FACT SHEET
(pursuant to Nevada Administrative Code [NAC] 445A.401)

Permittee: **Marigold Mining Company**
P.O. Box 160
Valmy, Nevada 89438

Facility Name: **Marigold Mine**

Permit Number: **NEV0088040 (2014 Renewal, Rev. 00)**
(**Factsheet Revision 00**)

A. Location and General Description

Location: The Marigold Mine is located in southeast Humboldt County, in northern Nevada. The mine site is approximately 30 miles southeast (by air) of the town of Winnemucca and occupies approximately 29 square miles (19,000 acres) of public and private lands. The mine and support facilities are located in Humboldt County, within portions of Section 36, Township 34 North, Range 42 East; Sections 1, 12, 13, 24, 25, and 36, Township 33 North, Range 42 East; Sections 19, 20, 21, 28, 29, 30, 31, 32, and 33, Township 34 North, Range 43 East; Sections 4, 6, 7, 8, 9, 10, 16, 17, 18, 19, 20, 30, and 31, Township 33 North, Range 43 East; and Section 6, Township 32 North, Range 43 East; Mount Diablo Baseline and Meridian (MDB&M).

Access: To access the Marigold Mine site, proceed approximately 37 miles east from Winnemucca or 13 miles west from Battle Mountain on Interstate 80 to Exit 216 (Valmy). The mine site is approximately 3.5 miles southwest of the interchange.

General Description: The Marigold Mine is operated by the Marigold Mining Company (Marigold), a wholly-owned subsidiary of Silver Standard Marigold Incorporated (SSMI). SSMI completed their purchase of Goldcorp's 67 percent interest and Barrick Gold Corporation's 33 percent interest in Marigold in early 2014. Goldcorp had earlier acquired its interest in Marigold through its purchase of Glamis Gold Corporation (Glamis) in 2006. Glamis acquired its interest in the property as part of its Rayrock Resources Inc. acquisition in 1999. Barrick acquired its interest in the property in 2002 when it merged with the Homestake Mining Company.

Gold had been mined intermittently at the Marigold Mine site since the late 1920's. However it wasn't until the late 1980's that full-scale development and production of the Marigold Mine site was initiated.

The Marigold Mine consists of several open pits and is authorized to process up to 25 million tons of ore annually utilizing conventional cyanidation technology. Gold is recovered by carbon adsorption and electro-winning. The facility is required to be designed, constructed, operated, and closed without any release or discharge from the fluid management system except for except for meteorological events which exceed the design storm event.

B. Synopsis

Geology: There are three major sequences or bedrock units present within the Marigold Mine Project Area. The rock units include the Ordovician Valmy Formation, the Pennsylvanian to Permian Antler or Overlap Sequence, and the Mississippian to Permian Havallah Formation. The three rock units are oxide in character and drilling has indicated that little to no sulfidic materials will be encountered during mining. The rock types are described below:

- Alluvium: Locally, alluvium is up to several hundred feet thick and consists of poorly sorted fan gravels interspersed with abundant fines and interbedded with thin layers of fine silt, sand, and clay. The upper 200 to 250 feet is derived mainly from chert. An older Tertiary Alluvium has been identified in the mine area. In addition to weakly consolidated gravels, silts, and sands, Tertiary volcanic rocks, including basalt, volcanic tuff, and intrusive have been identified.
- Antler Sequence: Pennsylvanian to Permian in age, this unit has also been called the Overlap assemblage. The Antler Sequence consists of interbedded siltstone, sandstone, mudstone, conglomerate, and limestone. This unit varies from 200 to 700 feet thick within the Project Area and rests unconformably in the Ordovician Valmy Formation. Locally, this sequence consists of the Battle Formation, the Antler Peak Limestone, and the Edna Mountain Formation. The Battle Formation typically contains conglomerate beds resting on eroded Valmy Formation along with some local beds of sandstone and shale. The basal part of this formation is typically composed of coarse chert and meta-quartzarenite cobble conglomerate. A distinctive shale unit is found just above the conglomerate in some places. Coarse siliceous sandstone with interbedded conglomerate may also be part of this formation. The Antler Peak Limestone, a late Pennsylvanian-to-early Permian unit, overlies the Battle Formation. The Antler Peak Limestone is a massive- to well-bedded, gray, micritic limestone. The Edna Mountain Formation overlies the Antler Peak Limestone. The lower member of the Edna Mountain Formation consists mostly of coarse-sized, very poorly sorted debris flows containing chert and meta-quartzarenite fragments. The upper member of the Edna Mountain Formation consists of a thick, brown or gray siltstone.
- Havallah Sequence: This Pennsylvanian- to-Permian aged unit consists of bedded chert, siltstone, sandstone, and mudstone. Mafic to intermediate volcanic flows occur randomly throughout this unit. The chert-siltstone-sandstone sequence can have a calcareous matrix, which is not present throughout the unit. Some minor limestone is also present. This unit has been thrust into the region along the Golconda thrust fault and emplaced above the Antler Sequence or the Valmy Formation. Thickness of this unit varies from zero to several thousand feet.
- Valmy Formation: Ordovician in age, this formation consists of bedded to massive chert, siltstone, quartzite, and argillite. The chert and siltstone is gray to black, and the quartzites are light to dark gray and interbedded with argillite. In areas to be mined, the Valmy marker units of interest are 1) a lower package of meta-quartzite

with a few argillite beds; 2) an intermediate package composed of meta-basalt, chert, and argillite; and 3) an upper package of meta-quartzite and argillite very similar to the lower package.

Mining: Currently there are several open pits at the Marigold site in various stages of development. Combined annual mine production is approximately 60 million tons of ore and waste rock annually. Their current status is as follows:

- Target 2—active;
- Antler and Basalt—active and backfilling;
- Terry Zone (including Old Marigold) and East Hill (includes Red Rock, Top Zone, and McKay)—partially developed and idle;
- Target 1—partially developed and backfilled;
- 8-Pit (previously referred to as the 8-North and 8-South) developed and partially backfilled; and
- 5-North Pit and Target 3—authorized but not yet developed.

Dewatering: Based on previous hydrological studies and the most recent (January 2011-Hydro Engineering, LLC) study for the Marigold site, the Permittee does not anticipate the need for dewatering any existing or proposed pit at this time. One pit (8-South) was completed to a depth slightly below the groundwater table. In an effort to eliminate any potential for pit lake formation, a pit lake plan was developed by the Permittee and approved by the Division, for placement of non-potentially acid generating (PAG) backfill in the 8-South Pit to an elevation of at least 10 feet above the pre-mining groundwater elevation observed in 1992.

The cessation of dewatering at the neighboring Lone Tree Mine (WPCP NEV0090058) has affected the regional groundwater table at the Marigold site. Since dewatering at the Lone Tree Mine ceased in November 2006, a gradual rebound of the groundwater table has been observed by an increase in monitoring well water elevation. The Permittee has installed groundwater monitoring wells around the property to monitor groundwater elevations associated with mining activities and will continue to monitor the water table rebound, but there is no expectation of groundwater entering open pits due to the pit floor elevations.

Waste Rock Characterization and Management: To date, waste rock characterization, using static and kinetic testing data have indicated very little PAG material due to the minimal amount of sulfidic material available and the abundance of limestone waste rock with excess neutralizing potential.

Waste rock material is hauled to the Top Zone, Old Marigold, Resort, 5-North, 8-North, South, North-West, and North-West Expansion waste rock disposal facilities (WRDFs) and end-dumped on the active bench face at the angle of repose. The dumps are constructed at an overall slope of 3H:1V with average bench heights of 50 to 60 feet.

Backfilling of open pits with waste rock and overburden material commenced in 1998. In a letter to the Permittee dated 5 May 2003, the Division provided specific pit backfilling criteria at the Marigold Mine. The Permittee is required to submit waste rock characterization results, geologic formation identification and hydrologic data for evaluation and approval by the Division prior to the placement of waste rock in any pit not specifically identified in the letter.

The following geologic formations have been approved for use as pit backfill material:

- Valmy;
- Antler;
- Edna Mountain; and
- Havallah.

The Edna Mountain and Havallah formations have also been approved for placement below the pre-1992 water table. Backfill with these formations will also eliminate the potential for a pit lake to form and is authorized for use in the 8-South Pit (now part of the 8-Pit) and the Terry Zone Pit.

Heap Leaching: As of June 2014, approximately 594 acres of heap leach pads (HLPs) and ponds have been constructed at the Marigold site. Nineteen HLP cells (Cells 1, 2, 3, 2/3 Infill, 4, 5a, 5b, 6, 9, 10, 11, 12, 13, 14, 15R, East Side Extension, 16, 17, and 18) have been constructed, of which 10 cells (Cells 10, 11, 12, 13, 14, 15R, East Side Extension, 16, 17, and 18) are currently active.

The HLP cells were constructed in the following sequence: Cells 1, 2, 8, 7, 6, 5a, 5b, 4, 3, 2/3 Infill, 9, 10, East Heap Leach Pad Extension, 11, 12, 14, 13, 15R, 16, 17, and 18. Each successive construction featured design improvements over the previous construction.

Leach solution is applied selectively to different areas of the constructed HLP and approximately 4.29 million square feet of pad area is being leached at any given time. Currently, HLP Cells 1, 2, 7, and 8 are inactive and in draindown with the remaining cells active. Future plans include the 5-North HLP, which will be constructed in conjunction with the development of the 5-North Pit.

Cells 1, 2, and 8: HLP Cells 1, 2, and 8 were constructed during 1989-90, on a 24-inch compacted clay surface. Since the construction of these cells pre-dates the promulgation of Nevada Administrative Code (NAC) NAC 445A.350 through NAC 445A.447, as-built drawings, liner QA/QC and compaction data were not required at the time.

HLP Cells 1 and 2 were constructed with an authorized ore stacking height of 85 feet above the liner surface; Cell 8 was constructed with an authorized ore stacking height of 100 feet above the clay surface.

The existing pipeline corridor between HLP Cells 1 and 2 was constructed in 1988, pre-dating the implementation of NAC 445A.350 through NAC 445A.447. The corridor is comprised of 40-mil very low-density polyethylene (VLDPE) liner placed on a minimum 12-inch clay layer, overlying a layer of re-compacted soil. The pipeline corridor runs south to north and reports to Pregnant Pond 1 and/or 2. The corridor provides secondary containment for a pressurized line and gravity flow solution lines that collect solution predominately from HLP cells 1, 2, 3, 11, and the East Extension. In 2004, a new corridor was constructed directly to the east and parallel to the old corridor in conjunction with the Cell 12 HLP Cell construction to facilitate closure of the older HLP cells. This corridor reports to Pregnant Pond 2.

An Engineering Design Change (EDC) approved October 30, 2008, authorized the re-lining of the old VLDPE-lined piping corridor to facilitate concurrent closure activities and add operational flexibility. In addition, the Permittee's future plans include the potential relocation of the material on HLP Cells 1 and 2. Whether or not these cells are relocated or reclaimed in-place, relining the old piping corridor must be completed prior to either of these activities.

A thorough re-evaluation of the solution storage requirements for the Marigold HLP was performed by the Permittee in 2008. The Permittee evaluated the effects of the proposed HLP Cells 1 and 2 relocations and the "in-place" reclamation on the east side of the solution corridor along HLP Cells 1 through 3. The Permittee and the Division agreed that the solution corridor design and solution storage system have sufficient capacity to handle any storm event run-off resulting from the 100-year, 24-hour storm event and that no modifications to the solution corridor design or solution storage system were necessary at that time.

Cells 6 and 7: Cell 7 was constructed prior to Cell 6. Both were constructed with a 12-inch thick low permeability soil layer with a permeability of 1 x 10^{-6} centimeters per second (cm/sec) overlain by a gravel drainage layer and a 60-mil high-density polyethylene (HDPE) synthetic liner. The cells were each constructed with multi-pipe leak detection/collection systems. Leakage has been observed in the Cell 7 Leak Detection System and was significant enough to require its premature removal from operation in March 2001. Cell 7 was constructed to an authorized height of 120 feet above the liner surface; Cell 6, which is still active, has an authorized ore stacking height of 350 feet above the liner surface.

An investigation was undertaken by the Permittee to investigate the increase in leakage from Cell 7 that was first noted during the 3rd Quarter of 2003. In January 2005, the Permittee concluded that a significant portion of the leakage could be attributed to an increase in natural recharge. This recharge corresponds to construction events that may have altered surface drainage, resulting in the capture of direct precipitation and runoff. Based on the January 2005 report, a remedial action and monitoring plan was developed, submitted to and approved by the Division.

In an effort to preclude surface accumulation of fluid, Marigold constructed a positive drainage system on top of Cell 7, covered the southeast corner of Cell 7 with clay, regraded the eastern slope of Cell 7, and installed an evapotranspiration (ET) cover.

Determination of Cell 7 compliance is via a comparison of modeling results and quarterly Profile I criteria monitoring results at downgradient monitoring point (e.g. monitoring well) LDMP-13. Compliance is determined based upon previously submitted (February 2006) and approved (March 2006) HYDRUS-2D modeling results. Cell 7 monitoring port LPLD7 is monitored weekly for flow rate and quarterly for Profile I constituents with the results reported quarterly. A separate report regarding the performance of the Cell 7 Remedial Action is also submitted quarterly.

Cells 5a, 5b, 4, and 3: In response to the leakage problems associated with Cell 7, construction for Cells 5a, 5b, 4, and 3 (in that sequence) included a 12-inch thick soil layer with a permeability of 1×10^{-6} cm/sec overlain by a 60-mil HDPE synthetic liner. A leak detection system was not installed for the cells since the minimum design requirements pursuant to NAC 445A.434.1(a) were met. All four of these active cells have an authorized ore stacking height of 350 feet above the liner surface.

Cell 2/3 Infill: In October 1998, the heap leach pad area was increased by construction of the Cell 2/3 pad infill area. A portion of the Cell 2/3 pad infill area was constructed with a 12-inch layer of compacted native material with permeability not greater than 1×10^{-6} cm/sec and was overlain by a 60-mil HDPE non-textured synthetic liner. The remainder was constructed similarly except that an 80-mil HDPE with one textured side (textured down) was used. A leak detection system was not required since the minimum design requirements pursuant to NAC 445A.434.1(a) were met when the Cell 2/3 Infill was permitted. The maximum authorized ore stacking height for the Cell 2/3 Infill is 350 feet above the liner surface.

Cell 9: The Cell 9 leach pad was completed in July 1999, and added 9.5 acres of lined pad surface. With Cell 9, an additional stormwater pond with a capacity of approximately 2.6 million gallons was completed. The Cell 9 liner system consists of a 12-inch layer of compacted native material with permeability not greater than 1×10^{-6} cm/sec, overlain by 4 inches of non-segregated tails, covered by a 60-mil HDPE non-textured synthetic liner. A leak detection system was not installed since the minimum design requirements pursuant to NAC 445A.434.1(a) were met at the time Cell 9 was permitted.

Cell 10: In July 2000, the construction of Cell 10 added an additional 6 acres of lined pad surface. In October 2000, another 6.7 acres of leach pad area were added with the completion of the East Heap Leach Pad Extension. Cell 10's liner system was constructed similar to that of Cell 9. A leak detection system was not installed since the minimum design requirements pursuant to NAC 445A.434.1(a) were met at the time Cell 10 was permitted. Allowable stacking height of ore above the liner for both Cells 9 and 10 is 350 feet.

Re-Leach Pad, Cells 9 and 10 Slope Regrade: Prior to the full-scale cyanide leaching of "Millennium Ore", the Permittee conducted a series of larger scale leaching optimization tests on approximately 400,000 tons of the ore on a test HLP (Re-leach Pad). The Re-leach Pad and solution collection system were constructed along the western flank of Cells 9 and 10 and adjacent to the 8-South Pit. This configuration required an extension of the existing Cell 9 and 10 liner systems approximately 160 feet from the toe of the existing pad and regrading of the existing Cell 9 and 10 heap slopes. In addition, a liner and solution collection system was installed to further segregate the "Millennium" test ore material and leach solution from the existing leached ore.

The liner expansion overlapped and welded to the existing liner. A portion of Cells 9 and 10 were regraded for installation of a supplemental liner to be placed on top of regraded area in large pre-welded panels or sheets shingled in the downslope direction overlapping the existing pad liner and liner extension. The supplemental liner was not welded to facilitate removal following the completion of testing. The initial design plan described above called for the Releach Pad to be graded slightly inward toward Cells 9 and 10. However, during the pad preparation, it was found that it would be more prudent to have the pad grade slightly outward.

On 11 April 2007, the Permittee submitted an EDC and a slope stability analysis to the Division requesting a revision from the previously approved design for the change in pad gradient. Engineered designs approved in May 2006 included the construction of a synthetically lined perimeter berm around the entire perimeter of the test pad to contain the ore, leachate, and divert any external runoff away from the Releach Pad. The change in Releach Pad gradient did not require any design changes to the perimeter berm.

The Permittee performed a slope stability analyses to evaluate what impact (if any) a change in the regrade direction may have on slope stability. Stability modeling results indicated nearly identical factors of safety (FOS) under both static and pseudo-static conditions and that both FOS were well within the acceptable range, demonstrating that the slight change in regrade direction would not impact Releach Pad slope stability. The EDC was approved by the Division on 2 May 2007.

Cell 11: In April 2002 construction began on the Cell 11 leach pad (also referred to as the Southwest Heap Leach Pad Expansion), which added an additional 64 acres of leach pad area. The Cell 11 liner system consists of a 12-inch layer of compacted native material, with permeability not greater than 1×10^{-6} cm/sec, overlain by an 80-mil HDPE non-textured synthetic liner. The authorized ore stacking height is 400 feet above the liner surface.

Cell 12: In September 2004, construction began on the Cell 12 leach pad as part of the Millennium Expansion. The final permitted height of Cell 11 was increased to 400 feet as part of the Cell 12 design with Cell 12 constructed in the northeast corner of Section 17, abutting against the current leach pad on its east side against Cell 11, Cell 3 and Cell 4. The

Cell 12 pad utilizes a dual liner system consisting of 80-mil HDPE overlying a compacted 12-inch layer of low permeability (1 x 10^{-7} cm/sec) soil liner. A protective layer of gravel drain rock containing perforated drainage piping is placed on top of the HDPE liner to facilitate drainage and provide a cushion during ore stacking activities. In addition, a perimeter berm has been constructed around the pad.

Cell 14: In May 2006, the Division authorized the construction of Cell 14. Cell 14 is located on the north and west sides of a knoll, upgradient of the existing Cells 11 and 12 and southwest of Cell 13. Cell 14 adds approximately 41.5 acres of additional heap leach pad area to the existing facility. The pad area has been be regraded so that all process flow is directed to the north and northeast into Cell 12. The authorized ore stacking height for Cell 14 is 400 feet above the liner surface.

The Cell 14 leach pad is a lined system consisting of 80-mil HDPE overlying a compacted 12-inch layer of low permeability (1 x 10^{-6} cm/sec) soil layer. For areas located within steep terrain and where soil placement and compaction is not possible, the Permittee has replaced the soil layer with 0.25-inch thick geosynthetic clay liner (GCL) where external slope buttressing already exists or can be implemented. A protective layer of gravel drain rock containing perforated drainage piping is placed on top of the HDPE liner to facilitate drainage and provide a cushion during ore stacking activities. In addition, a perimeter berm has been constructed around the pad.

The Cell 14 solution collection system consists of external berms, internal sloped drainage areas and the installation of perforated HDPE lateral and header collection piping. The header pipes will be connected to the existing header pipes within Cell 12. Cell 14 will drain into three headers on the pad, pass into the solution collection system of Cell 12, through a manifold system on the north side of Cell 12 and flow in the collection piping down to the existing collection ponds.

Cell 13: HLP Cell 13 was approved for phased construction in August 2005. To date (June 2009), Phases 1A and 3West have been completed. Cell 13 is located within the northwest corner of Section 16 and abuts the existing Cell 12. Cell 13 utilizes a liner system consisting of 80-mil HDPE overlying a compacted 12-inch layer of low permeability (1 x 10^{-7} cm/sec) soil liner and geosynthetic clay layer (GCL). A protective layer of gravel drain rock containing perforated drainage piping will is placed on top of the HDPE liner to facilitate drainage and provide a cushion during ore stacking activities and a perimeter berm has been constructed around the pad.

The existing fluid management system has sufficient capacity to ensure adequate fluid management for additional process solutions generated as a result of the operation of Cell 13. The authorized ore stacking height for Cell 13 is 400 feet above the liner surface. Because of timing constraints and contractor availability, only Phases-1A and -3West (approximately 26 acres, total) were completed. The phased construction was considered to be an interim measure and required several changes to the geometry of the prior-approved Cell 13 design, including a significantly smaller footprint and a lower HLP height.

Cell 15R: The original Cell 15 design was approved for construction by the Division in July 2005, and intended for construction within the northwest corner of Section 16, abutting the existing Cells 12, 13 and 14 to the south. The location was revised (designated as Cell 15R) to optimize the construction, operation and closure at the original Cell 15 location.

HDPE pipelines in HDPE lined ditches were constructed to convey leach solutions via gravity from the new pads to the process solution ponds. Cell 15 utilized a dual liner system consisting of 80-mil HDPE overlying a compacted 12-inch layer of low permeability (1×10^{-7} cm/sec) soil liner or synthetic clay liner. A protective layer of gravel drain rock containing perforated drainage piping will be placed on top of the HDPE liner to facilitate drainage and provide a cushion during ore stacking activities.
A perimeter berm was also constructed around the pad. Because of the Division's permeability concerns with the local soil and clay material used previously, Marigold has agreed to increase the number of permeability tests to demonstrate that the permeability criteria will be met. The authorized ore stacking height for Cell 15R is 400 feet above the liner surface.

Cell 16: In February 2011, the Division authorized the construction of HLP Cell 16 as a Minor Modification. In an effort to increase existing HLP capacity, the Permittee constructed an entirely new HLP (Cell 16) within the previously approved Cell 13 boundary, capable of accommodating future cell construction. When completed, the Cell 16 HLP Expansion will occupy a footprint of approximately 57 acres, located east of Cell 13 Phase-1A in an area previously assigned to the proposed Cell 13 Phase 1B and Phase 2 expansions. The expansion required additional carbon column circuit and an expansion of the existing pregnant solution pond capacity.

The Cell 16 leach pad is a lined system consisting of 80-mil HDPE overlying a compacted 12-inch layer of low permeability (1×10^{-6} cm/sec) soil layer. For areas located within steep terrain and where soil placement and compaction is not possible, the Permittee has replaced the soil layer with 0.25-inch thick GCL where external slope buttressing already exists or can be implemented. A protective layer of gravel drain rock containing perforated drainage piping is placed on top of the HDPE liner to facilitate drainage and provide a cushion during ore stacking activities. In addition, a perimeter berm has been constructed around the pad.

The Cell 16 solution collection system consists of external berms, internal sloped drainage areas and the installation of perforated HDPE lateral and header collection piping. Cell 16 drains into three headers on the pad and flows through the collection piping to the Pregnant Pond 4.

Cells 17 and 18: In March 2012, the Division authorized the construction of two additional HLP cells (Cells 17 and 18) as a Major Modification. Once constructed and commissioned, the cells will add an additional 90 acres of leach pad area to the existing HLP circuit. Cells

17 and 18 will be located east of Cell 15 and south (upgradient) of Cell 16 on alluvial deposits that slope about two to four percent to the north-northeast. The cells will be graded to follow the natural and existing topography and to direct process solution to the north and northeast into the new solution corridor on the east side of Cell 17. Additional fill materials were required in some areas of the pad; however, the fill depth did not exceed five feet. Fill materials were obtained from excavations of areas within Cells 17 and 18.

Each cell is divided into three sections, each with its own dedicated solution collection system. Solution collection will be controlled by internal berms, internal sloped drainage areas, and installation of perforated lateral and header HDPE collection piping. Four-inch diameter perforated laterals will drain to 18-inch diameter perforated headers located along the divider and perimeter berms within the pad. Typical flow within each section is estimated to be about 2,333 gallons per minute (gpm).

Assuming a design leach solution application rate of 0.0035 gpm per square foot and a maximum application flow rate of 15,000 gpm, the total calculated area under leach would be about 4.3 million square feet (98.4 acres).

The Cell 17 and 18 HLP liner system consists of compacted clay overlain by 60-mil HDPE or GCL overlain by HDPE alternative composite liner will consist of the following (from bottom to top):

- Minimum one-foot recompacted low-permeability soil with a maximum permeability of 1×10^{-6}cm/sec or 0.25 inch thick GCL;
- Minimum 60-mil HDPE; and
- Minimum 1.5 feet of free-draining crushed rock protective cover/drainage gravel over the 60-mil HDPE liner and 1.2 feet over the lateral pipes.

A water balance was calculated and presented in the original design of Cell 16 to determine how much additional pond volume was required during upset conditions. This design analysis also included examination of the water storage requirements for Cells 17 and 18. The analysis determined that a new pond would be necessary for the heap leach expansion of Cell 16 as well as cells 17 and 18. This new pond, Pond 7 (Pregnant Pond 4), was authorized for construction as a Minor Modification in February 2011 and completed that summer.

Cell 19: In December 2013, the Division authorized the construction of Cell 19. Cell 19 is within a portion of the Cell 13 footprint and was originally proposed as the last phase of the Cell 13 HLP construction. Because of timing constraints and contractor availability, only Phases-1A and -3West of Cell 13 (approximately 26 acres, total) were completed.

The phased construction was considered to be an interim measure and required several changes to the geometry of the prior-approved Cell 13 design, including a significantly smaller footprint and a lower HLP height.

In an effort to increase existing HLP capacity, the Permittee submitted a Minor Modification in October 2013 for the construction of an entirely new HLP cell (Cell 19) within a portion of the previously characterized Cell 13 area. The Cell 19 HLP Expansion will occupy a footprint of approximately 57 acres and will be located north of the existing Cell 16 HLP.

HLP area has been regraded so that all process flow is directed to the north into the new solution corridor on the north side of Cell 19. Cell 19 is located on alluvial deposits that slope at about 2 to 4 percent to the north-northeast. As with previous construction, the pad will be graded to generally follow the natural and existing topography. This will be accomplished by smoothing the natural ground and filling swales to provide a suitable slope and foundation for the liner system.

Cell 19 overlies relatively high strength alluvial soils; therefore, foundation failure will not occur and the most likely failure mode is sliding along the HDPE liner/soil layer interface. A stability analysis was performed to examine the potential for sliding along the proposed soil layer.

The liner for HLP Cell 19 consists of a standard soil and HDPE or an alternative liner comprised of GCL and HDPE. As noted in past designs, the thickness of the HDPE must be a minimum thickness of 60-mil in order to meet the general puncture criteria established for the heap leach system. During previous leach pad projects, the Permittee used a thicker 80-mil liner. A similar liner is proposed for Cell 19. For Cell 19, the site liner system will consist of the following from bottom to top:

- Minimum 1-foot of re-compacted low-permeability soil or GCL;
- Minimum 80-mil single-side textured HDPE; and
- Minimum 1.5 feet of free-draining crushed rock protective cover/drainage gravel. (1.5 feet over the HDPE liner and header pipes, 1.2 feet over lateral pipes).

One additional groundwater monitoring well (MPS9-1) will be installed as part of the proposed modifications in the southeast corner of Section 9 Township 33 N, Range 43 E.

Surface water will be diverted away from the cell 17 and 18 areas through the use of ditches, sloped roads, and lined perimeter berms. A diversion channel will be constructed on the south side of Cell 18 and east side of cells 17 and 18 to capture and control surface runoff from the watershed to the south of the leach pad. In addition, surface runoff from the area to the south of the pad may also be diverted by the pad perimeter berm and the external haul road under more extreme or emergency conditions.

New Cyanide Addition Line and Design Revision: In an effort to more effectively leach older sections of the heap leach pad and enhance concurrent closure of the heap leach facilities, Marigold permitted a new pipeline for cyanide delivery to the heap leach pad. The design called for an 8-inch diameter, SDR 11 HDPE pipeline to convey cyanide solution from the

Cyanide Addition Tank (located on containment adjacent to the new carbon columns) to the top of the heap leach pad where Cells 3 and 12 intersect. A portion of this pipeline would have been installed within the existing solution collection ditch, in those areas where placement within the ditch is not possible; the cyanide addition line was designed to be installed utilizing pipe-in-pipe configuration with drainage to existing containment.

Cyanide solution application pipe, design, at the Cells 3 and 12 intersection are either HDPE or stainless steel construction, between 3 and 6-inches in diameter and able to withstand pressures between 100 and 300 pounds per square inch (psi). In accordance with the Permittee's International Cyanide Management Code (ICMC) Certification Procedures for the development and/or expansion of cyanide transportation, delivery, storage and use systems, the Division-approved addition line (and other potential alternatives) were evaluated for environmental, health and safety considerations.

During this evaluation, it was determined that although the approved design adequately addressed Marigold's ICMC certification procedures, incorporation of several minor design revisions would further reduce any environmental, health and safety risks. These design changes were approved by the Division on 20 October 2006 and became effective on 4 November 2006. Descriptions of the modified and constructed system include:

1. The installation of a 12,000 gallon listed skid mounted horizontal storage tank for concentrated cyanide storage is placed within existing containment at the Cell 3/12 Area. In the event of a catastrophic failure, 110-percent containment for concentrated cyanide is maintained within the Cell 12 effluent collection area and ditch which ultimately report to the solution storage ponds.
2. The installation of a distribution system that dispenses concentrated cyanide to the existing solution application supply lines. The distribution system consists of pumps and piping systems, located directly adjacent to the horizontal tank and within the same secondary containment as the horizontal tank.
3. The construction of a concentrated-cyanide off-load site with secondary containment located on an unconstructed portion of the Heap Leach Pad Cell 13, Phase 3 West expansion. This provides secondary containment during off-loading activities or in the event of a catastrophic failure of the off loading system.
4. The construction of Cell 13 Phase 3 West expansion consistent with the previously approved Cell 13 designs (approved by the Division on 13 April 2005) with some minor piping changes. All earthwork, overliner and HDPE synthetic liner specifications and QA/QC will remain unchanged and will be conducted in accordance to the previously approved Cell 13 design.

Process Solution Ponds and Stormwater Pond: As of June 2014, there are five pregnant solution ponds identified as Pregnant Pond 1 (aka Pond 3), Pregnant Pond 2 (aka Pond 4), Pregnant Pond 3 (aka Pond 6), Pregnant Pond 4 (aka Pond 7), and Pregnant Pond 5 (aka Pond 8); two barren solution ponds, identified as Barren Pond 1 (aka Pond 2) and Barren Pond 1 (aka Pond 1) that are interconnected with HDPE-lined channels. In addition there is

one single-lined pond identified as Overflow/Stormwater Pond 2 (aka Pond 5).
Pregnant Ponds 1 and 2, Barren Pond 1: Pregnant Ponds 1 and 2 and Barren Pond 1 were completed in late 1988 and early 1989 and constructed with a 100-mil HDPE liner overlying a 60-mil HDPE liner with a leak collection and recovery system (LCRS). Pregnant Pond 1 and Barren Pond 1 each have a capacity of approximately 2.3 million gallons (at 1.5-feet of freeboard). Pregnant Pond 2 formerly served as a dual-lined storm pond (Stormwater Pond 1) until 2003. The pond has a capacity of approximately 3.6 million gallons (at 1.5 feet of freeboard).

Barren Pond 2: Barren Pond 2 was constructed west of the existing Barren Pond 1 during September 2004, to ensure adequate fluid management for process solutions. The pond was dual lined, with 60-mil HDPE as the primary liner, followed by a layer of geonet and a 60-mil HDPE secondary liner over a prepared surface. Barren Pond 2 has an LCRS and has been designed to maintain 2.0 feet of board after a 100-year, 24-hour storm event has a capacity of approximately 16 million gallons.

Pregnant Ponds 3 and 4: Pregnant Pond 3 was initially permitted as the *"Dual Lined Stormwater Pond/Surge Pond"* in July 2005, in the event additional capacity is necessary. The lined pond is located south of the existing Stormwater Pond (see below), with 60-mil HDPE as the primary and secondary liners with a layer of geonet in between, all overlying a prepared surface. The pond is equipped with an LCRS and is designed to maintain a 2.0 feet freeboard after a 100-year, 24-hour storm event, with a capacity of approximately 7.6 million gallons.

Pregnant Pond 4 was authorized for construction in February 2011 and is identical in design and construction to Pregnant Pond 3. Pregnant Pond 4 is located east of Pregnant Pond 3. The pond is also equipped with an LCRS. A monitoring point was added for Pregnant Pond #4 (PP4) and the Pregnant Pond #4 leak detection sump (PPLDS4).

Pregnant Pond 5: The Cell 19 Minor Modification also included designs for an additional process solution pond (Pregnant Pond 5) for operational flexibility. When constructed, Pregnant Pond 5 will be located north of Pregnant Pond 4 and is designed to collect any overflow from Pregnant Pond 4 via a lined spillway. Pregnant Pond 5 has a design capacity of approximately 6.7 million gallons, not including freeboard.

When combined with the existing process and storm water ponds, there is more than enough capacity to accommodate the proposed HLP Cell 19 expansion. Currently, an excess capacity of approximately 1.7 million gallons exists, not including Pregnant Pond 5. Pregnant Pond 5 will add approximately 8.2 million gallons of additional capacity within the ponds immediately once constructed.

Pregnant Pond 5 will be constructed with primary and secondary HDPE liners and an internal leak detection system in between the two liners. The liner system will consist of an 80-mil textured HDPE primary liner, overlying an HDPE drainage net leak detection layer, overlying

a 60-mil textured HDPE secondary liner placed over a prepared subgrade.
HDPE drain liner may be used in place of the drainage net and one of the HDPE liners and a geotextile cushion may be installed on the prepared subgrade to protect the liner if the surface is deemed unsuitable for direct placement of the secondary liner. Vents will be installed around the crest of the pond in the primary liner to equalize pressure between the HDPE liners. Each vent will be covered with a rain flap to prevent precipitation from entering into the leak detection layer. The pond bottom will be sloped to the southwest corner to a leak collection and recovery sump (LCRS) system with an effective capacity of 1,200 gallons. Two solid HDPE riser pipes will be installed between the two liners with perforated sections within the LCRS for collection. The top of the secondary liner and the bottom of the primary liner will be protected from puncture using a geotextile cushion layer which will encase the collection gravel used to fill the sump area between the two liners.

Overflow/Stormwater Pond 2: The Overflow/Stormwater Pond 2 was constructed in 1997 to accommodate run-off from the 25-year, 24-hour storm event. The Stormwater Pond has a capacity of 5.9 million gallons (at 2.0 feet of freeboard) and is constructed with a 100-mil HDPE liner overlying a 12-inch layer of compacted soil with permeability no greater than 1×10^{-7} cm/sec.

Gold Recovery (ADR Circuit): Gold is recovered in the Adsorption/Desorption/Recovery (ADR) Circuit. The ADR Circuit consists of twenty-five carbon columns in five trains of five (referred to as "A" through "E") and chemical storage, located adjacent to and interconnected with Barren Pond 1. Each train can process up to 2,000 gpm of pregnant solution. Gold is adsorbed onto carbon within the ADR columns and the resulting barren solution reports to the barren pond where fresh water, sodium cyanide, and caustic soda can be added prior to its recirculation back to the leach pads. Cyanide is typically added at the toe of the heap utilizing the new cyanide addition system. Lime is added to the run of mine ore before stacking to buffer the pH in the solution as it migrates through the HLP.

The ADR Circuit and chemical storage area has secondary containment in excess of the minimum 110-percent (of the largest tank or vessel) design criteria and is integral to the pond system.

The loaded carbon is stripped using hot caustic solution under pressure and following the stripping operation, the carbon is washed with nitric acid, neutralized with caustic, and rinsed with freshwater, thermally regenerated in a rotary kiln and then recycled back to the adsorption tanks. The resulting pregnant solution from the hot caustic stripping undergoes additional processing, including electrowinning. The electrowinning removes the gold from solution and produces a gold bearing precipitate. The gold bearing precipitate is then further refined using a retort and smelting furnace, with doré bars as the final end product.

Marigold replaced the existing carbon kiln and added improved mercury abatement controls pursuant to new mercury emission requirements developed by the Bureau of Air Quality Planning. These changes resulted in the removal of the existing carbon columns, storage tanks and vessels within the processing facility. A new kiln and replacement tanks were constructed on the existing elevated platform without a reduction in the minimum secondary containment volume. Original design parameters required 110 percent containment of the largest vessels, the 2,500 gallon carbon-in-column (CIC) tanks. New tanks installed in 2007 are significantly less (approximately 1,500 gallons).

Ancillary Operations/Activities: Ancillary operations and activities at the Marigold Mine include the water supply system, support facilities and surface water diversions

Petroleum-Contaminated Soil Management: An EDC for a Petroleum-Contaminated Soil (PCS) Management Plan (PCS Plan) was approved in August 2010. PCS generated at the Marigold Mine may be managed in accordance with the approved PCS Plan and the Division's Guidance for Mine-Site PCS Management Plans. Prior to transport of wet PCS (e.g., from the truck wash sediment basin), site personnel will inspect and verify that the vehicle or other container to be used is not leaking. PCS may be stored temporarily on the approved holding pads (former bioremediation cells) until screening analyses are performed. After determination that the PCS does not exceed screening levels established by risk-assessment, it is ultimately placed at the existing Class III waivered landfill with a secondary disposal location on the Resort Waste Rock Storage Area. Before PCS may be managed under the PCS Plan, it must be determined that it is not hazardous waste. Hazardous waste must be properly disposed off site at an authorized facility.

Inactive Process Components: The Marigold tailings impoundment has been inactive since 1999 and is in the final stages of closure. In the event the need for a tailings impoundment occurs, a new tailings impoundment facility would be designed, permitted and constructed a short distance north of the existing impoundment in Section 9.

The Marigold tailings impoundment encompasses approximately 180 acres and employs a 60-foot to 70-foot high dam. The design storage capacity is approximately 3,315 acre-feet. The WAD cyanide concentration for the solution stored in the impoundment ranged from 20 to 40 ppm. The impoundment is lined with a 12-inch thick compacted clay liner with a hydraulic conductivity of 5×10^{-7} cm/sec. The last discharge into the tailings impoundment was in April 1999.

Leakage of solution from the tailings impoundment has been identified in observation wells located north of the dam. Remedial actions undertaken have included both physical modifications to the impoundment, and development of a more extensive network of monitoring wells. The network of monitoring wells, within the tailings impoundment and downgradient of it, are monitored on a semiannual basis for TDS, WAD cyanide, chloride, barium, and nitrate.

With the closure of the tailings facility and placement of the evapotranspiration cover all of the internal wells were plugged and abandoned. Additionally with the evapotranspiration cover in place the seepage has been reduced such that several downgradient wells within the plume have gone dry. Several of these wells have been plugged and abandoned. The remaining wells are also monitored quarterly for arsenic, TDS, WAD cyanide, chloride, barium, and nitrate. Annually, these wells are monitored for Profile I analysis.

Downgradient wells intercept both the seepage plume, which has created a perched zone and the deeper, underlying groundwater. To date, no impacts to groundwater have been observed.

C. Site Hydrology and Background Water Quality

The Marigold Mine is located on the northern flank of Battle Mountain. Much of the project is contained within the Trout Creek drainage basin. The operations are located at elevations of 4,300 feet to 5,500 feet above mean sea level (AMSL). Two geologic rock types host the groundwater system underlying the site: alluvial basin-fill deposits, and underlying bedrock.

Surface Water: Ephemeral surface water flows in the area occur in Trout Creek, Cottonwood Creek, the unnamed drainage west of the 8-Pit (previously the 8-South Pit), and the unnamed drainage to the east of the Marigold HLP. Stream flow, if it occurs, is generally in the spring following periods of precipitation and/or snow melt.

The original Trout Creek drainage ran through the area of the current Terry Zone North Pit and 8-Pit but has been diverted west of the existing facilities by a temporary diversion channel; seasonal flows in the Trout Creek drainage in excess of the 100-year storm event will be routed away from the mine and into the Cottonwood Creek drainage by the Trout Creek Diversion Dam currently being constructed (NDWR permit number 76425). Several other small drainages exist in and around the Project Area and have been or may require diverting in the future.

When flowing, Trout Creek is monitored quarterly for Profile I constituents at the Western Exploration Doby/George (WEDG) boundary line in Section 6, and downgradient of the West Waste Rock Storage Area in Section 31, the West Waste Rock Storage Area in Section 30, the WEDG-Marigold boundary line in Section 30, the WEDG-Marigold boundary line in Section 19, and at the point where the creek leaves the Marigold permit boundary.

Several springs are present in the Project Area. Mud Spring and the Unnamed Spring are located in the southern half of Section 20 (T33N, R43E). Ames Spring is located in the southeast quarter of Section 16 (T33N, R43E). Both springs result from sub-surface drainage of meteoric water off of the range front of Battle Mountain south of the Project Area that comes to the surface where this shallow sub-surface drainage flow is cut off by northeast trending faults and clay rich alluvial formations in close proximity to the springs. A third spring, White Top is located south of the Project Area in Section 6 (T32N, R43E). This spring occurs where a Tertiary basalt flow dams drainage off of the Battle Mountain Range front. Physical impacts to this spring have occurred off of Marigold-controlled lands. These impacts are the results of activities by a mining/exploration company not associated with

Marigold. Planned mining and processing operations are located downstream of the springs or outside of the associated meteoric water collection basins.

Groundwater: Alluvium is the main groundwater storage unit in the Project Area with bedrock storage upgradient in the primary pit development areas. The geometry and saturated thickness of the alluvium is highly variable due to the irregular topography of the bedrock surface. The bedrock groundwater system is controlled by fractures in the Valmy and the Antler/Havallah formations. Studies have indicated the majority of the groundwater flow in the bedrock occurs below ground depths which are below the ultimate depth of the pit expansions.

The unsaturated zone thickness ranges from 530 feet at the south end of the project site, to about 280 feet at the north end. The regional hydraulic flow gradient is approximately 0.002 ft/ft to the northeast. Groundwater levels at the Marigold Mine's water supply well field have historically experienced a decline of approximately 8 to 10 feet annually. The underlying groundwater meets the Nevada Profile I water quality standards for metals. The Marigold open pits are not subject to dewatering operations and no pit lakes are expected to develop after the cessation of mining.

With the closure and covering of the tailings impoundment, the perched water system above the alluvial groundwater layer near the tailings impoundment continues to diminish. Several monitor wells have gone dry reflecting the system is not being replenished.

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 **Humboldt Sun** , located in Winnemucca, Nevada 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 permit.

F. Rationale for Permit Requirements

The facility is located in an area where annual evaporation is greater than annual precipitation. It must operate under a standard of performance, which authorizes no discharge except for excess accumulations, which are a result of a storm event beyond that required by design for containment.

The primary identification of escaped process fluids is based on the periodic inspection of leak detection systems, monitoring wells, and visual inspections. Monitoring will be in accordance with permit conditions and requirements.

G. Federal Migratory Bird Treaty Act

Under the Federal Migratory Bird Treaty Act, 16 United States Code (USC) 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 [CFR]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.

Prepared by:	*Rob Kuczynski, P.E.*
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