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STATEMENT OF BASIS

GROUND WATER DISCHARGE PERMIT UGW010015

Utah Alunite Corporation
Potash Ridge Mine
Beaver County, Utah

June, 2014

Purpose

Utah Alunite Corporation (UAC) proposes to develop an alunite mine and processing operation to produce potassium sulfate and sulfuric acid located approximately 28 miles west-southwest of Milford, Utah. Alunite ore from the mining operation will be processed in calcining and roasting units which decompose the alunite into potassium sulfate, alumina and silica. The processing releases gases containing sulfur dioxide which are used to produce sulfuric acid. The roasted ore will be leached with hot water and the resulting brine solution will go through a crystallization process where potassium sulfate will be precipitated and dried. Only hot water and flocculant will be used in the process. The tailings solids from the water leach will be re-pulped in a mix tank with reclaimed tailings water and pumped to an unlined tailings disposal area. The tailings will be coarse sand sized. Water drained from the tailings slurry will flow into the tailings disposal area and collected in an impoundment located downstream from the tailings disposal area. Water from the collection pond will be conveyed to a settlement pond to allow sediment to settle out of it and then will be pumped back to the mix tank for recycling.

Data submitted by UAC shows that the tailings water will be of similar quality to that of the receiving ground water under the tailings area and associated impoundments. Protection of ground water will be insured under this permit by regular sampling and analysis of both the tailings water and ground water down-gradient from the tailings area and impoundments.

Hydrogeology

Regional

The Potash Ridge mine site is located in the Basin and Range geological province of western Utah. A thick sequence of late Precambrian and Paleozoic sedimentary rocks was deposited in this area and in the Late Cretaceous Sevier Orogeny this sequence of rocks were subject to compressional stress producing folds and thrust faults. The Paleozoic rocks were folded about a north-trending axis and thrust eastward during this event. Older rocks were emplaced over younger rocks in the area of the mine site along 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. Localized volcanic centers developed during the Cenozoic Oligocene and Miocene Epochs. In the Miocene extensional events began to affect the Basin and Range province and the mine area. The surface expression of Basin and Range extension is alternating fault-block mountain ranges separated by valleys filled with deep alluvial deposits. The mountains and valleys generally trend north-south with some variation from west-northwest to northeast.

Ground water in the mountain blocks, therefore, is contained in the bedrock that makes up the mountains and in thin, localized alluvial deposits. Ground water in the valleys is contained in the thick alluvial deposits that fill the basins.

Local

Geology in the Blawn Mountain area where the mine will be located consists of volcanic ignimbrite and rhyolite flow deposits of Oligocene to Miocene ages ranging in thickness from several hundred to one thousand feet. The volcanics are faulted by Basin and Range normal faults and are the host rock for the alunite deposits to be mined. The volcanics were deposited over an eroded surface of folded and faulted late Precambrian and Paleozoic sedimentary rocks, primarily carbonates and quartzites.

It is likely that a shallow laccolithic igneous intrusion exists at depth, and was the source of hydrothermal fluids that formed the alunite deposits. The intrusion fractured the overlying volcanic rocks and allowed hot fluids rich in H_2S to rise though the fractures and encounter ground water rich in oxygen. Reaction of the H_2S and oxygen produced fluids rich in sulfuric acid. These fluids reacted with the volcanic rock, particularly in fractured and permeable zones, producing alunite mineralization. The alteration tends to be in linear bodies, reflecting the role of normal faults in controlling the flow of mineralizing solutions. Today the alunite mineralization is found on four ridges that occur in the project area, erosional remnants of a once larger altered area.

The area of the tailings impoundment is mapped as "undifferentiated volcanics" with some alteration related to the ore deposits along its fringes. UAC has drilled two monitor wells in and near the impoundment site. Well MW-2, located at the western end of the planned tailings dam and outside the impoundment, penetrated alluvium to 10 feet depth; clay from 10-75 feet; rhyolite from 75 to 140 feet; alunite from 140 to 160 feet; limestone from 160 to 190 feet and dolomite from 190 feet to total depth at 200 feet. MW-2 did not encounter ground water. Well MW-3, located near the center of the planned tailings disposal area, penetrated alluvium/colluvium to 25 feet; fractured claystone 25 to 75 feet; rhyolite 75 to 155 feet; and limestone 155 feet to total depth at 240 feet. The well encountered ground water and was screened from 140 to 160 feet depth. An aquifer recovery test performed on MW-3 suggests the rocks it is screened in have a hydraulic conductivity of 3.3×10^{-7} cm/sec (Table 7.5, UAC permit application).

Ground Water Quality

Background Ground Water Quality and Preliminary Classification

Four samples taken from MW-3 in 2013 (Table 7.9B, permit application) had an average total dissolved solids (TDS) content of 1,033 mg/l and no contaminants above the ground water standards in UAC R317-6, Table 1. As a preliminary determination, ground water under the site of the planned tailings impoundment is Class II. A formal determination of ground water class will be made following installation and background sampling of monitor wells down-gradient of the tailings area and associated collection and settling ponds. As the site of MW-3 will eventually be buried under tailings, this well will not be used for compliance monitoring.

UAC has constructed and sampled eight monitoring wells around its property. (Figure 10 and Tables 7.9 A through H, permit application) Average TDS content in these wells varies from 803 to 2727 mg/l, suggesting that Class II ground water conditions are widespread at the site.

UAC also conducted spring and seep inventories in spring and fall. Fifteen springs (with measurable flow) were identified during the spring season and twelve were identified in the fall. Specific conductance values were measured in these springs and these measurements suggest that TDS content of these springs ranges from 900 to 5,650 mg/l.

Effluent Quality

Roasted ore will be leached with hot water to produce a brine containing potassium sulfate. This brine will be drained from the tailings solids for product recovery by crystallization. The solids will then be re-pulped with water reclaimed from the tailings impoundment. Because the tailings are and associated impoundments will not be lined, there will be some loss of water from seepage into the subsurface, which will be compensated by adding fresh make-up water to produce the slurry for transporting the tailings to the impoundment.

UAC plans to obtain water for the tailings pipeline from wells to be located in several land parcels in Wah Wah Valley, about 5 miles northeast of the mine site, as shown in Figure 1 of the permit application. These wells have not been drilled yet. The best information on the likely quality of water produced from these wells is analyses of water samples taken in 1973-75 from nearby wells. (Water analyses, DWQ-2014-006055) Analysis for TDS was not done on these samples, but they showed electrical conductivity values ranging from 490 to 565 mmhos/cm, suggesting TDS content ranging from 350-400 mg/l. There were no other contaminants analyzed that exceeded current ground water standards.

Water in contact with the tailings can dissolve constituents from them. To evaluate the content of soluble material in tailings material, UAC obtained an extract fluid from six tailings samples taken from pilot studies done on drill hole samples of ore. The Synthetic Precipitation Leaching Procedure (SPLP), EPA Method 1312, was done on these samples to obtain an extract fluid. The SPLP extraction uses deionized water with pH adjusted to 5.0, to mimic precipitation. A solid sample is reduced until 80% of it passes a 9.5 mm screen. A representative sample is weighed into a container and is extracted with an amount of extraction fluid equal to 20 times the weight of the solid. Following extraction, the sample is rolled end over end for 18 hours. Then, the leachate is separated from the solid phase by filtering through a 0.6 to 0.8 µm glass fiber filter. While this procedure does not mimic the conditions of UAC's tailings slurry, it reveals the soluble constituents that may dissolve into the tailings water which will be stored in the impoundment before being recycled. Results of analyses of these SPLP extractions are reported in Appendix D, Table A-5 of the permit application (Sample IDs beginning with "BK"). Analyses show that the TDS concentrations of the extracts ranged from 220 to 630mg/l; most metals were at non-detect levels and no contaminants were present at concentrations greater than the ground water standards in Table 1 of UAC R317-6.

These results indicate that it is likely that the tailings water, composed of well water from Wah Wah Valley in contact with tailings solids, should be of comparable quality to the ground water around the mine site.

Best Available Technology (BAT)

This permit is founded on UAC's representation that the water used to transport the tailings and stored in the collection and settlement ponds is compatible with the receiving ground water quality. This assumption will be verified during operation of the facilities by the compliance monitoring plan outlined below. In addition, data provided by UAC shows that the geologic materials underneath the tailings area and associated impoundments, weathered and possibly

altered volcanic tuff, is of low permeability and will restrict discharge of tailings water into the subsurface. Surficial mapping and one drill hole within the tailings impoundment area also support this presumption. An investigation of the geologic materials underlying the entire impoundment area, required as a Compliance Schedule item in this permit, will evaluate the permeability of materials underlying the entire impoundment area.

Tailings will be transported to the tailings disposal area in a slurry containing approximately 55% solids. The tailings will predominantly be coarse-grained sand size and once the slurry is deposited, they should drain quickly. Tailings will be deposited via an outflow line starting in the southwest part of the tailings disposal area and expanding to the northeast over the life of the mine. Because of their grain size, the tailings will form sloped deposits. The tailings deposits should dewater to approximately 85% solids. The water from the deposited tails will drain within the natural drainage basin to a channelized flow.

A collection impoundment will be constructed downstream of the anticipated maximum extent of the tailings deposition area to collect the drainage from the tailings as well as the runoff from the mine site and process facilities, mine haul roads and associated areas (Figure 2, permit application). This water will be conveyed to a settlement pond impoundment to allow sediment to settle out of the water prior to its reuse.

The area under the collection pond and settling 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 that will extend to an elevation approximately 10 feet above the anticipated standing water level in the collection pond. The collection pond and settlement pond dams will be constructed under a permit issued by the Utah State Engineer, Dam Safety Division. During normal operation, water depth in the collection pond will be 10 to 15 feet.

As a permit condition and Compliance Schedule item, UAC shall design and install a monitor well network that will provide notice of whether operation of the tailings disposal area and associated impoundments are affecting ground water quality or ground water elevations down-gradient of the facilities. Ground water protection levels will be developed from background monitoring data from the wells, according to the provisions of UAC R317-6-4. Water quality of the tailings water will also be regularly monitored. The tailings water must not exceed the lowest protection level concentration for TDS, sulfate or any other parameter that may be designated for determination of permit compliance in the future, in any down-gradient monitor well. If tailings water exceeds these protection levels, UAC must add makeup water to the tailings water system or otherwise manage the tailings water quality to bring it down below protection level concentrations.

Compliance Monitoring Program

The intent of this permit's compliance monitoring program is to verify UAC's representation that water used to transport tailings is compatible with the receiving ground water at the tailings storage facility and its associated impoundments. Information needed to confirm this assumption will be obtained by regular comparison of the chemistry of water stored in the collection pond with ground water down-gradient from the tailings disposal area and impoundments.

Both collection pond water and ground water will be monitored quarterly for total dissolved solids (TDS), pH (measured in the field), major ions (Na, Mg, K, Ca, Cl, SO_4, alkalinity), fluoride, nitrate + nitrite, boron and metals from Table 1 of UAC R317-6, including asbestos. These parameters were chosen based on their presence in the ore, waste rock or tailings and their

potential as a contaminant in the discharge from the operations at the mine site. Protection levels will be developed in down-gradient monitor wells for pH, TDS and sulfate, based on the provisions of UAC R317-6-4 and background monitoring data. These parameters are associated with the tailings and would provide the least ambiguous indication of excessive leakage of collection pond water into down-gradient ground water. If monitoring reveals that other parameters would be useful for this purpose, permit protection levels for them may be added later when the permit is modified to include updated protection levels and information on background water quality. Similarly, if monitoring reveals that any parameters are not present in concentrations that would be useful for detecting excessive leakage or degradation of ground water quality they may be dropped from the list of required monitoring parameters upon permit modification.

UAC has not drilled down-gradient monitor wells yet. Existing well MW-3, located within the tailings area, will eventually be buried by tailings. As a compliance schedule item in Part I.H, within 60 days of permit issuance UAC shall propose a monitoring well network for the tailings area and associated impoundments for approval by DWQ. Under the plan, a sufficient number of monitor wells shall be installed down-gradient of the tailings disposal area, the collection pond and settlement pond to:

- Determine the depth to the uppermost aquifer, as defined in UAC R317-6-1, immediately down-gradient of the permitted facilities;
- Define the geologic structure, stratigraphy and likely ground water flow paths in the bedrock immediately down-gradient of these facilities;
- Provide the capacity to monitor changes in ground water elevation in the uppermost aquifer and to take samples from it;
- Provide for the capacity to evaluate whether seepage from the permitted facilities or ground water mounding is occurring along the entire down-gradient extent of the tailings disposal area and the collection and settlement ponds.

Monitor well coverage of the facilities will reflect the fact that seepage is more likely to occur from the collection and settlement ponds because they contain water bodies several feet deep, providing hydraulic head that will tend to drive the impounded water into the subsurface. Monitor well construction may begin following DWQ approval of the monitoring plan. At least one sample must be taken from each monitor well before any tailings or water is placed in the tailings area and associated impoundments. Existing monitor well MW-9 shall also be used for permit compliance monitoring, to monitor ground water quality in the area of the plant facilities, mining operations and ore stockpiles.

Upon completion and development of the monitor wells, an accelerated background monitoring program will be completed by the permittee to collect data for calculating well-specific background ground water quality statistics and protection levels. Protection levels will be developed from these statistics for pH, TDS and sulfate according to the provisions of UAC R317-6-4, for each monitor well. Because TDS and sulfate occur naturally in the background, protection levels will be the greater of the mean the background concentration times the class multiplier factor from the regulations, or the mean background concentration plus 2 times the standard deviation for the background data. Based on ground water monitoring previously done by UAC around the mine site, it is likely that ground water in the new monitor wells will be Class

II. Upon review and approval of the accelerated monitoring data by DWQ, the permit will be revised to include background ground water quality and protection levels for each monitor well.

Data from quarterly sampling of water from the collection pond will be compared to the lowest protection level values from the down-gradient monitor wells. In addition to quarterly sampling of the collection pond, UAC will measure pH, temperature and electrical conductivity of the collection pond water weekly. UAC shall also determine the relationship between electrical conductivity and TDS content for the collection pond water, and estimate TDS content of the pond water for the weekly conductivity measurements. If an electrical conductivity measurement indicates that the pond water may exceed the TDS protection level, UAC shall immediately sample the pond water and analyze it for the regular monitoring parameters.

As a permit condition, if sampling or measurements indicate that the collection pond water exceeds the protection levels for any parameter for greater than three consecutive weeks, UAC shall add make-up water to the tailings transport system or otherwise manage its water quality to bring concentrations of all parameters below the protection levels.

Potential Impacts to Ground Water

Potential impacts to ground water have been minimized by insuring that water used to transport tailings to the disposal area, which can discharge to the subsurface in the unlined disposal area and associated impoundments, will be compatible with existing ground water quality.

Compliance Schedule Items

Subsurface Investigation of Tailings Area and Associated Impoundments

At least sixty days before any tailings or water used to transport them are released into the tailings area and the collection and settlement ponds, UAC shall submit a report on the geologic materials underlying these facilities, their hydraulic conductivity and its variability across the site to DWQ for review and approval. If significant areas of high hydraulic conductivity are discovered, additional requirements for BAT and/or monitoring may be imposed for those areas.

Monitoring Well Network

Within sixty days of permit issuance, UAC shall submit a plan for a monitoring well network that will accomplish the goals listed under the Compliance Monitoring Program section above. Well installation may proceed upon DWQ approval of the plan. At least one sample must be taken from each new monitor well before any tailings or water are placed in the tailings area and associated impoundments.

Accelerated Background Ground Water Monitoring Report.

The Permittee shall submit a background ground water monitoring report for Director approval 60 days after the accelerated background monitoring program has been completed in accordance with the following requirements:

a) At least eight (8) samples will be collected for each compliance monitoring well and parameter over at least a one year period using the procedures outlined in the approved Water Quality Sampling and Analysis Plan.

b) Each sampling event will include independent grab samples for each compliance monitoring well.

c) Samples will be analyzed for all parameters listed in the Compliance Monitoring Plan section above.

d) All data for each well and parameter will be validated and reported to DWQ in Excel spreadsheet format Non-detect values will be reported as 0.5 x the detection limit and flagged in the spreadsheet.

Water Quality Sampling and Analysis Plan

UAC shall submit a Water Quality Sampling and Analysis Plan for DWQ approval within thirty days of permit issuance. The plan shall list procedures for field measurement of electrical conductivity and pH, obtaining ground and surface water samples, sample preservation and transport; analytical methods to be used and method detection limits, and quality assurance/quality control procedures. Analytical methods listed in the plan may only be changed with DWQ approval. Detection limits for analytical methods used must be equal to or lower than permit protection levels. Upon DWQ approval, the plan will be incorporated as an enforceable appendix to this permit.

Final Conceptual Closure Plan and Duty to Reapply

UAC shall submit a final conceptual closure plan for the tailings area and associated impoundments at least 180 days prior to the expiration date of this permit. The plan shall be protective of ground water quality after facility closure, incorporating knowledge gained on waste characteristics and site hydrogeology during the term of the permit. Also to be submitted at this time will be a reapplication for the ground water discharge permit which will include an updated operational plan describing the any proposed changes to operational and closure activities that may occur in the next five-year term of the permit. UAC shall resubmit the plan with 60 days of receipt of notice from the Director and correct any deficiencies noted in the agency review.

Permit Application Documents

The following documents are considered part of the ground water quality discharge permit application and will be kept as part of the administrative file.

1. Utah Groundwater Discharge Permit Application for Utah Alunite Corporation Blawn Mountain Project, February 4, 2014, updated March 1, 2014
2. Water analyses from Wah Wah Valley wells, 1973-75, DWQ-2014-006055