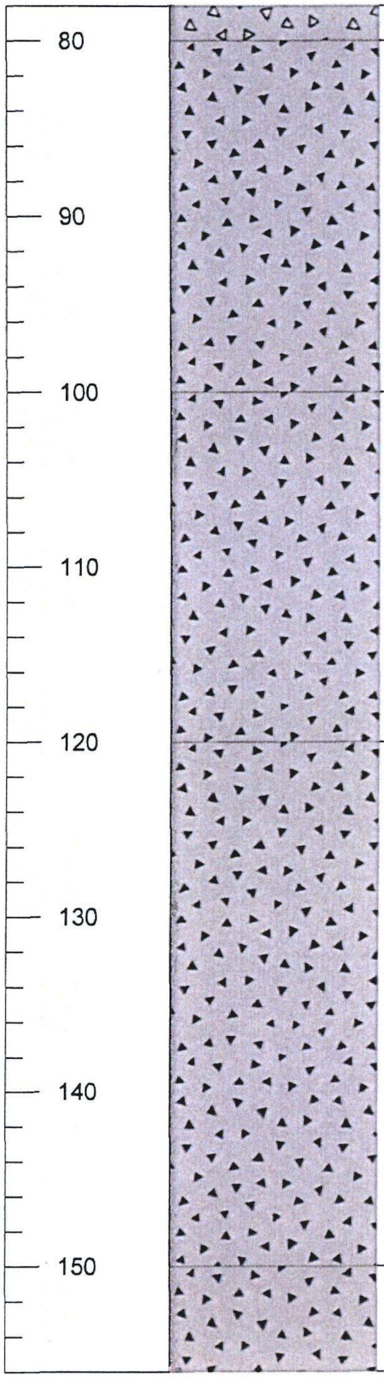
MW-6: Geologic Log

NORWEST CORPORATION

Township: 29 South
Range: 15 West
Section: 22 (11' North, 1510' East of SW corner)
GL Elev: 6,988'

Described By: Alger/Leppert
Date(s): 6/17/13-6/18/13

Depth (ft)	Graphic Log	Lithologic Description



(80-100) Andesite, medium grey, coarse, ~55% silica, micas, pyrite, chlorite, carbonate veins, propylitic

(100-120) Andesite, medium grey, some finer grains though still coarse, hematite, chlorite, pyrite, micas

(120-150) Same as above, Stop drilling at 6pm, morning driller notes ~45 feet of water in hole, higher density of pyrite, still appears weathered

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

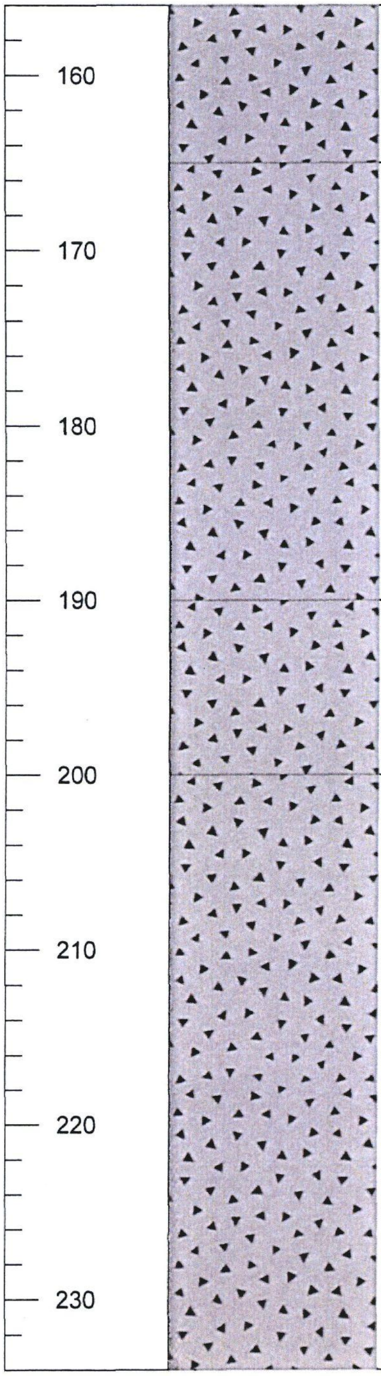
MW-6:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 22 (11' North, 1510' East of SW corner)
GL Elev: 6,988'

Described By: Alger/Leppert
Date(s): 6/17/13-6/18/13

Depth (ft)	Graphic Log	Lithologic Description



(150-165) Andesite, light to medium grey, silicates, abundant pyrite, contains micas, calcite veins, weathered, will break in hand, trace hematite, equal granular, altered

(165-190) Same as above, drill producing larger bits of rock, more abundant calcite veins, possible hornblende

(190-200) Same as above, decrease in calcite and pyrite

(200-240) Andesite, light to medium grey, coarse crystals, micas, hematites, pyrite, trace calcite veins, equal granular, altered

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

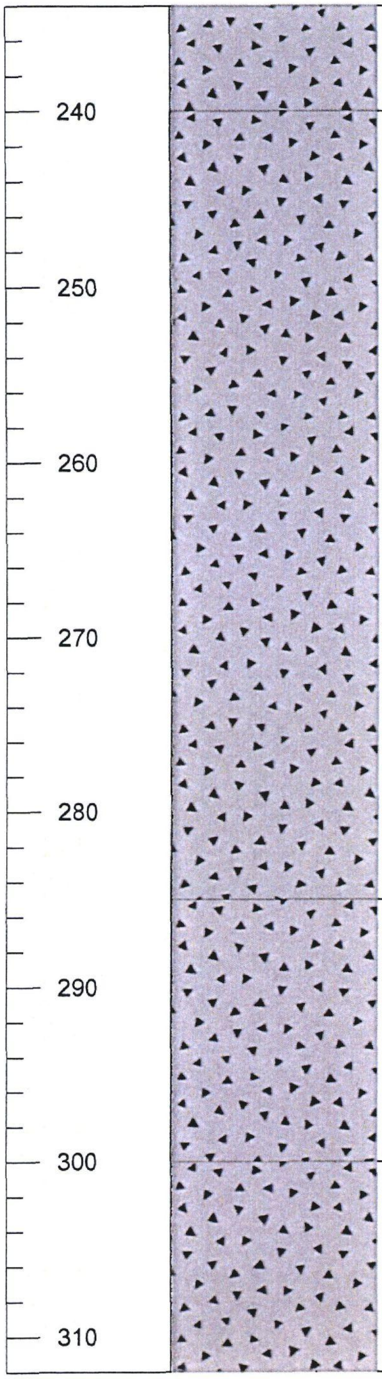
MW-6:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 22 (11' North, 1510' East of SW corner)
GL Elev: 6,988'

Described By: Alger/Leppert
Date(s): 6/17/13-6/18/13

Depth (ft) Graphic Log Lithologic Description



(240-285) Andesite volcanic, dark grey matrix holding lighter silicates, micas, calcite veins, no obvious pyrite, altered

(285-300) Same as above, change in alteration, does not break easily, chloritic crystals

(300-320) Andesite, medium to dark grey, red hued chlorite, hematite, feldspar, mica, equal granular, no sulfites

Lithology

- ▨ Colluvium/Alluvium
- ▨ Sandy Gravel
- ▨ Rhyolite
- ▨ Andesite
- ▨ Dolomite
- ▨ Limestone
- ▨ Mudstone
- ▨ Clay
- ▨ Alunite

POTASH RIDGE

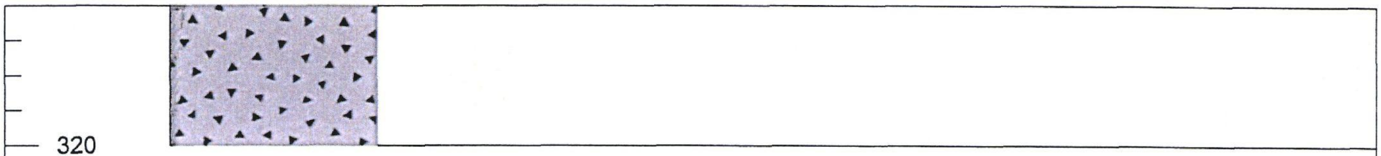
MW-6:
Geologic Log

NORWEST CORPORATION

Township: 29 South
Range: 15 West
Section: 22 (11' North, 1510' East of SW corner)
GL Elev: 6,988'

Described By: Alger/Leppert
Date(s): 6/17/13-6/18/13

Depth (ft)	Graphic Log	Lithologic Description



Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

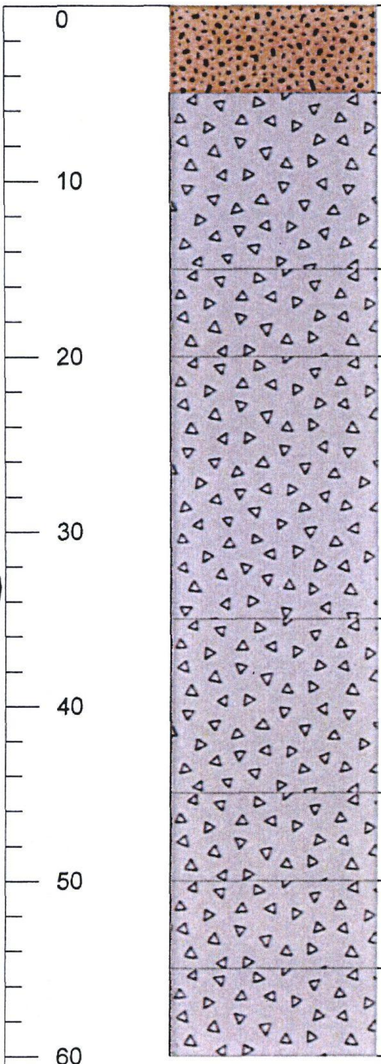
MW-9:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 22 (1960' South, 680' West of NE corner)
GL Elev: 7,691'

Described By: B. Alger
Date(s): 6/18/13-6/19/13

Depth (ft) Graphic Log Lithologic Description



(0-5) Overburden, yellowish red

(5-15) Rhyolite, medium to dark grey, silicates, calcite, hematitic, moderately coarse granuals, equagranular

(15-20) Same as above, using air hammer at 15 feet

(20-35) Same as above, pump broken down at 20 feet

(35-45) Same as above, driller notes rock is softer at 35 feet

(45-50) Same as above, flow check at 45 feet, nothing to note

(50-55) Rhyolitic volcanic, medium to dark grey, unaltered, hematite, mica (biotite), water flow appears to be picking up at 50 to 55 feet

(55-60) Same as above, water flow at 10gpm

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

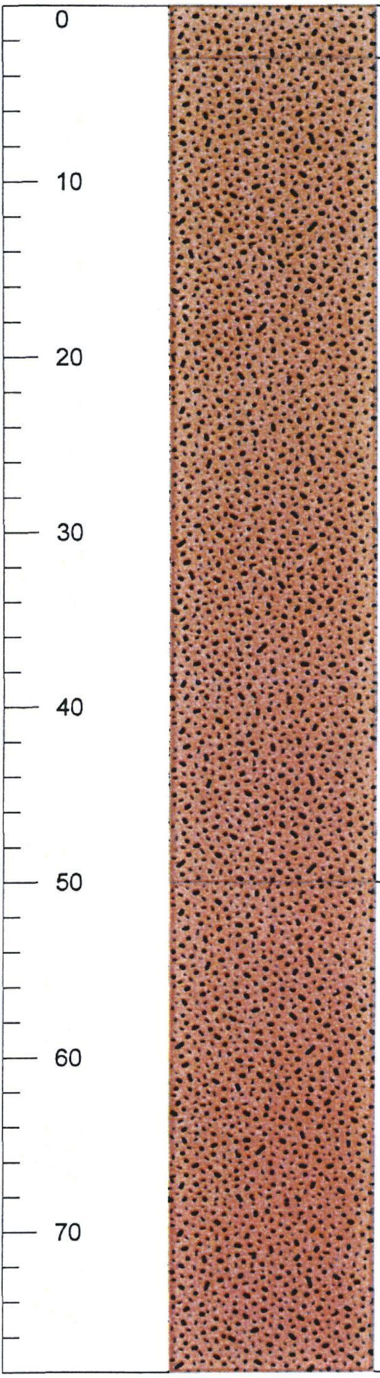
MW-10:
Geologic Log

NORWEST CORPORATION

Township: 29 South
Range: 15 West
Section: 15 (2525' South, 2540' West of NE corner)
GL Elev: 6,980'

Described By: Alger/Suchoski
Date(s): 6/24/13-7/2/13

Depth (ft)	Graphic Log	Lithologic Description



(0-3) Soil

(3-50) Colluvium, varying color, ~70% light grey to white, ~20% reddish brown, ~10% other colors, 80% very fine grained, 20% fine to medium grained, well sorted within chips

(50-80) Colluvium, medium grey, little crystalline content, mostly silica, some carbonate, significantly less than above

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

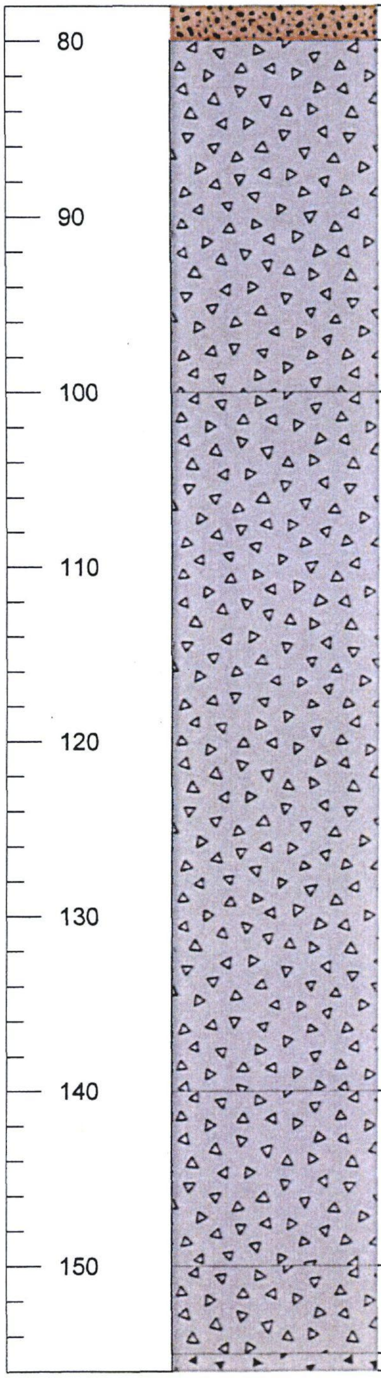
MW-10:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 15 (2525' South, 2540' West of NE corner)
GL Elev: 6,980'

Described By: Alger/Suchoski
Date(s): 6/24/13-7/2/13

Depth (ft)	Graphic Log	Lithologic Description
80-100		(80-100) Rhyolite, medium to dark grey, equagranular, well sorted, quartz, mica, hematite, not altered, drilling progressing slowly
100-140		(100-140) Rhyolite, medium grey, fine grains, not altered, contains calcite veins, mica, feldspars and trace hematite
140-150		(140-150) Same as above, no calcite veins
150-155		(150-155) Rhyolite, medium grained, well sorted, quartz, mica, and feldspar, no calcite veins



Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

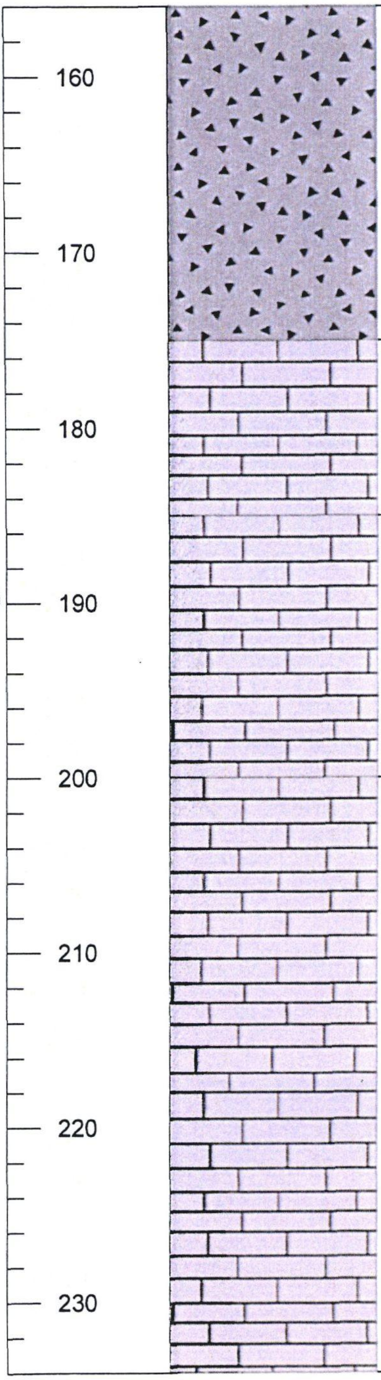
MW-10:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 15 (2525' South, 2540' West of NE corner)
GL Elev: 6,980'

Described By: Alger/Suchoski
Date(s): 6/24/13-7/2/13

Depth (ft)	Graphic Log	Lithologic Description



(155-175) Andesite, grey, medium to fine grained

(175-185) Limestone, calcite veins

(185-200) Sparry Limestone, black

(200-235) Limestone, medium black, well sorted, calcite veins, no water

Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

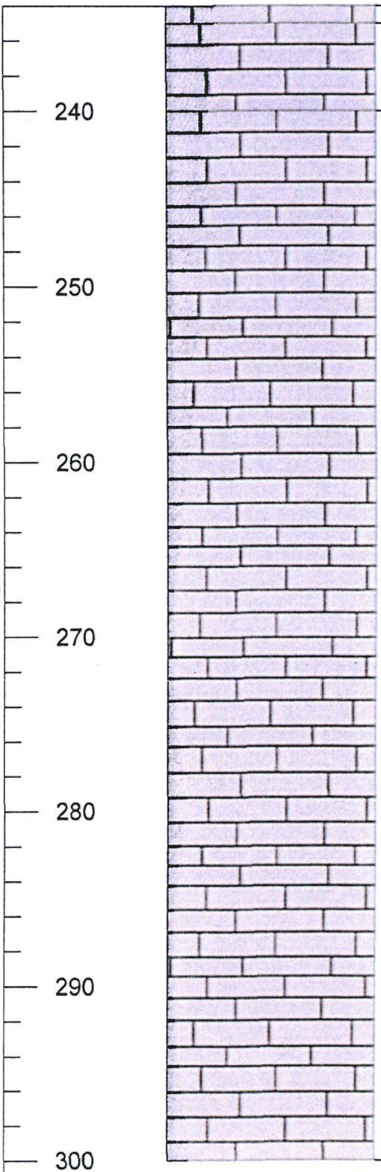
NORWEST
CORPORATION

MW-10:
Geologic Log

Township: 29 South
Range: 15 West
Section: 15 (2525' South, 2540' West of NE corner)
GL Elev: 6,980'

Described By: Alger/Suchoski
Date(s): 6/24/13-7/2/13

Depth (ft) Graphic Log Lithologic Description



(235-240) Sandy Limestone, buff-tan, very fine grained

(240-300) Limestone, medium black, well sorted, un-altered

Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite

▨ Andesite
▨ Dolomite
▨ Limestone

▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

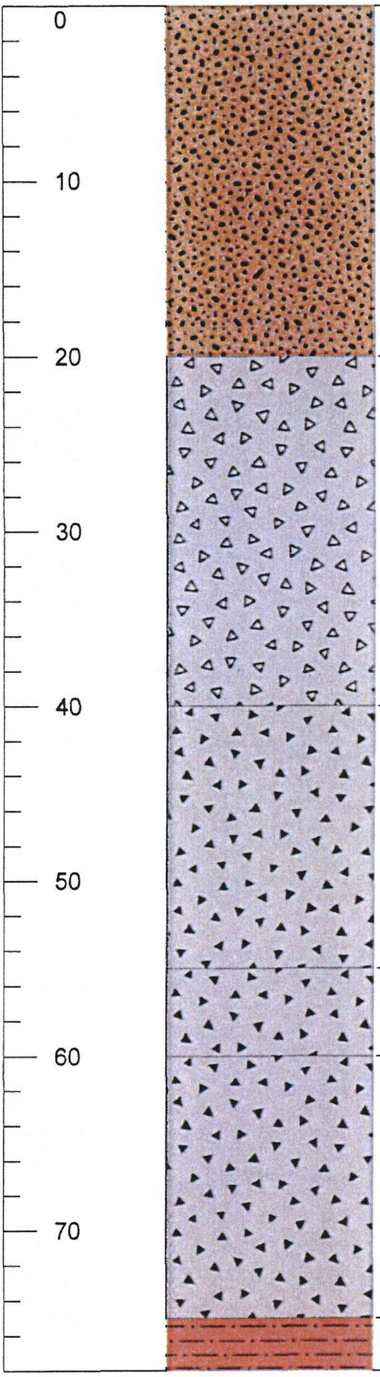
MW-11:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 7 (2095' South, 1945' West of NE corner)
GL Elev: 6,196'

Described By: B. Alger
Date(s): 7/20/13-7/21/13

Depth (ft)	Graphic Log	Lithologic Description



(0-20) Colluvium, poorly sorted, quaternary deposits, andesite, scoria, calcites

(20-40) Rhyolite, dark red, some slough from above

(40-55) Andesite, grey, hard, few crystals, no calcite, unreactive to HCl, no water, medium to fine grained, well sorted

(55-60) Andesite, fine to medium grained, well sorted, no water, unreactive to HCl

(60-75) Andesite, medium to dark grey, fine grained, well sorted, hard

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

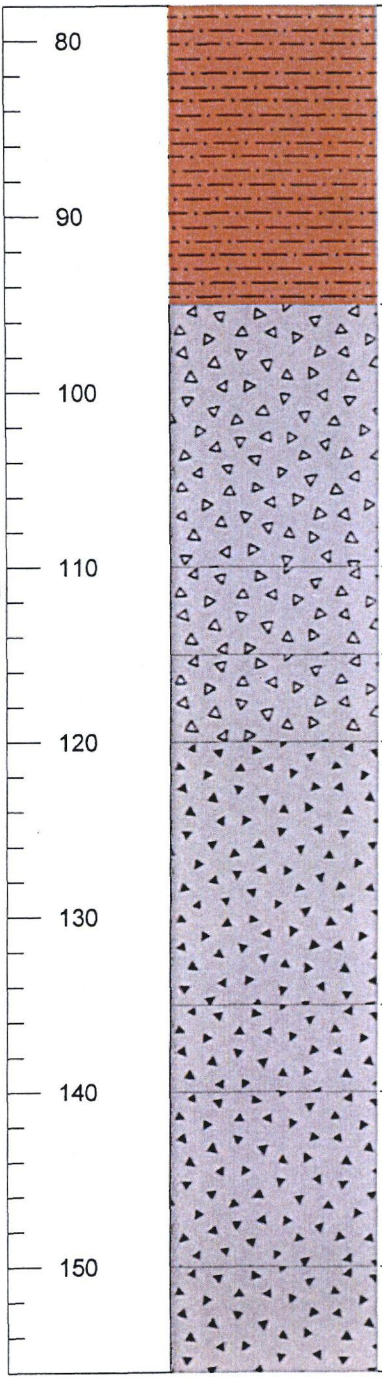
MW-11:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 7 (2095' South, 1945' West of NE corner)
GL Elev: 6,196'

Described By: B. Alger
Date(s): 7/20/13-7/21/13

Depth (ft) Graphic Log Lithologic Description



(75-95) Mudstone, dark reddish grey, no water, unreactive to HCl even in high concentration, very fine grained

(95-110) Rhyolite, red, some grey, fine grained, no water, unreactive to HCl, hard but more brittle than unit above

(110-115) Same as above, no grey, completely red, heavily oxidized

(115-120) Same as above, driller notes hitting water at 120 feet

(120-135) Andesite, trace rhyolite (possibly slough), medium grey and red, well sorted in chips, hard, still some water (possibly only circulation)

(135-140) Same as above, more andesite, no rhyolite

(140-150) Same as above, medium grey, hard, unreactive to HCl, some water, one chip of calcite

Lithology

▨ Colluvium/Alluvium
▨ Sandy Gravel
▨ Rhyolite
▨ Andesite
▨ Dolomite
▨ Limestone
▨ Mudstone
▨ Clay
▨ Alunite

POTASH RIDGE

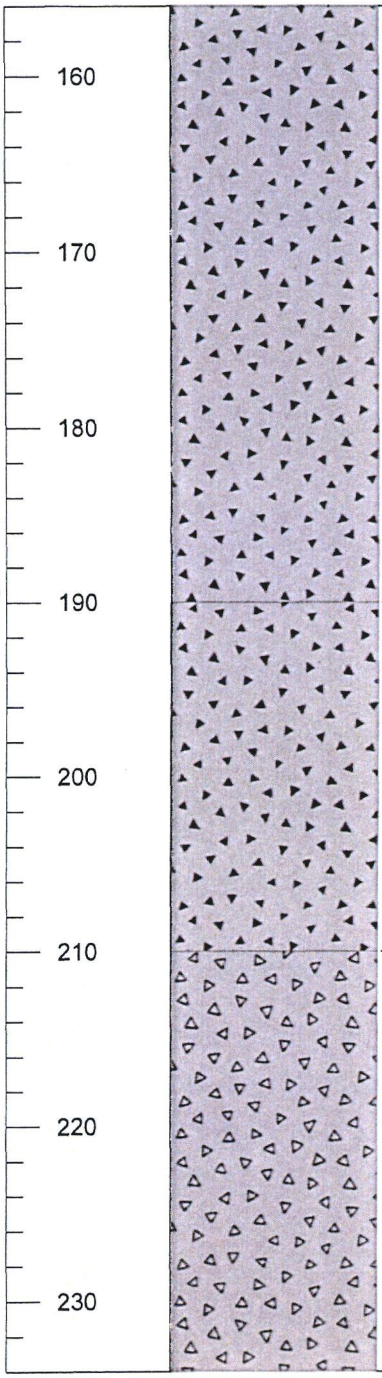
MW-11:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 7 (2095' South, 1945' West of NE corner)
GL Elev: 6,196'

Described By: B. Alger
Date(s): 7/20/13-7/21/13

Depth (ft) | Graphic Log | Lithologic Description



(150-190) Andesite, light grey, hard, light water flow, high silicate content

(190-210) Andesite, light to medium grey, hard, drills slowly, very fine grained, few crystals, no calcite

(210-245) Rhyolite, reddish orange, fine grained, moderately hard, oxidized, drills faster, some pieces brittle, poorly sorted with pieces of grey and white

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

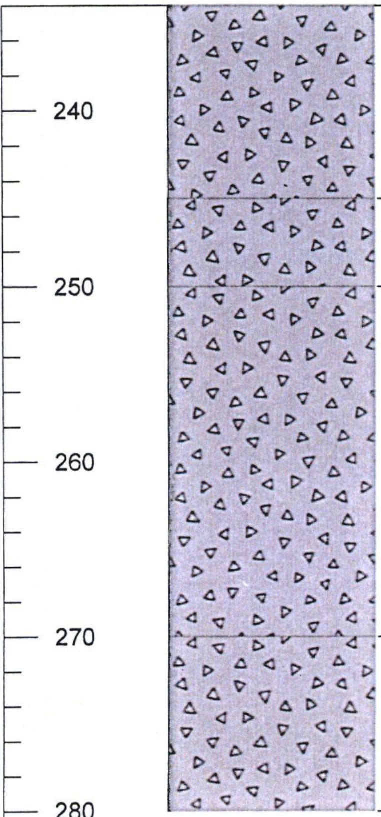
MW-11:
Geologic Log

NORWEST CORPORATION

Township: 29 South
Range: 15 West
Section: 7 (2095' South, 1945' West of NE corner)
GL Elev: 6,196'

Described By: B. Alger
Date(s): 7/20/13-7/21/13

Depth (ft) | Graphic Log | Lithologic Description



(245-250) Rhyolite, light reddish orange with white and medium grey, moderately hard, no significant water

(250-270) Rhyolite, poorly sorted, chips of reddish orange, white and medium grey, very fine grains, moderately hard, some brittle, no significant water, unreactive to HCl

(270-280) Same as above, very little if any water

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

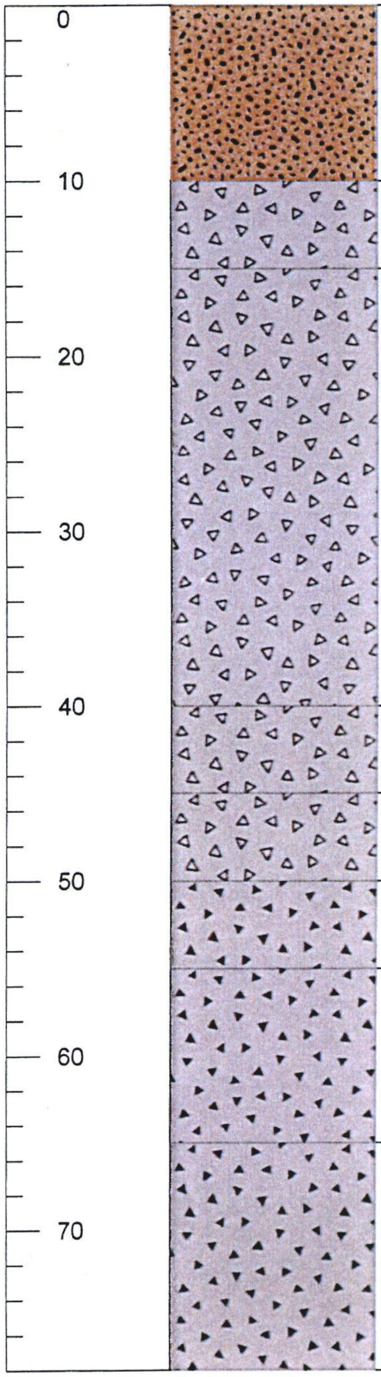
MW-13:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 1 (1455' North, 1585' East of SW corner)
GL Elev: 6,084'

Described By: Alger/Suchoski
Date(s): 7/8/13-7/18/13

Depth (ft) Graphic Log Lithologic Description



(0-10) Alluvium/ Colluvium, light to dark brown, soft, dry

(10-15) Rhyolite, red, hard, hole sloughing unconsolidated materials

(15-40) Rhyolite, red, hard

(40-45) Rhyolite, dark red, some grey

(45-50) Rhyolite, dark red to grey, hard

(50-55) Andesite, grey, hard

(55-65) Same as above, appears to be making a little water

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

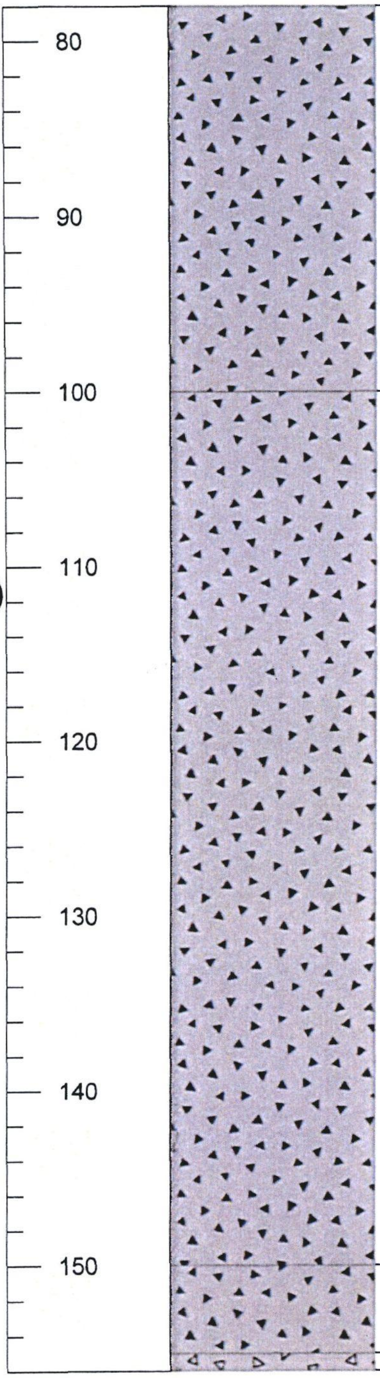
MW-13:
Geologic Log

NORWEST
CORPORATION

Township: 29 South
Range: 15 West
Section: 1 (1455' North, 1585' East of SW corner)
GL Elev: 6,084'

Described By: Alger/Suchoski
Date(s): 7/8/13-7/18/13

Depth (ft)	Graphic Log	Lithologic Description



(65-100) Andesite, dark reddish grey, hematite, mica, quartz, hard

(100-150) Andesite, medium reddish grey, hard, well sorted minerals of hematite, mica, quartz, water appears to be flowing

(150-155) Andesite, red to grey, hard, well sorted grains of hematite, biotite and silicates, no carbonates

Lithology

▨	Colluvium/Alluvium	▨	Andesite	▨	Mudstone
▨	Sandy Gravel	▨	Dolomite	▨	Clay
▨	Rhyolite	▨	Limestone	▨	Alunite

POTASH RIDGE

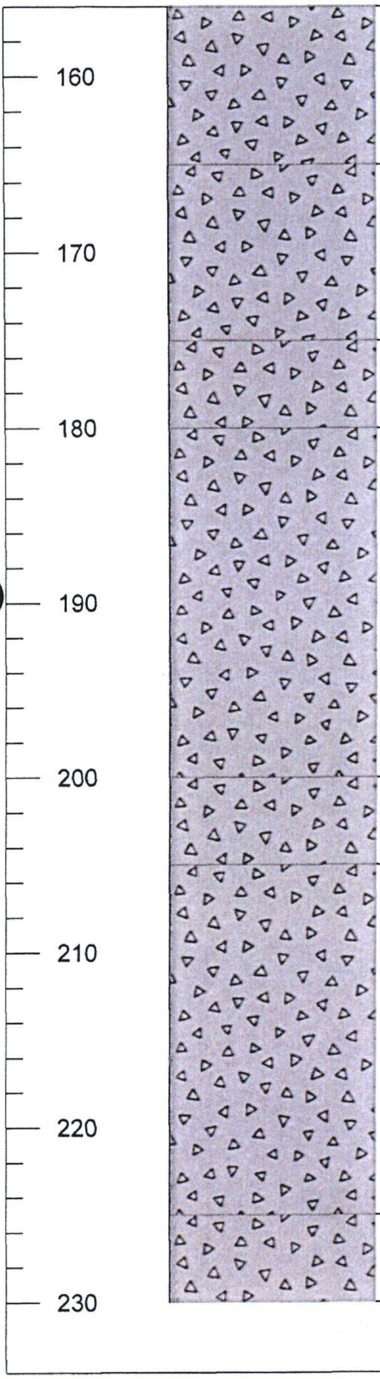
NORWEST
CORPORATION

MW-13:
Geologic Log

Township: 29 South
Range: 15 West
Section: 1 (1455' North, 1585' East of SW corner)
GL Elev: 6,084'

Described By: Alger/Suchoski
Date(s): 7/8/13-7/18/13

Depth (ft) Graphic Log Lithologic Description



(155-165) Rhyolite, medium grey, altered, brittle, equigranular, some chips with considerable hematite, chlorite or sulfates

(165-175) Same as above, trace pyrite

(175-180) Same as above, altered rhyolite

(180-200) Rhyolite, light greenish grey, altered, brittle, micas, hornblende, water flowing very well

(200-205) Rhyolite, dark grey, brittle, hematite, chlorite, quartz, sulfate

(205-225) Rhyolite, light grey, brittle, altered, very hematitic

(225-230) Rhyolite, light grey, altered, abundant calcite, some pyrite, hematite, mica, garnet, abundant water flow, caving in top of hole

Lithology

- ▨ Colluvium/Alluvium
- ▨ Sandy Gravel
- ▨ Rhyolite
- ▨ Andesite
- ▨ Dolomite
- ▨ Limestone
- ▨ Mudstone
- ▨ Clay
- ▨ Alunite