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

Permittee: Baker Hughes Drilling Fluids

Facility Name: Argenta Mine

Permit Number: **NEV0091045**
Review Type/Year/Revision: **Renewal 2016, Revision 00**

A. Location and General Description

Location: The Argenta Mine and Mill complex is located in Lander County, approximately 11 miles northeast (by air) from the town of Battle Mountain and 39 miles southwest (by air) from the town of Carlin. The mine is located in the historic Argenta Mining District, and is bordered by the Reese River Valley to the west, Whirlwind Valley to the east, the Humboldt River to the north and the Shoshone Mountains to the south.

The Argenta Mine and Mill facilities are located within portions of Township 32N, Range 47E, Sections 6, 18 and 19 and Township 32N, Range 46E, Sections 13 and 24, MDB&M (Mount Diablo Baseline and Meridian).

The Argenta Mine and Mill occupies a total of 592 acres, of which 121 acres are public land administered through the BLM (Battle Mountain District--Mount Lewis Field Office) and 471 acres are private land owned by Baker Hughes Drilling Fluids and Newmont Gold Corporation. The mill utilizes gravity separation to produce a concentrated barite product for use as a drilling mud. Physical constraints within the mill facility limit the process rate to 315,360 tons per year.

The Argenta Mine and Mill facilities are 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 Argenta Mill, proceed on Interstate-80 east from Winnemucca or west from Elko to *Exit 244-Argenta*. To access the mill facility, proceed north, then east approximately 0.25 mile on the frontage road, which parallels Interstate 80, to the facility entrance. To access the Argenta Mine, proceed south on Mosquito Canyon Road, approximately two miles to its terminus at the gated mine entrance.

General Description: Barite ore is mined from several pits, loaded and trucked to the Argenta Mill, where it is processed without chemicals to produce a saleable concentrate, which is packaged or loaded directly into covered hoppers for final shipment to the end user.
The Argenta Mine and Mill facilities pre-date the water pollution control regulations for mining facilities established pursuant to NAC 445A.350 through 445A.447. Consequently, many of the containment structures and facilities were constructed and/or

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installed at a time when minimum design standards, "as-built" drawings and liner QA/QC verification were not required.

Background/History: Baker Hughes Drilling Fluids is the current Permittee of record for the Argenta Mine and Mill. Historical records indicate that the Argenta barite deposit was discovered in Mosquito Canyon around 1930 by Milwhite Inc., a leading supplier of clay minerals for use in the manufacture of oil field drilling muds and specialty chemicals. Use of clay-based drilling muds had been the industry standard for several decades, however, by the mid 1920's, the use of barite-based muds were becoming more commonplace as economically viable deposits of high-density clays were quickly becoming depleted. Furthermore, barite's higher specific gravity (when compared to the clay minerals then in use) and its availability and proximity to the Texas and California oil fields, made the mineral even more desirable for use as a drilling mud.

To further develop the Argenta barite deposit and maintain its share of the drilling fluid market, Milwhite created a separate company, Milwhite Mud Sales Company. A surface mine, referred to as the "Barite King" or more commonly "Argenta", was developed in Mosquito Canyon and a small physical separation and loadout facility was constructed at nearby Argenta Siding, a rail spur serviced by the Southern Pacific Railroad (now Union Pacific).

The company gradually expanded its mining and milling operations to meet the demand of drilling muds and constructed a packaging facility on site. With the acquisition of the Aquaness Chemical Company in 1963, Milwhite Mud Sales Company changed its name to Milchem Inc. In 1971, Baker Oil Tools (later changed to Baker International), a leading supplier of oil field drilling equipment, purchased Milchem's drilling fluid operations in an effort to expand their interest within the highly competitive drilling fluids market. Milchem became a separate operating unit of Baker International.

In 1985, Baker International purchased Newpark Drilling Fluids from Newpark Resources, Inc., and merged it with Milchem's mud operations to form a new operating unit, Milpark Drilling Fluids Inc. The 1987 merger of Hughes Drilling Fluids (a division of Hughes Tool Company) with Baker International resulted in the creation of a new company, Baker Hughes. Hughes Drilling Fluids was merged into Milpark Drilling Fluids Inc., and in 1993, the company became a separate product line within Baker Hughes INTEQ, a division of Baker Hughes. Baker Hughes Drilling Fluids was established as a stand-alone division in 2004.

Despite drilling mud market fluctuations and several changes in ownership, the Argenta Mine and Mill have remained in continuous operation since the 1930's.

Incorporation into the NDEP-BMRR Water Pollution Control Permitting Program: Since the mill facility was first constructed in the 1930's, few changes have been made. The existing tailings impoundment was constructed much later and was last modified during the late 1970's. The engineered designs met the regulatory design criteria at the time of construction. In the early 1980's, seepage was first observed emanating from the

tailings impoundment structure. Because of the facility's significant potential to degrade waters of the state and Argenta's close proximity to the Humboldt River, the facility was incorporated into the NDEP-BMRR Water Pollution Control Permitting Program, beginning in 1991, pursuant to Nevada Administrative Code (NAC) 445A.387.

Geology/Hydrology: The Argenta Mill is located on fluvial deposits adjacent to the Humboldt River and is bordered on the southeast by alluvial fan deposits from the Shoshone Range. The fluvial material is comprised of sand, gravel and clay to a depth of at least 400 feet below ground surface (ft bgs). Depth to groundwater is approximately 20 ft bgs. The Argenta Mine is located within a complex series of Ordovician and Devonian cherts, argillites and quartzites capped by basalt and andesite. Characterization and humidity test results for the barite ore, waste rock, and overburden indicate that nearly all of the materials are not potentially acid generating (PAG).

Mining: At least seven pits (Argenta, Cuna, F, F-Pit North, Main, Velvet, and Yuba) have been developed over the 70+ years of operation at the Argenta site. Of these seven pits, only two (Cuna and F-Pit North) were active as of November 2010. A third pit (Yuba) is currently idled but may return to active operations in the near future. Currently the mine is in Temporary Closure due to mineral prices as of June 2016.

The Argenta, Main, Velvet and the F pits have been completely backfilled. The F-Pit was backfilled with a basalt to 10 feet above the highest recorded water elevation in the F-Pit (5,886 ft amsl). Then the F-Pit continued to be filled and re-contoured and as of February 2016 about half of the F-Pit is revegetated, is planned to be finished in 2016. The evaporation pond closure work was completed December 2014. Refer to the sections "F-Pit Lake" and "Evaporation Pond Minor Modification" for additional details.

Conventional open pit mining is used to remove the barite ore with concurrent reclamation. Barite ore, assaying 40-45 percent $BaSO_4$, was mined from the Cuna and F-Pit North pits by front-end loaders, loaded into a 100-ton ore truck and transported to the Argenta Mill where it is weighed and then stockpiled (approximate capacity 75,000 tons) for future processing.

With the exception of the Basalt and Limestone overburden material, MWMP and ANP/AGP results imply that the barite mill feed and process tailings are potentially acid generating. However, because of the stable, non-reactive nature of barite ores, these results are misleading. A more accurate indicator of acid generating potential is the determination of sample reactivity over the long-term, e.g. humidity cell tests.

Long-term humidity cell testing was performed on representative samples of barite ore, chert-argillaceous overburden, off-site barite ore, and waste rock samples. Humidity cell test results indicated that samples of the chert-argillaceous overburden that contained a particular rock lithotype (Slaven Chert) had slight acid generation potential. Pursuant to the Waste Rock Management Plan, any chert-argillaceous overburden encountered is encapsulated with non-PAG waste rock during active placement within the waste rock dumps. In the event larger quantities of PAG material are encountered and encapsulation

is no longer feasible, BMRR will require the construction of engineered waste rock containment structures at the Argenta Mine site.

Non-PAG waste rock generated from the mining is transported by one of four, 50-ton dump trucks for placement in assigned waste rock dumps, identified as Dump A through J, located near the pits. Waste rock from the Yuba Pit is transported to Dumps E and F, while waste rock from the Cuna and F North pits is transported to Dumps A, B, C, G, I and J. Waste rock dumps D and H are closed. During the development of F-Pit North, the non-PAG waste rock (limestone or basalt overburden) generated was utilized as backfill for the F-Pit.

Mineral Processing: A front-end loader transfers stockpiled run-of-mine (ROM) barite ore to a feed hopper where it is then discharged to a 125-ton per hour (tph) jaw crusher and crushed to minus 3-inches. The crusher discharge is conveyed to a ¾-inch mesh vibrating screen for separation into minus ¾-inch and plus ¾-inch size fractions. The undersize fraction is conveyed to the jig feed stockpile, the oversize fraction is discharged to a cone crusher where it is crushed to minus ¾-inch and then conveyed to the jig feed stockpile (approximate capacity 7,000 tons).

Material from the jig feed stockpile is conveyed to four, 32-ton capacity jig feed bins at a rate of 125 tph. The feed bins discharge at a rate of 25 tph to four, 3-cell Bendalari jigs (a jig design unique to the barite industry) for gravity separation into a crude barite concentrate and chert tails. No chemicals are used in the process. The concentrate and tails are each dewatered utilizing spiral classifiers. Make up water for the jigging circuit, supplied by dewatering water, supplements an on-site process well.

Following dewatering and depending on the desired product characteristics, the barite concentrate is conveyed to either the 200,000 ton crude product stockpile for loading into trucks or rail cars for direct shipment to the end user or to the 300,000 ton mill feed stockpile for further drying and grinding by a pair of Raymond Mills. Currently, all of the concentrate is conveyed to the mill feed stockpile. Because of their age, small size, and a maximum process throughput of 18 tph each, the Raymond Mills limit barite concentrate production.

Discharge from the Raymond Mills is pneumatically conveyed to six, 250-ton silos for temporary storage and then pneumatically conveyed to either the packaging plant where it is packaged into 50 pound bags or directly discharged to a covered railroad hopper car or dry-bulk semi-trailer for shipment to its final destination and use as a drilling mud. Barite concentrates suitable for use as a drilling mud must contain between 65 and 75% $BaSO_4$ and have a specific gravity greater than 4.2.

The chert tails are discharged via conveyor to the chert tails stockpile. Depending on barite demand, the chert tails may be reprocessed in the jig circuit to obtain a low-grade barite product. The fine tails slurry is discharged directly to the tailings impoundment/settling basin where the solids settle out and decant water overflows to the

fresh water pond. Decant water collected in the fresh water pond is returned to the jigging circuit for reuse.

Since 2006, barite ores from three off-site locations (Miller, Redhouse Pit, and Maggie Creek Pit), have been added on occasion to the processing circuit to supplement the on-site ores. Prior to the delivery of any new off-site ores to the Argenta Mill, the Permittee is required to submit ore characterization data to BMRR.

Tailings Seepage Issues: Three ponds comprise the Argenta Tailings Impoundment Facility (TIF), each separated by an earthen embankment. The ponds are referred to as the Fine Tails Pond (Tailings Pond #1), the Fresh Water Pond (Tailings Pond #2), and the Dry Tailings Pond (Tailings Pond #3). As stated previously, the Argenta TIF pre-dates the water pollution control regulations for mining facilities. Consequently, the impoundment was constructed at a time when minimum design standards, "as-built" drawings and liner QA/QC verification were not required. The Permittee is proposing the construction of a replacement TIF and closure of the existing TIF. The new TIF will be double-lined and leak detected and will be constructed east of the existing mill facility. The new TIF will require a Major Modification of the Permit.

The Fine Tailings Pond is believed to have been lined with clay and a type of bentonite sealant at the time of its construction (ca. 1950). Evidence suggests that seepage from the pond was first detected during the late 1970's along the western toe of the embankment where damp soil, standing water, and cattail growth were observed. The upstream embankment of the Fine Tails Pond was lined with clay in 1979, in an attempt to stop the seepage. Additionally, the 2003 Annual Monitoring Report for the Argenta facility noted Profile I exceedences for TDS, aluminum, manganese, and iron at groundwater monitoring well MW-1.

Beginning in 2004, MW-1 sampling frequency was increased from annually to quarterly. In addition, BMRR required the Permittee to submit a work plan for additional monitoring and sampling in an effort to delineate the lateral and vertical extent of possible contamination downgradient of the impoundment. The work plan included sampling of water from the ditch on the west side of the Dry Tailings Pond from the pool near the bridge and sampling of the water from the ditch just north of the Fine Tailings Pond. In addition, the work plan included drilling and sampling of at least one monitoring well downgradient of MW-1 and one monitoring well upgradient of the Argenta Mill. Downgradient monitoring well MW-2 was installed in August 2005, approximately 200 feet northwest of MW-1. Monitoring well MW-3 was installed in early 2006 at a location upgradient and east of Argenta Mill facility.

In an effort to evaluate the integrity of the Dry Tailings Pond embankment and its possible repair, the Permittee secured the services of an engineering consultant (Knight Piésold Consulting--Elko) in early 2006 to perform a comprehensive study of the seepage and develop a work plan for the implementation of mitigation measures. In addition, the Permittee moved the transfer/decant channel between the north and south ponds,

approximately 150 feet, east away from the existing channel and seepage in the impoundment to help slow or stop the seep in that area.

The consultant concluded that the pond is free draining based on its design, construction, and operation. In their opinion, seepage can be reduced significantly through the creation of additional beach area with fine grained material, which would distance the pond from the free draining materials. The Permittee began implementing the suggested mitigation measures during the spring of 2006 and by 2010, the amount of seepage had been reduced significantly to zero.

F-Pit Pit Lake:

Mining completed in 2004 for the F-Pit at an elevation of 5,840 feet and a pit lake developed in the following years to a final elevation of 5,880 ft amsl in 2008. The F-Pit was backfilled completely with a final cover layer. As of February 2016 the vegetative layer was about 50% complete with plans to complete the remainder by the end of the year. See previous fact sheets for more information.

Reclaimed Evaporation Pond:

The F-Pit evaporation pond was approved in 2010 and in operation until 2014. The pond was closed with the removal and disposal of the remaining water by Clean Harbors then the remaining sediment was encapsulated by the liner of the pad then covered with fill material. The reclaimed Evap Pond is located approximately 1,700 feet (ft) southeast of the F-Pit, in a "saddle" area near the site of the Truck Shop. Depth to ground water beneath the Evap Pond site is greater than 230 feet below ground surface (ft bgs). See pervious fact sheets for more information.

Conveyance Pipeline

The conveyance of F-Pit water to the Evap Pond required a lift of approximately 300 ft (total dynamic head 441 ft) and a pipe run distance of approximately 3,750 ft from pit to pond. To maintain the desired 500 gpm design pumping rate, a portable 80-horesepower (hp) centrifugal pump is installed near the F-Pit entrance, approximately 200 ft from the F-Pit water's edge. Water from the F-Pit was pumped through 6-inch (in) diameter, SDR-11 HDPE pipe inside 10-in diameter SDR-17 HDPE pipe for secondary containment and running paralleling an access road. The conveyance pipeline has since been removed.

Evaporation Pond Design

The Evap Pond is a lined pond with a leak detection, collection and recovery system. The Evap Pond is approximately 280 ft wide by 660 ft long and 28 ft deep. Working capacity of the pond is 25 million gallons, not including 3 ft of freeboard and is designed

to contain flows resulting from the 25-year, 24-hour storm event. Construction of the Evap Pond utilized cut and fill methods and required the removal of soil down to bedrock. Because of the topography, an embankment was required and constructed on the north and south sides of the Evap Pond from low permeability soil, compacted to 95 percent dry density (ASTM D1557) and a maximum hydraulic conductivity of 3.9×10^{-7} centimeters per second (cm/sec). All inside and outside embankment slopes are 2.5H:1V.

The Evap Pond liner system consists of 60-mil HDPE as the primary liner overlying a 12-in layer of excavated fill. The fill layer is used to provide proper bedding fill for the HDPE liner and overlies a 2-ft layer of drainage gravel surrounded by geotextile. Beneath the geotextile-drain rock layer is the prepared subgrade, which is comprised of two, 6-in lifts of low-permeability soil, compacted to 95 percent dry density (ASTM D1557) and a maximum hydraulic conductivity of 3.9×10^{-7} cm/sec. Beneath the prepared subgrade is weathered bedrock. Two trenches were excavated into the bedrock to accommodate the installation of a French drain system which reports to the collection and recovery sump.

Waste Rock Management Plan (WRMP) Revision Minor Modification: A Minor Modification was submitted by Baker Hughes on June 7, 2010 to revise the current WRMP. On June 16, 2010, BMRR approved the following changes to the WRMP:

Pit Backfill Final Elevation Increase: Non-PAG waste rock generated from the development of "F-Pit North" will be added to the "F-Pit" as backfill for the purpose of increasing the final backfill elevation from 5,890 ft amsl to 5,925 ft amsl. The rate of backfilling will be dependent on the development of "F-Pit North" and is expected to continue through the completion of mining in the pit. The pit highwalls will be covered with backfill to minimize exposure of these surfaces to meteoric water and in the event there is insufficient backfill material to cover the highwalls, benches will be constructed adjacent to the exposed pit surfaces prior to the construction of the evapotranspiration (ET) cover system (below).

Backfill Tentative Final Cover Design: Following the completion of backfilling, an ET cover system is proposed for placement on top of the backfill to preclude meteoric water from coming in contact with the waste rock. The cover system will be comprised of an underlying foundation layer, low hydraulic conductivity layer and an overlying erosion-resistant, vegetative layer incorporating diversion structures, regraded, reshaped and compacted to promote surface run-off.

C. <u>Site Hydrology and Background Water Quality</u>

The Humboldt River and the intermittent Mosquito Canyon Creek (MC-1) are the only surface water within one mile of the Argenta Mine and Mill site. Mosquito Canyon Creek parallels the west side of Mosquito Canyon Road until it reaches the range front. At this point, any water present in the creek penetrates the alluvium. Surface water is monitored at a point downgradient of the Argenta Mine site and pits near Mosquito Canyon Road. Water quality is generally good, with occasional exceedences of the

Profile I reference values for aluminum and iron.

The Argenta Mill facility is approximately 2,000 feet south of the Humboldt River. Ground water at the mill facility lies approximately 20 ft bgs. The Process Well (PW-1), for the Argenta Mill site, is located approximately 50 feet south of the truck scales and 600 feet southwest of administration building. Water quality is generally good, with frequent exceedences of the Profile I reference values for aluminum and iron.

Currently, the Permittee is not required to monitor Humboldt River water quality at the Argenta site. The NDEP Bureau of Water Quality Planning (BWQP) does monitor the Humboldt River quarterly at several locations throughout its entire reach, including monitoring sites at Battle Mountain (downstream from Argenta) and Palisades (upstream from Argenta). Elevated iron, phosphorus and total suspended solids concentrations often occur throughout the Humboldt River System, but these are not attributed to the Argenta Facility.

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 sent to the **Battle Mountain Bugle** for publication. 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 of public notice. 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, any affected 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 is located in an area where annual evaporation is greater than annual precipitation. Therefore, it must operate under a standard of performance which authorizes no discharge(s) except for those accumulations resulting from a storm event beyond that required by design for containment.

The primary method for identification of escaping process solution will be placed on required routine monitoring of leak detection systems as well as routinely sampling downgradient monitoring wells. 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 are 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 (covering with netting), and 2) chemical detoxification. 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.

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