COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

October 20, 2020

Tom Bird
GCC Energy, LLC
6473 County Road 120
Hesperus, CO 81326

Re: King Coal Mine, Permit C-1981-035,
Review of the 2019 Annual Hydrology Report

Dear Mr. Bird:

The Division received the 2019 AHR for the King Coal Mine on December 26, 2019 (written by Resource Hydrogeologic Services, Inc. or RHS). The Division reviewed this AHR in the context of Rules 4.05.1, 4.05.6, 4.05.11, and 4.05.13 (Regulations of the Colorado Mined Land Reclamation Board for Coal Mining).

Table 1 lists important logistical requirements of the King Coal Mine water monitoring plan, and indicates if the requirement was met with the 2019 AHR.

Table 1 Logistical Requirements of the King Coal Mine Water Monitoring Plan

Requirement	Source of Requirement (Rule or Page in PAP)	Requirement met for 2019?
Filing frequency of AHR - annually	Rule 4.05.13(4)(c)	Yes
Timely filing of hydrology report – submitted by December 31st each year	Section 2.05.6 of the King Coal Mine PAP, page 11	Yes
Sites sampled and sampling frequency at surface water monitoring sites	Section 2.05.6 of the PAP, page 6	Yes
Parameters sampled at surface water monitoring sites	Section 2.05.6 of the PAP, Table 2	Yes
Sites sampled and sampling frequency at groundwater monitoring sites	Section 2.05.6 of the PAP, page 6	Yes
Parameters sampled at groundwater monitoring sites	Section 2.05.6 of the PAP, Table 1	Yes

It is unclear to the Division why RHS states on page 3 that there are 30 monitoring locations; Table 1 only lists 27 locations. Please change this or explain this in the 2020 AHR.

Analysis of Surface Water Data – Hay Gulch

It is the Division's opinion that Regulation #34 (CDPHE, 2019) provides a benchmark for assessing the water quality in the receiving water below the King Coal Mine. The water standards in Regulation #34 include the following in Table 2 (parameters listed are those that are also in the King Coal 2019 AHR). The applicable segment within Regulation #34 for Hay Gulch is 3e. Comparisons of these standards to the data for the downstream site, Hay Gulch Ditch Downgradient, are listed in Table 3.

Table 2. Water Quality Standards from CDPHE Regulation #34

Parameter	Standard	Comments
Temperature	24.3 deg C, April – Oct. 13.0 deg C, Nov. - March	Cold Stream, Tier 2
Dissolved Oxygen	5 mg/l	Minimum standard, Chronic standard
pH	6.5 – 9.0	Acute standard
Chloride (dissolved)	250 mg/l	Chronic standard
Sulfate as SO_4	250 mg/l	Chronic standard
Arsenic (dissolved)	0.34 mg/l	Acute standard
Cadmium (dissolved)	0.001 mg/l	See Comment #1.
Copper (dissolved)	0.008 mg/l	See Comment #1.
Iron (dissolved)	0.3 mg/l	Chronic standard
Lead (dissolved)	0.036 mg/l	See Comment #1.
Manganese (dissolved)	2.5 mg/l	See Comment #1.
Manganese (dissolved)	0.05 mg/l	Chronic standard
Mercury (total)	0.00001 mg/l	Chronic standard
Selenium (dissolved)	0.0184 mg/l	Acute standard
Uranium (dissolved)	1.345 mg/l	See Comment #1.
Zinc (dissolved)	0.099 mg/l	See Comment #1.

1. *Acute standard, based on hardness of 59.1 mg/l (low value in AHR data for downstream site in Hay Gulch), which is a conservative estimate. This can be examined more closely if a potential problem is detected.*

Table 3. Exceedances of Water Quality Standards in Hay Gulch Ditch Downgradient

Parameter	Standard	Exceedances in Hay Gulch Ditch Downgradient
Temperature	24.3 deg C, April – Oct. 13.0 deg C, Nov. - March	None
Dissolved Oxygen	5 mg/l (minimum)	None
pH	6.5 – 9.0	One slightly low value is not considered problematic.
Chloride(dissolved)	250 mg/l	None
Sulfate as SO_4	250 mg/l	None
Arsenic(dissolved)	0.34 mg/l	None
Cadmium(dissolved)	0.0017 mg/l	None
Copper(dissolved)	0.008 mg/l	None
Iron(dissolved)	0.3 mg/l	None
Lead(dissolved)	0.036 mg/l	None
Manganese(dissolved)	0.05 mg/l	None
Mercury(total)	0.00001 mg/l	No data is above the laboratory reporting level.
Selenium(dissolved)	0.0184 mg/l	None
Uranium(dissolved)	1.345 mg/l	None
Zinc(dissolved)	0.099 mg/l	None

In addition to the parameters with CDPHE standards, listed above, the Division also looked at Total Dissolved Solids (TDS) data. A TDS guideline of 750 mg/L (Banta, 1988) is applicable to surface water, including Hay Gulch. None of the data from the Hay Gulch Ditch Downgradient site exceeds this concentration (the maximum was 390 mg/l on February 28, 2019).

None of the surface water data were found to be problematic.

Analysis of Groundwater Data

It is the Division's opinion that drinking water standards in Regulation #41 (CDPHE, 2016) provide a benchmark for assessing the water quality in the groundwater below the King Coal Mine (bedrock and alluvial groundwater). Regulation #41 includes the parameters in Table 4 (parameters listed are those that are also in the King Coal 2019 AHR).

Comparisons of these standards to the data for bedrock wells are listed in Table 5.

Table 4. Drinking Water Standards from CDPHE Regulation #41

Parameter	Standard
Chloride (dissolved)	250 mg/l
Copper (dissolved)	1 mg/l
Iron (dissolved)	0.3 mg/l
Manganese (dissolved)	0.05 mg/l
pH	6.5 – 8.5
Sulfate as SO_4 (dissolved)	250 mg/l
Zinc (dissolved)	5 mg/l

Table 5. Exceedances of Drinking Water Standards in Downgradient Bedrock Wells (A Seam and Menefee Interburden)

Parameter	MW-3-A	MW-3-MI	MW-4-A	MW-4-MI
Chloride (dissolved)	None	None	None	None
Copper (dissolved)	None	None	None	None
Iron (dissolved)	None	None	None	
Manganese (dissolved)	None	None	None	None
pH	None	**Several (slightly high)**	None	None
Sulfate as SO_4 (dissolved)	**Several (max of 724 mg/l)**	None	**Several (max of 584 mg/l)**	None
Zinc (dissolved)	None	None	None	None

The slightly high pH values were considered in light of the Division review of the 2018 AHR and the responses from RHS. RHS made the point that high pH values can be the result of high concentrations of bicarbonate. And high pH and bicarbonate are natural for groundwater west of the King Coal Mine. Based on the previous responses of RHS, the Division does not find the slightly high pH values to be problematic.

To determine spatial trends for sulfate, a comparison was made to one upgradient well, MW-1-A. (Another upgradient well, MW-1-MI, was dry.) All values for MW-1-A were over 490 mg/l, well above the standard, suggesting that higher sulfate values are not likely caused by mining activity.

Comparisons of groundwater quality standards to the data for alluvial wells are listed in Table 6.

Table 6. Exceedances of Drinking Water Standards in Downgradient Alluvial Wells (Well #2 and Wiltse Well)

Parameter	Well #2	Wiltse Well
Chloride (dissolved)	None	None
Copper (dissolved)	None	None
Iron (dissolved)	None	**0.38 mg/L in May 2019**
Manganese (dissolved)	**Several (max of 0.504 mg/l)**	**Several (max of 1.1 mg/l)**
pH	None	None
Sulfate as SO_4 (dissolved)	None	**Several (max of 801 mg/l)**
Zinc (dissolved)	None	None

For the parameters with exceedances, iron, manganese and sulfate, comparisons were made to the upgradient well, Well #1. The upgradient well did have high iron and manganese concentrations, suggesting that high values for this parameter are not mining related. However, none of the concentrations recorded for sulfate in Well #1 exceeded the standard of 250 mg/l.

A temporal analysis was performed for sulfate in the Wiltse well. Old AHRs (e.g., the AHR sent to the Division in July 1994) indicated high concentrations of sulfate, generally from 800 mg/l to 1,200 mg/l, from 1982 to 1984. This data illustrates that recent King Coal operations are not causing a deterioration of water quality in this well.

No potential problems were identified with any of the groundwater data; analyses were performed for both bedrock and alluvial wells.

Discussion of Recommendations

The RHS recommendations for a reduction in water monitoring requirements would require a permitting action. The Division is open to discuss these recommendations prior to submittal of a revision application, but I am not addressing this topic in this AHR review.

References

- Banta, 1988, "A Description of the Material Damage Assessment Process Pertaining to Alluvial Valley Floors, Surface Water, Ground Water and Subsidence at Coal Mines."
- CDPHE, Regulation No. 34 - Classifications and Numeric Standards for San Juan River and Dolores River Basins, effective 30 June 2019.
- CDPHE, Regulation No. 41 - The Basic Standards for Groundwater, 5 CCR 1002-41, effective 30 December 2016.

Thank you,

Robert D. Zuber, P.E.
Environmental Protection Specialist II

Cc: Sarah Vance, GCC Energy, via e-mail