FACT SHEET
(Pursuant to Nevada Administrative Code (NAC) 445A.401)

Permittee Name: **Halliburton Energy Services, Inc.**

Project Name: **Rossi Barite Mine**

Permit Number: **NEV2015112**
Review Type/Year/Revision: **Renewal 2021, Fact Sheet Revision 00**

A. Location and General Description

Location: The Rossi Barite Mine (i.e., the "Rossi Mine" or "Project") is a barite mining and physical (gravity) separation facility, located in eastern Nevada in northwest Elko County. The Project area is bordered to the west by the Santa Renia Mountains and the Tuscarora Mountain Range to the east, and is located approximately 50 miles northeast (by air) of Battle Mountain and 55 miles northwest (by air) of Elko within the historic Bootstrap Mining District.

Halliburton Energy Services, Inc. (Halliburton) is the Permittee for the Rossi Mine and is authorized to process up to 600,000 tons of barite ore per year. The Permittee also operates a dry grinding, bagging, and bulk loadout facility at Dunphy Siding (i.e., the Dunphy Mill Facility), in Eureka County, approximately 22 miles east (by air) of Battle Mountain and 26 miles southwest (by air) of the Project site. Although the Dunphy Mill Facility is associated with the Rossi Mine, the Facility is not subject to the regulations established in NAC 445A.350 through 445A.447.

The Project is located within all or portions of Township 37 North, Range 49 East; Sections 14, 15, 16, 21, 22, 23, 26, 27, 28, 34, and 35; Mount Diablo Baseline and Meridian. Mining occurs within private (patented) mining claims (approximately 208.3 acres) owned by Barrick Gold Exploration Inc. and public (unpatented) mining claims (approximately 1704 acres) administered by the U.S. Department of the Interior, Bureau of Land Management (BLM), Elko District—Tuscarora Field Office.

The Rossi Mine is required to be designed, constructed, operated, and closed without any release or discharge from the fluid management system except for meteorological events which exceed the design storm event.

Site Access: To access the Rossi Mine, proceed on Interstate-80 east from Winnemucca or west from Elko to *Exit 254-Dunphy*. Proceed north to the intersection of Dunphy Ranch Road and proceed east, paralleling Interstate-80. The Dunphy Mill Facility (and administrative complex) is located on Dunphy Ranch Road, approximately 2.3 miles east of the Dunphy exit. Continue on Dunphy Ranch Road 1.2 miles, to the intersection of Boulder Valley Road (a gravel road), located 400 feet west of the terminus of Dunphy Ranch Road. Proceed north on Boulder Valley Road, 28 miles to the Rossi Mine site.

General Description: The Rossi Mine consists of four pits and seven waste rock disposal facilities (WRDFs). Ore is blasted within the pits, transported to the crusher where it is crushed to minus ¾-inch. High-concentration/high-specific gravity barite ore is trucked directly to the Dunphy Mill Facility for additional grinding, packaging, bulk load-out while low-concentration/low-specific gravity barite ore is transported to the to the Rossi Jig Plant for additional concentration prior to its transport to the Dunphy Mill Facility.

Incorporation into the Nevada Division of Environmental Protection (the Division) Water Pollution Control Regulatory Permit Program: All mining facilities that have the potential to degrade waters of the State and not explicitly exempted pursuant to NAC 445A.387, are subject to NAC 445A.350 through 445A.447. The exempted mining facilities are limited to sand and gravel, cinder, diatomaceous earth, slate, shale, gypsum, clay, or crushed stone operations. Because of potential groundwater degradation due to acid rock drainage and metal liberation from the WRDFs, the Rossi Mine was incorporated into the Division's mine permitting program beginning with the 2016 new Permit issuance. As stated previously, the Dunphy Mill Facility is not subject to the regulations established in NAC 445A.350 through 445A.447 and not incorporated into the Permit.

B. Synopsis

Background/History: Until the mid-1920s, clay-based drilling muds had been the oil-industry standard. With the depletion of high-density clay deposits, several mineral-based alternatives were investigated as potential substitute for high density clay, among them the mineral barite (i.e., barium sulfate or $BaSO_4$).

Because of the higher specific gravity (sg) of barite (e.g., barite sg minimum of 4.1 versus 3.5 for the most optimum clay minerals then in use), its relative availability, and close proximity to the Texas and California oil fields, barite from the western U.S. quickly replaced clay in the manufacture of drilling muds.

A pair of weekend prospectors (Antonio Rossi and Carlo Cereghino) from Battle Mountain are credited with the April 1937 discovery of several barite outcrops within the Bootstrap Mining District. Historical records indicate that for several years, significant barite exploration activity occurred throughout the District and within the area of the present-day Rossi Mine; however, with the beginning of World War-II, barite exploration was considered non-essential to the war effort and ceased altogether.

Following World War II, Baroid Drilling Fluids, Inc. (Baroid), a division of the National Lead Company (now NL Industries), conducted additional exploration throughout the district and initiated design work for the Rossi Mine and a bulk load-out facility to be located at Dunphy Siding. The mining of direct-ship barite ore from several high-grade ore bodies (containing on average, 95 percent barite) began in 1947; however, by the late-1950s, these barite deposits approached depletion.

In an effort to supplement high-grade barite ore production and exploit the larger low-grade (e.g., low specific gravity) barite ore deposits, Baroid constructed a gravity separation/concentration facility (jig plant) at the Rossi Mine site and a grinding and packaging facility at Dunphy Siding (the Dunphy Mill Facility).

NL Industries sold their Baroid subsidiary to Dresser Industries (Dresser), a leading supplier of drilling equipment and fluids, in 1993. In 1998, Dresser merged with Halliburton, a leading supplier of drilling equipment and fluids and major competitor to Dresser. Halliburton kept Baroid as a separate subsidiary and has since sold-off all non-oil field related divisions formerly held by Dresser to others.

Geology: The geologic units in the Project area are predominantly upper plate of the Roberts Mountains Thrust (RMT) with the majority of the rock being the Devonian-aged Slaven Chert. Small areas of the Devonian Elder Sandstone and Ordovician Vinini Chert and shale are also present in the area. Blocks of Tertiary Carlin Formation up to 400 feet thick have been faulted into the upper plate units by high-angle normal faults. Unconsolidated Quaternary alluvial deposits occur in main drainages (unnamed tributaries to Antelope and Boulder creeks) and on a ridge on the east edge of the Project boundary. Small altered diorite and biotite lamprophyre dikes of Jurassic and Tertiary age are occasionally encountered.

The sedimentary geologic units encountered in the area are described below oldest to youngest:

- Vinini Formation (Ovsc): The Vinini Formation found in the Project area is structurally bound slivers (by thrust faults) of late to middle Ordovician-aged dark grey to black shale and chert. The extent of outcrop of the Vinini Formation is very small representing less than 5 percent of the Project area. The stratigraphic thickness is unknown in this area due to the faults and folds in the area.
- Elder Sandstone (DSe): The Elder Sandstone of Silurian and Devonian age is a slope-forming, generally olive gray-green, dolomitic, and calcareous very fine sandstone, coarse siltstone and dark grey shale. Local interbeds of chert are also included in this unit. The Elder Sandstone is present in the area as structurally bound slivers like the Vinini Formation and represents less than 10 percent of the outcrop within the Project boundary. The stratigraphic thickness is approximately 300 feet.
- Slaven Chert (Dsm): The Slaven Chert is characterized as generally resistant, ridge forming, relatively thin-bedded chert, variable in color (generally grey, black and green), and rhythmically stratified in sequences, nominally 1.5 inches thick, between parting surfaces. Shale comprises a small portion of the Slaven Chert. The barite mined at the Rossi Mine is

found in the Slaven Chert. As with the Vinini Formation, the stratigraphic thickness of the Slaven Chert is unknown in this area.

- Carlin Formation (Tcm): The Carlin Formation mapped in the Project area is comprised of Miocene-aged silt, sand, and mudstone deposits including abundant tuff. The poorly exposed silt, sand, and mudstone are mostly unconsolidated and include some resistant sedimentary breccias, ranging in thickness from 6 to 10 feet. The unit also includes angular boulders set in a tuffaceous matrix that grades upward into silts and local gravels, and laterally into mega-rippled fluvial tuffaceous sands and lacustrine clays. The Carlin Formation is up to 400 feet in thickness and is found faulted into the Slaven Chert by Tertiary and Quaternary-aged high-angle normal faults.
- Late Tertiary and Quaternary Gravel (QTg2): Unconsolidated deposits of gravel, boulders, and cobbles as thick as 2,000 feet, are found along the east edge of the Project area along the west side of Boulder Creek. The gravels appear to rest unconformably over the Tertiary Carlin Formation as a paleo-fanglomerate (e.g., cemented conglomerate) deposit.
- Quaternary Alluvium: Quaternary (Qoa, Qsw, Qya): These deposits are comprised of sand and gravel deposited by streams or in alluvial fans. The younger units are 6 to 10 feet thick and the older units are as thick as 80 feet in larger drainages. The Tertiary volcanic rocks (Tcm) are present in the southeast-northwest trending paleo valley between the Queen Lode Pit and King Pit and also appear in thrust blocks east of the King Pit area. Some Quaternary alluvium is also present in this paleo valley overlying the volcanic rocks.

Hydrology: Groundwater in the Basin and Range province is typically higher in elevated areas and lower in drainage basins. Locally, flow may be dominated by discrete faulting or fracture zones, which result in water levels inconsistent with general conceptual patterns.

Groundwater storage is often compartmentalized and dominated by fracture-controlled flows in these settings. Transmission of water into and out of these areas is dependent on fracture geometry, variations in fracture permeability and recharge. Typically, groundwater will infiltrate through the bedrock and eventually discharge into the basin-fill sediments. Groundwater in the lower parts of the basin-fill deposits is discharged by a combination of evapotranspiration, inflow to stream channels, and subsurface outflow from the hydrographic areas. However, groundwater may flow differently due to differences in hydraulic conductivities between hydro-stratigraphic units.

Three hydro-stratigraphic units have been characterized at the Rossi Barite Mine based on the following geologic groupings:

- Volcanic Rock (Carlin Formation/Tcm).

- Marine Clastic Rock (Upper Plate rocks of the RMT/Ovsc, DSe, Dsm).
- Deep Carbonate Rock (Lower Plate rocks of the RMT).

The Volcanic Rock hydro-stratigraphic unit consists of Tertiary through Jurassic igneous rocks including: rhyolitic to basaltic lava flows, welded and non-welded ash-fall tufts, flow breccia, and tuffaceous sedimentary rocks. Tertiary volcanic rocks (Tcm) are present in what appears to be southeast-northwest trending paleo valley between the Queen Lode and King pits and also in thrust block east of the King Pit area. The estimated thickness of the unit is approximately 475 feet. Refer to the sub-section ***"Receiving Water Characteristics"*** for additional details.

Mining: The existing mining operations consist of two main pits, the King Pit and the Queen Lode Pit, approximately 7,500 feet south of the King Pit. Currently two WRDFs are associated with the King Pit and two with the Queen Pit. Future plans include an expansion of the King Pit and development of the Queen Lode Complex and Dawn Pit and the construction of three new WRDFs. The waste rock associated with the Rossi Mine consists predominately of chert and argillite with minor quantities of alluvium or volcanic ash. Refer to the sub-section *"**Characterization and Management of Ore, Waste Rock, and Jig Plant By-Products"*** for additional details.

Conventional drill and blast methods are used to reduce the rock to a suitable size to run first through a small crushing plant. The blasted ore is loaded into haul trucks (less than 100 tons) using a front-end loader and then trucked to an ore stockpile adjacent to the crusher. Waste rock is trucked directly to the waste rock dumps. At the crusher, the ore is crushed into ¾-inch minus material.

Crushed barite ore that is of high concentration is stockpiled onsite and shipped via dump trucks directly to the Dunphy grinding mill for additional processing. Lower concentration crushed ore is transported via conveyors to the jig plant where barite ore is separated from the tails through wet gravity beneficiation. Refer to the sub-section ***"Jig Plant Operation"*** for additional details.

Characterization and Management of Ore, Waste Rock, and Jig Plant Reject Products: The Permittee undertook a geochemical characterization program to address mineralogy, bulk geochemical characteristics, and the potential of the waste rock, ore and jig reject products associated with the Rossi Mine to generate acid drainage and liberate metals. The characterization program was also designed to provide an estimate of future water quality that would result from precipitation contacting the material(s) and the influence this may have on groundwater and surface water quality in the area.

Representative samples of waste rock, ore, and jig reject products were collected from the Rossi Mine and characterized for Acid Neutralization Potential/Acid

Generation Potential (ANP/AGP), Static Net Acid Generation (NAG), and Meteoric Water Mobility Procedure (MWMP)-Profile I parameters.

The Division only considers waste rock to be non-acid generating without kinetic testing if there is at least 20 percent excess neutralizing capacity (i.e., Neutralization Potential Ratio [NPR]>1.2). The Division requires that all samples failing to meet these criteria require kinetic testing to determine the acid generating potential.

When interpreting ANP/AGP data, the presence of barite in a particular mineral sample must be taken into account. Barite often undergoes incomplete dissolution and extraction in hot water, hydrochloric acid, and nitric acid extractions with most sulfur from barite reporting as non-extractable sulfur and nitric acid extractable sulfur. Because the nitric acid extractable sulfur fraction is considered acid generating, the presence of barite in a sample typically results in an overestimate of sulfide sulfur and acid generation. Consequently, the ANP/AGP test results might not accurately indicate the potential for acid generation from barite-containing material. Realizing this, the Division has developed a specific guidance document for determining acid generation potential from barite ores, tailings, and waste rock, using the Nevada Modified NAG test discussed below.

The Nevada Modified NAG test differs from the ANP/AGP test in that it provides a direct empirical measurement of acid production and neutralization produced by the intense oxidation of the sample using hydrogen peroxide (H_2O_2). The NAG test may provide a better estimate of field acid generation than the ANP/AGP method, which determines acid generation potential on water soluble sulfate and sulfide content only, particularly in the case of complex mineral matrices containing barite or other semi-soluble sulfate minerals that can skew ANP/AGP results.

Samples with NAG pH values greater than 4.5 Standard Units (SU) are predicted to be non-acid generating. Net acid generation is measured only for samples with NAG pH values less than 4.5 SU. NAG results greater than one kilogram (kg) sulfuric acid (H_2SO_4) per ton indicate the sample will generate some acidity in excess of available alkalinity. However, by convention, any NAG value below 10 equivalent kg H_2SO_4 per ton of material has a limited potential for acid generation and the results are considered inconclusive because a blank hydrogen peroxide solution (the reagent in the NAG test) can generate a NAG value up to 10 equivalent kg H_2SO_4 per ton.

In an attempt to further define the acid generation potential for the Rossi ore, waste rock, and jig by-products, the Permittee also performed characterization utilizing the NAG determination method in addition to humidity cell testing (also known as "kinetic testing")

Kinetic testing is intended to simulate the accelerated wreathing of materials through their repeated exposure to wet and dry conditions, followed by a rinse that is collected and analyzed for Division Profile I or III parameters. Kinetic testing is utilized to further define if a material is acid generating and to determine constituent release from a material over time.

The main conclusions that can be drawn from the Rossi characterization program are as follows:

- Results of the geochemical testing confirm that the lithology and oxidation state are sensitive indicators of acid generation and can be used to define the acid generating potential of the Rossi material types.
- The mineralogy results indicate sulfide minerals (i.e., pyrite) can occur within the Rossi material types. However, when present, pyrite typically occurs at trace levels and is encapsulated in quartz, therefore, it is not readily available for weathering and acid generation. The exception to this is a subset of the un-oxidized chert samples that contain visible fine-grained pyrite. However, this material will not be mined under the current mine plan.
- From the ANP/AGP tests, only three out of the 62 samples meet the BLM criteria for acid neutralizing material (ANP:AGP ≥ 3:1 ratio versus the Division ANP:AGP ≥ 1.2:1 ratio). The remaining samples have either an uncertain potential for acid generation or are classified as potentially acid generating.
- The occurrence of barite within the Rossi samples presents some challenges with respect to the interpretation of the ANP/AGP test that relies upon sulfur speciation data to predict acid generation potential. Barite will undergo incomplete dissolution and extraction in the extraction steps with sulfur from barite reporting as either non-extractable sulfur or nitric acid extractable sulfur.
- Kinetic testing (also known as Humidity cell testing (HCT)) has been undertaken on 11 samples to address the uncertainties of the ANP/AGP test and determine the potential for the Rossi material types to generate acid and leach metals. The HCTs were operated for between 48 and 73 weeks and terminated with Division approval. Only one cell of un-oxidized chert showed the development of acidic conditions; the remaining 10 cells generated circum-neutral to mildly alkaline leachates with low associated metal release.
- The ANP/AGP methods do not provide a reliable prediction of acid generation for the Rossi material types, in particular the ore grade and jig by-product material, and cannot be used alone to define the potential for mine waste to generate acid in the long term. This is confirmed by HCT data that demonstrate the ANP/AGP results generally over-predict acid generation.
- The NAG test provides a direct measurement of acid production and neutralization produced by the intense oxidation of the sample using

hydrogen peroxide. A good correlation is observed between the HCT and NAG results indicating the NAG test is a reliable indicator of acid generation for the Rossi material types.

- Results from the Rossi characterization program indicate acid generation is not predicted for any of the Rossi waste rock, ore, or jig by-products that will be mined as part of the current mine plan. The only material type to show a potential for acid generation is the un-oxidized chert that contains visible pyrite. However, this material type will not be mined as part of the current mine plan.
- Metal mobilization during the MWMP test was generally minimal, with base metal concentrations being low or below detection indicating a limited amount of weathering products (from the oxidation of sulfide) are available for mobilization from the material. The exceptions to this are aluminum and arsenic leached under circum-neutral pH conditions at concentrations above the Division Profile I reference values for several samples. Fluoride, manganese and mercury were also sporadically elevated above the Division Profile I reference values.

Based on the characterization program results, material that will be mined from the Rossi operations will consist entirely of non-potentially acid generating (non-PAG) material. The Permittee is required to sample and characterize the ore, waste rock, and jig reject product, pursuant to the Permit; in the unlikely event PAG material is encountered, the material will be segregated and encapsulated within the WRDFs.

Jig Plant Operation: The Jig Plant is located southeast of the King Pit and includes the plant (a crusher and jig circuit), feed material, coarse and fine tailings piles, ore stockpiles, a maintenance shop, an office, and miscellaneous storage structures. In addition, there are numerous storage tanks for fuel, oils, and magnesium chloride (all with secondary containment), a contractor equipment maintenance area, and a vehicle wash rack. The jig plant can be operated 24 hours per day, seven days per week. The barite product is discharged from each jig to a product bin and is removed by a front-end loader to a stockpile. The waste rock from the jig is routed to the jig tails stockpiles for use as road base or final disposal in the waste rock dumps.

Three unlined ponds (e.g. the Upper Pond, Lower Pond, and Stock Pond) lie to the south of the Jig Plant. The Upper Pond (2.19 million gallons capacity) collects reject sediments (i.e., tails) from the jig operations while the Stock Pond (7.69 million gallons capacity) provides make-up water for the plant. The Lower Pond (7.23 million gallons capacity) is currently in use; however, it is expected to be taken out of service following the completion of Jig Plant modifications discussed below.

The ponds are unlined and are periodically excavated to remove accumulated fines. The collected fines are combined with growth media from stockpiles located adjacent to the waste rock dumps. Portable pumps, generators, and pipelines are used to direct water between the ponds and the jig circuit.

In an effort to optimize jig processing efficiency and minimize water consumption, the Permittee will be modifying the existing jig circuit. Planned activities include the replacement and modernization of jig components, the installation of a non-toxic flocculant (HYPERFLOC® AE 853, an anionic acrylamide) delivery system to increase the recovery of fine tails, and a reduction in the amount of water required by the jig process from 80 gallons per minute (gpm) to 39 gpm.

A new jig hutch (jig underflow) discharge system will be installed to reduce the jig process feed water requirements and improve the jig uptime. The new discharge system consists of abrasion resistant hoses and chutes as well as abrasion resistant control valves to accurately set the jig hutch discharge rate.

A Jig Tails Dewatering System will also be installed to dewater the jig tails product (e.g. jig overflow) and transfer the recovered slurry to the clarifier where the silt will be removed from the return water via the metering of a non-toxic flocculant discussed above. The system consists of dewatering screens, sumps, pump and piping system. A Jig Sands Dewatering System will also be installed to dewater the jig sands product (e.g. jig underflow) and transfer the recovered slurry to the clarifier where the silt is removed from the recycle water via the metering of the same flocculant described above.

The Jig Sands Dewatering System will consist of a three-compartment sump where the jig sand slurry product is discharged to the first compartment and pumped through a hydrocyclone, to separate the fine light-silt particles (e.g., hydrocyclone overflow) and return to the sump intermediate compartment, where heaviest separated particles will settle to the floor of the intermediate section and be recycled to the first section where they will be pumped to the hydrocyclone for further separation. The lightest particles overflow to the sump's third compartment and are then pumped to the clarifier for silt removal.

The hydrocyclone underflow (e.g., sand product) is discharged to the sand dewatering screen, for water removal and the residual solids product is discharged into the sump's intermediate compartment, where it is combined with the hydrocyclone overflow for further separation and transfer to the clarifier.

Because of the dewatering equipment performance characteristics, some entrained water and spilled water is expected to be conveyed to the Dewatering Screen and then discharged to a concrete collection/containment pad. The pad is graded to a collection sump and then pumped to the tailings dewatering sumps or clarifier.

Slurry discharged to the clarifier is treated with the same flocculant described previously to precipitate the solids. Precipitated solids are pumped to a settling pond or to a future belt press for further water recovery. The Clarifier Flocculant

Metering System is controlled automatically based on the percent solids measured, the clarifier sludge compositions, and discharge rates. The clarifier overflow or reclaimed water will be gravity transported to the Reclaimed Water Tank and eventually pumped back to the jig as Jig Process Water Feed.

The Reclaimed Water Tank will be equipped with an automatic make-up water addition system to ensure that the reclaimed water tank always has a safe operating level.

Water used in the beneficiation process is provided by three on-site production wells and groundwater water meeting Profile I reference values is trucked from the neighboring Barrick North Block Operation (WPCP NEV0091029). Nevada Division of Water Resources (NDWR) Wells #61410 (PW-3) and #76543 (PW-5) are located in the southern portion of the site and pump water directly into the Stock Pond and then to the Jig Plant. NDWR Well #42932 (PW-1) pumps directly to the Jig Plant.

Approximately 3,000 gpm of water is used in the jig beneficiation process; however, because the process water is recycled, currently 80 gpm of water is used as make-up water. The jigged ore discharges into piles below the jig plant. The collected product is stockpiled onsite, prior to being transported to the Dunphy grinding mill. The ore stockpile residency period varies depending on production and demand before being transported to Dunphy. Jigged tailings are collected from beneath the discharge located below the jig plant with a front-end loader and stockpiled onsite, where it is either used as road base or placed in the WRDFs.

At the Dunphy Mill, direct-ship or processed ore is stockpiled on site prior to grinding. The milled ore (300-mesh minus grind) is stored in silos and can be loaded into 50, 88, and 100 pound bags, then palletized and shrink wrapped for eventual shipment. The palletized bags are stored outside, adjacent to the warehouse. Bagged ore is shipped off-site by truck or railcar. The milled ore also can be directly loaded onto trucks or railcars for bulk shipment. No water is used at the Dunphy facility.

Ancillary Facilities: Ancillary facilities at the Rossi Barite Mine include an office and maintenance building, numerous storage tanks for fuel, oils, and magnesium chloride, a contractor equipment maintenance area, and a vehicle wash rack. The Permittee is not authorized to treat any petroleum contaminated soil (PCS) generated on site; PCS must be disposed of accordingly at a Nevada-authorized disposal facility.

Stormwater Management: Stormwater flow that discharges from the west and south sides of the King Pit area flows south and west toward a normally dry drainage that is an intermittent tributary to Antelope Creek. Stormwater flow that discharges from the east side of the active mining area flows east onto vacant undeveloped land and eventually infiltrates. Surface flow from the Queen Lode Pit area generally flows north toward the normally dry drainage that is an intermittent tributary to Antelope Creek.

Dewatering of pits is not required with the exception of accumulated rainfall and small perched lenses of groundwater encountered in the King Pit. Water removed from the pit is used for dust control or in the jig plant and does not require treatment.

Stormwater control features such as channels, sediment basins and check dams are designed to handle the 100-year, 24-hour storm event. Other stormwater controls and Best Management Practices (BMPs) will be placed in accordance with the Stormwater Pollution Prevention Plan (SWPPP). Stormwater up gradient of the stock pond will be collected, diverted to the Stock Pond, and used for jig make-up water. Stormwater down gradient of the stock pond is diverted to prevent run-on and run-off from contacting operating areas.

Facilities are monitored following spring snowmelt and intense rain events in accordance with the SWPPP for Industrial Activities to assess that drainage and sediment control measures are effective and operating properly. Quarterly inspections and event monitoring will be conducted to verify that stormwater controls are functioning as designed and modified in accordance with the SWPPP if necessary.

C. Receiving Water Characteristics

Groundwater: Table 1 lists the production and groundwater monitoring wells currently operating at the Rossi Mine site. Also included in the table are their respective depths to groundwater and the lithological unit monitored.

Most of the production and groundwater monitoring wells installed at the Rossi Mine site are screened within the Marine Clastic Rock hydro-stratigraphic unit. Previous groundwater investigations within this hydro-stratigraphic unit have calculated hydraulic conductivity (K) values of 0.01 to 0.5 feet per day (ft/day) with maximum well yields of 10 to 600 gallons per minute (gpm). Regional evaluations indicate that the unit has low primary permeability, but may have significant secondary permeability in areas where fracturing and faulting are present.

The Deep Carbonate Rock hydro-stratigraphic unit consists of massive limestones and dolomites with lesser amounts of shale, sandstone, and quartzite. This regional aquifer system includes several basins north and south of the Humboldt River. Groundwater investigations within this unit have estimated conductivity values of 0.1 to 100 ft/day, from wells that have yielded 500 to 5,000 gpm. Secondary permeability due to faulting and fracturing along with dissolution contributes to the increased well yields within the Deep Carbonate Rock hydro-stratigraphic unit.

Table 1—Operational Production and Groundwater Monitoring Wells, Rossi Mine Project.

Production Well (PW) Monitor Well (MW)	*Lithologic Unit Monitored*	*Completion Depth feet below collar elevation (completion year)*	*Screen Interval (feet)*	*Static Water Elevation feet below collar elevation*	
				When Completed	*Current*
PW-1 (NDWR#42932)	Chert	2000 (2012)	900 to 1,000 1,290 to 1,990	669	669
PW-3 (NDWR #61410)	Sandstone	520 (1995)	330 to 350 500 to 520	158	237
PW-4 (NDWR #70710)	Chert	780 (2012)	700 to 780	470	430
PW-5 (NDWR #76543)	Shale	891 (2005)	132 to 891	437	131
MW-1	Chert	140 (2013)	780 to 820 1,120 to 1,140 1,160 to 1,180	832	859
MW-2R	Silty Clay and Sand	115 (2015)	60 to 110	68	76.7
MW-3R	Chert	300 (2015)	245 to 295	>300	Dry
MW-4	Chert	590 (2013)	450 to 570	403	380
MW-5	Chert	300 (2015)	245 to 295	>300	Dry

Groundwater levels in wells that penetrate the Deep Carbonate Rock hydro-stratigraphic unit suggest that the groundwater flow is generally to the southwest from the Tuscarora Mountains area. However, no water wells are screened within the Deep Carbonate Rock hydro-stratigraphic unit at Rossi.

The groundwater monitoring well network currently consists of five monitoring wells (MW-1, MW-2R, MW-3R, MW-4, and MW-5). Four production wells (PW-1, PW-3, PW-4, and PW-5) provide make-up water for the mining operations and are equipped with dedicated pumps. The other wells were sampled through March 2015 using a HydraSleeve™ sampling system, but beginning in the 2015 second quarter sampling round new dedicated bladder pumps were installed in each monitoring well and in PW-4 at the request of the Division, due to erratic water quality results.

Groundwater quality at the Rossi Barite Mine is good and meets the Division Profile I reference values for all constituents. On occasion, elevated Manganese in excess of the Division Profile I reference value of 0.10 mg/L, has been observed at monitoring wells MW-1 and MW-4 and in production well PW-4. The Permittee is required to monitor groundwater elevation and the presence of Profile I constituents quarterly for each monitoring well, and the presence of Profile I constituents annually for each production well. The exception to this is MW-01 which is on a sample collection suspension due to decreasing groundwater elevations and pump constraints. Groundwater elevation data will continue to be collected on a quarterly basis until groundwater elevations increase to an elevation where they can be sampled.

There are two seeps (SP-001 and SP-002) identified at the Rossi Barite Mine. Seep SP-001 is located north of the King North Dump and seep SP-002 is located along the southern edge of the King South Dump. Flow from these seeps is believed to be the result of post-mine operations. The BLM identified the apparent source of seepage is from the gradual release of water stored within the dumps collecting in shallow ponds.

Quarterly water quality data collected since 2012 often indicates nitrate + nitrite (as total nitrogen) for both seeps in excess of the Division Profile I reference value of 10 milligram per liter (mg/L), due to the presence of residual blasting agents.

For SP-001, nitrate + nitrite (as total nitrogen) is between 9.4 and 14 mg/L with seepage rates between 5 and 50 gallons per minute; for SP-002, nitrate + nitrite (as total nitrogen) is between 14 and 29 mg/L with seepage rates between 2 and 5 gallons per minute. The permittee monitors these seeps quarterly when water is present.

Sometime between the January and March of 2018 quarterly sampling events, the northeast facing slope of the King North Dump failed, producing a steeply dipping, roughly concentric fault/slip surface with approximately 10 feet of offset exposed on the fault near the top of the WRDF. The offset waste rock and minor uplift at the toe of the slide created a small "dam" that blocked flow from the seep, resulting in the pooling of approximately 365,000 gallons of water. The pooled water was broadly pumped to a sprinkler system and applied over a large area to gradually infiltrate the solutions and minimize run-off and erosion. Once the water had been removed, the channel was improved to prevent ponding and minimize erosion.

Due to the Rossi Barite Mine being incorporated into the Division's mine permitting program in 2016 and due to the extensive dewatering from the neighboring Barrick North Block Operation (WPCP NEV0091029), there exists limited information to determine if a pit lake would form within the King Pit and Queen Lode Complex Pit at closure. In accordance with Schedule of Compliance item 1 in the 2021 renewed Permit and the Monitoring and Mitigation Plan approved by the 2019 Final Environmental Impact Statement, the Permittee shall install additional monitoring wells and perform aquifer characterization prior to mining below the threshold elevations of 5,420 feet above mean sea level (AMSL) in the King Pit and 5,480 feet AMSL in the QLC pit. The results of this testing will be utilized for a pit lake evaluation which, dependent on results, will further drive necessary actions as described by the Monitoring and Mitigation Plan.

Surface Water: The closest surface water body is Antelope Creek, a perennial creek located approximately one mile west of the King Pit. The creek is a tributary of Rock Creek and subject to water quality standards pursuant to NAC 445A.1522 (Rock Creek below Squaw Valley Ranch). The Permittee monitors flow and water quality in Antelope Creek downgradient and upgradient of the sediment basins quarterly when flow is present.

Flow from several unnamed drainages has on occasion has reached the Antelope Creek during extreme storm events. As stated previously, stormwater control features such as channels, sediment basins and check dams have been installed to manage the 100-year, 24-hour storm event. Facilities are monitored following spring snowmelt and intense rain events in accordance with the SWPPP for Industrial Activities to assess that drainage and sediment control measures are effective and operating properly. Quarterly inspections and event monitoring will be conducted to verify that stormwater controls are functioning as designed and modified in accordance with the SWPPP if necessary.

D. Procedures for Public Comment

The Notice of the Division's intent to issue a Permit authorizing the facility to construct, operate and close, subject to the conditions within the Permit, is being published on the Division website: https://ndep.nv.gov/posts/category/land. The Notice is being mailed to interested persons on the Bureau of Mining Regulation and Reclamation mailing list. Anyone wishing to comment on the proposed Permit can do so in writing within a period of 30 days following the date the public notice is posted to the Division website. The comment period can be extended at the discretion of the Administrator. All written comments received during the comment period will be retained and considered in the final determination.

A public hearing on the proposed determination can be requested by the applicant, any affected State or intrastate agency, or any interested agency, person or group of persons. The request must be filed within the comment period and must indicate the interest of the person filing the request and the reasons why a hearing is warranted.

Any public hearing determined by the Administrator to be held must be conducted in the geographical area of the proposed discharge or any other area the Administrator determines to be appropriate. All public hearings must be conducted in accordance with NAC 445A.403 through NAC 445A.406.

E. Proposed Determination

The Division has made the tentative determination to issue the renewed Permit.

F. Proposed Limitations, Schedule of Compliance, Monitoring, Special Conditions

See Section I of the Permit.

G. Rationale for Permit Requirements

The facility must not discharge a pollutant that would result in degradation of existing or potential underground sources of drinking water, or that would cause an exceedance of an applicable surface water quality standard or regulation.

The primary method for ensuring compliance will be required routine monitoring and reporting, augmented by Division site inspections. Specific monitoring requirements can be found in the Water Pollution Control Permit.

H. Federal Migratory Bird Treaty Act

Under the Federal Migratory Bird Treaty Act, 16 U.S. Code 701-718, it is unlawful to kill migratory birds without license or permit, and no permits are issued to take migratory birds using toxic ponds. The Federal list of migratory birds (50 Code of Federal Regulations 10, 15 April 1985) includes nearly every bird species found in the State of Nevada. The U.S. Fish and Wildlife Service (the Service) is authorized to enforce the prevention of migratory bird mortalities at ponds and tailings impoundments. Compliance with State permits may not be adequate to ensure protection of migratory birds for compliance with provisions of Federal statutes to protect wildlife.

Open waters attract migratory waterfowl and other avian species. High mortality rates of birds have resulted from contact with toxic ponds at operations utilizing toxic substances. The Service is aware of two approaches that are available to prevent migratory bird mortality: 1) physical isolation of toxic water bodies through barriers (e.g., by covering with netting), and 2) chemical detoxification. These approaches may be facilitated by minimizing the extent of the toxic water. Methods which attempt to make uncovered ponds unattractive to wildlife are not always effective. Contact the U.S. Fish and Wildlife Service at 1340 Financial Boulevard, Suite 234, Reno, Nevada 89502-7147, (775) 861-6300, for additional information.

Prepared by: Matthew Schulenberg
Date: 27 April 2021

Revision 00: **Day Month 2021;** Revised text to capture slope failure at norther portion of the North King Dump which resulted in the impoundment of Seep 001 and how this was mitigated; Added the temporary deferral of sampling at MW-1; Added discussion regarding possible pit lakes and mitigative measures.