

5. COMPARISON OF ALTERNATIVES

This chapter compares the impacts of each of the alternatives to resources. Impacts to each resource by alternative are detailed in the Environmental Consequences sections of Chapter 3.

Table 5-1 summarizes the potential impacts of each alternative for each resource.

5.1. COMPARISON OF ALTERNATIVES

Chapter 2 provides a detailed description of the No Action Alternative, the Proposed Action, and the Agency Modified Alternative (AMA); a summary is provided here for reference.

5.1.1. No Action Alternative

The No Action Alternative is the baseline upon which potential impacts can be measured due to the Project. Under the No Action Alternative, DEQ would not approve the Proponent's application for an operating permit under the MMRA, an MPDES Permit, or an Air Quality Permit. The Proponent would not be able to construct and operate the proposed mine. Land within the Project site would remain largely as it is today (see Affected Environment sections of Chapter 3), with the exception of potential exploration activities. Impacts of the No Action Alternative would be limited to the current land use activities associated with cattle grazing and hay production, and the potential continuation of exploration activities conducted by the Proponent under its Exploration License No. 00710.

5.1.2. Proposed Action

The Proposed Action is described in detail in Section 2.2 of this EIS, and summarized here with a focus on Project details relevant to proposed changes associated with the AMA.

The Proponent intends to construct, operate, and reclaim a new underground copper mine over 19 years and thereafter monitor and close the site. Project construction would occur in Mine Years 0 through 2; Project operations (active mining) would occur in Mine Years 3 through 15. Tailings would total 12.9 million tons over the life of the Project. The tailings would be thickened and sent to a paste plant where cement, slag, and/or fly ash may be added to the tailings as a binder. These cemented paste tailings would be piped either to the underground mine to backfill workings or to a double-lined tailings basin called the CTF. During operations, all water would be routed to the WTP for treatment. The treated water would then either be routed to the Sheep Creek alluvial UIG or TWSP, or used in the internal mine processes.

Project reclamation and closure would occur in Mine Years 16 through 19. Closure and reclamation would focus on removal of surface infrastructure and exposed liner systems, covering exposed tailings, and revegetation of the site. Mine closure would include the continued backfilling of all underground mined-out stopes and some primary and secondary access drifts with fine-grained, low permeability, cemented paste tailings. The decline, access ramps, and ventilation shafts would not be backfilled. Mine workings would be sequentially flooded at closure. Prior to the final flooding in a particular portion of the mine, the walls of the workings within that zone would be rinsed to remove oxidation products. Rinse water would be collected,

pumped, and treated as necessary, and the rinsing process would be performed repeatedly for a particular segment of the mine. The zone would then be flooded with groundwater and a hydraulic barrier would be installed. In all, 14 hydraulic barriers would be installed in the underground workings. The primary purpose of the hydraulic barriers is to segment the mine workings based upon sulfide content to facilitate rinsing and improve water management. The Proponent would continue to treat water until groundwater non-degradation criteria are attained.

Impacts of the Proposed Action on each resource are presented in **Table 5-1**.

5.1.3. Agency Modified Alternative: Additional Backfill of Mine Workings

The AMA is described in detail in Section 2.3 of the EIS, and is summarized here. The AMA includes all elements from the Proposed Action with one replacement component: backfilling additional mine voids as part of mine closure, as compared to the Proposed Action. The AMA was proposed by DEQ to further reduce the potential for groundwater mixing between upper and lower aquifers, and further reduce potential groundwater contamination from exposed underground mine surfaces at closure compared to the Proposed Action.

The AMA proposes to backfill the decline, access ramps, ventilation shafts, and all mine voids in the USZ and LSZ with a low hydraulic conductivity material consisting of cemented paste tailings generated from mill processing of the stockpiled ore and/or waste rock at the end of operations. Hydraulic barriers would be used to separate the backfilled and open areas of the access decline. The AMA would result in extended production of cemented tailings, as well as a small increase in truck traffic.

The potential environmental and social impacts of the AMA are evaluated for each resource in Chapter 3, and are summarized in **Table 5-1**. The AMA is expected to have the same impacts to each resource as the Proposed Action, with the following exceptions:

- **Air Quality:** Emissions from extended production of cemented tailings to backfill more of the mined areas are a small fraction of emissions from the Proposed Action, and are likely to have little impact on the air quality resource.
- **Surface Water and Aquatic Biology:** Additional backfill of the mine workings would potentially reduce impacts to base flow in Coon Creek.
- **Transportation:** Additional backfilling associated with the AMA would marginally increase truck traffic compared to the Proposed Action over a 4-year period. These additional trips would not meaningfully change the traffic impacts described for the Proposed Action.
- **Wildlife:** There would potentially be a slight increase in mortalities due to more vehicle traffic onsite associated with additional backfilling. Fencing around the facilities would exclude large mammals from this impact, but birds and small mammals could still be impacted (low likelihood).
- **Groundwater Quality:** Backfilling would further reduce the potential for groundwater mixing between upper and lower aquifers, and further reduce potential groundwater contamination from exposed underground mine surfaces at closure compared to the Proposed Action.

**Table 5-1
Comparison of Project Impacts by Alternative**

Resource Area / Impact ^a	No Action Alternative	Proposed Action	Agency Modified Alternative
Air Quality			
Ambient Air Quality Standards	No change from current condition.	Predicted impacts for criteria pollutants at all offsite locations comply with health-based Montana and federal primary standards, which are protective of ambient air quality.	Same as Proposed Action. Emissions from extended production of cemented tailings to backfill more of the mined areas are a small fraction of emissions from the Proposed Action, and likely to have little impact on the air quality resource.
Regional Haze/Visibility	No change from current condition.	Project emissions of haze precursor pollutants are sufficiently below regulatory thresholds to not warrant evaluation of haze/visibility impacts.	Same as Proposed Action.
Chemical Deposition	No change from current condition.	Predicted impacts from Project emissions comply with Montana and federal secondary air standards, which are protective with respect to chemical deposition impacts.	Same as Proposed Action.
Cultural/Tribal/Historic Resources			
Historic Properties	Historic properties have been impacted by subsurface archaeological testing and Project-related, ground-disturbing activities. Additional mitigation would not occur under the No Action Alternative.	Historic properties have been impacted by subsurface archaeological testing and Project-related, ground-disturbing activities. Historic properties would be avoided or would be mitigated with a SHPO-approved treatment plan.	Same as Proposed Action.
Groundwater Hydrology			
Groundwater Quantity	No change from current condition.	Mine dewatering would extensively lower groundwater levels around the mine, somewhat reducing base flow in nearby creeks; potentially impacting springs and seeps within the cone of depression. Operation of UIG would increase groundwater discharge, partially compensating mine-dewatering caused by decreased base flow. Operation of a NCWR would potentially increase groundwater discharge, partially compensating the mine-dewatering caused decrease in base flow.	Same as Proposed Action.
Groundwater Quality	No change from current condition.	The contact groundwater from post-mine voids ^b would migrate via shallow bedrock toward discharge zones mixing with non-contact groundwater; transport of chemicals dissolved in contact groundwater would be retarded by process of adsorption; groundwater discharging to Sheep Creek would not affect its water quality.	Backfilling would further reduce the potential for groundwater mixing between upper and lower aquifers, and further reduce potential groundwater contamination from exposed underground mine surfaces at closure compared to the Proposed Action.
Surface Water Hydrology			
Runoff Surface Disturbance	No change from current condition.	Surface disturbance is less than 1% of local watershed area. Best management practices and the relatively small percentage of the total area (<1%) of stream and wetland features would be impacted through surface disturbance during construction.	Same as Proposed Action.
Stream Flows	No change from current condition.	Diversion of water to the NCWR falls within existing leased water rights along Sheep Creek (pending review and approval by the DNRC).	Same as Proposed Action.
		Secondary impacts on base flow of Sheep Creek as a result of mine dewatering and disposal of treated water to the UIG are expected to be insignificant and to partially offset one another. A more significant impact upon base flow would be possible for Coon Creek (70% reduction) during mine dewatering and recovery. Pending approval by the DNRC, this would require an agreement with the water rights holder. No other creeks are present within the area of a 10-foot drawdown of the water table, as computed by the groundwater model.	Same as Proposed Action.

Resource Area / Impact ^a	No Action Alternative	Proposed Action	Agency Modified Alternative
Water Quality	No change from current condition.	Process water discharged to surface waters via UIG would be treated and therefore not impact water quality in Sheep Creek. The contact groundwater from post-mine voids would migrate via shallow bedrock toward discharge zones mixing with non-contact groundwater; transport of chemicals dissolved in contact groundwater would be retarded by process of adsorption; groundwater discharging to Sheep Creek would not affect its water quality.	Same as Proposed Action.
Land Use and Recreation			
Existing Land Use	No change from current condition.	A total of 311 acres of existing land use would be impacted, which would be reclaimed back to existing uses after mine closure (i.e., 19 years).	Same as Proposed Action.
Hunting, Fishing, and Boating	No change from current condition. Recreational opportunities and use levels, patterns, and growth trends would be expected to continue at current rates.	No direct impacts on hunting opportunities would occur. There is abundant adjacent habitat for big game species surrounding the Project area. No secondary impacts on fishing or boating would occur from surface water.	Same as Proposed Action.
Population Increase	No change from current condition.	Recreational resource demands may be higher during construction and operations given the increase in local population from construction workers and mine operators; however, given the number and abundance of regional recreational opportunities, it is not expected that mine employee recreational resources use would significantly deprive other regional recreationists from enjoying the same resources.	Same as Proposed Action.
Visual and Aesthetics			
Visual Resources	No change from current condition.	Impacts to visual resources during construction caused by removal of existing vegetation, temporary fencing, grading, construction of roads and mine structures, and increased construction vehicle traffic would be short term, medium frequency, local in scope, and partially reversible. Impacts to visual resources after reclamation would be long term, medium frequency, and local in scope.	Same as Proposed Action.
Socioeconomics			
Population Increase	No change from current condition. Current population and use trends would continue.	The Proponent expects to hire up to 200 contractors during construction and employ an operating workforce of 235 employees. The associated population influx (i.e., the number of in-migrating workers and their family members) would be distributed across area county and town populations. Growth in population due to Project workforce would mean increased demand for and use of socioeconomic resources, such as housing, public infrastructure, and services. The nature and extent of these impacts would depend on where in-migrating populations choose to reside, the ability of public service providers to serve fluctuating populations, and the ability of area residents to adjust to (and accept) changes in life style.	Same as Proposed Action.
Employment, Income, and Tax Revenues	No change from current condition. Current employment, income and tax revenues trends would continue.	In addition to employment and income impacts, affected government units would benefit from the additional tax revenues generated by the mine.	Same as Proposed Action.
Soils			
Soil Loss	No change from current condition. Erosion and sedimentation would occur at current rates along the existing roads. Loss of soil development characteristics would be limited to new disturbances planned in the Project area in the reasonably foreseeable future.	Potential adverse impact expected. A total of 283.7 acres of soils would be disturbed as part of the Project in areas of stockpiled and non-stockpiled soils. Total soil volumes of about 563,692 cubic yards would be salvaged and stockpiled long-term, and approximately 304,773 cubic yards of soils would be temporarily stored and replaced on site.	Same as Proposed Action.

Resource Area / Impact ^a	No Action Alternative	Proposed Action	Agency Modified Alternative
Physical, Biological, and Chemical Characteristics	No change from current condition. Physical, biological, and chemical changes to soils would be minimized and limited to new disturbances planned in the Project area in the reasonably foreseeable future.	Short-term soil compaction impacts would occur as part of the Proposed Action. Biological impacts would occur in salvaged soils. No changes to soil pH values are expected from Project construction or operations.	Same as Proposed Action.
Reclamation Impacts	No change from current condition.	The soils in the analysis area are generally suitable for salvage and reclamation. The majority of soils would be salvaged using a two-lift method, which improves reclamation success. The loss of soil development and the time required to rebuild a new soil profile would be unavoidable long-term Project impacts given the long-term storage of soil.	Same as Proposed Action.
Noise			
Sound Levels at Residential Receptors	No change from current condition.	Construction, operation, and mine closure could result in some audible noise at nearby residential receptors.	Same as Proposed Action.
Sound Levels at Recreational Receptors	No change from current condition.	Noise from construction and operations would not likely be audible at the Smith River. However, temporary blasting associated with mine construction could result in some audible noise at nearby recreational receptors in the Smith River area. If audible, it would be below DEQ's noise threshold for noise sensitive areas.	Same as Proposed Action.
Transportation			
Traffic Congestion	No change from current condition.	Project construction would generate an average of 160 employee daily vehicle movements (i.e., one trip to or from the Project site), along with 8 supply truck round trips per day. Project operations would generate up to 477 employee vehicle movements per day, 36 concentrate haul truck movements per day, and 12 other truck movements per day. Traffic generated by Project construction and operations would not meaningfully impact traffic capacity on analysis area roads. As a result, traffic congestion is a low-likelihood event during both construction and operations.	Same as Proposed Action. Additional backfilling would marginally increase truck traffic over a 4-year period. These additional trips would not meaningfully change the traffic impacts described for the Proposed Action.
Road Safety	No change from current condition.	During Project construction and operations, Project traffic could increase the chance of traffic incidents, degradation of roadways, and other risks to road safety. Non-Project drivers are likely to be already accustomed to varying road and weather conditions, as well as the presence of heavy truck traffic on analysis area roads. Proponent-recommended road and intersection improvements would further minimize impacts on road safety.	Same as Proposed Action. Additional traffic would not meaningfully change the traffic impacts described for the Proposed Action.
Vegetation			
Vegetation	Ongoing exploration and ranching activities may disturb vegetation within the Project area.	A total of 311 acres of vegetation would be disturbed, which would be reclaimed after mine closure (i.e., 19 years). No impacts to T&E species.	Same as Proposed Action.
Wetlands			
Wetland Fill, Hydrology, and Quality	Ongoing ranching activities may slightly disturb wetlands within the Project area.	A total of 0.85 acre of permanent direct impacts to wetlands would occur due to access/service roads, CTF, and the wet well for the Sheep Creek water diversion. Negligible and temporary secondary impacts to small, isolated, non-jurisdictional wetlands due to hydrology changes. No secondary impacts expected due to fragmentation or water quality.	Same as Proposed Action.
Wildlife			
Habitat	Continued exploration activities and agricultural use of Project site could affect habitat.	A total of 311 acres of habitat removal, to be reclaimed after mine closure (i.e., 19 years).	Same as Proposed Action.

Resource Area / Impact ^a	No Action Alternative	Proposed Action	Agency Modified Alternative
Direct Mortalities	Ongoing potential for wildlife-vehicle collisions due to private recreational and agricultural use of the land.	Low likelihood of wildlife-vehicle collision for T&E species. Medium likelihood for big game species and other species of concern. No population-level impacts anticipated.	Potential increased adverse impact compared to Proposed Action. Potentially a slight increase in mortalities as more vehicle traffic onsite associated with additional backfilling. Fencing would limit potential impacts to birds and small mammals.
Displacement	Wildlife occasionally disrupted by exploration activities or recreational use.	Wildlife likely disrupted within 1 to 2 miles of the Project throughout the life of the mine.	Same as Proposed Action.
Water Quality and Quantity	No change from current condition.	Process water discharged to surface waters via the UIG would be treated to avoid impacts to wildlife. Potential contamination for avian species ingesting water from CWP brine pond. There would be no adverse impacts related to water quantity.	Same as Proposed Action.
Aquatic Biology			
Stream Crossings and Sedimentation	Ongoing potential for increased sedimentation from continued exploration activities, ranching, and fishing activities.	The two crossings combined would affect 0.1 acre of riparian wetlands, 85 feet of Little Sheep Creek, and 69 feet of the Brush Creek tributary to Little Sheep Creek, disturbing aquatic habitat and potentially introducing sediment into the aquatic system and affecting spawning fish.	Same as Proposed Action.
Water Quantity	Aquatic biota may be impacted by exploration and ranching activities when water is withdrawn for use. Otherwise, no change from current condition.	Aquatic biota, particularly in Coon Creek, could be impacted by changes in hydrology due to mine dewatering during operations. The Proponent proposes to augment flows with water from the NCWR.	Same as Proposed Action.
NCWR Wet Well and Pipe	No change from current condition.	Aquatic biota could be impacted by the installation of the intake pipe. Further impacts likely due to the presence of the intake pipeline include entrainment and impingement of fishes and invertebrates; alteration of natural flow rates when water is pumped (when the flow in Sheep Creek exceeds 84 cfs); degradation of shoreline and riparian habitats; and alteration of aquatic community structure and diversity.	Same as Proposed Action.
Water Quality	No change from current condition.	Process water discharged to surface waters via the UIG would be treated to avoid impacts to wildlife.	Same as Proposed Action.
Thermal Impacts	No change from current condition.	As part of mine operations, the Proponent anticipates discharging water seasonally from the WTP and/or TWSP via the UIG, which would discharge to a segment of Sheep Creek after mixing with an alluvial groundwater system. The discharge would be governed by an MPDES permit. Montana administrative rules applicable to B1 classified streams such as Sheep Creek restrict temperature changes to a 1 °F maximum increase above naturally occurring water temperatures, and a 2 °F decrease below naturally occurring water temperatures. Under these requirements, impacts to aquatic life are not anticipated.	Same as Proposed Action.

CTF = Cemented Tailings Facility; CWP = Contact Water Pond; MPDES = Montana Pollutant Discharge Elimination System; NCWR Non-Contact Water Reservoir; PWP = Process Water Pond; SHPO = State Historic Preservation Office; T&E = threatened and endangered; UIG = Underground Infiltration Gallery

Notes:

^a Impacts include direct and secondary impacts, as well as severity, probability, and duration of impact.

^b A “void” is the space from which the ore was removed.

Impacts to groundwater quantity and quality would be similar under the AMA, yet the AMA would have potential benefits over the Proposed Action. Complete backfill of the Upper and Lower Sulfide Zones with cemented paste tailings would return hydraulic parameters within these bedrock zones to conditions similar to the pre-mining state, eliminating the potential for development of new groundwater flow paths through these areas. As such, backfilling would further reduce the potential for groundwater mixing between upper and lower aquifers, and further reduce potential groundwater contamination from exposed underground mine surfaces at closure compared to the Proposed Action. As described in Section 3.4.3.3 of this EIS (Groundwater Environmental Consequences), it is unlikely that the mine would affect shallow groundwater quality or Sheep Creek surface water quality regardless of whether the access tunnels/shafts were backfilled, plugged, or left completely open.

In summary, the AMA would be expected to have only a negligible (if any) impact compared to the Proposed Action, with some potential benefits to groundwater (**Table 5-1**).