



Supplement to the Antidegradation Review Form

Emery Underground Mine

Prepared for
Bronco Utah Operations, LLC

September 2022 (Amended October 2022)

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1 Introduction

This document is a supplement to the Utah Division of Water Quality's (DWQ) Antidegradation Review Form. Headings in this document correspond to question prompts in Part C through Part F the form. Instructions from the Antidegradation Review Form are *italicized*.

As described in the associated renewal application for Utah Pollutant Discharge Elimination System (UPDES) Permit No. UT0022616, Bronco Utah Operations, LLC (Bronco) is requesting the maximum daily discharge from Emery Underground Mine increase from 1.5 million gallons per day (MGD) to 3.0 MGD.

Emery Underground Mine intercepts groundwater from its underground workings as part of the normal mining process. Water is pumped to the surface and then directed to two sediment ponds (Pond 1 and Pond 6), where it undergoes additional settling prior to discharge into Quitchupah Creek via Outfall 001 and Outfall 003. Bronco plans to manage the additional mine water by constructing a new sediment pond discharge to replace decommissioned Outfall 004 (Farmers pond).

2 Part C. Is the degradation from the project socially and economically necessary to accommodate important social or economic development in the area in which the waters are located?

The applicant must provide as much detail as necessary for DWQ to concur that the project is socially and economically necessary when answering the questions in this section. More information is available in Section 6.2 of the Implementation Guidance.

2.1 C1. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

Dewatering of the Emery Underground Mine is necessary to provide safe operating conditions for workers and to remain viable. Emery Underground Mine cannot function either operationally or within the terms of its Mine Safety and Health Administration (MSHA) permit if groundwater is simply allowed to collect underground. Thus, the groundwater discharge must occur regardless of production levels or types of mine operations, including periods of temporary mining cessation. Since workers are the mine's most valuable asset, ensuring worker safety is a critical economic and social benefit.

Emery Underground Mine operations create mining, distribution, and related service-sector jobs as well as indirectly support the local and regional economy through increasing the demand for non-mine related goods and services. The mine is located in Emery County, where coal mining is a major industry (Reference (1)). Emery Underground Mine produced 474 thousand short tons of coal in 2020 (Reference (2)). In 2021, Bronco averaged 151 employees with wages and benefits paid totaling \$16,149,164. In addition, associated goods and services were purchased in the amount of \$29,031,394.

Because the mine is located in Emery County, it is assumed that this county receives most of the economic benefits associated with the mine. The estimated county population in the year 2019 was 10,012, which is approximately the same as the population in 2018 (10,003) (Reference (3)). Mining jobs make up 7.6% of the nonfarm employment in Emery County, and Bronco is the seventh largest employer in the county (Reference (3)). In Emery County, the average monthly wage in the mining sector in 2020 was \$6,205; this is significantly greater than the average monthly wage for all industries of \$3,868 (Reference (4)). Wages paid by the mining industry are an important component of Emery County's economy. Contributing to these rural economies in turn provides a social benefit to residents of Emery County.

Economic multipliers are used to describe the effects on the economy resulting from changes in the industrial sector. The U.S. Bureau of Economic Analysis has provided a list of United States Industry Employment Multipliers. A direct effect employment multiplier is used to predict total changes in employment due to an initial direct change in a given sector or industry. The mining direct effect employment multiplier is 3.9; this indicates that for every new job in the mining sector, employment in other sectors goes up by 3.9 jobs.

Some of the coal mined at the Emery Mine is Federal coal. Federal coal leasing generates assorted revenues including a bonus paid at the time the coal is leased, rental payments to hold the lease, and royalties paid on the value of the coal produced per year. The state in which the coal is leased receives half of the bonus as well as half of the royalties. Every competitively issued lease requires a royalty rate of 8% for coal mined by underground methods. The Utah Legislature distributes Federal mineral lease funds to communities, counties, and other entities as part of the annual budget and appropriation process.

Bronco's contribution in this area in turn provides a social benefit to residents. Further, the Emery Underground Mine provides important social and economic benefits on a regional/national scale by supplying coal for domestic energy production.

2.2 C2. Describe any environmental benefits to be realized through implementation of the proposed project.

The continued discharge of intercepted groundwater provides an important supplement to natural stream flows in Quitchupah and Ivie Creeks. The discharge provides water of a suitable quantity and quality to support riparian vegetation, which in turn supports a diversity of aquatic, avian, reptilian, and mammalian species. The discharge also supports the streams' designated Class 4 beneficial use (agricultural uses).

2.3 C3. Describe any social and economic losses that may result from the project, including impacts to recreation or commercial development.

This is a proposed increase of an existing discharge. No impacts are projected.

2.4 C4. Summarize any supporting information from the affected communities on preserving assimilative capacity to support future growth and development.

The communities in Emery County, who are the primary economic beneficiaries of the continued operations at the Emery Underground Mine, are all located upstream of the UPDES discharge and thus would not be affected by any decreases in Quitchupah Creek's assimilative capacity related to the mine discharge. Further, there are no downstream communities along or near Quitchupah Creek, Ivie Creek downstream of the Quitchupah Creek confluence, or Muddy Creek downstream of the Ivie Creek confluence. Hanksville is the nearest downstream community, and it is located more than 50 stream miles away at the confluence of Muddy Creek and the Fremont River. The intervening lands are remote, isolated, and topographically challenging; they are unlikely to be subject of future growth or development that would require additional use of assimilative capacity.

Some additional assimilative capacity of Quitchupah Creek will be used by the project. However, the discharge, through compliance with applicable UPDES Permit effluent limits, will continue to be of sufficient quality to support the attainment of the designated beneficial uses of the waterbody, which in turn will support any future growth in irrigation or agricultural use of the waterbody.

2.5 C5. Please describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

Bronco plans to construct an additional sediment pond discharge, which will replace decommissioned Outfall 004. An outlet structure will be installed adjacent to Quitchupah Creek.

3 Part D. Identify and rank (from increasing to decreasing potential threat to designated uses) the parameters of concern.

Parameters of concern are parameters in the effluent at concentrations greater than ambient concentrations in the receiving water. The applicant is responsible for identifying parameter concentrations in the effluent and DWQ will provide parameter concentrations for the receiving water. More information is available in Section 3.3.3 of the Implementation Guidance.

Chloride, total dissolved solids (TDS), sulfate, dissolved iron, dissolved aluminum, dissolved cadmium, and dissolved mercury are identified as parameters of concern for this ADR, in part, because it has previously been determined that mine discharge concentrations often exceed ambient concentrations. Table 3-1 provides the ambient and effluent concentrations for the parameters of concern. In the current UPDES Permit, the effluent limitation for sulfate is 3,366 mg/L as a daily maximum; the effluent limitation for TDS is 4,766 mg/L as a daily maximum; and the effluent limitation for total iron is 1.4 mg/L as a daily maximum. There are no effluent limitations for chloride, dissolved aluminum, dissolved cadmium, or dissolved mercury. Part E addresses alternative treatment options for the identified parameters of concern.

Table 3-1 Parameters of Concern

Rank	Pollutant	Ambient		Effluent	
		Concentration / Units	Basis	Concentration / Units	Basis
1	Chloride	None available from DWQ		69 mg/L	80 th percentile of samples collected at active outfalls between January 2020 and September 2022
2	Total Dissolved Solids (TDS)	1031.2 mg/L (summer) 857.6 mg/L (fall) 851.8 mg/L (winter) 741.2 mg/L (spring)	Ambient concentration for Quitchupah Creek provided by the DWQ.	2,712 mg/L	80 th percentile of samples collected at active outfalls between January 2020 and September 2022
3	Sulfate	None available from DWQ		1,508 mg/L	80 th percentile of samples collected at active outfalls between January 2020 and September 2022
4	Iron, dissolved	0.015 mg/L	Ambient concentration for Quitchupah Creek provided by the DWQ.	0.04 mg/L	80 th percentile of samples collected at active outfalls between January 2020 and September 2022
5	Aluminum, dissolved	2.385 µg/L	Ambient concentration for Quitchupah Creek provided by the DWQ.	200 µg/L	80 th percentile of samples collected at active outfalls between January 2020 and September 2022
6	Cadmium, dissolved	0.0795 µg/L	Ambient concentration for Quitchupah Creek provided by the DWQ.	2 µg/L	80 th percentile of samples collected at active outfalls between January 2020 and September 2022
7	Mercury, dissolved	0 µg/L	Ambient concentration for Quitchupah Creek provided by the DWQ.	15.8 µg/L	80 th percentile of samples collected at active outfalls between January 2020 and September 2022

According to Utah’s 2022 Integrated Report (Reference (5)), Quitchupah Creek Lower (AUID UT14070002-007_00) was listed as impaired for Benthic Macroinvertebrates Bioassessments in 2010 and for TDS in 2014. The impaired reach extends both upstream and downstream of Bronco’s mining facilities and outfalls.

In addition, Bronco evaluated whether other parameters with effluent limits and/or monitoring requirements in UPDES Permit No. UT0022616 should be considered as potential parameters of concern. Table 3-2 summarizes the results of this evaluation.

Table 3-2 Pollutants Evaluated that are not Considered Parameters of Concern

Pollutant	Ambient Concentration ⁽¹⁾	Effluent Concentration ⁽²⁾	Justification
Total Suspended Solids (TSS)	None available from DWQ	11 mg/L	<ul style="list-style-type: none"> Less than the effluent limitation of 25 mg/L as a maximum monthly average
Oil & Grease	None available from DWQ	Non-detect	<ul style="list-style-type: none"> Less than the effluent limitation of 10 mg/L as a daily maximum
pH	8.1 S.U. (summer) 8.1 S.U. (fall) 7.9 S.U. (winter) 8.0 S.U. (spring)	8.3 S.U.	<ul style="list-style-type: none"> Within the effluent limitation of 6.5 to 9 SU
Arsenic, dissolved	0.795 µg/L	Non-detect	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Chromium III, dissolved	0.795 µg/L	Non-detect	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Chromium VI, dissolved	3.975 µg/L	None available	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Copper, dissolved	0.8 µg/L	Non-detect	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Lead, dissolved	0.795 µg/L	Non-detect	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Nickel, dissolved	0.795 µg/L	Non-detect	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Selenium, dissolved	1.59 µg/L	Non-detect	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Silver, dissolved	0.15 µg/L	Non-detect	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Zinc, dissolved	0.0795 µg/L	Non-detect	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek
Boron, dissolved	1.59 µg/L	None available	<ul style="list-style-type: none"> Within assimilative capacity of Quitchupah Creek

(1) Ambient parameter concentrations for Quitchupah Creek provided by the DWQ.

(2) 80th percentile of samples collected at active outfalls between January 2020 and September 2022.

4 Part E. Alternative Analysis Requirements of a Level II Antidegradation Review

Level II ADRs require the applicant to determine whether there are feasible less-degrading alternatives to the proposed project. For new and expanded discharges, the Alternatives Analysis must be prepared under the supervision of and stamped by a Professional Engineer registered with the State of Utah. DWQ may grant an exception from this requirement under certain circumstances, such as the alternatives considered potentially feasible do not include engineered treatment alternatives. More information regarding the requirements for the Alternatives analysis is available in Section 5 of the Implementation Guidance.

4.1 E1. The UPDES permit is being renewed with or without any changes to flow or concentrations. Alternative treatment and discharge options including changes to operations and maintenance were considered and compared to the current processes. No economically feasible treatment or discharge alternatives were identified that were not previously considered for any previous antidegradation review(s).

Does not apply.

4.2 E2. Attach as an appendix to this form a report that describes the following factors for all alternative treatment options: 1) a technical description of the treatment process, including construction costs and continued operation and maintenance expenses, 2) the mass and concentration of discharge constituents, and 3) a description of the reliability of the system, including the frequency where recurring operation and maintenance may lead to temporary increases in discharged pollutants. Most of this information is typically available from a Facility Plan, if available.

Refer to Appendix A for the *Mine Water Disposal Alternatives and Cost Estimates*, prepared in June 2008, and to Appendix B for the *Emery Mine Water Disposal Alternatives and Updated Cost Estimates*, prepared in July 2022.

4.3 E3. Describe the proposed method and cost of the baseline treatment alternative. The baseline treatment alternative is the minimum treatment required to meet water quality based effluent limits (WQBEL) as determined by the preliminary or final wasteload analysis and any secondary or categorical effluent limits.

Emery Underground Mine currently discharges excess mine water to two sediment ponds (Pond 1 and Pond 6) which in turn discharge to Quitcupah Creek following settling. The baseline treatment alternative is construction of an additional sediment pond. Sediment ponds provide sufficient treatment to meet effluent limitations in the UPDES Permit for the receiving water. Refer to Appendix A and Appendix B for additional information.

4.4 E4. Were any of the following alternatives feasible and affordable?

Alternative	Feasible	Reason Not Feasible/Affordable
Pollutant Trading	No	Bronco considered purchasing credits through DWQ's offsets program. With this program, there would be no change to the discharge water quality. Bronco would instead be required to pay into a fund which would then be used to support a reduction project elsewhere in the Quitchupah Creek watershed. Quitchupah's downstream water quality would be expected to improve as a result of the reduction project. However, there are limited opportunities for an offset project within the Quitchupah Creek watershed given the lack of irrigated agriculture.
Water Recycling/Reuse	No	Water is currently reused for dust control on all of the appropriate surfaces and at all of the appropriate times. There are no feasible means of increasing this use.
Land Application	No	Land application would require an extensive acreage to dispose of even a portion of the dewatered mine water. Further, land application requires a sprinkler or other type of delivery system and intensive operational protocols to ensure a proper application rate. Given the nature of area soils along with the TDS concentration of the mine water, land application would likely result in either increased stream salinity due to shallow groundwater flow towards Quitchupah Creek or buildup of evaporites in the soil profile leading to sodic conditions.
Irrigation	No	The irrigation alternative would involve constructing a pipeline from the vicinity of Emery Underground Mine to a location where it would be diluted with higher quality water and used for irrigation by local ranchers and farmers. The alternative has minor surface impact and is considered economically feasible, with an estimated cost of \$429,000 to construct a pipeline/pumping delivery system. A major disadvantage of this alternative is that deliveries would only occur during the irrigation season. During several months of the year, the full volume of mine water would still need to be discharged to Quitchupah Creek. Another disadvantage is that this alternative would depend upon continued contractual agreements with irrigators which makes this alternative potentially unreliable.
Groundwater Injection	No	This alternative involves injecting a portion of the mine water discharge into a formation underlying the mine workings via two 10-inch diameter wells. This alternative is not economically feasible with an estimated cost of \$2,345,000. While an injection well setup has minimal surface disturbances, there are many unknowns that could affect not only cost but effectiveness of the wells (e.g., low material permeability, high hydraulic pressures, or chemical incompatibilities).
Connection to Other Facilities	No	Bronco evaluated the option of overland piping the discharge to Muddy Creek, which would allow the discharge to bypass both Quitchupah and Ivie Creeks. This would be advantageous because Muddy Creek has less restrictive water quality standards. However, there are numerous permitting, engineering, and construction difficulties with this option. These, coupled with the high estimated cost (\$4,258,000), make it economically infeasible. Additionally, there are no other industries near Emery Underground Mine that could support treatment of the dewatered mine water.

Alternative	Feasible	Reason Not Feasible/Affordable
Upgrade to Existing Facility	Yes	As noted below, Bronco proposes to replace decommissioned Outfall 004 with a sediment pond to accommodate the increase in mine water discharge.
Total Containment	No	This alternative would involve constructing multiple unlined evaporation ponds into which a portion of the mine water would be discharged. The primary advantage of this alternative is that it is relatively straightforward to construct and maintain. While technically feasible, this option would have a large surface impact, as approximately 350 acres of ponds would be needed. There is a relatively high cost for construction, estimated at \$6,357,000. Additionally, a portion of the mine water would still need to be discharged to Quitchupah Creek, and accumulated salts would eventually need to be removed and disposed.
Improved O&M of Existing Systems	No	Existing systems do not have adequate capacity for the proposed increase in mine water discharge.
Seasonal or Controlled Discharge	Yes	Bronco proposes to use a controlled discharge from a new sediment pond to replace decommissioned Outfall 004.
New Construction	No	This alternative would involve treating the mine discharge water with a desalination system. This alternative is economically infeasible with an estimated cost of \$12,142,000. In addition to being cost-prohibitive, this treatment system requires a substantial amount of power, is maintenance-intensive, and results in a high concentration waste brine flow that requires disposal.
No Discharge	No	Emery Underground Mine cannot operate safely without dewatering mine water.

4.5 E5. From the applicant's perspective, what is the preferred treatment option?

The preferred treatment option is continued reuse of a portion of the discharge water through on-site dust control, along with construction of a sediment pond to replace decommissioned Outfall 004.

4.6 E6. Is the preferred option also the least polluting feasible alternative?

Yes, a controlled discharge from a newly constructed sediment pond to replace decommissioned Outfall 004 is the least polluting feasible alternative.

5 Part F. Optional Information

5.1 F1. Does the applicant want to conduct optional public review(s) in addition to the mandatory public review? Level II ADRs are public noticed for a thirty day comment period. More information is available in Section 3.7.1 of the Implementation Guidance.

No

5.2 F2. Does the project include an optional mitigation plan to compensate for the proposed water quality degradation?

No

6 References

1. Largest Employers by County. *Utah Department of Workforce Services*. [Online] 2021. <https://jobs.utah.gov/wi/data/library/firm/majoremployers.html>.
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4. Utah Economic Data Viewer. *Utah Department of Workforce Services*. [Online] <https://jobs.utah.gov/jsp/utalmis/#/industry>.
5. Utah Department of Environmental Quality. Final 2022 Integrated Report on Water Quality. *Water Quality Integrated Report Program*. [Online] 2022. <https://documents.deq.utah.gov/water-quality/monitoring-reporting/integrated-report/DWQ-2022-002386.pdf>.

Appendix A

Mine Water Disposal Alternatives and Cost Estimates (June 2008)

Appendix B

Emery Mine Water Disposal Alternatives and Updated Cost Estimates (July 2022)