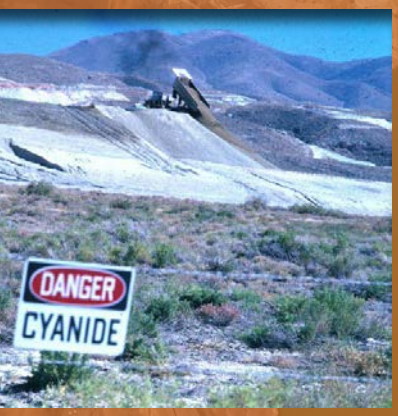


The Track Record of Environmental Impacts Resulting from Pipeline Spills, Accidental Releases and Failure to Capture and Treat Mine Impacted Water

# U.S. Gold Mines
# Spills & Failures Report

EARTHWORKS

Great Basin Resource Watch

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## The Track Record of Environmental Impacts Resulting from Pipeline Spills, Accidental Releases and Failure to Capture and Treat Mine Impacted Water

JULY 2017

BY BONNIE GESTRING AND JOHN HADDER

Report available at earthworksaction.org/USgoldminefailures

COVER PHOTOS, TOP - DOWN:

Pit lake at Lone Tree Mine, Nevada. Photo by Bruce Gordon.

Acid mine drainage at Kensington Mine, Alaska. Photo by U.S. Forest Service.

Cyanide warning sign at Hycroft Mine, Nevada (formerly Crofoot Lewis).

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*Earthworks is dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions.*

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*Great Basin Resource Watch is a regional environmental justice organization dedicated to protecting the health and well being of the land, air, water, wildlife, and human communities of the Great Basin from the adverse effects of resource extraction and use.*

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# Table of Contents

# Introduction

Gold mining is a significant source of toxic releases in the U.S. – including releases of cyanide, arsenic, mercury, cadmium and other hazardous substances to the air, water and land.[1]

The most common method for processing gold from mining is cyanide leaching, which uses cyanide to extract gold and other metals from ore. Cyanide leaching facilitates the mining of low-grade ores, generating large volumes of mine waste that become a permanent feature on the landscape.

This mine waste, as well as the processing chemicals used to extract the gold, can be a source of pollution to surface and groundwater. Because virtually everything that is mined becomes waste, and this waste is disposed of on the mine site, the toxic materials contained in the waste are permanent as well.

This report compiles the record of spills and seepage control failures at operating gold mines in the United States and documents associated water quality impacts.

The mine facilities where releases of hazardous materials can occur include heap leach pads, tailings impoundments, pipelines, process water ponds, waste rock piles and pit lakes.

- **Heap leach pads:** Heap leach pads are used to process lower grade ore using surface irrigation with a sodium cyanide solution, which picks up gold and other metals as it infiltrates through the ore. Leach pads often have one containment liner that serves as the primary capture for the gold and cyanide-laden (pregnant) solution. Some mines incorporate two liners. The second liner is used to monitor for leakage of the primary liner. Despite the existence of these liners, leakage still occurs when the liner is compromised or degrades over time.
- **Tailings:** Higher grade ore is crushed and combined with processing chemicals in large vats. The waste product, called tailings, are usually stored as a fine textured slurry behind an earthen dam. In most cases these tailings impoundments are not lined.
- **Process ponds** are lined, of much smaller size and are typically completely removed as part of the reclamation process.
- **Heap leach pads, tailings impoundments and process solution ponds** generally contain high levels of metals and cyanide, so containment is vital to avoid contamination. These facilities can be a long-term source of pollution if reclamation and long-term maintenance are inadequate.

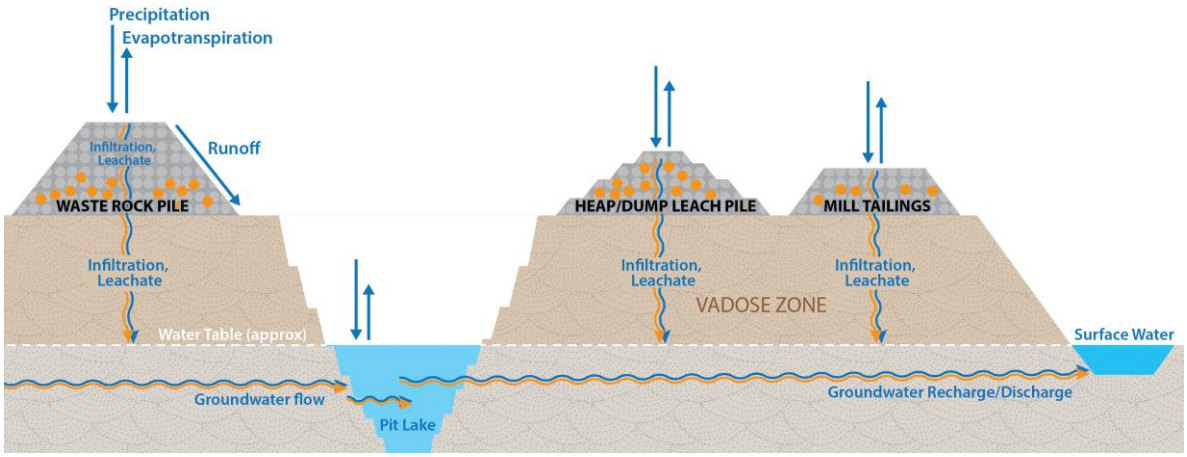
**Lone Tree Mine pit lake.** Photo by Bruce Gordon.

**Acid mine drainage, Kensington Mine, Alaska.** Photo by U.S. Forest Service.

Acid mine drainage can develop at gold mines where sulfide minerals are present. When sulfide minerals are exposed to air and water, they react to form sulfuric acid, which can leach minerals

from the surrounding rock to form acid mine drainage. If the acid mine drainage is not contained, it becomes a long-term source of contaminants.

When mining occurs below the water table, dewatering is required to keep the mine dry. Once mining operations cease, ground water seeps back into the underground mine workings, or back into the pit to create a pit lake. For open pit mines, since most gold mines occur in areas of high evaporation, the flow of water is typically into the open pit. However, if outflow occurs, groundwater can be degraded since pit lake water and water from underground mine workings is typically of poorer quality than the surrounding groundwater.




**This diagram illustrates the various mine components that can become a source of contaminants to surface and/or groundwater.**

# Methods

This report is based on information gathered from an extensive review of state and federal documents, news reports, and a federal database. It provides data for 27 operating U.S. gold mine operations, representing 93% of U.S. gold production in 2013 – the most current data on U.S. gold production available from the U.S. Geological Survey.[2] The report focuses on documenting two failure modes:

1) pipeline spills and/or other accidental releases of hazardous materials[3] and
2) seepage collection and treatment failures.[4]

Although the report focuses on water quality impacts, soil impacts may also occur from a hazardous release. This report does not catalog soil impacts.

Most of the mines in this report are primarily gold producers. However, gold can be produced as a by-product at other metal mines (e.g., copper, zinc/lead operations). This report includes data from the Bingham Canyon, Robinson and Greens Creek mines because gold is a significant by-product as identified in the 2013 U.S.G.S. gold report. The report did not evaluate the Cresson (Cripple Creek and Victor Mine), an operating gold mine in Colorado, due to the difficulty in obtaining comprehensive information on the site.

# Results

Our research determined that 100% of the mine operations reviewed in this report experienced at least one failure, with most mines experiencing multiple failures.

- **27 of the 27 mining operations (100%) have experienced at least one pipeline spill or other accidental release**, such as spills of cyanide solution, mine tailings, diesel fuel, and ore concentrate.
- **20 of the 27 mining operations (74%), have failed to capture or control contaminated mine seepage**. The seepage of cyanide solution was one of the more common impacts. The development of acid mine drainage was associated with some of the most lasting impacts.
- **Water quality impacts to surface and/or groundwater were identified at 20 of the 27 mining operations (74%)**, including impacts to drinking water supplies for residential homes and businesses, loss of fish and wildlife habitat, and fish kills.
- **Water quality impacts were not identified at 7 out of 27 mining operations**. At 6 of those 7 mines (86%), no perennial streams were present in the project area and groundwater was generally deep.

Research shows that mines with high acid generating potential and in close proximity to surface and groundwater are at highest risk for water quality impacts.[5] Availability of water is key to the development of acid drainage and the extent of containment. Many of the currently operating gold mines are located in the arid southwest, where precipitation is low (often less than 10 inches per year). Thus, the potential for surface precipitation to carry contaminants to the groundwater is significantly limited. Acid mine drainage will require water treatment and capture in perpetuity at the Bingham Canyon Mine, Golden Sunlight Mine, and Phoenix Mines, among others.

At 6 of the 7 gold mines where water quality impacts were not identified (e.g., Bald Mountain, Ruby Hill, Mineral Ridge, Mesquite, Denton/Rawhide, Turquoise Ridge) no perennial streams are present in the project area and groundwater is generally deep (>250 feet). For example, at the Denton Rawhide mine in Nevada, groundwater is so deep that it has not been located and there is no surface water within five miles of the mine. Impacts to ephemeral streams, where water flows only briefly after rainfall events, are more difficult to assess. Monitoring opportunities are limited, and in some cases ephemeral streams are not protected by the provisions of the Clean Water Act.[6] For example, at the Mineral Ridge Mine, the ephemeral streams in the mine area were determined to be non-navigable, and therefore, not subject to the water quality protections and monitoring requirements provided by the Clean Water Act.[7]

The ability to fully realize the extent of impacts is hampered by the limitations of monitoring. Often seepage from tailings or other mine facilities are recognized by a visual inspection of the containment dam. However, seepage can and has occurred from portions of a facility that are not monitored or difficult to monitor. In many cases, documentation of the failure does not occur until contamination reaches the nearest down gradient water monitoring point. As stated above, the depth to groundwater can be great and there is the potential that a containment failure could occur and not be noticed until after the mine is closed. Despite the incorporation of leak detention systems, which are applied at most new mines, (regulations vary from state to state) many failures of containment occur beyond detection.

| TABLE 1 - 2013 gold production amounts for mines reviewed in this report | | | |
|---|---|---|---|
| **Mine** | **Location** | **Company** | **2013 Gold Production (Kilograms)** |
| Newmont Operations | NV | Newmont | 53,200 |
| • Carlin Operations | | | |
| • Phoenix | | | |
| • Twin Creeks | | | |
| Cortez and Pipeline Mines | NV | Barrick | 41,600 |
| Goldstrike | NV | Barrick | 27,700 |
| Fort Knox/True North | AK | Kinross | 13,100 |
| Pogo | AK | Sumitomo (50%); Barrick (50%) | 10,400 |
| Smoky Valley | NV | Kinross (50%); Barrick (50%) | 9,700 |
| Turquoise Ridge | NV | Barrick | 6,970 |
| Bingham Canyon | UT | Kennecott | 6,430 |
| Hycroft | NV | Allied Nevada | 5,940 |
| Marigold | NV | Goldcorp | 5,080 |
| Kettle River - Buckhorn | WA | Kinross | 4,670 |
| Jerritt Canyon | NV | Veris Gold | 4,340 |
| Kensington | AK | Coeur Mining | 3,570 |
| Mesquite | CA | New Gold | 3,330 |
| Bald Mountain | NV | Barrick | 2,920 |
| Golden Sunlight | MT | Barrick | 2,860 |
| Ruby Hill | NV | Barrick | 2,830 |
| Greens Creek | AK | Hecla | 1,790 |
| Wharf | SD | Goldcorp | 1,750 |
| Robinson | NV | KGHM International | 1,480 |
| Florida Canyon | NV | Jipangu | 1,440 |
| Mineral Ridge | NV | Scorpio | 1,220 |
| Briggs | CA | Atna Resources | 990 |
| Rochester | NV | Coeur Mining | 960 |
| Denton Rawhide | NV | Rawhide | 743 |
| Total production of listed mines | | | 215,013 |
| Total U.S. production[8] | | | 230,000 |
| Percent of total U.S. production | | | 93% |

| TABLE 2 - Synopsis of pipeline spills and other accidental releases, and mine water capture and treatment failures (e.g. seepage) for U.S. gold mines | | | | |
|---|---|---|---|---|
| **Mine Operations** | **Pipeline spills and/or other accidental releases*** | **# of pipeline spills and/or other releases** | **Mine water collection and treatment failures** | **Water quality Impacts to surface water and/or groundwater** |
| Carlin Operations | YES | 11 | YES | Cyanide has exceeded water quality standards in Maggie Creek and James Creek. Groundwater has also been degraded by cyanide. |
| Phoenix | YES | 4 | YES | Springs and seeps have exceeded drinking water standards for antimony, arsenic, beryllium, cadmium, copper, chromium, fluoride, iron, magnesium, manganese, mercury, nickel, nitrate, pH, sulfate, total dissolved solids, and zinc. Surface water has been adversely affected by acid mine drainage. Groundwater has exceeded water quality standards for many pollutants. |
| Twin Creeks | YES | 38 | YES | Groundwater has been degraded with cyanide, arsenic, total dissolved solids, and there have been water quality violations for arsenic in Rabbit Creek. Cyanide solution has also reached Kelley Creek. |
| Cortez and Pipeline Mines | YES | 31 | YES | Groundwater has been degraded with arsenic, sulfates, total dissolved solids and cyanide. |
| Goldstrike North Operations | YES | 12 | YES | Springs in Antelope Creek drainage have been adversely affected by acidic seepage (low pH). |
| Fort Knox/ True North | YES | 2 | None identified | None identified. |
| Pogo | YES | 1 | YES | Groundwater has been degraded and there have been violations of surface water quality standards for manganese, pH, cyanide and iron for discharges to the Goodpaster River. |
| Smoky Valley (Round Mountain) | YES | 49 | YES | Groundwater has been degraded with cyanide. |
| Turquoise Ridge | YES | 36 | None identified | None identified. There are no perennial streams in the project area. |
| Bingham Canyon | YES | 28 | YES | Waste water from the mine has escaped the site's collection system, contaminating groundwater with metals, pH and sulfates. The groundwater plume covers more than 72 square miles – rendering water for thousands of Salt Lake City residents undrinkable.[9] Water treatment in perpetuity will be required at this mine to treat acid mine drainage. The release of hazardous pollutants has harmed natural resources, including migratory birds and their support ecosystems, which includes wetlands, marshes, freshwater wildlife habitats, playas and riparian areas and freshwater ponds. |
| Hycroft | YES | 16 | YES | Water quality standards for cyanide, mercury selenium and nitrates have exceeded water quality standards in groundwater. |
| Marigold | YES | 14 | YES | Groundwater has been degraded with chloride, total dissolved solids and cyanide. |
| Kettle River (Buckhorn) | YES | 1 | YES | The mine has degraded water quality in Gold Bowl Creek, Nicholson Creek, Upper South Fork Bolster Creek and Marias Creek, as well as groundwater, seeps, and springs. Water quality violations occurred for exceedances of total dissolved solids (TDS), total suspended solids (TSS), ammonia, arsenic, chloride, copper, lead, mercury and zinc.[10] |

| Mine Operations | Pipeline spills and/or other accidental releases* | # of pipeline spills and/or other releases | Mine water collection and treatment failures | Water quality Impacts to surface water and/or groundwater |
|---|---|---|---|---|
| Jerritt Canyon | YES | 40 | YES | Water quality standards in groundwater have been exceeded for chloride, arsenic, sulfates, total dissolved solids and trichloroethane, and groundwater has been degraded by cyanide, and in some cases antimony, cadmium, magnesium, mercury, nitrates and selenium. Surface water has been impaired in Sheep Creek, North Fork Humboldt River and South Fork Owyhee. |
| Kensington | YES | 2 | YES | Acid mine drainage has degraded water quality in Lower Slate Lake and mine discharges have caused water quality violations for manganese, zinc, aluminum and cadmium in East Fork Slate Creek. Water treatment in perpetuity will be required due to acid mine drainage. |
| Mesquite | YES | 15 | None identified | None identified. No perennial streams. The closest perennial surface water is approximately 15 miles southwest of the site. |
| Bald Mountain | YES | 12 | None identified | None identified. There are no perennial streams in the project area. |
| Golden Sunlight | YES | 10 | YES | The mine has violated water quality standards for cyanide in groundwater, and adversely affected groundwater in four domestic wells and a veterinary clinic. Water treatment in perpetuity will be necessary to capture and treat acid mine drainage. |
| Ruby Hill | YES | 3 | None identified | None identified. No perennial streams exist in the permit area and ephemeral drainages were to be eliminated with the construction of the East Archimedes pit. |
| Greens Creek | YES | 8 | YES | Surface water in Further Creek, Further Seep and Duck Blind Drain has been degraded with sulfates, lower pH and zinc. Surface water quality standards for zinc and lead have been violated as a result of discharges into Greens Creek, and violations have occurred as a result of discharges of diesel oil and drilling mud to Zinc Creek. Contaminated sediments in Hawk Inlet have occurred as a result of a spill of ore concentrate. Groundwater has been degraded with sulfates. |
| Wharf | YES | 11 | YES | Exceedances of water quality standards for nitrates, arsenic and cyanide in groundwater. Annie Creek has been polluted with selenium, ammonia, cyanide, arsenic above water quality standards. Adverse impacts to surface water in Annie Creek resulted in a fish kill, and adverse impacts to the fish population. |
| Robinson | YES | 15 | YES | The mine has caused groundwater degradation, and a consent decree was executed in response to a major release of mine tailings process water that harmed 2.3 miles of stream bed. |
| Florida Canyon | YES | 25 | YES | Water quality standards for cyanide, mercury and nitrates have been exceeded in groundwater. |
| Mineral Ridge | YES | 3 | None identified | None identified. No springs or seeps are located within the Project Area and only ephemeral drainages are present. |
| Briggs | YES | 2 | YES | Water quality standards for cyanide have been exceeded in groundwater. |
| Rochester | YES | 12 | YES | Groundwater has been degraded with arsenic, mercury, manganese, nitrate/nitrite, total dissolved solids and cyanide. American Canyon (an intermittent drainage) has been adversely affected by process solution. Exceedances of water quality standards for nitrate and arsenic have occurred in American Canyon springs. |
| Denton Rawhide | YES | 10 | None identified | None identified. Groundwater was not located, and there is no surface water within 5 miles of the mine. |

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

# Mine Operations Data

| Carlin Operations, NV[11] | |
|---|---|
| The Carlin Operations are located in Eureka County, Nevada, between 6 and 21 miles north of the town of Carlin and 35 to 40 miles west of Elko. The Carlin Operations include the North and South Area Operations. The South Area Operations site is located in Eureka County, Nevada and consists of the Gold Quarry open pit mine.<br>The North Area Operations site is located in Eureka and Elko Counties, Nevada. The operation consists of: 1) The Carlin, Genesis/Blue Star, Post, Bootstrap/Capstone, Tara, Beast, Sold, North Star, Payraise, Bob Star, Bobcat, Pete, Castle Reef, and Crow open pits; 2) Carlin, Deep Star, Deep Post, and Leeville underground mines. | |
| **Reports of pipeline spills and other accidental releases[12]** | According to the 2014 NPDES Fact Sheet, mill tailings, and sewage from the Carlin North and South area facilities are pumped to the Mill 5/6 Tailings Storage Facility Booster Pump House. Over the years, failures of pipelines, pumps, and valves have resulted in excursions of tailings slurry and associated process solution outside the original limited containment of the Mill 5/6 Tailings Storage Facility Booster Pump House and onto unlined areas.[13]<br>**July 9, 2014:** At Gold Quarry, 6,400 gallons of process solution (.33 mg/L WAD cyanide) was spilled due to a damaged pipeline from construction activity. April 29, 2008: A report of a release from the slurry tank of 110,632 gallons of cyanide solution.[14] The release affected soil and a roadway.<br>**December 21, 2000:** A report of 69,000 gallons of pregnant solution released from pregnant pond leak detectors in North Area leach facility due to unknown causes.[15]<br>**June 16, 1997:** A news report of 245, 000 gallons of cyanide solution released as the result of a heap leach pad failure and discharged into James Creek. About 18,000 gallons then flowed into Maggie Creek.[16] Cyanide levels were well above drinking water standards when the spill reached Maggie Creek. The spill was caused when material on the leach pad slid, breaking a cyanide solution line. The company reported fish fatalities.<br>**August 17, 1993:** A report of a release of 1.58 pounds of mercury from sump pump leak due to a broken shaft.[17]<br>**April 16, 1990:** A report of 13 pounds of cyanide spilled due to failure of drainage valve in storage tank.[18] |
| **Seepage collection and treatment failures** | In 2012, acid mine drainage was observed seeping from the south wall of the Pete Pit and forming a small pit lake in the spring of 2011 after a small pit wall failure.[19] A makeshift HDPE-lined sump was constructed to collect the drainage and transport it via water truck to the Leeville De-Sedimentation Project. In the summer/fall of 2012 an additional splay of the Pete Pit stormwater diversion ditch was constructed to collect and divert stormwater from an area below the existing diversion ditch but above the rim of the Pete Pit. It is hoped that this additional diversion will dry up the acid mine drainage seep in the Pete Pit. In 1990, it was determined, based on the presence of cyanide and elevated Total Dissolved Solids (TDS) in downgradient monitoring wells, that the James Creek Tailings Storage Facility at Gold Quarry was leaking process solution into groundwater.[20] Pumpback wells were installed to achieve compliance by 1996. |
| **Impacts to water resources** | Cyanide has exceeded water quality standards in Maggie Creek and James Creek. Groundwater has also been degraded by cyanide. |

| Phoenix Mine, NV<br>The Phoenix Mine is located in north-central Nevada in Lander County, 12 miles southwest of Battle Mountain. The mine is located on public BLM lands and private lands. The mine was originally permitted in 2003. | |
|---|---|
| **Reports of pipeline spills and other accidental releases** | **June 3, 2014:** Cyanide solution release occurred as a result of leaks in the leach pad. The holding pond for the leach pad leaked fluid, which were released into the soil. Soil contamination near the leach pad is possible. Dead ducks were found in the holding pond. Some contaminated items – acid, copper and lead – taken to the local landfill within 3 weeks.[21]<br><br>**Feb 10, 2014:** 1,404 gallons of tailings seepage leaked as a result of overflow from the seepage tank. The seepage was collected from the North Fortitude Waste Rock Facility.[22]Dec 12, 2013: 200 gallons of 93% sulfuric acid were released to pavement and ground during offloading from delivery tanker to storage tank due to a hose coupling failure during the transfer. Affected soils were to be removed and placed on the copper heap leach pad. The contaminated soil was replaced with clean fill.[23]<br><br>**February 26, 2008:** A failure of the tailings pipeline resulted in the release of approximately 49,000 gallons of tailings slurry. The pipeline was quickly repaired however further investigation revealed the presence of HDPE liner fragments within the Tite- Liner® pipe, indicating that the internal liner surface has started to shear (peel) off.[24] |
| **Seepage collection and treatment failures** | **2006:** Seepage of a small quantity of low pH and poor quality water was discovered at the toe of the historic Box Canyon Waste Rock Facility (BCWRF) in early 2006, following an intense precipitation event. Flow was estimated at approximately 2 gallons per minute. An EDC was approved 11 September 2006, to construct a solution collection, conveyance, and storage system at the toe of the Box Canyon Waste Rock Facility, similar in design to that constructed for the North Fortitude Waste Rock Facility seeps.[25]<br><br>**2005:** Seepage of low pH and poor quality solution emanating from a portion of the southern toe of the North Fortitude Waste Rock Facility (NFWRF) was noted in June 2005 and formally inspected during a 30 August 2005 compliance inspection. Flow emanates from two locations along a 300-foot width of the toe and ultimately migrates to a natural drainage and into the Fortitude Pit along the north pit wall. The seepage rate averages approximately 2 gpm except during storm events when the solution volume is significantly increased by meteoric contributions reporting to the waste rock facility and the natural drainage watershed area. Solution at the seep exhibits an average pH of 3 and the Fortitude Pit Lake exhibits an average pH of 4 or less. Solution at both locations also reports exceedances for numerous Profile I constituents.[26]<br><br>**2002:** Ground water from the Gold Tailings Facility (monitoring wells CVM-1, CM-22, CM-24, PW-1, PW-4), contains elevated concentrations of chloride, sodium, and sulfate, which is the result of a solute plume originating from the Gold Tailings Facility. This plume is the result of an unlined disposal area that was used for copper and gold tailings intermittently from 1965 to 1993. The chloride plume is currently being managed under the State of Nevada Water Pollution Control Permit.[27]<br><br>**2002:** According the 2002 Final Environmental Impact Statement, iron concentrations were highest in the ground water samples from the Copper Leach Area and the Midas Pit, reaching 1,500 and 100 milligrams per liter, respectively. However, ground water samples throughout the study area had iron concentrations that exceeded the secondary drinking water standard of 0.6 milligrams per liter, including the Copper Leach Area, Fortitude Pit, Galena Canyon, Iron Canyon, Midas Pit, Philadelphia Canyon, proposed Phoenix Pit, proposed Reona Pit, and the West Copper pit. |

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|---|---|
| | **PHOENIX MINE, NV - CONTINUED**<br><br>Manganese concentrations show a pattern similar to iron, reaching their highest level of 190 milligrams per liter at the Copper Leach Area and showing widespread exceedances of the secondary drinking water standard of 0.1 milligram per liter over the entire study area, including Buffalo Valley, Copper leach Area, Fortitude Pit, Fortitude Waste Rock Facility, Galena Canyon, Iron Canyon, Midas Pit, Philadelphia Canyon, proposed Phoenix Pit, proposed Reona Pit, and East Copper Pit. Aluminum concentrations exceeded the secondary drinking water standard of 0.2 milligrams per liter in ground water samples from the Midas Pit and the proposed Phoenix Pit, although aluminum was not determined for all samples.[28]<br><br>"The most acidic surface waters occurred adjacent to historic mining facilities and mineralized areas (e.g., Iron Canyon and Butte Canyon). The total dissolved solids concentrations in samples from these surface waters often exceeded the drinking water standard of 500 milligrams per liter and had pH values less than the drinking water standard of 6.5 (Figure 3.2-6). These surface waters also had the highest metal concentrations. In general, the metal concentrations in these springs and seeps exceed drinking water standards for antimony, arsenic, beryllium, cadmium, copper, chromium, fluoride, iron, magnesium, manganese, mercury, nickel, nitrate, pH, sulfate, total dissolved solids, and zinc.<br><br>"The combination of low pH and high dissolved metal and sulfate concentrations reported for surface waters, found near historic mining facilities and mineralized areas, indicates that acid rock drainage exists. Acid rock drainage is caused by water and air interacting with sulfide minerals commonly present in ore deposits. This result has been observed in surface water from Iron and Butte Canyons."[29]<br><br>Groundwater at the site has been affected by the numerous leaks and seepages from mine facilities. "The oxidation of sulfide minerals is the primary cause of acid rock drainage observed in the surface and ground water monitoring locations adjacent to existing mines and excavated areas."[30]<br><br>The Fortitude Pit Lake water is of poor quality. Based on the 2005 analysis of the treated water, Nevada Profile I maximum contaminate level (MCL) exceedances were reported for sulfate, lead, nickel, manganese, cadmium, and total dissolved solids.[31] The pit lake is being dewatered currently for water use at the mill.<br><br>**1998:** Low quality stormwater drainage was noted in the Iron and Butte Canyons. Battle Mountain Gold began collecting and treating acidic surface water from Iron Canyon and Butte Canyon in April 1998 (Brown and Caldwell 1998c).[32] Acid mine drainage continues from these areas. As of the end of 2015, acidic water (pH 2.81 – 3.21) was collected from the Iron Canyon drainage.[33]<br><br>Dead ducks were found in the leach fluid leak holding pond. |
| **Impacts to water resources** | Springs and seeps exceeded drinking water standards for antimony, arsenic, beryllium, cadmium, copper, chromium, fluoride, iron, magnesium, manganese, mercury, nickel, nitrate, pH, sulfate, total dissolved solids, and zinc. Surface water has been adversely affected by acid mine drainage. Waterfowl fatalities have occurred. Water quality exceedances have also occurred in groundwater. |

## Twin Creeks Mine, NV

The Twin Creeks Mine (Rabbit Creek and Chimney Creek Mines) is located on private and public land approximately 26 miles northeast of Golconda, NV. The open pit mine was permitted in 1997.

**Reports of pipeline failures and other accidental releases**[34]

**July 26, 2016:** 4,000 gallons of process solution (no cyanide content) was spilled due to a drain valve failure.

**July 15, 2015:** 24,000 gallons of process water containing 0.006 lbs. of cyanide was spilled when a process line split.

**June 30, 2013:** Approximately 191,000 gallons of tails slurry was released due to a disconnect elbow joint in the line.

**September, 5 2012:** 2,984 gallons of process solution of unknown concentration was spilled when a mill line failed.

**February 20, 2013:** 9,200 gallons of tails slurry containing 0.52 lbs. of cyanide was released due to a separated flange on the CIL-Tails discharge line.

**September 17, 2012:** 1,253 pounds of carbon containing 1.74 lbs. of mercury was released in a landfill from a baghouse sock malfunction.

**February 1, 2008:** 800 gallons of barren cyanide solution with a concentration of 18 mg/L was spilled due to a pump failure resulting in an overflow.

**September 11, 2007:** Approximately 45,000 gallons of barren solution containing about 68.93 lbs. of cyanide was spilled when a pipeline was ruptured by a large rock dislodged during road/ramp widening.

**January 6, 2007:** 200 gallons of ammonium nitrate solution was spilled when a trailer rolled over and down a ditch.

**2007:** A report of a release of cyanide solution onto the ground from a process pipe. Report incident 848526.

**October 11, 2005:** 1,500 gallons of tails slurry containing 51 mg/L cyanide was released as a result of a pipe failure.

**June 16, 2005:** 24,000 gallons of process solution containing .89 pounds of sodium cyanide spilled when construction damaged a pipeline.

**May 23, 2005:** 67,500 gallons of 11.8 WAD cyanide solution (tails underdrain) spilled when a bulldozer ruptured double HDPE line.

**January 2, 2005:** About 2,000 gallons of tails solution containing cyanide spilled.

**January 8, 2004:** 37,500 gallons of process solution containing 0.6 pounds of sodium cyanide seeped through six locations along the tailings embankment.

**May 21, 2004:** About 200 pounds of ore containing arsenic trisulfate was assumed to be released during hauling.

**October 31, 2003:** About 1,200 pounds of ore containing arsenic spilled during the cleaning of trailers.

**October 28, 2003:** 300 pounds of Getchell containing 3.5 of arsenic compounds spilled.

**July 17, 2003:** An estimated 60,000 gallons of water containing 56 micrograms per liter of arsenic were discharged into Rabbit Creek as a result of a leak in the main supply valve.

TWIN CREEKS MINE, NV - CONTINUED

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| **Reports of pipeline failures and other accidental releases** | **May 9, 2003:** 1.4 million gallons of water containing arsenic at 260 ug/L of arsenic were released as a result of pipeline break. Newmont was able to pump about 444,600 gallons back into containment.<br><br>**January 21, 2003:** 500 gallons of lime with mill water solution of unknown cyanide concentration spilled due to a failed fitting on a pump.<br><br>**2003:** Process columns in the mill overflowed, releasing approximately 34 pounds of cyanide.[35]<br><br>**August 13, 2002:** 1,500 gallons of process solution containing 1.30 pounds of cyanide spilled when a slurry line coupler failed.<br><br>**August 12, 2002:** 900 gallons of mill water with a cyanide concentration of 0.003 mg/L escaped when a hose was left unattended.<br><br>**May 13, 2002:** 24,000 gallons of process solution containing 34 pounds of cyanide was released when process columns overflowed. Some of the solution made its way to Rabbit Creek and then to Kelley Creek.<br><br>**April 8, 2002:** 3,500 gallons of mill water containing 0.0134 pounds of cyanide spilled when a hose was left unattended.<br><br>**2002:** 24,000 gallons of cyanide solution spilled at a mining facility, as a result of an overflow of process solution from the Pinion Mill at the Twin Creeks Mine, owned by Newmont Mining Company. A Nevada official said 5,000 gallons entered Rabbit creek.[36]<br><br>**January 30, 2002:** 4,000 and 30,000 lbs. of Getchell gold ore containing 8.7 and 65 lbs. of arsenic sulfide in the matrix spilled from failures in the hydraulic systems in dumping trucks.<br><br>**January 8, 2002:** 1,200 lbs. of Getchell ore containing 2.6 lbs. of arsenic sulfide spilled by the roadside and discovered later.<br><br>**October 24, 2001:** 3,000 gallons of barren solution containing 2.32 lbs. of cyanide spilled due to a pipeline failure.<br><br>**2001:** A report of a release of an estimated 75 pounds of cyanide after the line was flushed and left open for 30 hours causing a release. The spill reached Rabbit Creek.[37]<br><br>**2001:** When flushing a heap leach line the valve on the line was left open for 36 hours, releasing cyanide solution.[38]<br><br>**December 8. 2000:** 1.5 tons of gold ore containing arsenic trisulfide (5%) spilled from the transport trunk from operator error, and was recovered.<br><br>**November 13, 2000:** 3,000 gallons of water containing 0.27 pounds of cyanide spilled due to a frozen line.<br><br>**November 1, 2000:** 1,000 gallons of reclaimed water containing 0.39 pounds of cyanide spilled due to a frozen line.<br><br>**March 3, 2000:** 16 lbs. of mercury spilled when a bucket was tipped over a scissors lift.<br><br>**December 28, 1999:** 500 gallons of solution containing 0.0104 lbs. of WAD cyanide spilled due to a malfunction in the filter plant.<br><br>**1997:** On May 2, thousands of gallons of cyanide solution used to leach gold from crushed rocks were flushed into the desert. The mine reported 8,100 gallons.[39] |

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| **Seepage collection and treatment failures** | **TWIN CREEKS MINE, NV - CONTINUED**<br><br>The Pinon tailings impoundment formed a leak which caused a perched zone with poor water quality including high concentrations of WAD cyanide, arsenic, TDS and other constituents.[40] Water discharged to Rabbit Creek has shown occasional exceedances (by 1-10 times) of total dissolved solids and arsenic (over 10 times).[41] |
| **Impacts to water resources** | Groundwater has been degraded with cyanide, arsenic, total dissolved solids, and there have been water quality violations for arsenic in Rabbit Creek. Cyanide solution has also reached Kelley Creek. |

| Cortez Hills and Pipeline Mines, NV<br>The Cortez operations, owned by the Cortez Joint Venture, are located on a combination of public (BLM) and private land in Lander County. The operations are a mix of inactive and active open pit and underground mine facilities. | |
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| **Reports of pipeline spills and other accidental releases**[42] | **October 4, 2016:** 5,000 gallons of contact water were spilled due a broken valve.<br><br>**August 31, 2016:** 24,000-gallon spill of infiltration water form Pipeline mine. Possible elevated arsenic levels in infiltration water.<br><br>**February 24, 2015:** Barren solution release of about 2,000 gallons due to a failure of a pressure relief valve. A total of about 1.2 pounds of cyanide were released.<br><br>**October 29, 2014:** About 61,172 gallons of contact water were released from a pressure relief valve that froze and cracked. Estimated amount of arsenic discharged to the environment is 0.5 lbs.<br><br>**1992-1994:** Twenty-seven spills involving cyanide-containing process solution occurred between July 1992 and December 1994 at Cortez. The majority of the spills were caused by equipment failures or operator error.[43] For example, in July 1992 a ruptured line to the leach pad resulted in 50,000 gallons of barren solution being sprayed across a road and collected in a 100' x 40' gully. Twenty pounds of cyanide were released. In November 1994, a grader hit and ruptured a hose at an inactive impoundment area releasing 140,000 gal of process solution and 50 lbs. of sodium cyanide. Other noteworthy spills occurring during the period include 330,912 lbs. of slurry with a concentration of 2.8 mg/l WAD CN at the #2 thickener in February, 1994 and 256,192 gallons of toe seepage solution with a concentration of 0.042 mg/l WAD CN at tailings impoundment 6 in October, 1994. The remaining spills involved a total of between 225 and 100,000 gallons of roaster calcines, barren solution, pregnant solution, tailings material, reclaim solution and cyanide containing groundwater.[44] |
| **Seepage collection and treatment failures** | At the Cortez Mine, six monitoring wells were installed around the perimeter of Tailings Impoundments 1,2,3 and 4 in 1969.[45] These monitor wells were sampled occasionally, revealing cyanide. In 1980 an area of degraded shallow groundwater was identified downgradient of tailings impoundment 5. In the 1980's multiple monitor wells were installed, and then converted to pumpback wells to pump out the degraded water.<br><br>According to the Nevada Department of Environmental Protection (NDEP) Fact Sheet, "Solution from Tailings Impoundments 1, 2, 3 through Tailings Impoundment 6 and the East and West heap leach pads is the likely cause of contamination in the shallow groundwater aquifer. Arsenic, sulfate, total dissolved solids (TDS), and cyanide are the remaining constituents of concern."[46]<br><br>The fact sheet also reports that poor water quality and Profile 1 reference value exceedances were reported from Monitoring Well-09A in a 2008 report (chloride at 3000 mg/l; nitrate as N at +130 mg/l: total dissolved solids at 10,500 mg/l; sulfate at +3,400 mg/L). Final permanent closure of Pregnant Pond 2 was approved, which included the removal and appropriate disposal of all pipelines, pumps, tanks, and associated infrastructure. The site was backfilled and recontoured to promote free drainage from the site. Water quality in MW-09A has not improved since the closure. |
| **Impacts to water resources** | Groundwater degradation with arsenic, sulfate, cyanide and total dissolved solids (TDS). |

| Barrick Goldstrike – North Block, NV<br>The North Block operations consist of the Betze open pit and Meikle and Rodeo underground operations. The operations are located on BLM lands and private lands north of Carlin, Nevada. | |
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| **Reports of pipeline failures and other accidental releases**[47] | **July 16, 2016:** 559 gallons of process solution containing thiosulfate was spilled due to a hose failure on a sump pump.<br><br>**January 2, 2016:** 3,000 gallons of "Milk of Line" was released with unknown constituents due to a level indicator malfunction on the pH control line.<br><br>**August 27, 2015:** 3,000 gallons of calcium thiosulfate solution was spilled due to a hose failure on a pump. After cleanup composite soil samples still indicated "significant thiosulfate concentrations were present."<br><br>**May 28, 2015:** 9,700 gallons of process water was released containing thiosulfate and possibly metals.<br><br>**April 28, 2015:** About 1,700 gallons of autoclaved ore slurry containing metals was released due to a failure of a valve on a reclaim water tank<br><br>**April 28, 2015:** About 11,000 gallons of tailing reclaim solution containing heavy metals was released due to operator error.<br><br>**August 16, 2012:** 2,805 gallons of caron-in-leach slurry was released due to operator error.<br><br>**August 18, 1996:** 4,250 gallons of reclaim water was released from Mill #2 during an unscheduled shutdown of Mill #1. The valves on top of Mill #1's reclaim water tanks failed to close causing the sumps at Mill #2 to become overwhelmed, resulting in a loss of containment.[48]<br><br>**August 9, 1996:** Approximately 1,500 pounds of ammonia vapor was released from the refrigeration building through the building's ventilation system. The release was caused by the failure of a Bi-Lok type fitting on an oil tube at one of the refrigeration machines.<br><br>**February 27, 1996:** 2,000 gallons of diluted cyanide (86.4% cyanide) solution was released due to a pump failure at the mill site.<br><br>**February 22, 1996:** 1,000 gallons of Bio-Leach water (pH of 2.61) overflowed due to a transfer line failure.<br><br>**January 15, 1991:** Approximately 200 gallons of concentrated sodium cyanide solution was released when a weld on a one-inch diameter HDPE pipeline failed. This pipeline is part of a system which delivers a concentrated sodium cyanide solution from the storage tank to the ADR facility. It was estimated that 394 pounds of sodium cyanide was released. |
| **Seepage collection and treatment failures** | **2012:** Seepage that contained cyanide at 0.018 mg/L from the North Block Tailings Facility was observed. At the time the area was trenched and the solution was pumped back into the tailings impoundment.[49]<br><br>**2006:** A seep was detected downgradient of the Goldbug Refractory Ore Stockpile. The stockpile was excavated, and a flaw was discovered in the soil liner due to settling of the foundation material below. The source of the low pH seep was removed and disposed of in a contained process facility.[50] |
| **Impacts to water resources** | There is some evidence of contamination of surface water as mentioned in the Betze Pit Expansion EIS, "Two springs in the upper Antelope Creek located below old mine workings had pH values between 3.0 and 4.0 standard units."[51] |

| Fort Knox Mine, AK<br>Fort Knox, originally permitted for construction and operation in 1994, is an open-pit heap leach gold mine located approximately 26 miles northeast of Fairbanks. True North is a satellite deposit. It is located primarily on State of Alaska lands and private land. | |
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| **Reports of pipeline failures and other accidental releases** | **2012:** Fairbanks Gold Mining, Inc. estimates that approximately 45,000 gallons of cyanide solution were released onto the mine roadway of the heap leach operation. A heavy-equipment operator working in the area of a buried cyanide solution pipeline inadvertently damaged a 12-inch supply line with a bulldozer ripper blade.[52]<br><br>**2010:** Fort Knox estimates 305,300 gallons of process water spilled. Approximately 270,000 to 275,000 gallons remained within the building, while the remaining 30,000 to 35,000 gallons spilled onto the gravel roadway and parking area.[53] |
| **Seepage collection & treatment failure** | **2012:** There was uncertainty about whether seepage from the True North waste rock dump was affecting surface water. According to a 2012 audit, "it appears that pit runoff as well as non-contact stormwater is collecting behind a portion of the reclaimed Zeppelin/Hindenburg dump in the upper Spruce Creek drainage. As a result of reclamation grading activities in that area, the upper reach of Spruce Creek has been blocked by waste material. Water, containing elevated total dissolved solids and sulfate concentrations, is ponding on the up-gradient side of the waste dump. The exact nature of this water is currently unknown, but could be water infiltrating/flowing from the pits. According to site records, a pit lake existed in the Central Pit in 2005 and 2006, but suddenly disappeared in 2007. Coincidentally, a new spring appeared in the upper reaches of Spruce Creek; a spring which ADNR believes did not exist prior to mining. It is this spring that is currently feeding the aforementioned pond. The probability is high that this water is permeating through the waste rock dump, exiting at the toe, and may be contributing to ambient water quality impacts in Spruce Creek. However, upon review of the water quality in Spruce Creek by ADEC, the agency concluded (in their findings letter dated February 5, 2010) that a correlation between the water quality in Spruce Creek and water quality effects from FGMI's mining and reclamation activities could not be established at this time."[54] Subsequent monitoring in 2012 found no correlation. |
| **Impacts to water resources** | None identified. |

| Pogo Mine, AK<br>The Pogo Mine is an underground gold mine located 38 miles northeast of Delta Junction, Alaska near the Goodpaster River. The mine was permitted in 2003, and it is located primarily on lands owned by the State of Alaska. | |
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| **Reports of pipeline failures and other accidental releases** | **2015:** A spill of 90,000 gallons of paste backfill occurred, releasing a mix of mine tailings and cement containing three parts per million cyanide. The spill occurred as a result of a ruptured line.[55] |
| **Seepage collection and treatment failures** | **2011:** Pogo Mine exceeded its surface water discharge limits for pH, iron, manganese and cyanide.[56] On December 11, 2011 the State of Alaska issued a notice of violation for these exceedances. The company paid a penalty for the violations, and was required to increase the capacity of the waste water treatment plant in response.[57]<br><br>Investigations also found that the recycled tailings pond (RTP) was experiencing seepage. Three wells located below the RTP Dam (MW12-500, MW12-501, and MW12-502) monitor groundwater downstream of the RTP seepage collection system. Chloride, nitrate, selenium, sodium, and potassium levels in groundwater were measured above the trigger limits in 2012.[58] The company was required to conduct additional grouting in 2012 to control seepage, but excess precipitation delayed the mitigation.[59] Samples for these wells were collected monthly throughout 2013. Eight sampling events occurred in 2013 for MW12-500 when water was present in the well. Chloride and sodium were detected above the trigger limits on all sampling events and nitrate was detected above the trigger limits during 7 sampling events.<br><br>Two sampling events occurred in 2013 for MW12-501 when water was present in the well. Chloride and sodium were detected above the trigger limits on all sampling events. Nitrate was detected above the trigger limits during one sampling event. Other parameters were also analyzed and compared to the Water Quality Standards. In March and June higher than normal levels of several parameters were indicated. MW11-001A and MW11-001B provide information on water quality trends down-gradient from the Dry Stack Tailings Facility (DSTF) and up-gradient of the RTP. MW11-001A is an alluvial well and MW11- 001B is a bedrock well. Samples were taken MW11-001B on March 13, May 7, June 23, September 4, and October 20, 2013. The copper and nitrate values for both wells are fluctuating over time with no apparent trend. However, the fluctuations exceed the standard. |
| **Impacts to water resources** | The mine has degraded groundwater and resulted in water quality standard violations for manganese, cyanide, iron and pH for discharges into the Goodpaster River. |

## Smoky Valley/Round Mountain Mine, NV

The Round Mountain Mine is an open pit heap leach mine located in Nye County, Nevada approximately 55 miles north of Tonopah. It is located on private land and BLM land.

**Reports of pipeline failures and other accidental releases[60]**

**April 19, 2015:** 1,077 gallons of tailings slurry spilled due to a plugged grit screen.

**April 10. 2015:** An unknown amount of hydrated lime was released into the potable water system. Cause and amount are not reported.

**March 17, 2015:** 9,000 gallons of tailings slurry spilled due to an air/relief valve malfunction.

**January 8, 2015:** 5,925 gallons of process solution released due to a split in a pipeline. A soil sample from the spill site was analyzed at 0.021 mg/L for WAD cyanide.

**September 15, 2014:** 935 gallons of cyanide solution at a concentration of 0.35 lbs./ton spilled off the R-pad containment.

**September 23, 2013:** 48,510 gallons of process solution overflowed the tailings dam containment ditch and ran to the toe of the previous ramp. The cause was the removal of the barge pump and restriction of tailings discharge both necessary for new construction.

**January, 28, 2013:** Approximately 300,000 gallons of mill reclaim solution was released. The solution was above standards in sulfate, total dissolved solids, WAD cyanide, manganese and arsenic at 850, 1500, 010, 0.28, and 0.14 mg/L.

**December 4, 2013:** About 9,214 gallons of tailings slurry was released due to the failure of a two vacuum breaker valves under extreme cold temperatures.

**June 26, 2013**: From 1,000 to 1,600 gallons of tailings reclaim process solution spilled due to a break in a pipeline during relocation. Titrated samples showed no cyanide and pH of 7.9 to 8.1.

**June 22, 2013:** 2,887 gallons of process solution with a cyanide concentration of 0.04 lb./ton spilled as a result of a pipe rupture.

**June 1, 2013:** 3,70 gallons of process solution containing 6.38 lbs. of cyanide spilled due to a temporary pump outage.

**March 18, 2013:** 1,556 gallons of reclaim water spilled due to a failure in a pipeline.

**January 27, 2013:** An estimated 202,000 gallons of tailings/mill reclaim water released from an overtopping of a small event pond.

**August 20, 2012:** About 538 gallons of process solution with a cyanide concentration of 0.5 lbs./ton spilled due to a valve failure.

**April 17, 2012:** 1,403 gallons of process solution containing 4.09 lbs. of cyanide spilled from a burst pipe.

**December 28, 2011:** Approximately 18,200 gallons of process solution containing 8.34 lbs. of cyanide spilled due to a valve failure.

**July 12, 2011:** About 1,400 gallons of a blend of fresh and reclaim water released as a result of an accidental pump shut off.

**April 10, 2011:** 3,070 to 6,900 gallons of process solution containing 3.45 to 7.77 lbs. of cyanide spilled due to high flows in the process solution return ditch.

**November 21, 2009:** 787 gallons of reclaim water spilled due to an air valve relief valve failure.

**December 18, 2008:** 13,000 gallons of tailings thickening overflow water containing no detectable cyanide spilled due to a failure of the bypass valve.

**SMOKY VALLEY/ROUND MOUNTAIN MINE, NV - CONTINUED**

**October 5, 2008:** 592 gallons of tailings slurry at pH 7.93 spilled from a pump failure.

**April 18, 2008:** 748 gallons of mill tails slurry containing no cyanide spilled when a flange on a pipe blew out.

**April7, 2008:** About 90,000 gallons of decant water that was non-detect for cyanide spilled due to an overflow in a filter causeway.

**December 30, 2007:** Approximately 6,000 gallons of tailings slurry spilled when a vacuum breaker froze and broke.

**November 2, 2007:** 3,150 gallons of mill tailings slurry and solution containing no cyanide breached containment.

**June 14, 2007:** 577 gallons of reusable pregnant cyanide solution containing a total of 0.36 lbs. of cyanide spilled when line maintenance occurred.

**May 19, 2007:** About 5,600 gallons of solution containing 8.19 lbs. of cyanide spilled due to a blown plug on a process line.

**February of 2012:** Seepage that contained cyanide at 0.018 mg/L from the North Block Tailings Facility was observed. At the time the area was trenched and the solution was pumped back into the tailings impoundment.[61]

**2006:** A seep was detected downgradient of the Goldbug Refractory Ore Stockpile. The stockpile was excavated, and a flaw was discovered in the soil liner due to settling of the foundation material below. The source of the low pH seep was removed and disposed of in a contained process facility.[62] 37,398 gallons of mill tailings slurry with no detectable cyanide spilled due to a line rupture.

**December 20, 2006:** Approximately 30,000 gallons of 50/50 mill tailings and water that contained no cyanide spilled when the tails slurry line broke.

**June 9, 2006:** 3,727 gallons of mill tailings slurry were released due to a pipe failing from internal wear.

**November 17, 2005:** 5,500 gallons of tails slurry with no detectable cyanide spilled due to a broken flange.

**November 3, 2005:** About 16,429 gallons of sodium cyanide solution containing about 3.43 lbs. of cyanide overflowed the collection ditch.

**March 7, 2005:** About 10,000 gallons of cyanide solution containing about 6.61 lbs. of cyanide spilled due to a coupler failure at a leach pad.

**December 5, 2004:** 33,000 gallons of solution containing 43 lbs. of cyanide leaked when the lime slaker system failed from cold weather.

**September 25, 2004:** 7,154 gallons of pregnant carbon solution containing 0.9 lbs. of cyanide spilled when the carbon screen plugged resulting in overfilling.

**August 27, 2003:** 64,731 gallons of barren solution containing 60.7 lbs. of cyanide spilled as the solution breached containment from an operator error.

**August 27, 2003:** Greater than 500 gallons of process solution spilled due to a faulty process line.

**July 19, 2003:** 943 gallons of solution containing 0.16 lbs. of cyanide spilled when a fresh water line within a K5 valve box broke.

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| | **SMOKY VALLEY/ROUND MOUNTAIN MINE, NV - CONTINUED**<br><br>**June 10, 2003:** 37,000 lbs. of nitric acid (70% solution) was accidentally filled into the wrong truck at Battle Mountain. The acid dissolved the welds of the tank trunk and leaked acid at the mine.<br><br>**May 23, 2003:** 707 gallons of solution containing 0.003 lbs. of cyanide spilled when a tailings pump seal failed.<br><br>**March 17, 2003 (date uncertain):** 1,226 gallons of solution containing about 0.92 lbs. of cyanide was spilled due to a power spike.<br><br>**December 26, 2002:** 1,254 gallons of solution containing 2.23 lbs. of cyanide spilled when a ditch overflowed.<br><br>**July 2, 2002:** 2,198 gallons of barren solution containing 0.13 lbs. of cyanide spilled when power was accidentally turned off.<br><br>**March 11, 2002:** 620 gallons of process solution containing 0.09 lbs. of cyanide spilled due to an improper shutdown during a planned power outage.<br><br>**December 12, 2001:** 748 gallons of mill tailings slurry with no detectable cyanide spilled from a failed flange on a pipeline from temperature changes.<br><br>**July 28, 2000:** 6,829 gallons of barren solution containing 0.3 lbs. of sodium cyanide seeped out of primary containment due to a leaking valve on a dedicated heap leach pad.<br><br>Three spills involving between 4,515 and 7,015 gallons of cyanide solution occurred at the Round Mountain mine in the period of 1992-94. Two of the spills resulted from problems with either the operation of a leach pad or flawed repairs to the leach pad. The third spill was a result of an equipment failure and operator error. See these details below.[63]<br><br>**1992:** On March 18, inadequate percolation in a section of the leach pad caused ponding of leaching solution on top of the pad. A portion of the ponded solution overflowed into the collection ditch where a plug subsequently formed. As a result of the plug the ditch overflowed releasing 2,000 gallons of cyanide solution in a run 200 feet south of the pad.<br><br>**1992:** On March 24, between 2,500 and 5,000 gallons of process solution containing between 11.5 and 22.9 pounds of sodium cyanide spilled - contaminating soil and a road bed. The solution leaked through the leach pad berms following operator and management error in repairs to reshape the leach lines.<br><br>**1994:** In October, a spill occurred of 15 gallons of liquid cyanide solution containing 45 pounds of dry cyanide. The spill resulted when a gasket on an overfilled delivery truck burst. |
| **Water collection and treatment failures** | Monitoring wells are located along the downgradient side of the process facilities and in various other locations around the property. Analytical results are reported to NDEP quarterly and annually. For the period 2007 to the first quarter 2010, WAD cyanide concentrations ranged between 0.0124 mg/L and less than the detection limit of 0.002 mg/l – indicating groundwater impacts from cyanide.[64] |
| **Impacts to air and water resources** | Groundwater degraded by cyanide. |

## Turquoise Ridge, NV

The operation consists of several inactive open pits and two underground mines (Turquoise Ridge and Getchell) operated by Turquoise Ridge Joint Venture. Turquoise Ridge now sends all of its ore to the Twin Creeks Mine for processing. It is located about 70 miles north of Winnemucca, NV on private lands and on public lands owned by BLM.

**Reports of pipeline failures and other accidental releases**[65]

**November 23, 2013:** 7,500 gallons of dewatering water with an arsenic concentration of 0.98 mg/L spilled when a pipe repair failed.

**January 10, 2011:** About 3,000 gallons of untreated mine water with an arsenic concentration of 2.5 mg/L spilled as a result of a frozen line.

**April 3, 2008:** Less than 3,000 gallons of underdrain solution with an arsenic concentration of 20 mg/L spilled when an indicator failed causing a tank to overflow.

**November 19, 2005:** 7,180 gallons of mine water containing arsenic spilled when an air bubble caused a dewatering line rupture.

**August 4, 2005:** 5,000 to 6,000 gallons of mine dewatering water containing 2 mg/L arsenic spilled due to a leaking pipe.

**May 20, 2005:** About 6,000 gallons of mine sediments sludge containing 150 lbs. of arsenic spilled when a pipeline ruptured.

**December 10, 2004:** 2,500 gallons of mine water high in arsenic spilled due to an air vac failure.

**October 12, 2004:** 1,000 gallons of dewatering water high in arsenic spilled from a failed AIRVAC.

**October 1, 2004:** An estimated 15,000 gallons of dewatering water spilled due to a break in an HDPE pipe. The water may have contained arsenic at a concentration of 1.4 mg/L.

**September 30, 2004:** 10,000 to 15,000 gallons of high arsenic mine water spilled as a result of a failed coupler.

**April 5, 2004:** Less than 5,000 gallons of magnesium chloride solution spilled when the bladder containing the solution ripped.

**February 23, 2004:** 4,000 gallons of treated process water spilled as a result of a line rupture.

**November 5, 2002:** 750 gallons of pit water with an arsenic concentration of 0.2 mg/L spilled as a result of a cracked valve.

**May 20, 2002:** Approximately 3,000 gallons of tailings underdrain solution spilled from a pump failure as a result of a wind storm. The maximum soils contamination was 0.013 mg/L for WAD cyanide.

**April 2, 2002:** About 3,000 gallons of tails water with a 0.5 mg/L and 30 mg/L concentration of cyanide and arsenic respectively spilled due to a pump failure during a power outage.

**March 6, 2002:** 2,000 gallons of heap leach water spilled due to a blockage in the piping.

**February 20, 2001:** 1,000 gallons of heap leach pad runoff and rain water containing 0.05 mg/L WAD cyanide spilled from a broken pipeline.

**February 18, 2001:** 1,000 gallons of pregnant pond water spilled.

**December 20, 2000:** About 20,000 gallons of treated water containing arsenic at 10 to 15 ug/L spilled due to a factory welded lateral failure.

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| | TURQUOISE RIDGE, NV - CONTINUED<br><br>**December 19, 2000:** 30,500 gallons of treated water containing arsenic at < 5 ug/L was released; caused unknown.<br><br>**December 5, 2000:** 22,600 gallons of treated water containing arsenic at 8.5 ug/L spilled due to a split pipe.<br><br>**August 16, 2000:** 900 gallons of mine water containing 1.5 mg/L arsenic spilled when a fusion coupling broke.<br><br>**March 6, 1998:** 10,000 gallons of cyanide solution were released due to a power outage.<br><br>**May 16, 1996:** About 480 cubic feet (100 tons) of ore slurry spilled when a tank overflowed.<br><br>**March 25, 1996:** 500 gallons of solution containing 4.17 lbs. of cyanide spilled as a result of a broken plastic fitting.<br><br>**May 25, 1995:** 3,000 gallons or ore slurry spilled due to a broken line.<br><br>**May 16, 1995:** 6,400 gallons of process solution containing 0.3 lbs. of cyanide spilled due to a break in a pipeline as a result of construction.<br><br>**May 5, 1995:** About 3,000 gallons of tailings slurry spilled when a truck ran over a pipeline.<br><br>**February 2, 1995:** 4,070 gallons of slurry/cyanide mix solution containing 1.4 lbs. of cyanide spilled as a result of operator error.<br><br>**January 31, 1995:** 61 tons of cyanide slurry spilled.<br><br>**May 11, 1994:** Underdrain tailings solution containing 3.5 lbs. of cyanide spilled from a broken pipeline as a result of a storm event.<br><br>**February 22, 1994:** 25 tons of overflow slurry/cyanide solution with a cyanide concentration of 0.11 lbs./ton spilled from a neutralizer tank.<br><br>**February 1, 1994:** Approximately 20,000 gallons of barren solution spilled when the pipeline came apart.<br><br>**October 27, 1993:** 25,500 gallons of process solution containing 0.855 lbs. of cyanide spilled as a result of an overload of ore in the circulating part of the grinding circuit.<br><br>**August 3, 1993:** 22,800 gallons of 18.3 mg/L cyanide solution spilled due to a faulty subdrain.<br><br>**July 17, 1993:** 36,000 gallons of pregnant solution containing 6.4 lbs. of cyanide spilled when a perimeter ditch became plugged. |
| **Seepage collection and treatment failures** | None documented. |
| **Impacts to water resources** | None documented. There are no perennial streams in the project area. |

## Bingham Canyon Mine, UT

The Bingham Canyon mine is an open pit, copper, gold, silver and molybdenum mine located 28 miles southwest of Salt Lake City, Utah. It is the largest open pit mine in North America.

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| **Reports of pipeline failures and other accidental releases** | **2011:** Report of malfunction of equipment that allowed the release of approximately 145,424 gallons of copper tailings.[66]<br><br>**2011:** Report of pipeline overflow onto soil with estimated 100,000 – 290,000 gallons of copper tailings material released from pipeline.[67]<br><br>**2011:** Report of tailings slurry released from tailings slurry hot box. 160,000 gallons of tailings released.[68]<br><br>**2010:** Report of a release of process water due to broken pipeline.<br><br>**2010:** Report of a discharge of sulfuric acid from a pipeline in the precious metal plant released between 4,000-5,000 gallons.[69]<br><br>**2007:** Report of a release of 35,000 gallons of hydromet tails containing arsenic due to pipeline break.[70]<br><br>**2007:** Report of 1,240,000 gallons of process water containing arsenic from pipeline break due to cold temperatures. [71]<br><br>**2006:** Report of 270,000 gallons of process water released because of pump failure, which resulted in overflow of containment area.[72]<br><br>**2006:** Report of 660,000 gallons of process water containing arsenic released due to cracked pipe.[73]<br><br>**2006:** Report of 1,000,000 gallons of process water released from the Magna Reservoir due to a failed level indicator.[74]<br><br>**2004:** Report of 4,000,000 gallons of process water with arsenic from pipeline.[75]<br><br>**2004:** Report of 2,000,000 gallons of process water with arsenic from broken process water line.[76]<br><br>**2004:** Report of 202,000 gallons of process water released due to pipeline failure.[77]<br><br>**2003:** Report of 70,000 gallons of process water with arsenic released due to pipeline failure.[78]<br><br>**2003:** Report of 70 tons of copper concentrate released from pipeline.[79]<br><br>**2003:** Release of copper concentrate, containing 340 pounds of arsenic, 20,000 pounds of copper, and 200 pounds of lead.[80]<br><br>**2003:** Copper concentrate pipeline ruptured, releasing 24,000 tons of copper, 428 tons of arsenic, 253 tons of lead.[81]<br><br>**2002:** Report of 5,800 gallons of process water from slag pot cooling area due to plugged drain line.[82]<br><br>**2001:** Report of tailings pipeline failure, releasing 4 pounds of arsenic, 14 pounds of chromium and 1 pound of lead.[83]<br><br>**2000:** Report of 110 tons of ore slurry released due to a leak in ore line.[84]<br><br>**2000:** Report of 18,000 tons of sulfuric acid released from pipe due to flange failure.[85]<br><br>**1999:** The process water pipeline sprung a series of leaks in 1989 and 1999. It has been estimated that 100 million gallons of process water with high arsenic levels spilled before the leak was discovered.[86] |

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| | **BINGHAM CANYON MINE, UT - CONTINUED**<br><br>**1998:** Report of copper sulfate released into a canal.<br><br>**1998:** Report of clogged piping system causing pipe to back up and overflow releasing acid rock drainage into water.<br><br>**1997:** Report of settling pond overflow due to clogged outlet valve. Release of copper sulfate into water.<br><br>**1997:** Report of pipeline rupture releasing process water (pH 2.5-4.0) into water.<br><br>**1993:** Report of 45,000 gallons of wastewater spilled due to a rupture of the transfer line.[87]<br><br>**1991:** Report of 30,000 gallons of industrial wastewater spilled at the wastewater treatment plant due to line break.[88] |
| **Seepage collection and treatment failures** | **2011:** Noncompliance in April-June 2011 for discharges of copper, zinc and total suspended solids at copper smelter.[89]<br><br>Wastewater from the mine has escaped the site's collection system, contaminating groundwater with acid, metals and sulfates. The groundwater plume extends towards the nearby Jordan River and covers more than 72 square miles – rendering water for thousands of Salt Lake City residents undrinkable.[90] There have been multiple tailings spills.[91]<br><br>Drainage from the waste rock piles will require water treatment in perpetuity to prevent additional groundwater pollution.[92]<br><br>In February 2008, the United States Fish and Wildlife Service took legal action against Kennecott for the release of hazardous substances from the mine's facilities, including selenium, copper, arsenic, lead, zinc and cadmium.[93] Groundwater contaminated by mine operations has been released from the mine site through artesian springs into areas that serve as fish and wildlife habitats. According to the federal biologists, the release of these hazardous pollutants has harmed natural resources, including migratory birds and their support ecosystems, which includes wetlands, marshes, freshwater wildlife habitats, playas and riparian areas and freshwater ponds.[94]<br><br>Soils and sludge are contaminated, as are surface water and groundwater, which affect wetlands between the site and the shore of Great Salt Lake.[95] |
| **Impacts to water resources** | Wastewater from the mine has escaped the site's collection system, contaminating groundwater with acid, metals and sulfates. The groundwater plume extends towards the nearby Jordan River and covers more than 72 square miles – rendering water for thousands of Salt Lake City residents undrinkable.[96] Groundwater contaminated by mine operations has been released from the mine site through artesian springs into areas that harm natural resources. This includes fish and wildlife habitats, including migratory birds and their support ecosystems, which includes wetlands, marshes, freshwater wildlife habitats, playas and riparian areas and freshwater ponds. |

## Hycroft Mine, NV (Crowfoot-Lewis)

The Hycroft Mine is an open pit heap leach gold and silver mine located within a 14,753 – acre mine boundary on public land administered by the BLM and private land. Hycroft was formerly known as the Crofoot-Lewis open pit mine, which was a small heap leaching operation that commenced in 1983.

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| **Reports of pipeline failures and other accidental releases**[97] | **July 27, 2016:** 3,117 gallons of pregnant solution, containing 0.39 lbs. of cyanide, spilled due to a pump failure.<br><br>**April 8, 2016:** 2,500 gallons of process solution spilled when a pipeline broke.<br><br>**February 11, 2016:** About 1,000 gallons of process solution, with a cyanide concentration of 0.17 mg/L, spilled when a hose gasket on a pump failed.<br><br>**January 14, 2016:** 600 gallons of process solution, containing 0.67 lbs. of cyanide, spilled as a result of a broken vacuum breaker on a pump.<br><br>**January 11, 2016:** 16,830 gallons of process solution spilled as a result of a broken line.<br><br>**January 10, 2016:** An estimated 1,200 gallons of process solution, with a cyanide concentration of 0.29 lbs./ton, spilled due to an insecure 8-inch HDPE pipe at the North Event Pond.<br><br>**January 5, 2016:** Approximately 6,000 gallons of process solution, containing 3.12 lbs. of cyanide, spilled when a closed valve created excessive internal pressure causing a weld to fail.<br><br>**October 20, 2015:** Mining impacted storm water was released. The water had a pH of 2.9 to 3.1.<br><br>**March 30, 2015:** Process water was released. There is no additional information on this event.<br><br>**July 8, 2015:** An estimated 1,402 gallons of process water, containing 4 lbs. of cyanide, spilled when an 8-inch HDPE pipe pulled loose.<br><br>**January 16, 2015:** About 2,400 gallons of process solution, with a cyanide concentration of 0.03 lbs./ton, spilled from an uncapped abandoned pipe.<br><br>**January 10, 2015:** An estimated 2,000 gallons of process solution containing 0.834 lbs. of cyanide spilled from a failed feed line hose.<br><br>**November 18, 2014:** 596 gallons of process solution containing cyanide at 0.13 lbs./ton spilled when a power pump caused the B side pump to trip, hence losing power.<br><br>**November 6, 2014:** 7.5 gallons of 30% sodium cyanide solution containing 21.7 lbs. of sodium cyanide spilled from a broken line.<br><br>**1994:** On December 4, the facility reported a spill of approximately 30 gallons (or 100 pounds) of liquid sodium cyanide with a concentration of approximately 30 percent cyanide. The spill was the result of a mechanical failure on a delivery truck.[98]<br><br>**1990:** The facility experienced problems associated with electrical power interruptions compounded by record sub-zero temperatures. During the hours of 6 p.m. to midnight on December 20, 1990, sub-zero temperatures (near -20 F), combined with two separate power interruptions by Sierra Pacific Power, resulted in several frozen lines on the leach pads. As a result, four header system failures on Pad 1 and one header system failure on Pad 2 occurred. The blow-out on Pad 2 discharged 1.7 pounds of sodium cyanide contained in 5,000 gallons of solution into a man-made 100-year storm drainage ditch between Pad 1 and Pad 2. The freezing leach lines discussed in Incident No. 2 resulted in a gradual raising of solution storage pond levels to the extent that an estimated total of 300,000 gallons containing 100-150 pounds of sodium cyanide flowed from the low-pregnant pond to an earth lined containment dike. Two separate flows occurred - one on December 24, 1990 (estimated 228,000 gallons) and the other on December 27-28, 1990 (estimated 72,000 gallons). These flows contained 76 pounds and 24 pounds of cyanide, respectively. |

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| **Water collection and treatment failures** | **HYCROFT MINE, NV (CROWFOOT-LEWIS) - CONTINUED**<br>In April 2004, it was noted that in the shallow perched aquifer that underlies the Crofoot Heap Leach pad various constituents of concern exceeded Nevada Division Profile I RVs at various sampling points [e.g., selenium (SP-27 and SP-30), WAD cyanide (SP-18 and SP-28), mercury (SP-25 and SP-30), and nitrate (SP-30)]. Although SP-30 showed exceedances for selenium (1.9 mg/L), mercury (0.017 mg/L), and nitrate (18 mg/L), cyanide was at less than detectable levels (<0.005 mg/L). As of the fourth quarter of 2016, the influence of process solution is still evident in shallow investigation wells SP-25 and SP-30. Well SP-25 shows concentrations of mercury at 0.04 mg/L and nitrate at 13 mg/L, and well SP-30 has mercury concentrations of 0.012 mg/L.[99] |
| **Impacts to water resources** | Water quality standards for cyanide, mercury selenium and nitrates have exceeded water quality standards in groundwater. The only perennial surface water occurrence that exists within the area is approximately 2 miles to the west of the project, consisting of shallow duck ponds.[100] |

| Marigold Mine, NV<br>The Marigold Mine is an open pit gold mine, which was initially authorized in 1998. It is located 3 miles south of Valmy, NV on private land and public BLM land. | |
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| **Reports of pipeline failures and other accidental releases**[101] | **May 23, 2013:** 58,000 gallons of process solution containing 48 lbs. of sodium cyanide was released due a weld failure in a 10-inch HDPE pipe.<br><br>**February 8, 2012:** 5,000 gallons of barren solution containing 6.9 lbs. of cyanide was released when header feeding line broke.<br><br>**May 28, 2005:** 400 gallons of process solution was spilled due to a defect in a flange connecting two HDPE pipes.<br><br>**May 19, 2005:** 30 gallons of process solution was spilled as a result of the failure of two HDPE pipes.<br><br>**December 8, 2004:** Solution from a carbon-in-leach area breached containment. The final report does not indicate the volume of the spill. However, given the effort involved in developing the final cleanup report the volume is likely to be have been very large.<br><br>**November 17, 2004:** About 1,100 gallons of barren solution containing 0.413 lbs of cyanide was released due to a leaking buried line.<br><br>**June 24, 2004:** Approximately 3,000 gallons of barren solution with a sodium cyanide concentration of 0.1 lbs./ton was spilled when an excavation struck a process pipeline.<br><br>**April 14, 2004:** 5.940 gallons of heap leach pregnant solution containing 0.743 lbs of cyanide was spilled as a result of line damage from an excavation.<br><br>**March 22, 2004:** 3,191 gallons of process solution containing 0.065 lbs. of cyanide was spilled as a result of a rupture in a process line from an excavation.<br><br>**July 26, 2002:** 5,000 gallons of cyanide solution containing 7.39 lbs. of cyanide was released from a pipeline failure.<br><br>**June 20, 2002:** 800 gallons of heap leach barren solution containing 0.67 lbs. of cyanide was released due to a burst feed line.<br><br>**April 16, 2002:** 2,712 gallons of barren solution containing 0.34 lbs. of cyanide was spilled due to a failed screen.<br><br>**January 17, 1993:** 10,000 to 20,000 gallons of containing 1.9 lbs. of sodium cyanide was released due to a frozen pipeline.<br><br>**April 3, 1991:** About 3,00 gallons of tailings solution containing 4.9 lbs. of cyanide was released when a tailing line broke. |
| **Seepage collection and treatment failures** | **2000:** According to 2000 DEIS for the Marigold Mine expansion, the current tailings impoundment is leaking water at a rate of about 34 gpm at the north end, down from the 1991 seepage of 110 gpm. The seepage is elevated in TDS and chloride relative to Nevada drinking water standards and is elevated in background levels of these constituents in groundwater.[102] |

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| **Seepage collection and treatment failures** | **MARIGOLD MINE, NV - CONTINUED**<br><br>**1992:** It was discovered that the tailings impoundment was seeping tailings fluid into the vadose zone near the decant tower on the northern side of the facility. Monitor wells were installed in the vadose zone and the alluvial aquifer north of the tailings to determine the extent of the seepage plume, and monitor its impact on the aquifer. The pH of the seepage plume ranges from 6.2 to 7.5 and is somewhat more acidic than the alluvial groundwater. TDS is elevated in the seepage plume with values in the range of 500 to 1,000 mg/l. Chloride is also elevated. WAD cyanide ranges from 0.01 to 0.15 mg/l staying with the Nevada water quality standard of 0.2 mg/l. Although the seepage plume has reached alluvial groundwater at monitor well TDOH-12U, the water quality in that well is within drinking water standards. Leakage initially observed in 1991 was estimated 190 gpm. In 1992, monitoring indicated that the rate was 110 gpm.[103] |
| **Impacts to water resources** | The mine has degraded the groundwater aquifer with total dissolved solids (TDS), chloride and cyanide. |

| Buckhorn Mine, WA<br>The Buckhorn Mine is an underground gold mine located in northeastern Washington. It began operations in 2008. Ore is processed off-site at the Kettle River Mill in Republic Washington. | |
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| **Reports of pipeline failures and other accidental releases** | 2012: A truck carrying concentrated wastewater from the Buckhorn Mine crashed and spilled about 4,200 gallons into Marias Creek.[104] The wastewater contained nitrates and sulfates. |
| **Seepage collection and treatment failure** | Concentrations of mine-related contaminants have increased over time at certain surface water, groundwater, spring, and seep locations since mining was initiated.[105] The three primary reasons for the increases are intended or unintended discharge of inadequately treated wastewater, seepage of mine water from the underground mine, and the possible onset of acid drainage from the weathering of sulfide ore and mined materials, including underground workings, development rock, and ore.[106]<br><br>**2012:** A $395,000 fine was issued from the Department of Ecology for repeated and continued water quality violations. The groundwater capture zone failed to contain spring rains and snow melt, resulting in contaminated water reaching Gold Bowl Creek.[107] According to a news article, "In the first five years, the state agency issued six notices of violation, two civil penalties and six administrative orders, the hearings board ruling states."[108] Also in 2011, Ecology determined that discharges of treated mine water created slope instability and triggered a landslide that impacted a small stream below the mine.[109]<br><br>**2010:** In September 2010, Kinross reported that misconduct by treatment plant staff had resulted in unreported discharges that exceeded permit limits for ammonia, nitrate, TDS, arsenic, zinc, and pH between May 2009 and August 2009.[110]<br><br>**2009:** Washington Department of Ecology issued a $40,000 fine for a violation of its water quality permit for failing to adequately capture and treat water from the mine operation.[111] Notice of Violation 6965 was issued for exceeding Total Dissolved Solids effluent and stormwater limits. Notice of Violation 7031 was issued for 7 water quality exceedances in outfalls in April, May and June 2009. Notice of Violation 7080 was issued for 57 water quality exceedances for zinc, copper, lead and TRC effluent limits.[112]<br><br>**2007:** Washington Department of Ecology issued a $62,000 penalty over issues including stormwater discharges and slope failures during mine construction.<br><br>Administrative Orders were related to failure of the treatment plant to properly remove contaminants and failure to adequately capture water potentially affected by the mine. |
| **Impacts to water resources** | The mining operations have degraded water quality in Gold Bowl Creek, Marias Creek, South Fork Nicholson Creek and Upper South Fork Bolster Creek as well as groundwater, seeps and springs downstream and downgradient of the mine.[113] The Washington State Department of Ecology (Ecology) has issued numerous Notices of Violation (NOVs) and Administrative Orders (AOs) to Kinross. The water quality violations were for exceedences of TDS, TSS, ammonia, arsenic, chloride, copper, lead, mercury, and zinc, as well as pH values that were higher than the permit limit of 8.5.[114] |

## Jerritt Canyon Mine, NV

The Jerritt Canyon Mine has been in operation since 1980. The primary commodities mined are gold and silver from underground and open pit mining and heap and vat leach processing operations. It is located approximately 46 miles north of Elko in the Independence Mountain Range on federal lands managed by the Forest Service and BLM, and private lands.

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| **Reports of pipeline failures and other accidental releases**[115] | **December 6, 2015**: About 5,000 gallons of tailing facility seepage for the East Lined Pond spilled as a result of failed transformers.<br><br>**September 1, 2015:** Approximately 18,000 gallons of seepage water escaped from the East Line Pond when a pump failed resulting in an overflow. The seepage was very high in total dissolved solids and chloride, and elevated in antimony, arsenic, magnesium, manganese, mercury, and total nitrogen.<br><br>**April 29, 2015:** 1,000 gallons of reclaim water of was spilled as a result of a corroded pipe. The water was very high in total dissolved solids and chloride, and elevated in lead, manganese, magnesium, mercury, and sulfate.<br><br>**February 14, 2015:** 4,000 gallons of process solution was released when a transfer line to one of the heap leach carbon column blew apart.<br><br>**January 2, 2015:** 2,000 gallons of process solution was released from a seepage well when a flow check valve froze. The solution was high in total dissolved solids, chloride, arsenic, and manganese.<br><br>**January 2, 2015:** 6,000 gallons of process solution (unknown concentrations) was released from a failure of a pump in the west seepage system causing overflow in the East lined pond.<br><br>**January 1, 2015:** 2,000 gallons of process solution was released from a seepage well when a flow check valve froze.<br><br>**December 12, 2014:** About 500 gallons of process solution was spilled due to a failure of a discharge pump line.<br><br>**November 28, 2014:** 800 to 1,000 gallons of process solution (unknown concentration) was released from a sump pump failure.<br><br>**December 8, 2013:** Unknown volume of seepage recovery water from Tailings Facility I was spilled which was high in total dissolved solids and chloride<br><br>**November 7, 2013:** Approximately 450 gallons of process solution was spilled due to an overwhelmed overflow pump. The solution was high in total dissolved solids, sulfate, chloride, antimony, arsenic, magnesium, mercury, nitrate (total N), and selenium.<br><br>**August 11, 2013:** An estimated 90,000 gallons of Tailings Storage Facility (TSF-1) seepage water was released due to a weld failure in the seepage return line. The solution was high in total dissolved solids, chloride, antimony, and manganese.<br><br>**July 28, 2013:** An estimated 1,500 gallons of process slurry with a cyanide concentration of 0.003 mg/L was released when a line on the discharge side of the thickener pump came apart.<br><br>**July 25, 2013:** About 300 gallons of process slurry with a cyanide concentration of 0.003 mg/L was released when a line on the suction side of the thickener underflow came apart.<br><br>**July 1, 2013:** 1,000 gallons of carbon-in-leach solution containing 0.009 lbs. of cyanide was spilled due to excessive tank pressures on the concrete floor and access road.<br><br>**June 20, 2013:** 10 pounds of elemental mercury spilled from scrubber solution lines from operator error. |

JERRITT CANYON MINE, NV - CONTINUED

**November 21, 2012:** About 1 pound of mercury was found 1.5 feet below the ground surface and was considered to be a historical release.

**September 18, 2012:** A calculated 10,080 gallons of solution from the WSR-W storage reservoirs which have total dissolved solids that average 20,000 mg/L. The cause of the leakage was unknown.

**September 18, 2012:** Roughly 5 pounds of mercury spilled near the toe of the Tailings Facility I adjacent to the Splitter Box Pond. The release appears to have come from a piping that originally carried mill tailings.

**September 28, 2011:** Cyanide solution with a concentration of 10 mg/L of an unknown amount spilled and the source was unknown.

**December 3, 2010:** 43,000 gallons of seepage water at 13,500 mg/L total dissolved solids was released when a pipe separated from a joint.

**October 3, 2010:** 10,200 gallons of Tailings Facility water containing cyanide and arsenic spilled when a sample port was left open.

**July 22, 2010:** About 170,000 gallons of seepage water from the mill was released (Spill Report 110923-02) resulted in a Finding of Alleged Violations issued on August 17, 2011.[116] The spill occurred due to a corroded bolt flange failure on a buried pipe located outside of the Wet Mill. The water was extremely high in total dissolved solids (~28,000 mg/L) and chloride (~10,000 mg/L), and above Profile I reference values for antimony, arsenic, cadmium, magnesium, manganese, mercury, selenium, sulfate, and thallium. Analysis indicated that the groundwater in the mill area was degraded by a multiple discrete sources of process solution. Data from groundwater monitoring wells located downgradient of the release showed that this release was a partial contributor to the groundwater degradation with respect to chloride, TDS and other constituents.[117] Elevated cyanide concentrations observed in several wells indicated that a release from a source of cyanide-rich process solution unrelated to tailings seepage solution. Upon further investigation, the source of the cyanide release was determined to be from the secondary containment for the Liquid Cyanide Storage Tank.

**May 30, 2010:** About 90,000 gallons of seepage reclaim water containing mercury, arsenic, cyanide, and thallium was released as a result of a broken weld at the flange adapter on the south seepage line. The water was extremely high in total dissolved solids (~20,700 mg/L) and chloride (~11,500 mg/L), and above Profile I reference values for antimony, arsenic, cadmium, magnesium, manganese, mercury, selenium, sulfate, and thallium.

**November 8, 2009:** 2,500 gallons of process solution containing 20.5 mg of cyanide and 0.01 pounds of arsenic spilled from a leaking valve.

**August 27, 2009:** Approximately 5,000 gallons of cooling pond process solution was released as a result of a leaking valve.

**August 26, 2008:** Drain down fluid from the Coffee heap leach pad spilled when construction activity pulled a drain line loose. The amount and concentrations were not known.

**December 3, 2007:** About 30,000 pounds of gold ore containing 1,500 pounds each of arsenic and mercury was spilled due a vehicle accident.

**November 28, 2007:** About 1,000 gallons of tailings seepage water spilled due to a failed pipe fitting.

**September 9, 2007:** About 25,000 pounds of Pete ore containing < 5% arsenic and mercury was spilled when a trailer rolled from driver inattention.

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| | **JERRITT CANYON MINE, NV**<br><br>**August 9, 2006:** Approximately 2,000 gallons of seepage water was released when a motor grader punctured a partially buried seepage pipeline. The seepage water exceeded Profile I levels for chloride, sulfate, magnesium, total dissolved solids, manganese, selenium, and thallium.<br><br>**August 5, 2005:** 71,000 gallons of tailing slurry overflowed the tailing overflow catchment pond due to a weld failure on a discharge pipeline. The water was extremely high in total dissolved solids (~19,000 mg/L) and chloride (~9,300 mg/L), and above Profile I reference values for antimony, arsenic, cadmium, WAD cyanide, magnesium, mercury, nickel, nitrate, selenium, sulfate, and thallium.<br><br>**February 10, 2005:** 30,000 gallons of Cooling Pond Quench Pond Lime solution was released as a result of a failing weld on a "Y" connection. The solution was high in arsenic.<br><br>**January 13, 2005:** 5,700 gallons of tailing seepage water containing elevated levels of arsenic, chloride (8,500 mg/L), manganese, mercury, and total dissolved solids (20,000 mg/L) was released when an equipment blade from snow removal struck a pipeline.<br><br>**2000:** A report of eight pounds of arsenic released from a lined pond and partial out of a cooling tower due to pump failure.[118]<br><br>**May 26, 1996:** 1,000 gallons of process slurry flowed out of the chlorination building after a tank valve was inadvertently left open during maintenance operations. The slurry flowed out of the east doors and into the milk of lime containment area. The slurry contained approximately 0.03% (3.2 lbs.) of sodium hypochlorite.[119]<br><br>**January 11, 1996:** Jerritt Canyon experienced a power bump at the mill resulting in the overflow of a heap leach carbon column. The power bump disabled the pump at the end of the heap leach carbon column train, while the feed pump remained operating. Barren solution overflowed the last carbon column in the train and flowed out of the building into the driveway area, and into a ditch that drains to the tailings line drainage pond. Approximately 2,500 gallons of barren solution flowed onto the ground and into the ditch. The solution contained approximately one pound of cyanide.<br><br>**August 21, 1995:** The south chlorination tank #2 ruptured, resulting in approximately 2,000 gallons of slurry.[120]<br><br>**1995:** Jerritt Canyon experienced a rupture in the south tailings slurry line. The rupture occurred at a fatigued joint in the pipeline, approximately 100 yards west of the tailings line drainage pond and 50 yards north of the tailings dam. An estimated 2,400 gallons of tailings slurry was discharged to the road and surrounding ground surface. Less than 10 pounds of cyanide was involved in this spill.<br><br>**1989:** 20,000 gallons of cyanide released.[121] |
| **Seepage collection and treatment failures** | The tailings generated from the vat leach operation were responsible for creation of a cyanide plume in groundwater.<br><br>Exceedances of chloride, TDS, arsenic and sulfate were also observed in wells downgradient of the tailings impoundment. The tailings impoundment was lined and had seepage control features, but these were not adequate to prevent groundwater contamination. In 1991, a cyanide plume was detected from tailings pond. From 1993-2004, groundwater monitoring wells downgradient of the tailing impoundment showed exceedances for Cl and TDS consistently from 1993-2004.[122] |

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| | **JERRITT CANYON MINE, NV - CONTINUED**<br><br>According to the mine's recent discharge permit review, contamination from TSF-1 leakage has degraded groundwater with respect to chloride and TDS (and in some cases with antimony, arsenic, cadmium, magnesium, manganese, mercury, nitrate, selenium and WAD cyanide).[123]<br><br>Four waste rock disposal areas (Marlboro Canyon East, Gracie, Snow Canyon, and DASH East) all exhibited seepage from the toe slope. The quality of the seepage water has been shown to exceed the 500 mg/l total dissolved solids (TDS) standards for the South Fork Owyhee River, due primarily to high sulfate and magnesium concentrations. The State of Nevada has been working with the Permittee to address these seepages since the 1990s.[124] In 2004, routine sampling of the lower Sheep Creek drainage indicated elevated sulfate, TDS, and magnesium concentration as a result of seepage emanating from the DASH East RDA UDS. Drainage from the toe of the East DASH waste rock disposal area into Sheep Creek exceeded the 500 mg/L TDS reference value for the North Fork Humboldt River due to elevated sulfate and magnesium concentrations.[125] Both Sheep Creek and the NF Humboldt have been incorporated into the State of Nevada 303(d) List of Impaired Waters — Sheep Creek for TDS and the NF Humboldt for total phosphorous and dissolved oxygen.<br><br>Precipitation infiltrating through the angle of repose slope along the lower lift of the East DASH waste rock disposal area was previously believed to be contributing to the elevated sulfate, magnesium and TDS concentrations present in the seepage solution emanating from the toe of the East DASH disposal area. This seepage discharge entered Sheep Creek which flows through an under-dump drain constructed in the bases of both the Northwest DASH RDA and the East DASH RDA. Sheep Creek is a tributary of the NF Humboldt and on occasion, surface flow from the Sheep Creek has reached the NF Humboldt. As a point of reference, flow in Sheep Creek would travel a distance of seven (7) miles from the toe of the DASH waste rock disposal area to its confluence with the NF Humboldt.[126]<br><br>In June of 2008 groundwater was found to contain volatile organic compounds in four monitoring wells. Four wells contained trichloroethane and three of the wells exceeded the Nevada State action level for trichloroethane. The trichloroethane levels ranged from 2.3 to 1,360 micrograms per liter. Chloroform was found in three of the wells from 68 to 1,320 micrograms per liter.[127] |
| **Impacts to water resources** | Water quality standards in groundwater have been exceeded for chloride, arsenic, sulfates, total dissolved solids and trichloroethane, and groundwater has been degraded by cyanide and in some cases antimony, cadmium, magnesium, mercury, nitrates and selenium. Surface water has been degraded in Sheep Creek, North Fork Humboldt River and South Fork Owyhee. |

| Kensington Mine, AK<br>The Kensington Mine, permitted in 2005, is an underground mine using flotation process to recover gold. It is located in southeast Alaska on private and federal lands in the Tongass National Forest, approximately 45 air miles north of Juneau. | |
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| **Reports of pipeline failures and other accidental releases** | 2005: In October a piece of drilling equipment fell and released drilling fluid into Slate Creek Cover, north of Juneau.[128]<br><br>**2005:** In August, kerosene spilled at Comet Beach, and about 2 gallons of diesel spilled into Slate Creek Cove in September.[129] |
| **Seepage collection and treatment failures** | **2013:** A 2013 inspection report identified acid mine drainage occurring at the north end of Lower Slate Lake.[130] The pH was usually 4 or 5, with one point as low as 2. The mine collected water samples and sent them to the lab for analysis. The acid mine drainage is coming from rock that was excavated during the phase 2 construction of the dam last summer.<br><br>Some of the acid generating material was mixed with other fill for unknown reasons during last summer's construction of the second stage of the downstream dam raise, and placed into a non-lined area of the tailings facility. Water quality tests showed that the resulting drainage from the area contained high levels of metals and a low pH.[131]<br><br>Acid drainage was noticed by Coeur staff when the snow cover melted from the tailings facility in late spring 2013. Acid generating material had been accidentally placed as fill at the north end of the tailings facility after being excavated from near the dam while preparing the foundation for the Stage II lift. Attempts to seal the seeping water from cracks and holes in the shotcrete were ineffective. A small water treatment plant was built to treat the water being collected from the seeps, however a September inspection found that water quality was still being degraded in Lower Slate Lake, and speculated that not all the fill material had been removed.[132]<br><br>**2006-2010:** EPA issued a $140,000 fine for CWA violations over mine discharges. Water quality violations were issued for violating water quality standards for manganese, zinc, aluminum and cadmium. Acid mine drainage was released into East Fork Slate Creek during construction between 2006 and 2010.[133] According to a report in the Juneau Empire in 2008, the mine operator had records of water quality violations dating back to March 2007, but didn't inform the agencies until December of that year.[134] |
| **Impacts to water resources** | Acid mine drainage has degraded water quality in Lower Slate Lake, and mine discharges have caused water quality violations for manganese, zinc, aluminum and cadmium in East Fork Slate Creek. Water treatment in perpetuity will be required due to acid mine drainage. |

| Mesquite Mine, CA<br>The Mesquite Mine is an open pit cyanide heap leach mine located in at the southern end of the Chocolate Mountains on public lands, state lands and private lands approximately 33 miles east of Brawley, CA. | |
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| **Reports of pipeline failures and other accidental releases** | **February 1, 2017:** An estimated 5 gallons of process solution was released off containment.[135]<br>**April 4, 2015:** 525 gallons of diesel fuel spilled off containment.[136]<br>**August 12, 2015:** 500 gallons of hydraulic oil spilled off containment due to mechanical failure on hydraulic fitting on shovel.<br>**August 14, 2015:** estimated 100 gallons of hydraulic oil were spilled off containment.[137]<br>**August 19, 2015:** 25 gallons of process solution containing .011 lbs. of cyanide were spilled off containment.[138]<br>**June 27, 2014:** 11.13 gallons of cyanide solution escaped containment on the north east side of heap leach pad #6.<br>**August 19, 2014:** 25 gallons of process solution was spilled off containment.[139]<br>**October 14, 2014:** a fueling hose came disconnected from a haul truck and subsequently leaked 100 gallons of diesel fuel off containment.<br>**2014:** 11.13 gallons of cyanide solution escaped containment on the heap leach pad.<br>**2014:** A fueling hose came disconnected and leaked 100 gallons of diesel off containment.[140]<br>**1990:** Leaching solution (770, 50, 2,520, 33, 26 gallons)[141]<br>**1990:** Pregnant solution (52 gallons)<br>**1989:** Pregnant solution (4,000 gallons)<br>**1986:** Goldfields Operating Co., Mesquite CA, Leaching solution (amount unknown)[142] |
| **Seepage collection and treatment failures** | None identified. |
| **Impacts to water resources** | None identified. The closest perennial surface water feature is the Coachella Canal, approximately 15 miles southwest of the site.[143] |

| Bald Mountain Mine, NV<br>Bald Mountain Mine is an open pit mine located 65 miles northwest of Ely on private and BLM lands. | |
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| **Reports of pipeline failures and other accidental releases**[144] | **September 15, 2016:** 3500 gallons of (0.029g/ton) of cyanide solution spilled with a total release of 0.435 lbs. The release resulted from a strut off valve failure.<br>**September 27, 2007:** 610 gallons of cyanide at 0.03lb/ton spilled due to an<br>**Inadvertent carbon column overflow.**<br>**March 12, 2005:** 12,000 gallons of magnesium chloride solution of unreported concentration released to soil.<br>**February 8, 2002:** 500 gallons of cyanide solution at 0.08mg/L concentration released due to a frozen pipe.<br>**February 17, 2001:** Approximately 14,000 gallons of heap drain down solution released with a cyanide concentration of about 0.08 mg/L. The cause was a frozen pipe.<br>**December 3, 1998:** 10,000 gallons of cyanide solution at 0.62 mg/L was spilled due to a broken solution line.<br>**September 8, 1998:** Storm water release of 3,000 gallons from a leach pad with trace amounts of cyanide.<br>**February 8, 1998:** 4,000 gallons of cyanide solution (barren solution and heap material) of a total release of 3.3 lbs. released due to a heap pad failure.<br>**June 22, 1997:** Approximately 38,000 gallons of 0.22 lb./tons of cyanide solution was spilled as a result of a 2 inch plug becoming undone from a threaded coupler on a 10 inch header pipe.<br>**January 6, 1991:** 5,000 gallons of sodium cyanide solution containing 4 pounds of cyanide were spilled due to a loose check valve; a maintenance operator had failed to tighten the bolts. The spill affected 50 square yards of soil to a depth of 4-8 inches. About half of the solution was pumped back into the system. The remainder froze in place and was to be removed for placement on the heap. Follow up soil sampling confirmed low cyanide levels.[145]<br>**September 14, 1989:** Process solution release at a 10 mg/kg of unknown quantity<br>**1989:** Barren solution 9,000 gallons. |
| **Seepage collection and treatment failures** | None identified. |
| **Impacts to water resources** | None identified. There are no perennial streams in the project area.[146] |

## Golden Sunlight Mine, MT

The Golden Sunlight Mine is an open pit, cyanide leach mine operated on BLM and private lands in Montana, approximately five miles northeast of Whitehall, Montana. The BLM issued its plan of operations in 1982.

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| **Reports of pipeline spills and other accidental releases** | 2006: A spill of approximately 560 gallons of cyanide solution occurred on January 6, 2006 as a result of a displaced hose at the Slaker Building.[147]<br><br>**2000:** Golden Sunlight reported two recent cyanide leaks, one occurred as a result of a failed vat leach tank, leading to the release of 390,000 gallons of cyanide solution and another prompting a 2,020-gallon discharge. The spills occurred on Aug. 31 and Oct. 26, respectively.[148]<br><br>**1998:** Golden Sunlight reported a cyanide spill on Sept. 2 to the Montana Department of Environmental Quality. Mine officials said the leaks, which migrated to several ground-water wells at the mine site, occurred between June 1 and July 21. Cyanide was detected in five of six ground-water wells, with levels of cyanide reaching as high as between 30 and 39 parts of cyanide per million parts of water. The state water-quality standard for cyanide is 0.005 parts per million. The mining company did not notify the agency of the spill until a month after it occurred. The company did not have pumpback wells on site to address the spill[149]<br><br>**1994:** 48.3 tons of tailings were spilled due to a leak in the spare tailings line. State agencies were not notified for many months. A notice of noncompliance was issued for failure to notify the agency and conduct required cleanup activities.[150]<br><br>**1991:** 60 pounds of cyanide spilled due to tailings line leak causing soil contamination.[151]<br><br>**1989:** A pipeline blockage caused acid mine drainage to discharge onto the ground.[152]<br><br>**1988:** A pipeline leak occurred sometime between March 31 and April 5 before it was discovered by the company. Approximately 15,000 gallons of mine waste flowed from the emergency spillway.[153]<br><br>**1987:** A cyanide slurry spill occurred. Estimated that the spill included 60 pounds of cyanide.<br><br>**1986:** A pipe fitting split and discharged approximately 2000 gallons of cyanide solution.[154] |

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| **Seepage collection and treatment failures** | GOLDEN SUNLIGHT MINE, MT - CONTINUED<br><br>**2013:** Montana Department of Transportation submitted a letter to the Montana Department of Environmental Quality asserting that Golden Sunlight has degraded groundwater quality at the MDT Whitehall facility at least since 1993, a period of 20 years. The agency attributes the source of groundwater quality degradation to the discharge from the nearby mine tailings impoundment.[155]<br><br>**2004:** According to the 2004 Supplemental Environmental Impact Statement, various reports describe the failure to capture seepage from the tailings impoundment.[156] Despite continual upgrading of the wells, seepage is escaping the south pumpback system. Data suggest slow migration of seepage away from Tailings Impoundment No. 1 (GSM 1998, 1999, and 2000 annual reports). There also is a vertical component to the seepage migration as well (GSM 2000 annual report). Keats (2001) concluded the second and third rows of pumpback wells were not completely capturing the seepage. Keats recommended treatment at the source area rather than adding pumpback wells. Portage Environmental Inc. reviewed the current monitoring well program in 2004. It summarized the level of contamination in all wells in the report. The majority of wells below the pumpback system still show some cyanide, nitrate, or metal contamination. According to the SDEIS, "It is hard to define how much of that is from the 1983 leak or from the continued migration of seepage past the capture systems. The agencies and GSM continue to review sampling results and modify the seepage containment system to prevent violations at the permit boundary."<br><br>**1993:** In August, a 7 gpm seep was discovered in a drainage area below the tailings impoundment. Cyanide levels in the seep were measured at 0.6 ppm (3 times human health standards). Another seep was found further down the drainage.[157] The water flowed down to a manmade catchment pond in the drainage, which was discharging into an overflow pipe down into an intermittent stream.<br><br>**1993:** Cyanide solution from tailings impoundment leached into groundwater and surfaced as seeps which flowed into an intermittent drainage below. Cyanide concentrations ranging up to 45 ppm total cyanide (204 times human health standards).[158] |
| **Tailings spills or failures.** | **1983:** 19 million gallons of cyanide solution leaked from an unlined tailings impoundment. Cyanide solution leaked down through underground alluvial gravel channels, under a cut-off wall intended to prevent groundwater migration out of the impoundment. Resulting groundwater contamination affected the Jefferson River alluvium. Four domestic wells and a well at the veterinary clinic were contaminated. Placer Dome was sued by neighboring landowners. In 1989, six years after the spill, the groundwater was still contaminated with cyanide. The company eventually bought out the landowners.[159] |
| **Impacts to water resources** | The mine resulted in groundwater contamination to four domestic wells and a veterinary clinic. Water treatment in perpetuity will be required at this mine to prevent further impacts to water resources. |

| Ruby Hill Mine, NV<br>The Ruby Hill Mine is an open pit gold mine located approximately 0.7 miles northwest of Eureka, NV on private land and BLM land. Mining operations were approved in 1997. | |
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| **Reports of pipeline failures and other accidental releases**[160] | **August 7, 2015:** A storm event resulted loss of containment from the Barren Tank, North Side Heap Leach Pipe Channel, and the Pregnant Solution Tank and Pregnant Solution Pond. All solution contained cyanide and may have contained elevated levels of some metals.<br>**August 16, 2004:** 1,900 gallons of process solution was released containing 1.2 lbs. of sodium cyanide as a result of a several hour rain event which overwhelmed lined leach pad beam.<br>**June 19, 2003:** 2,400 gallons of process solution containing about 1.8 lbs. of cyanide was released from the Ruby Hill Leach Pad containment system when a barren solution pump failed. |
| **Seepage collection and treatment failures** | None identified. |
| **Impacts to water resources** | None identified. There are no perennial streams in the permit area and intermittent stream segments were removed or filled during construction of the East Archimedes Pit.[161] |

## Greens Creek Mine, AK

Greens Creek, which started production in 1989, is an underground mine using flotation processes to recover zinc and lead and gravity processes to recover gold and silver. It is located in southeast Alaska in the Tongass National Forest on Admiralty Island, 18 miles southwest of Juneau.

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| **Reports of pipeline failures and other accidental releases** | **2009:** On December 21, EPA issued a Notice of Violation (NOV) to Hecla Greens Creek Mining Company resulting from a June 8, 2009 inspection, which found the following violation: on August 11, 2009, Hecla Greens Creek Mining Company drillers observed an unpermitted discharge of mud entering Greens Creek.<br><br>**2007:** On April 25, EPA issued a Notice of Violation (NOV) to Kennecott Greens Creek Mining Company resulting from a July 7, 2006 inspection. The following violation was cited in the NOV: 1) the 2005 storm water monitoring report showed numerous discharges from storm water outfalls exceeding Water Quality Standards for lead and zinc.[162]<br><br>**2007:** On 12/20/2007, a report of 450 gallons of diesel fuel from a broken hose connected to a barge, spilled into Hawk Inlet during fuel transfer.[163]<br><br>**2007:** On 3/14/2007 a report of diesel fuel spilled into Hawk Inlet.[164]<br><br>**2006:** On April 10, approximately 4,163 gallons of mine drainage discharged into Greens Creek due to a joint failure in a steel pipeline that normally transfers mine drainage from the mine to the Tailings Storage Facility Waste Water Treatment Plant. This event resulted in the Department of Environmental Compliance issuing a Notice of Violation (NOV) to Kennecott Greens Creek Mining Company on April 28, 2006 for discharging water with lead and zinc concentrations exceeding Alaska Water Quality Standards (WQS).[165]<br><br>**2004:** Greens Creek was fined $12,900 for two leaks the company reported, on June 28, 2004. The first water quality violation occurred when a bucket tipped over, spilling an estimated four gallons of diesel oil into upper Zinc Creek. Greens Creek personnel tracked the diesel sheen for ½ mile downstream.[166] Drilling mud was also released into Zinc Creek due to an overflow of a mine pond.<br><br>**1989:** In May, the first attempt to load a barge with ore concentrate resulted in a major spill of approximately 95-100 pounds of lead sulfide and a total of approximately 1,000 pounds concentrate into Hawk Inlet.[167] In 1995, efforts to use a suction dredge to clean up the spill occurred, however a 2015 annual monitoring report states that concentrate is still present in the sediments.[168] |
| **Seepage collection and treatment failures** | The Draft Environmental Impact Statement (DEIS) for expanding the tailings storage facility documents impacts to surface and groundwater: The water quality in Further Creek, Further Seep, and Duck Blind Drain is generally of lower quality than that of Greens Creek, Tributary Creek, and Cannery Creek. In general, these drainages and seeps have elevated sulfate, lower pH, and elevated dissolved zinc as well as some other metals. The lower pH and elevated sulfate and metals in these drainage features were from other pyritic sources such as waste rock or production rock that were outside the slurry walls of the Tailings Disposal Facility.[169] Elevated metals levels in the North Fork of Further Creek were reported to be caused by a thin veneer of tailings residue at the toe of the West Buttress that accumulated from the removal of the temporary tailings cover in 1999, and from residual tailings found in the Northwest Diversion Ditch.[170] |

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| | **GREENS CREEK MINE, AK - CONTINUED**<br><br>According to the DEIS, in 2006, groundwater in several bedrock wells had elevated sulfate concentrations and conductivity. These wells are down-gradient and in close proximity to the Tailings Disposal Facility (TDF). Tailings contact water from the old unlined portion of the TDF likely seeped into the bedrock aquifer. This is also shown by the increasing sulfate concentration in Monitoring Well (2S). Monitoring Well 2S is located in an area where groundwater has an upward gradient and bedrock water may discharge to the shallow aquifers and surface water. Since then, the northwestern part of the tailings facility was excavated to install a liner, before re-depositing tailings. Sulfate concentrations increased in wells MW-T-04-14 and MW-T-05-04 in the most recent sampling event. It is possible that construction for the liner installation temporarily caused the increases."[171]<br><br>Seepage from D Pond Berm contains some constituents above Alaska Department of Environmental Conservation Water Quality Standards and is discharging directly into Greens Creek.[172]<br><br>According to the 2013 EIS, acid mine drainage from the mine will require water treatment for hundreds of years, if not in perpetuity.[173] |
| **Impacts to water resources** | Surface water in Further Creek, Further Seep and Duck Blind Drain has been degraded with sulfates, lower pH and zinc. Water quality violations for zinc and lead have occurred as a result of discharges into Greens Creek, and discharges of diesel oil and drilling mud to Zinc Creek. Adverse impacts to sediments in Hawk Inlet from a spill of ore concentrate. Groundwater has been degraded with sulfates. |

| WHARF MINE, SD<br>Wharf is an open pit cyanide heap leach mine in the northern Black Hills of South Dakota. It has been operating since 1982. The mine is located on private lands and public lands managed by the Bureau of Land Management. | |
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| **Reports of pipeline failures and other accidental releases** | **2014:** Approximately 5,000 gallons of blasting agent spilled.[174]<br><br>**2001:** A release of process solution from a leak in the Pregnant Pond. Wharf also violated its surface water discharge permit for selenium.[175] According to the State, the violations stem from a series of water tests between July 2000 and June 2001 that showed selenium levels have been 5.79 to 8.59 parts per billion. To protect aquatic life, the standard for long-term exposure to selenium is 5 parts per billion. Wharf was fined $31,000 for violations.<br><br>**2000:** Approximately 8,000 gallons of process solution containing cyanide spilled at Wharf mine when a pipe joint fell apart. The pipe is located in the leak detection system.[176]<br><br>The EPA documented the following releases from 1984-1991[177]<br><br>**1991:** Cyanide (1,317 gallons per day)<br><br>**1991:** Cyanide (1,288 gallons per day)<br><br>**1990:** Leachate 10,000 gallons<br><br>**1988:** Cyanide (500 gallons)<br><br>**1988:** Leachate (100 gallons)<br><br>**1987:** Diesel fuel (4,000 gallons)<br><br>**1986:** Process water (1 gallon/hour, amount unknown)<br><br>**1984:** Cyanide (200 gallons) |
| **Seepage collection and treatment failures** | **2008:** Wharf violated its surface water discharge permit with the release of biomass from its water treatment plant during the summer of 2007.[178] The discharge affected fish populations in Annie Creek. Wharf also violated its permit limits for ammonia, cyanide, arsenic, and pH. Wharf was issued a civil penalty of $214,930.[179]<br><br>**2008:** Coincident with the in situ biotreatment of Process Area ground water, concentrations of arsenic in Process Area ground water dramatically increased.[180] Background arsenic concentrations associated with the Pahasapa limestone aquifer underlying the Process Area are very low to negligible. Prior to 2008, most process area wells only rarely yielded water with detectible concentrations of arsenic. In 2008, arsenic levels in Monitoring Well-44, Monitoring Well-47, HDH-11 and HDH-12 all increased to well above the 0.01 mg/l ground water standard. In general, as of 2011, arsenic levels in these wells appear to be stabilizing and/or decreasing. However, arsenic concentrations in MW-47, HDH-11 and HDH-12 still exceed the 0.01 mg/l standard.<br><br>**2003:** Wharf violated its surface water discharge limits for ammonia and its groundwater discharge limits for nitrate down gradient of the spent ore pile.[181]<br><br>**2000:** Surface water compliance point below Wharf's Reliance waste rock depository in the headwaters of Annie Creek exceeded daily maximum selenium during a period from August 1998 to July 1999.[182] Surface water monitoring below Wharf's spent ore depository in Ross Valley failed a Whole Effluent Toxicity test for the January to March 1999 quarter. Surface water compliance point 5 exceeded ammonia standards during November and December 1999.<br><br>**WHARF MINE, SD - CONTINUED** |

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| | **WHARF MINE, SD - CONTINUED**<br><br>**1997:** Surface water compliance points below Wharf's Reliance waste rock depository in the headwaters of Rock Creek and below Wharf's spent ore depository in Ross Valley, and the instream sampling points in Annie Creek have exceeded the daily maximum total cyanide limit of 0.02 mg/l since March 1994.[183] From June 1995 to December 1997 groundwater sampling below Wharf's contingency pond in McKinley Gulch indicated nitrate concentration over groundwater standards directly attributable to the discharge of process solution. Monitoring well in the alluvium of Annie Creek approximately 450 feet upstream of its confluence with Spearfish Creek exceeded the 10 ppm groundwater for nitrate during 1996 and 1997. Also on a few occasions, Wharf exceeded selenium and copper at compliance point 1. These discharges caused numerous violations of law.<br><br>**1995:** From August 21-28, Wharf discharged inadequately treated cyanide solution into Ross Valley and subsequently into Annie Creek. Approximately 300 fish were killed as a result of the discharge. The discharge caused several violations.[184] Wharf agreed to pay the department $150,000.<br><br>Mining of the East and West Liberty Pits encountered sulfide rich rock. Department inspectors identified a number of small acid seeps in the Pit. Although mitigation occurred in 1999, the mine's 2011 discharge permit summary states that drainage from the West Liberty Pit area continues to impact the bedrock groundwater system in Nevada Gulch.[185] Sulfate levels in SMO1A are on an upward trend, with concentrations exceeding 1,900 mg/l. Pre-mining levels of sulfate were around 40 mg/l. The mine has also resulted in high concentrations of nitrates in groundwater, which is created from the breakdown of residual cyanide in the process area and spent ore impoundments and from blasting residues in fuel explosives found in the waste rock depositories. Since the mid-1990s, nitrate impacts have occurred in the groundwater underlying the process ponds and leach pads. Since 1995, nitrate levels have repeatedly exceeded nitrate water quality standards to protect public health.[186] Wharf identified leakage sources in the leach pad dams, process ponds, and leak detection galleries. |
| **Impacts to water resources** | Groundwater has been polluted with nitrates, arsenic and cyanide at levels above water quality standards. Annie Creek has been polluted with selenium, ammonia, cyanide, and arsenic above water quality standards. Adverse impacts to surface water in Annie Creek resulted in a fish kill; adverse impacts to fish population. |

| ROBINSON MINE, NV<br>The Robinson Mine is an open pit gold and copper mine located in eastern Nevada approximately 11 km west of the town of Ely. It is located on private lands and BLM lands. It was formerly owned by BHP Copper, Magma Nevada Mining Company. | |
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| **Reports of pipeline failures and other accidental releases**[187] | **November 30, 2016:** 5,490 gallons of tailings slurry was released from a failed pipeline.<br><br>**May 30, 2016:** About 2,800 gallons of tailings solution was released from a leaking embankment.<br><br>**January 23, 2015:** 5,200 gallons of process solution was released from a failed startup valve.<br><br>**September 3, 2013:** An estimated 420,000 gallons of water and 2,500 tons of tailings solids was released from the Downstream Stormwater and Sediments Control Facility as a result of a significant storm.<br><br>**July 13, 2013:** Approximately 20,000 gallons of process solution was spilled when a collection box became overwhelmed.<br><br>**May 13, 2004:** Approximately 4,800 gallons of process solution was spilled when a weld on a pipeline failed.<br><br>**May 5, 2004:** About 180,000 gallons of tailings slurry was released when a pipeline broke.<br><br>**1996:** The mine experienced eight reported spills during 1996. Most of these spills involved tailings solution and reclaim water releases due to equipment failures. The five spills resulting in releases of copper flotation tailings had spill volumes ranging from 1,500 gallons to 66,000 gallons. Four of these spills resulted in contamination of relatively small areas of soil. The largest spill resulted in contamination of a downstream drainage bed for 2.3 miles with an average flow path width of 3 ft. Two spills resulted in a combined release of 76,000 gallons of reclaim water.[188] In August of 1996, the NDEP notified BHP Copper that it was in violation of its Water Pollution Control Permit due to increased levels of Total Dissolve Solids and pH. A consent agreement was developed in 1997 for the accidental release of tailings from the tailings storage facility on February 24, 1996. |
| **Seepage collection and treatment failures** | **2016:** The Final Environmental Assessment for expansion of the mine documents the continued degradation of groundwater from sulfates, which has occurred as a result of seepage from the tailings pond.[189] According to the EA, "The existing TSF was permitted without a liner. Groundwater fate and transport modeling completed to support the original permit considered the transport of sulfate from the facility, but not at the concentrations that now exist in groundwater downgradient from the facility. The seepage from the unlined impoundment has impacted downgradient groundwater causing exceedance of maximum contaminant levels (MCLs) of sulfate in several monitoring wells (Figure 2-3)."<br><br>**2015:** In early 2015, groundwater degradation with respect to sulfate was discovered in groundwater monitoring well WCC-G7 – south of the tailings embankment.[190] The detected sulfate concentration of 711 mg/l exceeds the 500 mg/l reference value for sulfate. On April 29, 2015, the Division issued a Finding of Alleged Violation and Order, requiring the company to complete actions, which had already begun, to investigate and remediate the contamination – including groundwater wells to delineate the size of the contaminant plume. |

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| CONTINUED<br>**Seepage collection and treatment failures** | **ROBINSON MINE, NV - CONTINUED**<br><br>**2010:** The State of Nevada issued a Finding of Alleged Violation and Order for the failure to comply with permit and regulatory requirements regarding stabilization of spent ore and associated acid rock drainage at the Intera and Green Springs area.[191] As required by the October 2010 Corrective Action Plan, the company was required to reconstruct the liner system of the Mill Water Ponds because leakage from the ponds was believed to be contributing to the Intera monitoring water flow. The Order required the mine to "submit a plan by May 11, 2010 stating whether the Mill-Water Ponds, the overhead standpipe near the Mille-Water Ponds, and any other leaking pipes or tanks in the area, would remain on the Liberty Dump or be moved off the Liberty Dump (and any other potential sources)."<br><br>**1996:** A Consent Agreement and Order was developed in 1997 to resolve the Finding of Alleged Violation and Order issued August 20 1996 for alleged violations of discharge limits set by the Permit for the Giroux Wash Tailings Storage Facility. |
| **Impacts to water resources** | Groundwater degradation from sulfates, total dissolved solids, and manganese.[192] Contamination of downstream drainage bed for 2.3 miles from mine tailings process water (see spills above). |

## Florida Canyon Mine, NV

The Florida Canyon Mine is an open pit cyanide leach gold mine on BLM land and private land approximately 7 miles southwest of Imlay, Nevada. It has been in operation since 1986.

**Reports of pipeline failures and other accidental releases**[193]

July 7, 2016: Unknown quantity spill occurred from a leach pad (washout), but with no cyanide content.

**February 21, 2011:** 100,000 gallons of pregnant solution (cyanide) was released due to a blockage of the solution ditch by ore that slid off the angle of repose slopes. The solution was high in chloride, arsenic, nitrate, mercury, sulfate, and total dissolved solids.

**January 8, 2008:** 7,892.7 gallons of cyanide process solution spilled releasing 0.17 lbs. of cyanide. The spill results from an overflow in the solution collection channel from the accumulation of debris in the channel.

**May 17, 2005:** Stormwater released from sedimentation pond overflow at a rate of 200 gallons per minute. There were no process contaminants suspected in the release.

**December 30, 1996:** 52,500 gallons of cyanide solution (concentration less than 90 mg/L but greater than 22 mg/L) was released with a cyanide content estimated at 20.9 lbs. caused by a foreign object in a chemical pipe.

**January 7, 1994:** 79,260 gallons of 65 mg/L cyanide solution flowed out of containment from a ruptured pipe releasing 22.76 lbs. of cyanide.

**April 13, 1993:** 400 gallons of cyanide solution containing less than 0.002 lbs. of cyanide spilled as a result of a frozen pump.

**June 4, 1991:** 112 gallons of cyanide solution was spilled from a split in a line releasing 0.10 lbs. of cyanide.

**April 8, 1991:** 535 gallons of cyanide solution sprayed on an access road due to a split in the line, and about 0.47 lbs. of cyanide was released.

**March 12, 1991:** 1,200 gallons of cyanide solution was released due a failure from a pipe from the barren pond to the heap leach pad. The total amount of cyanide released was about 1 lb.[194]

**September 4, 1990:** 30 gallons of cyanide solution containing 0.042 lbs of cyanide leaked due to a crack in the mainline onto the leach pad perimeter road.

**August 27, 1990:** Approximately 30 gallons of sodium cyanide solution containing 0.053 lbs. of cyanide was spilled due to a failure in a sump pump the process plant.

**August 15, 1990:** 503 gallons of cyanide solution containing 0.61 lbs. of cyanide was released due to a pipeline rupture.

**June 25, 1990:** 20 gallons and 240 gallons of cyanide containing 0.02 and 0.5 lbs. of cyanide respectively around one of the ponds. (Cause not stated)

**June 22, 1990:** 52 gallons of cyanide solution containing 0.098 lbs. of cyanide leaked from a valve; 10 gallons of cyanide solution containing 0.002 lbs. of cyanide leaked due to operator error.

**June 14, 1990:** 10 gallons of cyanide solution containing 0.04 lbs. of cyanide leaked due to a faulty valve.

**May 16, 1990:** 13.735 gallons of cyanide solution containing 25.78 lbs. of cyanide was released when a d4 dozer torn a hole in the perimeter mainline.

**May 8, 1990:** 45 gallons of cyanide solution containing 0.094 lbs. of cyanide from a valve failure as a result of a rusted bolt.

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| | **FLORIDA CANYON MINE, NV - CONTINUED**<br><br>**May 2, 1990:** Approximately 2880 gallons (6 gpm for ~8 hours) of pregnant solution containing 8.28 lbs. of cyanide leaked due to a tear in the liner seam from high winds and an unanchored liner edge.<br><br>**January 11, 1990:** 100 to 150 gallons of cyanide solution containing 0.33 pounds of cyanide was spilled due to operator error.<br><br>**September 9, 1989:** 20 gallons of a lead nitrate solution was spilled when the barrel containing the solution was knocked over. There are no details on the amount of lead.<br><br>**July 4, 1989:** 100 gallons of cyanide solution containing 0.2 lbs. of cyanide was spilled due to a break in a welded joint in a plastic pipe.<br><br>**July 30, 1989:** Excessive dust from the crushing/conveying facilities was reported<br><br>**November 27, 1987:** 200 to 300 gallons of cyanide solution was released.<br><br>**October 2, 1987:** 6,000 gallons of barren solution sprayed off of the heap leach pad due to a cracked barren pipe. The amount of the release is unclear. |
| **Seepage collection and treatment failures** | **2000:** A contaminant plume comprised of process solution was discovered near the west side of the existing leach pad. Initially, the plume, consisting of weak acid dissociable (WAD) cyanide, mercury, and nitrates, was traced to leach pad solution channels.<br><br>Routine monitoring in the second quarter of 2000 revealed elevated concentrations of process-related constituents in the vicinity of monitoring well MW-16. Continued monitoring of the area has shown that the process-related constituents have been detected in monitoring wells MW-16B, MW-F, MW-G, MW-KA, MW-M, MW-O, and MW-N.[195] In 2012, new monitoring wells confirm that groundwater in MW 28 is an area of detectable WAD cyanide and total nitrogen, with MW 29 and MW 31 within the plume.[196]<br><br>**2000-2014:** Between 2000 and 2014, additional leaks were identified at various locations including the Barren Pond, solution channels, and sumps. As a result of continued contamination of groundwater NDEP issued a Finding of Alleged Violation and Order in August 2012. BLM placed the mine in Noncompliance in August 2012.[197] |
| **Impacts to water resources** | Groundwater has been polluted with cyanide, mercury and nitrates at levels that exceed drinking water standards.[198] |

| Mineral Ridge, NV<br>The Mineral Ridge Project (Mineral Ridge) is an active open pit and inactive underground mine located approximately 4.5 miles northwest (by air) of the town of Silver Peak, Nevada. The project is located on both private land and public land administered by the BLM. | |
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| **Reports of pipeline failures and other accidental releases**[199] | **May 11, 2011.** A cyanide waste of unknown quantity was released as an improper disposal in a landfill. The practice had been occurring for the past several months.February 26, 2005. About 100 gallons of pregnant solution was spilled when a heap well failed at a joint.<br>**March 3, 2004**. 2,355 gallons of cyanide leach solution containing 1.57 lbs. of cyanide was released from heavy snow melt on a leach pad. |
| **Seepage collection and treatment failures** | None documented. |
| **Impacts to water resources** | None documented. See above. No seeps, springs or perennial streams are located within the mine permitted area.[200] Off-site springs are monitored only once a year. Groundwater >500 feet bgl. |

| Briggs Mine, CA<br>The Briggs Mine is an open pit heap leach gold and silver mine located about seven miles north of Ballarat, CA in the Panamint Valley near Death Valley National Park on public lands managed by the BLM and private lands. | |
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| **Reports of pipeline spills and other accidental releases** | **2009:** A Notice of Violation was issued for process solution discharged to the ground outside the containment of the lined leach pad area on two separate occasions n 2009. The process solution contained 120 parts per million cyanide. On December 14, 2009 approximately 50 gallons of process solution was released. On December 31, 2009 a second released occurred in which 400 gallons of process solution was discharged.[201] |
| **Seepage collection and treatment failures** | **2017**: Ground water monitoring wells continue to show elevated cyanide levels.[202]<br>**2015:** A Notice of Violation was issued for cyanide detected in a monitoring well at levels that violate compliance action levels.[203] The initial detection of WAD cyanide in MW-6 was confirmed in subsequent sampling events at a concentration of 0.064 milligrams per liter (mg/L) on October 28, 2015 and 0.066 mg/L on December 10, 2015. The detected concentrations of WAD cyanide exceed the Water Quality Protection Standard (WQPS) concentration limit of 0.03 mg/L and constitutes verification of measurably significant evidence of a release and establishes the requirement for an EMP as required under Title 27 of the California Code of Regulations (CCR) §20420(k)(5).[204] An engineering report in 2016 determined that the cyanide in groundwater is due to leaks in the barren solution line located north and east of the solution ponds at the Site.[205] |
| **Impacts to water resources** | Groundwater contamination from cyanide. |

## Rochester Mine, NV

The Rochester Mine has been in operation since 1986. It mines gold and silver from open pit mining and heap leach processing operations, and it is located on private land and BLM land.

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| **Reports of pipeline spills and other accidental releases[206]** | **2013:** Report of 5,447 pounds of cyanide released onto ground.[207]<br><br>**March 19, 2012:** 123.5 tons of heap leach material slide off the pad and out of containment. As a result, a calculated 4,203 gallons of solution containing 24.5 lbs. of material containing cyanide was released from a heap leach pad due to a break in a broken 8 inch solution feed line.[208]<br><br>**November 23, 2007:** About 700 gallons of solution containing 3.2 lbs. of cyanide was spilled due to a frozen pipeline.<br><br>**November 11, 2013:** Saturated leach pad material overwhelmed the containing berm, which was calculated to contain 6,288 gallons of solution and 47.2 lbs. of sodium cyanide.<br><br>**May 6, 2013:** 1105.08 gallons of barren solution containing 6.91 lbs. of cyanide was released due to operator error.<br><br>**May 23, 2007:** An estimated 3,792 gallons of pregnant solution containing cyanide, elevated levels of arsenic, mercury, silver, and nickel were released from a pipeline failure.<br><br>**2007:** A report of a leak in a solutions line released 20 pounds of cyanide.[209]<br><br>**1997:** A report of a broken pipe from the heap leach pad released 40 pounds of cyanide.[210] Also a report of a process line failure released 7.9 pounds of cyanide.[211]<br><br>**1996:** The second spill occurred on March 6, 1996. Freezing overnight temperatures caused a line in the leach pad to rupture. Consequently, 5,500 gallons of sodium cyanide process solution escaped the heap leach pads primary containment system. 4,500 gallons of the process solution mixed with 35,000 gallons of fresh water from snowmelt. The remaining solution mixed with an unknown amount of snowmelt.[212]<br><br>**1994:** Two spills have been reported at the mine facility since 1994. The first reported spill occurred on February 18, 1994. As a result of a power outage, 450 tons of ore containing process solution was displaced from the leach pad. From 1.97 to 9.861 lbs. of cyanide were washed out with the ore.<br><br>**1988:** A broken pipeline resulted in the displacement of 200 tons of ore off the liner, causing 19,400 gallons of process solution containing 45.3 lbs. of cyanide to be released to the environment. Of this, ,5000 gallons of process solution containing 11.7 lbs. of cyanide were discharged off site to American Canyon, an intermittent drainage. A dike was installed in American Canyon to stop solution flows.[213]<br><br>**1987:** A release of process solution from the East Pregnant Pond occurred, causing pregnant solution to run into American Canyon for 12-18 hours at a rate of 5-10 gpm. The USEPA issued a Notice of Violation on June 30, 1988 for violating the Clean Water Act by discharging pregnant to American Canyon.[214] |

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| **Water collection and treatment failures** | ROCHESTER MINE, NV - CONTINUED<br><br>Releases from the Stage I heap leach pad have contaminated groundwater. Leakage from the pad was first noticed in 1991, near the north side (HydroGeo, 2010). Concentrations of arsenic, mercury, manganese, nitrate/nitrite, TDS, and WAD CN were measured; they were found to be above the Nevada reference values in WI-16, WI-17R, WI-19, WI-29/R, MW-30/R, MW-35, MW-37, and MW54 (SWS 2014). Well TB-1, downgradient of the stage 1 pad, exceeds Nevada Profile I reference values. The maximum detected concentration at TB- 1 between March 2011 and May 2013 was 650 mg/L CN-, 0.075 mg/L arsenic, 3.8 mg/L mercury, and 2,300 mg/L TDS (SWS 2014).[215]<br><br>In 2003, the Nevada Department of Environmental Protection issued Rochester a Finding of Alleged Violation (FOAV) for cyanide exceedences discovered during quarterly monitoring. The violation was issued in response to the discovery of cyanide exceedences in MW-16, a monitoring well screened in the shallow bedrock below the site. Contamination had been previously confined to the alluvium.[216] Groundwater monitoring wells downgradient of the Stage I heap leach pad showed exceedences of arsenic, mercury, cadmium, nitrate and WAD cyanide during the period 2000 to 2003.<br><br>Surface water monitoring sites in a spring downgradient of the Stage I heap leach pad showed exceedances of nitrate, lead, cyanide, arsenic, mercury.[217] |
| **Impacts to water resources** | Groundwater polluted with arsenic, mercury, manganese, nitrate/nitrite, TDS and cyanide. American Canyon (an intermittent drainage) has been contaminated by a process solution spill in 1988. Exceedances of arsenic and nitrate in American Canyon springs. |

| Denton Rawhide Mine, NV<br>The Denton-Rawhide Mine is located approximately 36 miles southeast of the town of Fallon, NV. The mine is located on private land and public land administered by the U.S. Bureau of Land Management (BLM). The project consists of an open pit gold and silver mine. | |
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| **Reports of pipeline failures and other accidental releases**[218] | **January 18, 2015**: 6,000 gallons of cyanide solution released due to a weld failure in a HDEP pipe, and the total release was about 6.25 lbs.<br><br>**January 3, 2012:** 20 to 30 gallons of 0.015 mg/L mercury solution released due to an elevated flow volume in a carbon vessel.<br><br>**November 24, 2011:** Water flooded the mercury retort's outside filter and flowed out of containment. The contaminated water exceeded standards for arsenic (0.27 mg/L), mercury (0.015 mg/L), sulfate (2,600 mg/L), and total dissolved solids (3,700 mg/L).<br><br>**December 13, 2008:** Approximately 3,000 gallons of process solution released do to a pipe failure form excessive corrosion and cold temperatures resulting in section pulling apart. The total release of sodium cyanide was about 0.25 pounds.<br><br>**2002:** Rawhide experienced three process solution spills off the heap leach pad, the largest consisting of 40,000 gallons (47 pounds of cyanide) occurred as a result of ruptured pipe. The remaining two were 6,000 gallons (8 pounds of cyanide) and 1,000 gallons (1.5 pounds of cyanide), respectively.[219]<br><br>**November 1, 2001:** 1800 gallons of cyanide solution released for a total of 2.25 lbs. of cyanide discharged. The cause of the release was a bulldozer running over a barren solution return line.<br><br>**October 15, 2001:** 25,000 gallons of cyanide solution spilled for a total of 0.2 lbs. released as a result of a HDPE pipe weld splitting.<br><br>**September 8, 1999:** Two cyanide spills occurred at 4,700 and 3,000 gallons of cyanide solutions at concentrations of 0.1 lbs./ton and 0.05 lbs./ton respectively due to a broken pipeline.<br><br>**1990:** Safety pond solution (167 gallons per day). Unknown total amount.[220] |
| **Water collection and treatment failures** | None documented. |
| **Impacts to water resources** | Groundwater in the vicinity of the facility was not located. More than 300 exploratory holes were drilled to depths of at least 500 feet, with several drilled to 2000 feet depth. None of the holes drilled encountered groundwater. No surface water is within 5 miles of the project except for ephemeral washes that drain into the alkali flat of northwest Gabbs Valley. |

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