Anaconda Copper Mine
Lyon County, NV

U.S. Environmental Protection Agency • Region 9 • San Francisco, CA • November 2016

Proposed Plan for Operable Unit 8

This Proposed Plan (Plan) describes how the Nevada Division of Environmental Protection **(NDEP)**, U.S. Environmental Protection Agency **(EPA)** and the Bureau of Land Management **(BLM)**, propose to protect human health and the environment by implementing remedial actions at the former Arimetco portion of the Anaconda Copper Mine commonly referred to as Operable Unit 8 (**OU-8**, Site). The Plan describes the remedial alternatives that the NDEP, EPA and BLM (the agencies) are considering, and identifies the preferred alternative for implementation. The Plan also explains how the public can participate in this decision, including where to find more information and the date and location of a public meeting. The agencies request public comment on the Plan and will accept comments at the public meeting and in writing during the public comment period.

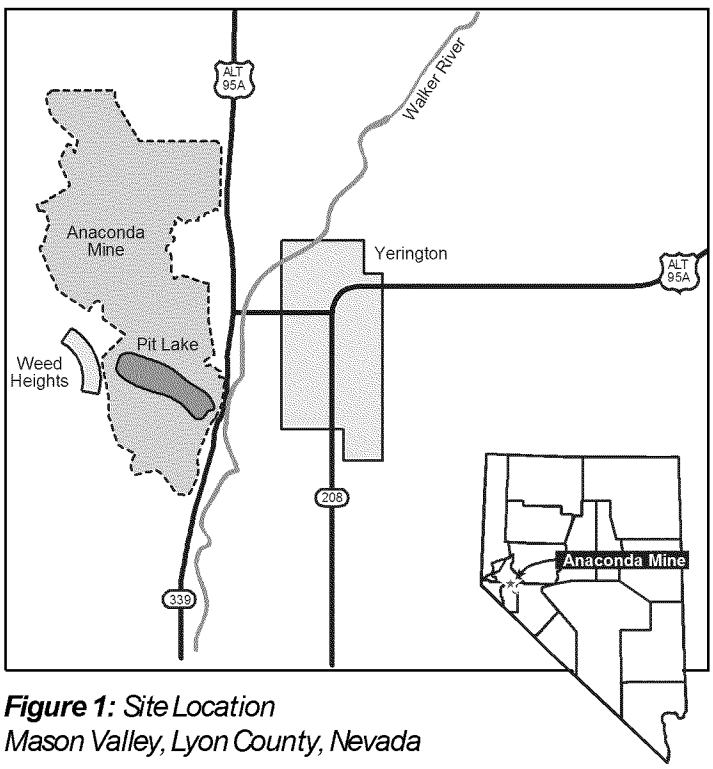

Figure 1: *Site Location*
Mason Valley, Lyon County, Nevada

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Proposed Plan at a Glance

Statement of the Problem

Acidic **drain-down fluids** containing elevated Total Dissolved Solids (salts) from the OU-8 **heap leach pads (HLPs)** associated with the former Arimetco ore-processing operations are managed in a system known as the **Fluid Management System (FMS)**. The HLP fluids continue to accumulate in the FMS **evaporation ponds**, and the ponds are expected to reach capacity in two (2) to four (4) years from now. Additionally, it can be challenging to maintain fluid capacity in the ponds due to unpredictable precipitation, aging pumps and pipes between ponds, varying evaporation rates, and salt build up in the ponds, which limits capacity over time. Repeatedly constructing new evaporation ponds is not a sustainable, fiscally responsible long-term remedy to manage the drain-down fluids.

**A glossary of terms can be found on page 15.*

Your Comments

You can provide your comments on this Proposed Plan and on the administrative record either verbally during the public meeting (see below) or in writing via letter, fax, or email (see page 16 for contact information). The agencies invite comment on all alternatives and rationale presented in this Plan. The agencies will consider your comments as we develop our final decision on how to remediate OU-8, and will respond to all comments in a final written document which will be attached to the Record of Decision.

Public Comment Period

The public comment period runs for 30 days from

Monday, November 21, 2016 to
Wednesday, December 21, 2016

Ways to Comment:

» Verbally at public meeting
» Written – you can deliver them at the public meeting or submit them to NDEP via mail/email (see contact info on page 16)

Public Meeting

A public meeting will be held at two times on

Monday, December 12, 2016

2:30 – 4:30 pm	**6:00 – 7:30 pm**
Yerington Library	**Yerington High School**

The purpose of this meeting is to give the community the opportunity to ask questions and provide official comments regarding the proposed remediation plan. In addition to the public meeting, the public is invited to send their comments via letters, faxes, and emails to NDEP.

Proposed Solution

The agencies propose to reduce the risks of potential releases of OU-8 HLP drain-down fluids by: (1) regrading and capping all surfaces of the HLPs, including side slopes, with an evapotranspiration **(ET)** soil cap, to further minimize precipitation infiltration; (2) closure and conversion of ponds to e-cells for ponds not needed to manage residual drain-down fluids; (3) installation of stormwater routing and storage features including piping, open channels, and stormwater basins; and (4) continuation of active management and evaporation of the fluids, rehabilitation of the HLP perimeter ditches, and continuation of other operations and maintenance **(O&M)** activities. The stormwater basins will be designed and constructed with the long-term objective of connecting to and complementing site-wide stormwater management features in adjacent areas of the site. Site-wide stormwater connections are part of the proposed alternative; connections to the OU-8 stormwater system will be completed as adjacent areas undergo remedial action. The basins would only be used for storing precipitation, not drain-down fluids. This remedy is recommended because it will achieve substantial drain-down fluid reduction by addressing the source of the fluid generation (infiltration of precipitation) through capping the HLPs, which will significantly reduce volumes and flowrates of fluids to manage.

Cleanup Framework

The Plan is a document that is required to fulfill the requirements of **Comprehensive Environmental Response Compensation and Liability Act (CERCLA**, also known as "Superfund" law) Section 117(a) and the National Contingency Plan Section 300.430(f)(2). This Plan highlights key information from the **Remedial Investigation (RI)** and **Feasibility Study (FS)** Reports. Interested readers can obtain copies of these and all other documents in the administrative record file (documents relied upon for making this remedy decision).

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Site Background and Characteristics

The Site has been proposed for inclusion on the EPA's National Priorities List, which would make it eligible for federal clean-up funding. The Site is managed jointly by the EPA, BLM and NDEP.

Mine History

Copper in the Yerington District was initially discovered in the 1860s, with large-scale exploration of the copper system occurring in the early 1900s when the area was organized into a mining district by Empire-Nevada Copper Mining and Smelting Co. Large scale mining operations began at the Site around 1918 as the Nevada Empire Mine. Anaconda Copper Mining Company acquired the Anaconda Mine property (Property) in 1941 and conducted active mining operations from 1953 through 1977. During Anaconda's twenty-five (25) year operational period, approximately 1.7 billion pounds of copper were produced, resulting in the generation of waste rock, tailings impoundments, and evaporation ponds. Atlantic Richfield Company **(ARC)** acquired the Property from the Anaconda Copper Mining Company in June 1978 and terminated mining operations at the Site. In 1982 ARC sold its interests in the Property to a local resident who leased the Site to a small mining operation. In 1989 all of the former Property was sold, with the exception of the Weed Heights community, to Arimetco. Arimetco operated their HLP copper recovery operation using existing ore at the Site and ore from the MacArthur Pit from 1989 to 1999, at which time it ceased all mining operations. The area of former Arimetco operations comprises approximately 250 acres within the entire 3,400-acre Property. During Arimetco's operation of the Site, four phases of HLP construction were completed. High density polyethylene liners were installed under most of the HLPs to collect leachate that was transferred to collection ponds comprising twelve (12) acres and then conveyed at flow rates exceeding 5,000 gallons per minute **(gpm)** to the solvent extraction and electrowinning (SX-EW) plant for processing.

Investigation and Interim Response Actions

Several site investigations, regulatory actions and interim abatement and fluid management activities have occurred at the Site since the mid-1980s. In December of 1998, NDEP issued a notice of non-compliance to Arimetco because they lacked a valid reclamation permit and had not posted an adequate bond to ensure reclamation responsibilities would be completed. NDEP also required Arimetco to cease mining and adding new ore, acid, and make-up water to the HLPs. After Arimetco abandoned the Site in November 1999, NDEP began managing the HLP drain-down fluids to prevent overflow of fluids from the ponds. At that time there was an estimated 90 million gallons of solution present in the HLPs and FMS. The solution drain-down rate decreased from 3,300 gpm during active operation to less than 35 gpm in 2002. Currently, less than 10 gpm (annual average) is leaving the HLPs and collecting in the ponds. ARC continues to perform O&M activities for the OU-8 FMS, and has paid for other investigation and response activities as a result of a series of EPA Orders (1985, 10/20/02, 3/31/05, 1/12/07 and 5/1/09).

In 2004, NDEP requested that EPA take regulatory lead of the entire Site, including OU-8, with NDEP as support agency. Since then several interim response actions have been performed, with ARC and EPA assuming the costs of those actions. Response actions have included repairing and replacing liners, and in 2006, construction of a new evaporation pond to increase the FMS capacity. Over the years, evaporation increased the amount of solid precipitates in the system ponds, reducing FMS capacity. Currently ARC continues to perform O&M for OU-8, as provided for in the 2009 Consent Order. Also in 2009, a mining company, Singatse Peak Services **(SPS)** agreed to purchase mineral rights and surface land in OU-8, with the intent of re-processing the recoverable copper in the solids and liquids as part of an overall site-wide mining plan. From 2010 to 2012 EPA conducted a Feasibility Study evaluating remedial alternatives. In 2013, in response to diminishing fluid capacity, NDEP utilized funds from EPA and ARC to contract a local engineering firm to construct two additional evaporation ponds. In 2015, NDEP again utilized EPA and ARC funds to contract a local engineering firm to produce a more detailed Focused Feasibility Study Conceptual Closure Plan **(FFS)**. The FFS is a preliminary engineering design and cost estimate for closing the HLP system. In 2016, SPS implemented an enhanced evaporation pilot study on the vat leach tailings HLP. This technology is not intended to act as a final remedy, but may potentially reduce the fluids and solids in the FMS, providing additional time to secure Superfund or other funding sources for design and construction of the approved remedy.

Drain-down Fluid Characteristics

There are currently five ponds collecting hazardous drain-down fluids from the HLPs with a total design capacity of approximately 14.54 million gallons. The drain-down fluids are considered the Principal Threat Wastes. Pond capacity becomes an issue due to the high total dissolved solids in the copper sulfate solution, which precipitate out causing reduced fluid capacity in the ponds. The drain-down fluids that exit the HLPs were assessed and their characteristics

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Table 1: Contaminants of Concern

Comparison of Analytical Results from Drain-Down Fluids with Maximum Contaminant Levels **(MCLs)**

Analyte	Range of Detected Concentrations[a] (µg/L)	Primary MCL[b] (µg/L)	State of Nevada Secondary MCL[c] (µg/L)	Federal Secondary MCL[d] (µg/L)
Aluminum	9,000,000 – 27,000,000	NA	200	50 – 200
Antimony	160 – 200	6	NA	NA
Arsenic	110 – 280	10	NA	NA
Beryllium	550 – 1,500	4	NA	NA
Boron	1,100 – 2,500	NA	NA	NA
Cadmium	170 – 420	5	NA	NA
Chromium (total)	460 – 2,100	100	NA	NA
Cobalt	28,000 – 70,000	NA	NA	NA
Copper	1,700,000 – 5,700,000	1,300	1,000	1,000
Iron	210,000 – 1,100,000	NA	600	300
Lead	Non-detect	15	NA	NA
Manganese	270,000 – 740,000	NA	100	50
Mercury	4.7 – 29	2	NA	NA
Nickel	17,000 – 41,000	NA	NA	NA
Selenium	Non-detect	50	NA	NA
Silver	50	NA	100	100
Thallium	380 – 890	2	NA	NA
Vanadium	65 – 1,100	NA	NA	NA
Zinc	26,000 – 67,000	NA	5,000	5,000

Notes:

MCL = Maximum Contaminant Level
NA = Not Available
µg/L = microgram(s) per liter

are summarized in the table above. It is important to note that this water is not being used by anyone as a drinking water source. The flow rate and quality of the drain-down fluids were found to fluctuate seasonally, with the highest metal concentrations occurring during the warm summer months, when fluids have evaporated and dissolved solids concentrations have increased.

Heap Leach Pad Characteristics

There are five HLPs covering approximately 250 acres at the Site. The HLPs are the source of the drain-down fluids. Precipitation infiltrates the HLPs and leaches out metals, exiting the HLPs as the drain-down fluids described above.

In addition to being the source of the drain-down fluids, the HLP material at or near the surface contains many of the same **Contaminants of Concern (COCs)** as the drain-down fluids.

Operable Unit Prioritization

EPA, NDEP, BLM and ARC individually and collectively discussed the overall Anaconda Mine Site priorities, and have prioritized the OUs at the Site. It was determined that the highest priority OUs are OU-8 (Arimetco), OU-1 (Site-Wide Groundwater), OU-3 (Anaconda Process Areas), OU-4a (Evaporation Ponds), and OU-7 (Wabuska Drain).

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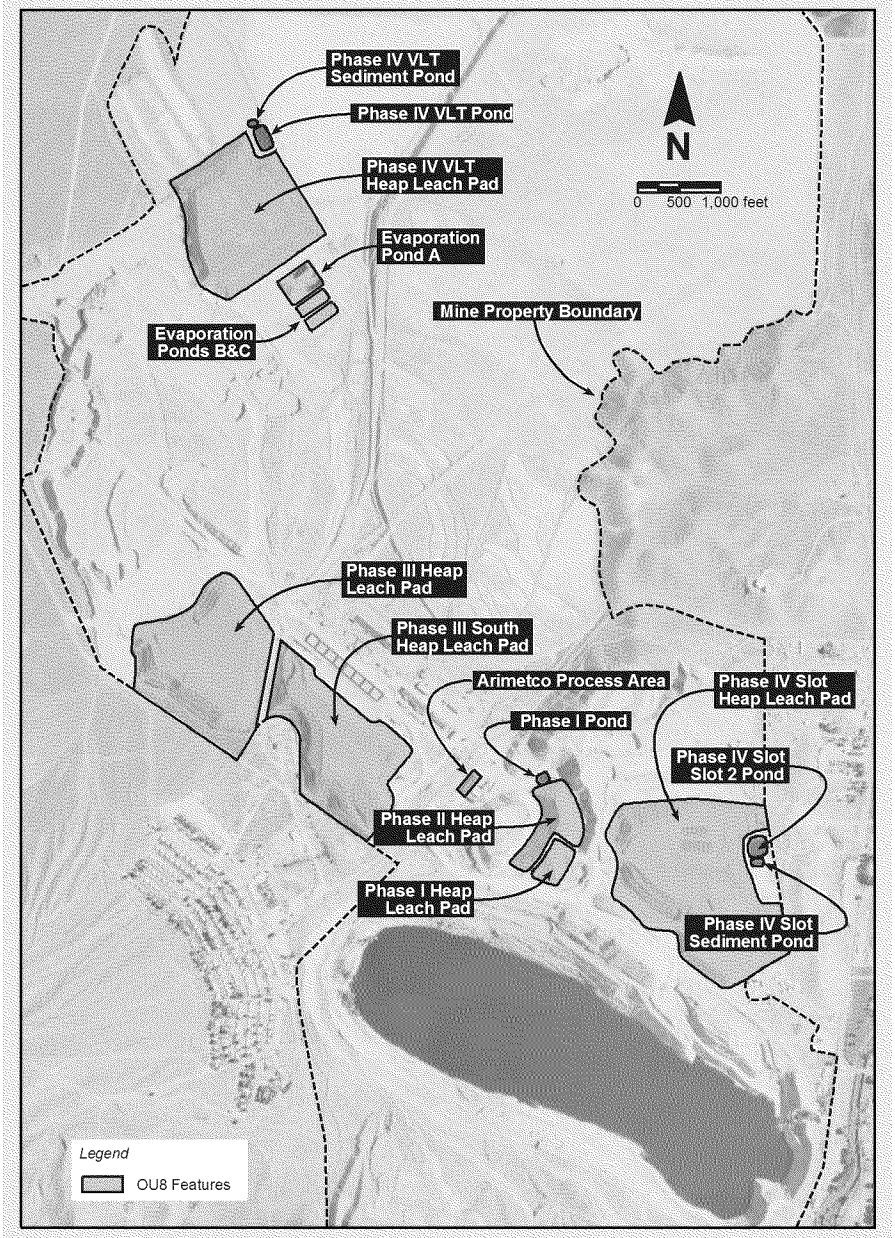
The agencies decided to act more quickly on these higher priority OUs due to the potential human health and environmental risks posed by these OUs. The remaining OUs - OU-2 (Pit Lake), OU-4b (Sulfide Tailings), OU-5 (Waste Rock Dumps), and OU-6 (Oxide Tailings) - pose less risk to human health and the environment; work on these OUs will proceed once the priority OUs have finalized the RI and FS, **Human Health Risk Assessments**, Proposed Plans, and Records of Decision (RODs), and remedial actions have begun.

This Proposed Plan addresses the surface features of OU-8 (see Figure 2) but does not address the shallow soils outside of the HLPs. The shallow soils in adjacent areas will be addressed at a later time.

Figure 2: OU-8 Features



OU-8 consists of the surface features (heap leach pads, fluid management ponds and conveyance channels), and shallow zone soils in the process areas associated with the former Arimetco Operations.

Summary of Site Risks

Solid materials and drain-down fluids in OU-8 contain COCs that pose a potential risk to individuals and wildlife that come into contact with them. Although these contaminants are naturally occurring, residual materials from past ore extraction and processing activities contain these contaminants at higher concentrations than in native rock and soil. EPA evaluated the risk to humans from these contaminants in a study called a Human Health Risk Assessment. For potential effects to area biota, EPA completed a **Screening-Level Ecological Risk Assessment (SLERA)**. A summary of the risk assessment process and the results of the risk assessment for OU-8 are presented in this section of the Proposed Plan.

Human health risk assessments estimate the potential health risks to people from exposure to contamination either now or in the future. For EPA studies, "risk" is the probability of harm to people from exposure to contaminants. Two types of health risks for people are evaluated: the risks that can cause cancer, and the risks that can cause other health effects. The results of the risk assessment are used to determine if the contamination at a site poses an unacceptable risk to human health or the environment under CERCLA. For cancer risk, EPA calculates an increased likelihood of developing cancer from exposure to a site contaminant over a person's life time. For non-cancer health effects, EPA calculates a hazard quotient (HQ) or hazard index (HI). The non-cancer hazard index has a threshold below which EPA does not expect any non-cancer health effects. If the HQ or HI is 1.0 or higher, it is possible that exposure to site contaminants could be a risk to human health. Because site risk assessments found that potential human health risks exceeded acceptable levels, a determination was made to develop remedial alternatives to reduce the risk.

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Human Health Risks

The risk assessment indicates that for the HLP materials, arsenic, chromium, radium-228, and uranium-238 are the primary contributors to human health risk from OU-8, based on their concentration, toxicity, locations throughout OU-8, and potential for humans to come into contact with them. At some locations, the contaminants cobalt and copper are also primary contributors to the potential risk from OU-8.

The risk assessment includes evaluation of potential exposure to the HLP materials and drain-down fluids based on current and reasonably anticipated uses of land on and adjacent to OU-8. Access to OU-8 is currently restricted by fencing around the former Arimetco Property, thus limiting the potential for direct contact with these materials. However, future land uses may change and increase exposure. The current landowners of OU-8, Singatse Peak Services, and the BLM (as United States land manager) indicate mining is a potential future use of these properties. The timing of this potential future use is dependent on uncertain economic factors, including the price of copper on the world market. If SPS determines that mining is not viable and vacates the Property, other reuse options become more likely. Variable OU-8 topography is likely to limit building development on several areas, but there are level areas where future development may bring people into contact with contaminants of concern. Mixed private and federal ownership of the land, along with the presence of contamination also limits re-development potential due to federal restrictions associated with transfer of contaminated land. Input from the community gained as part of Site Reuse Assessment for the Mine Property completed by EPA in April 2010 indicates a range of potential reuses, with mining considered to be most likely. Current and future

Are Neighboring Agricultural Products Safe?

Agricultural products grown in the area have been tested and there is no evidence that OU-8 or the Anaconda Copper Mine Site has had any impact on agricultural production. Most agriculture fields in the Mason Valley are located away from the Anaconda Site, either hydrologically up-gradient or not hydrologically connected to the Site at all.

Is the Site Safe?

The results of the risk assessment indicate that incremental cancer risks exceed 1 in 1,000,000 for exposure to OU-8 HLP materials at each of the HLPs under the on-site outdoor worker, indoor worker and construction worker scenarios, and at 3 of the 5 HLPs for the trespasser scenario. The maximum cancer risk to an outdoor worker exposed to OU-8 materials at the Phase IV vat leach tailing HLP, is 8 in 100,000, primarily through ingestion of soil materials. The contaminants driving this risk are arsenic, chromium, radium-228, and uranium-238. The non-cancer health effects evaluation found that for all the HLPs, the construction worker scenario results exceeded the threshold at which exposure to contaminants could pose a non-cancer health risk. The contaminants driving this risk are arsenic, cobalt and copper. Results found that all other exposure scenarios would not exceed the non-cancer threshold for risk. The drain-down fluids were also reviewed and it was determined they exhibit low pH levels (≤ 2.5) which, if contacted with a person's eyes or skin, could cause irreversible and extensive eye and skin injuries.

On the basis of these potential cancer and non-cancer risks from exposure to the HLP materials, and the potentially immediate damage to persons exposed directly to the drain-down fluids, remedial action to address these threats at OU-8 is warranted.

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adjacent land uses include residential, agricultural, light industrial and commercial uses.

Based on these current and reasonably anticipated future land uses, risk presented by OU-8 contaminants of concern was evaluated for the following populations on-site: industrial construction workers, trespassers, and future residential children and adults. Risk to off-site residents (outside of the Property) was also evaluated.

Ecological Risks

The SLERA identified contaminants of concern in OU-8 surface materials and drain-down solutions that were present at concentrations that may cause adverse effects to terrestrial wildlife (birds, mammals, insects, reptiles, and plants). Aquatic habitat supportive of aquatic species is not present, but the risks of exposure to drain-down fluids by terrestrial wildlife was evaluated. The primary contaminants of concern for wildlife included copper, lead, mercury, molybdenum, selenium, thallium, and zinc from surface materials and copper and uranium from drain-down solutions. The assessment found that potential chronic risks are likely overestimated due to lack of habitat and food resources within OU-8. However, the SLERA noted that concentrations of aluminum and copper and the low pH in the evaporation pond fluids are at levels acutely lethal to birds and mammals. Current bird deterrence measures help to limit the potential for bird exposure to pond fluids, but are not considered a permanent solution.

Risks to Groundwater

Part of the risk posed by OU-8 is the potential for additional groundwater contamination if drain-down fluids are not continuously controlled. Because the heaps are not covered, precipitation on the heaps continues to generate acidic fluids that require ongoing management in the fluid management system. Failure to reduce the generation of, or continuously manage these fluids, is likely to result in releases to soil and groundwater from the system. Additional contamination of groundwater will increase risk associated with beneficial uses of that groundwater, including its currently designated use as a domestic water supply. Although past releases and potential future releases from OU-8 and other Operable Units at the Site also have the potential to contaminate groundwater, the actual risk evaluation of exposure to contaminated groundwater both on the Mine Property and in other areas will be completed separately as part of Operable Unit 1 Site-wide Groundwater study.

It is the collaborative best professional judgment of the agencies that active measures are necessary to protect public health and the environment from actual or threatened releases of hazardous substances into the environment.

Remedial Action Objectives

Remedial Action Objectives **(RAOs)** focus on isolating the contaminant source, preventing contact with contaminant sources, and limiting further migration of metals contamination from source areas into surrounding soil, surface water and groundwater.

The RAOs:

1. Prevent ingestion/direct contact with heap leach materials and fluids containing contaminants of concern (COCs) above human health risk-based levels;

2. Minimize exposure to heap leach materials and fluids containing contaminants of ecological concern at levels that are harmful to ecological receptors;

These first two objectives are source control objectives, which are established to protect humans and ecological receptors from mine residual materials.

3. Maximize groundwater protection by preventing migration of COCs to groundwater at levels above maximum contaminant levels (MCL).

This objective is an additional source control objective to prevent further degradation of groundwater.

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Description of Remedial Alternatives

The agencies selected four remedial alternatives for evaluation and have reached agreement on the selection of a Preferred Alternative. Each of the Alternatives are described separately below.

Alternative 1	FS Alternative 2	No Further Action Alternative
Alternative 2	FS Alternative 6a	Passive Evaporation and Top Capping of HLPs
Alternative 3	FS Alternative 8a	Passive Evaporation and Complete Capping of HLPs
Alternative 4 (Preferred Alternative)	Combination - key elements of FS Alternatives 6a and 8a, plus stormwater management.	

Each of these alternatives are categorized as somewhat to mostly compliant with the RAOs, implementable, and effective, and they range from relatively low to very high cost of implementation and O&M.

Other alternatives in the FS were rejected for final consideration as non-compliant, less cost-effective, or impractical to implement. The FS is available in the information repositories, and is part of the administrative record; more detail on the alternatives may be found in the FS.

The 2015 FFS focused on a combination of key elements of FS Alternatives 6a and 8a, and after careful evaluation of RAOs, cost estimate analyses, and discussions between NDEP and EPA, it was determined that some combination of Alternatives 6a and 8a (PP Alternatives 2 and 3), with the addition of stormwater management, accomplished the goals and objectives while maintaining a reasonable cost. A brief discussion of each alternative is presented, followed by an evaluation of each alternative.

Alternative 1 (FS Alternative 2)
No Further Action

Alternative 1, a baseline for comparing other alternatives, continues the existing FMS O&M activities. It is a required alternative in the evaluation process. It specifically includes active fluids collection, passive evaporation of pond fluids, HLP perimeter ditch rehabilitation and maintenance, wildlife deterrent measures for all ponds, and site access controls. Institutional controls that restrict human and wildlife contact with materials are inherent in the ongoing O&M activities.

The 30-year Net Present Value (NPV)* cost of Alternative 1 is approximately $2.1 million. The estimated costs are mostly associated with long-term O&M requirements, with $1,740 allocated for capital expenses and $168,500 allocated for annual O&M costs.

*** Net Present Value (NPV)**

Net Present Value (NPV) is the cost in today's dollars of a project's total costs, including post- construction operations and maintenance activities, taking into account the time value of money.

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Estimated Engineering and Construction Costs for Alternatives 2, 3 and 4

Given uncertainties regarding the availability of soil borrow areas and associated haul distances, specific requirements for new pond construction and existing pond closure, and other unknown design constraints not currently factored into the final remedy, the actual costs are potentially highly variable from the costs estimated in the alternatives.

Alternative 2 (FS Alternative 6a)
Passive Evaporation and Top Capping of HLPs

Alternative 2 includes all the components included in Alternative 1, plus closure of the existing pond system, except for the EPA 4-acre pond which will be subdivided into two cells using a berm. A new 2-acre concrete basin divided into four cells will be constructed for solids dewatering and management (see Figure 3). A solids repository for residuals from liner replacement will be constructed on a graded, existing HLP pad location, which will be constructed and closed. Access restrictions and engineering controls will be implemented. Leak detection monitoring will be performed on the ponds. As part of routine O & M, the pond liner will be replaced. Based on the age of the pond this will occur in approximately 10 years.

Each HLP will be graded, and an ET soil cap will be constructed on the top of each HLP. The ET soil cap will be approximately 4 feet in thickness including 6 inches of vegetative cover with the remainder constructed from on-site soils which have been found to meet the criteria for ET soil cap construction. Sealants and sprays will be applied on sideslopes on all HLPs for dust control. ET soil caps manage precipitation water by storing it in a layer of soil from which it is removed through evaporation. Drain-down fluids will continue to be contained and will be treated via enhanced evaporation. Treatment residuals consist of precipitated drain-down fluid solids that are known to be high in metals. Monitored Natural Attenuation (MNA) will occur which, in the context of this Proposed Plan, refers to the attenuation over time of the quantity of drain-down fluid and metals concentrations therein. Drain-down fluids will be regularly monitored, sampled and analyzed to assess the quantity and quality over time. Alternative 2 will require eventual closure of the existing 4-Acre Pond (as well as the on-site solids repository) at project completion, although closure is not included in the 30-year net present value cost estimate for this alternative.

The 30-year NPV cost of Alternative 2 is approximately $29.7 million. The estimated costs are broken down into $21,128,500 for capital expenses and $686,300 allocated for annual O & M expenses.

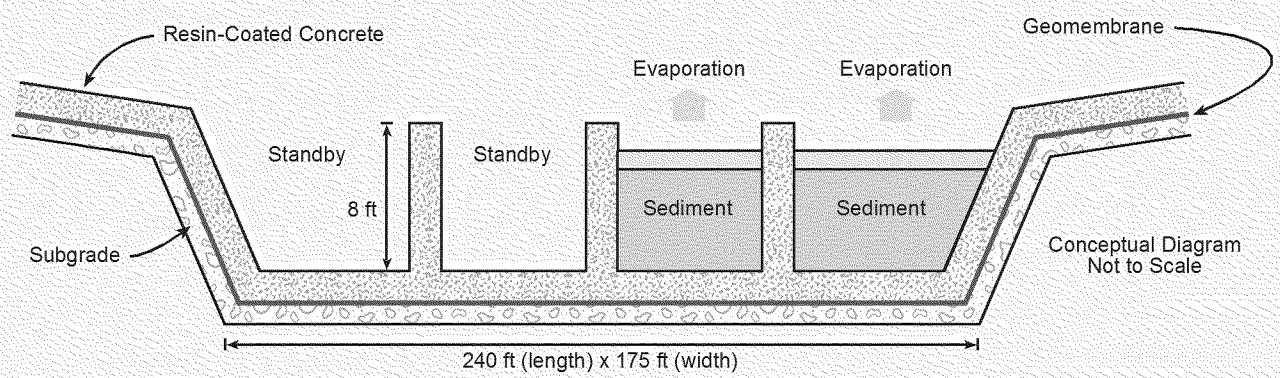

Figure 3: *Concrete Evaporation Basin*

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Alternative 3 (FS Alternative 8a)
Passive Evaporation and Complete Capping of HLPs

Alternative 3 includes all the components of Alternative 2 with the addition of major re-grading, re-shaping and capping (with a 4-foot-thick ET soil cap, see Figure 4) of the entire HLP surface areas (not just the top deck) to minimize infiltration of stormwater and keep clean water from becoming contaminated through contact with heap materials. Complete capping will be performed on all HLPs. Spillways will be installed atop the HLPs to collect and convey stormwater away from the HLPs. Alternative 3 will also require eventual closure of the existing 4-Acre Pond (as well as the onsite solids repository) at project completion, although closure is not included in the 30-year net present value cost estimate for this alternative.

The 30-year NPV cost of Alternative 3 is approximately $58.2 million. The estimated costs are broken down into $51,738,000 for capital expenses and $519,200 allocated for annual O & M expenses.

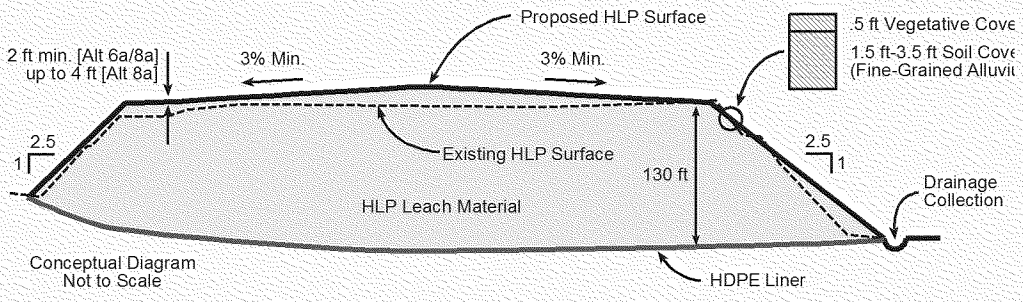

Figure 4: *Cross-Section of a Cap*

Alternative 4 (Preferred Alternative)
Modified Evaporation, Complete Capping of HLPs, Pond Conversion to E-cells and Stormwater Management

Alternative 4 includes all the components of Alternative 3 except the ET soil cap over the HLPs will only be two (2) feet thick, plus conversion of some existing ponds to E-Cells (Figure 5), and stormwater management actions are included. In addition, this alternative replaces the new 2-acre concrete basin (Alternative 3) with reprocessing and removal or in-place closure of precipitates in the existing 4-acre pond; and installation of four new stormwater management basins. The stormwater management includes a plan (Figure 6) that will store and route stormwater using piping, open channels (Figure 7), and stormwater basins. The system will be designed and constructed with the long-term objective of connecting to and complementing site-wide stormwater management features as they are constructed in the future.

The minimum 30-year NPV cost of Alternative 4 is approximately $36.1 million. The estimated costs are broken down into minimum of $30.4 million for capital expenses and approximately $381,700 allocated for annual O & M expenses.

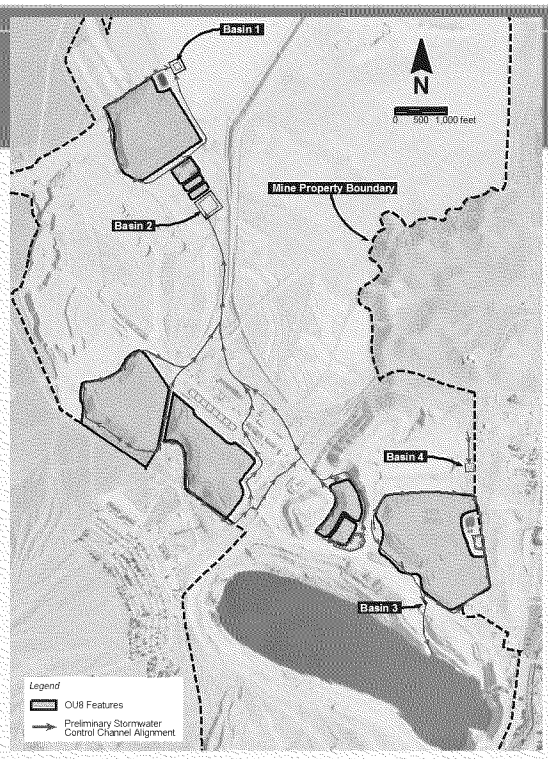

Figure 6: *Stormwater Drainage Plan*

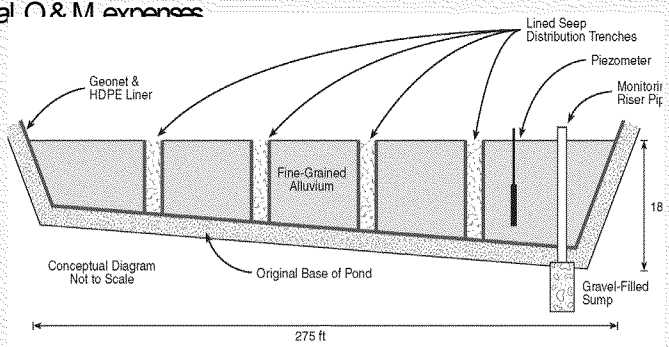

Figure 5: *E-Cell*

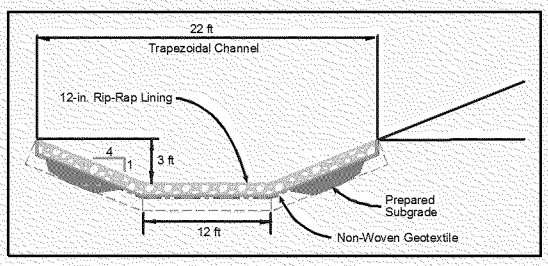

Figure 7: *Stormwater Drainage Channel*

Discussion of Nine Criteria: Threshold Criteria, Primary Balancing Criteria and Modifying Criteria

Threshold Criteria include:

1. Protection of human health and the environment

This criterion addresses how the alternative achieves and maintains protection of human health and the environment. It focuses on whether a specific alternative achieves adequate protection from site risks.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This criterion addresses how the alternative performs relative to mine closure and water protection requirements.

Primary Balancing Criteria include:

1. Long-term effectiveness and permanence

This criterion addresses the long-term effectiveness of alterna tives in maintaining protection of human health and the environment and their relative permanence. It is an assessment of how the system will perform years into the future.

2. Reduction in toxicity, mobility and volume

This criterion addresses the ability of the alternative to permanently or significantly reduce toxicity, mobility or volume of contaminants. It addresses the type and quantity of treatment residuals remaining at the site, and the degree to which treatment reduces the inherent hazards posed by principal threats at the site.

3. Short-term effectiveness

This criterion addresses the impacts of the alternative during construction and implementation until the project's initial objectives and goals are met. The criterion is also used as a measure of how quickly an alternative can meet remedial action objectives.

4. Implementability

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of services and materials, including technical difficulties and unknowns associated with the construction and operation of a technology and the ability to monitor the effectiveness of the remedy.

5. Cost

This criterion addresses the capital, operations and maintenance costs of each alternative.

Modifying Criteria include:

1. State acceptance; and,
2. Community acceptance.

Evaluation of Alternatives 1, 2 and 3

Each of the final closure alternatives evaluated in the FS, and further focused in the FFS, are outlined above and discussed below. For more detailed analyses of all the remedy alternatives, those retained and those rejected by the agencies, the reader is directed to the 2016 Final FS, which can be found at the Site's information repositories listed at the end of this Plan. Each of the Agency-retained alternatives was scored for its effectiveness in addressing seven of the nine criteria. The community acceptance criterion will be considered during the public comment period for the Proposed Plan. The state acceptance criterion is inherently met as this Proposed Plan is developed and approved by the State, together with EPA and BLM.

Alternative 1 Evaluation
No Further Action

Some of the site RAOs would be achieved with Alternative 1. This alternative would not be protective because human health and ecological risks to exposure of contaminated drain-down fluids and HLP materials would be reduced, but not eliminated. Similarly, the risk of leaks and possible groundwater contamination would be reduced, but not eliminated. The human health risk would be reduced by maintaining existing site access controls and FMS operations, and the ecological risk would be reduced by maintaining existing wildlife deterrents. FMS operations and perimeter ditch maintenance and rehabilitation would reduce, but not eliminate, the risk of leaks and possible contamination of groundwater. This alternative would not reduce infiltration of precipitation, and collection of drain-down fluids would continue. No action would be taken to protect groundwater or prevent ecological exposure to HLP materials.

Alternative 1 would only comply with ARARs to the extent that the existing infrastructure of ponds and HLPs meet Nevada Administrative Code requirements for groundwater

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protectiveness and containment of heap leach materials. Mine closure ARARs would not be met.

The volume of contaminated fluids in the ponds would be reduced as evaporation occurs, if the evaporation rate exceeds the drain-down rate. The mass of contaminants would remain the same, although as solids are generated through precipitation, their mobility decreases. No other treatment or disposal of contaminated solids is included in this Alternative. The toxicity of fluids emanating from the HLPs will decrease over time as acidity and dissolved metals are removed by flushing.

Long-term effectiveness and permanence would not be achieved. Short-term effectiveness remains the same as no additional risk is incurred. Alternative 1 is implementable and is currently being implemented. In reality, as solid precipitates accumulate and reduce fluid capacity, additional ponds would need to be constructed in perpetuity; the costs for that long-term activity is not included in this Alternative. Estimated time for construction and implementation of Alternative 1 remedy is 1 year.

Alternative 2 Evaluation

Passive Evaporation and HLP Top Capping

In Alternative 2, there is an increased potential that all of the RAOs would be met because the ET soil covers further reduce potential human and ecological exposure to HLP materials and reduce long-term generation of drain-down fluids, thereby reducing potential releases to groundwater. Much of the existing FMS system will be either upgraded or closed, reducing potential releases to groundwater. However, even with installation of the evaporative soil cover and the considerable FMS improvements, it is not certain that complete protection of groundwater from releases of drain-down fluids will be achieved. Therefore, Alternative 2 is not protective because human health and ecological risks would be further decreased but not entirely eliminated.

Alternative 2 would likely comply with ARARs by upgrading the FMS components and installing the evaporative covers on the HLPs. The new FMS facilities will meet State of Nevada ARARs and combined with the HLP covers provide a reasonable chance of meeting state ARARs for groundwater protectiveness and HLP closure requirements. However, fully complying with all ARARs will depend on the condition of HLP liners and portions of the FMS.

Due to the top cap greatly reducing infiltration of fluids through the HLPs, drain-down fluid rates will be greatly reduced. However, contaminant mass and volume would not be substantially reduced. Short-term risks to exposure from dust inhalation during cap construction would be increased. Alternative 2 is deemed more difficult to implement than Alternative 1. Estimated time for construction and implementation of Alternative 2 remedy is 2 years.

Alternative 3 Evaluation

Passive Evaporation and Complete Capping of HLPs

Under Alternative 3, it is anticipated that the RAOs would be met because the complete capping with the ET soil covers further reduces potential human and ecological exposure to HLP materials and reduces long-term generation of drain-down fluids, thereby reducing potential releases to groundwater. Alternative 3 would be protective, primarily due to the complete capping of HLPs, including sideslopes.

This alternative more closely approaches mine closure practices under the Nevada Administrative Code. The new FMS facilities would meet State of Nevada ARARs and combined with the HLP covers would provide a reasonable chance of meeting state ARARs for groundwater protectiveness. This alternative would likely comply with HLP closure requirements. Full compliance with all ARARs would depend on the effectiveness of the ET cover and condition of existing HLP liners and portions of the FMS.

The drain-down fluid rate would decrease over time through storage and evaporation in the cap materials, but it is unclear how much the ultimate volume of drain-down fluids requiring treatment will change. As drain-down fluids are treated via evaporation, the mobility and volume of contaminated material decreases.

Long- term effectiveness would be increased and further reduction in infiltration and drain-down fluid rates would be achieved, although contaminant mass and volume may not change. Moderate to high short-term risks would be increased due to additional dirt moving work during construction. Alternative 3 is even more difficult to implement than the other Alternatives. Estimated time for construction and implementation of Alternative 3 remedy is 2 years.

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Alternative 4 Evaluation

Modified Evaporation Complete Capping of HLPs, Pond Conversion to E-cells, and Stormwater Management

It is anticipated that the RAOs would be met because the complete capping with ET soil covers further reduces potential human and ecological exposure to HLP materials and reduces long-term generation of drain-down fluids, thereby reducing potential releases to groundwater. This alternative would be protective, primarily due to the complete capping of HLPs, including sideslopes. Much of the existing FMS system would be either upgraded or closed, reducing potential releases to groundwater. Alternative 4 would be protective because the ET cover would eliminate or nearly eliminate infiltration into the HLPs, control stormwater runoff from the HLPs, and provide a complete barrier over the HLP materials, eliminating risks to human and ecological receptors from direct contact with HLP materials.

This alternative is consistent with similar HLP closures recently approved by NDEP under the Nevada Administrative Code. The new FMS facilities would meet State of Nevada ARARs and combined with the HLP covers would provide a reasonable chance of meeting state ARARs for groundwater protectiveness and HLP closure requirements. However, full compliance with all ARARs would depend on the effectiveness of the ET cover and condition of existing HLP liners and portions of the FMS.

The use of complete capping would increase the effectiveness and permanence of the action. Although the cover is a minimum of 2 feet thick, the thickness is consistent with the current practices for HLP closure in Nevada and is considered effective and permanent. Use of a cover across the entire surface of the HLP reduces infiltration. Drain-down fluids would continue to be contained and treated via evaporation, thereby reducing the mobility and volume of contaminated material. The most significant potential short-term impact on workers and the surrounding community is dust generation during construction. Estimated time for construction and implementation of Alternative 4 remedy is 2 to 3 years.

Summary of the Evaluation of Alternatives

Of the 4 alternatives, Alternative 1 is the least favorable. Alternative 1 does not meet all of the RAOs, is not protective, and does not meet ARARs. Therefore, this alternative is not discussed further. Alternatives 2, 3, and 4 will comply with ARARs by managing the heap leach fluids through use of ET-caps or a combination of a cap and sealants to meet Nevada Administrative Code requirements for groundwater protectiveness. Alternatives 3 and 4 have the greatest potential to comply with HLP closure requirements because each of these alternatives completely cap the HLPs. Alternative 2 addresses RAOs and protection of human health and the environment through a combination of a deck top ET cap, sealants of the side slopes of the HLPs and access restrictions (site access controls, and wildlife deterrent measures). However, even with installation of the ET soil cover and the considerable fluid management system improvements, it is not certain that complete protection of groundwater from releases of drain-down fluids would be achieved. Alternatives 3 and 4 have the added protection of extending the ET cap to the side slopes of each HLP which will increase both the protectiveness and long-term effectiveness of these two alternatives and achieve RAOs. Alternatives 2, 3, and 4 each have similar short-term risks associated with movement of heap leach materials during grading and capping and management of fluids. Alternatives 2, 3, and 4 each used standard methods for excavation, grading and capping. Alternative 3 is the most difficult to implement due to the larger volume of soils to be moved for grading and construction of the cap. Alternatives 2, 3, and 4 each achieve a reduction in toxicity mobility and volume through treatment. Drain-down fluids would continue to be contained and treated via evaporation, thereby reducing the mobility and volume of contaminated material. Alternative 4 costs less than Alternative 3, and is a comparable cost to Alternative 2.

Preferred Alternative

Based on the evaluation presented in this Proposed Plan, Alternative 4– Modified Evaporation, Complete Capping of HLPs, Pond Conversion to E-cells and Stormwater Management is the preferred alternative to address the potential human health and ecologic risk from the heap leach materials and drain-down fluids and prevent migration to groundwater.

This Alternative is recommended because it will meet the RAOs and achieve substantial risk reduction by both treating the source materials constituting principal threats at the Site, and providing safe management of remaining material. This combination reduces risk sooner than the other alternatives and costs less than Alternative 3, and is a comparable cost to Alternative 2. The Agencies agree that a maximum degree of protectiveness occurs with Alternative 4 actions, although, as in Alternatives 2 and 3, short-term exposure risks are increased. This alternative also more closely adheres to NDEP Bureau of Mining Regulation and Reclamation closure requirements and guidance, which are required at active, permitted mines in Nevada. These closure requirements are also deemed important standards for closure of Abandoned Mine Land sites. The thickness of the cap is a minimum of two feet, which is consistent with current practices in Nevada for HLP closures. The ARARs are also met because

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leachate is controlled. Alternative 4 is deemed more effective than Alternatives 2 and 3 with the addition of the routing of non-contact stormwater flow around the HLPs and FMS. Additional cost savings are realized as well due to reduction in O&M tasks related to the closure of all ponds not needed to manage residual drain-down fluids. Phasing of Alternative 4 remedy construction and implementation is timed for 2-3 years. The preferred alternative will meet all RAOs by:

- Construction of an ET soil cap over the entire surface (top deck and sideslopes) of each of the HLPs will remove the pathways for contact (ingestion/direct contact) for both human and ecological receptors to the heap leach materials.
- The ET soil cap will prevent as much precipitation as possible from infiltrating the heap leach pad materials effectively reducing drain down flows and associated management costs. The stormwater management system will route non-contact stormwater out of the fluid management system, reducing fluid management requirements.
- The ET soil cap will maximize protection of groundwater by reducing the generation of drain-down fluids. Drain-down fluids would continue to be contained and treated via evaporation, thereby reducing the mobility and volume of contaminated material.

Based on information currently available, the agencies believe the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The agencies expect the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost- effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element.

The Preferred Alternative can change in response to public comment or new information. Additionally, some aspects of closure elements, including, but not limited to, cap design and cap material selection will be specified during the remedial design phase. The details of those design-related elements are not specified in this Proposed Plan.

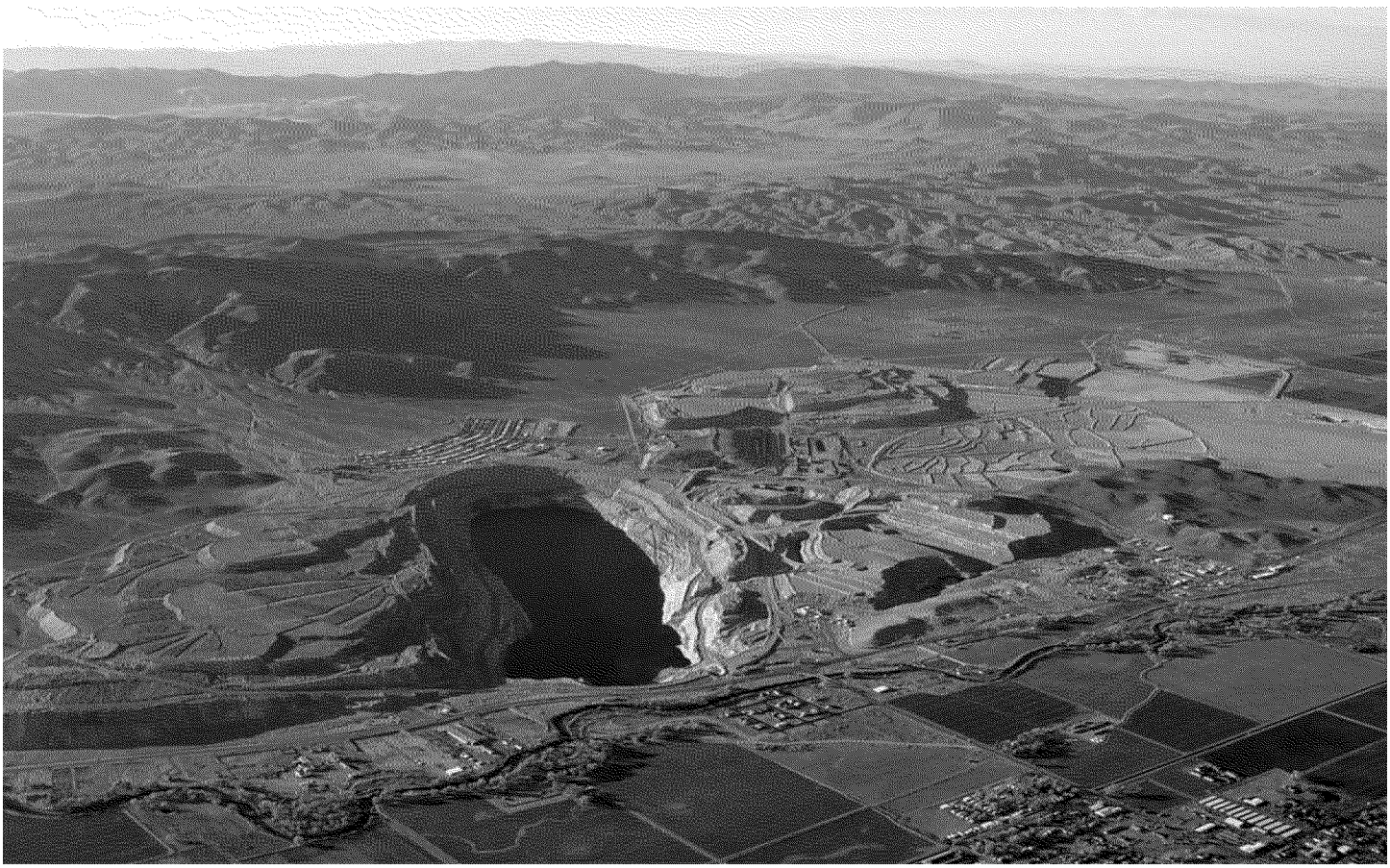

Figure 8: *Anaconda Copper Mine*

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List of Acronyms and Abbreviations

ARAR Applicable or Relevant and Appropriate Requirements

ARC Atlantic Richfield Company

BLM Bureau of Land Management

CERCLA Comprehensive Environmental Response, Compensation and Liability Act

COC Contaminant of Concern

EPA U.S. Environmental Protection Agency

ET evapotranspiration

FMS Fluid Management System

FS Feasibility Study

FFS Focused Feasibility Study Conceptual Closure Plan

gpm gallons per minute

HLP Heap Leach Pad

MCL Maximum Contaminant Level

NDEP Nevada Division of Environmental Protection

NPV Net Present Value

O&M Operations and Maintenance

OU Operable Unit

RAO Remedial Action Objective

RI Remedial Investigation

SLERA Screening Level Ecological Risk Assessment

SPS Singatse Peak Services

Glossary of Terms

Applicable or Relevant and Appropriate Requirements (ARARs) – Any state or federal statute or regulation that pertain to the protection of human health and the environment in addressing specific conditions (chemical, action, and location) or use of a particular cleanup technology at a Superfund site.

Contaminant of Concern (COC) – A chemical that significantly contributes to unacceptable risks to human health.

Contaminant of Ecological Concern – A chemical that significantly contributes to unacceptable risks to ecological receptors.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – The Federal law that addresses problems resulting from releases of hazardous substances to the environment.

Drain-down Fluid – The solution that is collected at the bottom of the heap leach pad that typically contains salts and metals.

Evaporation ponds – These are artificial ponds with large surface areas designed to efficiently evaporate water by convection. These ponds are also used to separated ores or sediment from water.

Feasibility Study (FS) – A process under CERCLA to develop, screen, and evaluate various remedial alternatives being considered for selection of a remedial action.

Fluid Management System (FMS) – A network of ponds and ditches used to separately convey and treat drain-down fluids, and collect and discharge stormwater.

Heap leach pad (HLP) – Heap leaching is a mined ore extraction process for recovering metals. In the process crushed ore is placed on a liner which constitutes a HLP and a liquid is passed through the crushed ore, creating a drain-down fluid that is concentrated in dissolved metals for recovery. At the end of mining operation, a HLP may be left in place with steps taken to prevent continued leaching of metals.

Human Health Risk Assessment – A study that provides an evaluation of the potential threat to human health in the absence of any remedial action.

Remedial Investigation (RI) – A process under CERCLA to determine the nature and extent of the problem presented by a contaminant release.

Screening-Level Ecological Risk Assessment (SLERA) – A study that estimates the possible effects of contamination on plants and animals in the absence of any remedial action.

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EPA Anaconda Copper Mine

Public Participation and Solicitation of Comments

The agencies will accept public comments for thirty (30) days from November 21 to December 21. Persons providing comments should be aware that this public comment period is an opportunity to comment not only on this preferred action, but also on the alternatives that were considered by the agencies. Comments will be accepted by mail, email or fax. Comments will also be accepted during Public Meetings on December 12, 2016. Please reference the "Anaconda Copper Mine Proposed Plan" in your submitted comments.

Comments should be submitted to the following contact:

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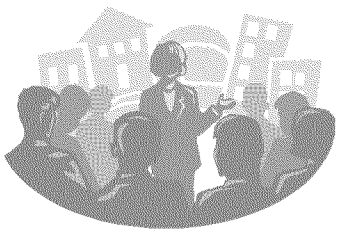

Information Repositories Locations

Nevada Division of Environmental Protection
901 S. Stewart St.
Carson City, NV 89701

Bureau of Land Management
1340 Financial Blvd
Reno, Nevada 89502

Yerington Public Library
20 Nevin Way
Yerington, NV 89447

US Environmental Protection Agency
Region 9 Superfund Division (SFD-1)
75 Hawthorne St.
San Francisco, CA 94105

United States Environmental Protection Agency, Region 9
75 Hawthorne Street (SFD-6-3)
San Francisco, CA 94105
Attn: Sarah Cafasso (Anaconda 11/16)

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