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

Interoffice Memorandum

October 23, 2024

From: Leigh Simmons
To: Hunter Ridley

Subject: Colowyo Mine (Permit No. C-1981-019)
2023 AHR Review

As you requested, I have reviewed the Annual Hydrology Report submitted by Colowyo Coal Company (CCC) for the 2023 water year. The water monitoring program at the Colowyo Mine is described in Volume 15, Rule 4 of the Permit Application Packet (PAP). The 2023 Report was submitted in good time and satisfies the requirements of Rule 4.05.13.

Streams draining the Colowyo Mine flow generally toward the north-east. From east to west we have: Good Spring Creek, Taylor Creek, Wilson Creek, Jubb Creek, Little Collom Gulch and Collom Gulch.

Groundwater monitoring at Colowyo is limited to alluvial aquifers, with the exception of a single bedrock well completed in the Trout Creek Sandstone, since deeper bedrock aquifers are assumed to be hydrologically isolated from the impacts of mining. The alluvial systems present at the mine are assumed to be hydrologically connected to the associated stream, so I have reviewed both Surface Water data and Groundwater data and organized my comments by drainage.

All monitoring locations are given on Map 10B of the PAP. The point locations were digitized from the scanned and georeferenced map and added to a feature layer of water monitoring locations. This layer, filtered to display only active sites, is shown in figure 1, with streams and the approximate permit boundary overlaid on an aerial image

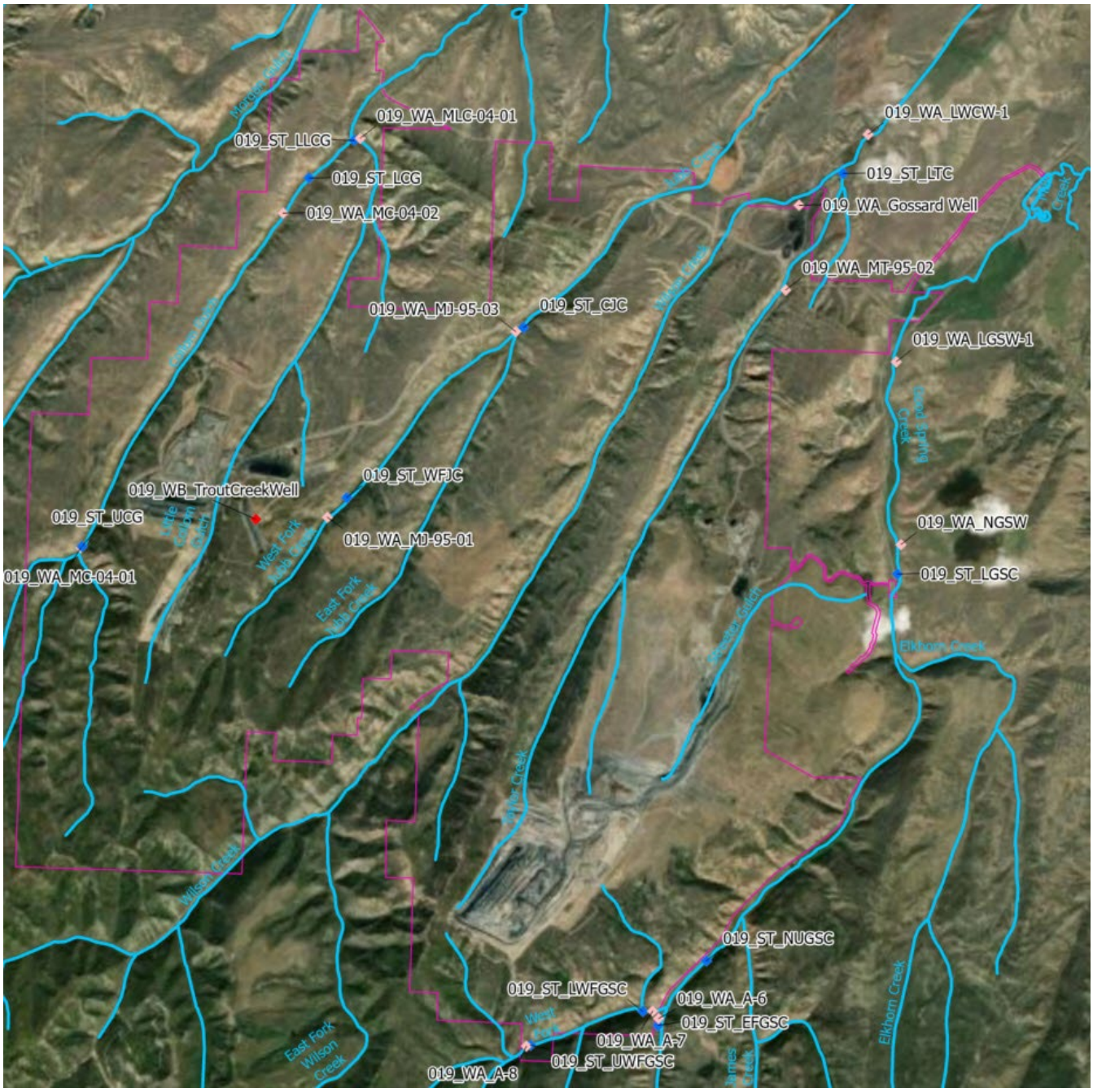


Figure 1: Active water monitoring locations at the Colowyo Mine

The Point of Compliance wells LGSW-1 and LWCW-1 were incorporated into the Permit Application Packet (PAP) with TR-148, issued on August 3, 2021, and the first monitoring results of these wells were from Q4 2021.

With the approval of TR-148, CCC and the Division established numerical values for various water quality parameters which would represent the application of the Interim Narrative Standard from Regulation 41: The Basic Standards for Groundwater at these two POC locations; these values are recorded in Volume 2C, Exhibit 7, Item 19, Table 16 (which is reproduced below in Figure 2).

Table 16 Proposed Groundwater Compliance Standards
Colowyo Mine, Meeker, Colorado

Parameter	Units	Proposed Compliance Standard	Standard Source
Arsenic	mg/L	0.01	Reg. 41 Human Health Standard
Field pH	s.u.	6.5 - 8.5	Reg. 41 Drinking Water Standard
Iron	mg/L	0.3	Reg. 41 Drinking Water Standard
Manganese	mg/L	**0.75**	**Pre-1994 Data Background UTL**
Mercury	mg/L	0.002	Reg. 41 Human Health Standard
Nitrate (as N)	mg/L	10.0	Reg. 41 Human Health Standard
Nitrate+Nitrite (as N)	mg/L	10.0	Reg. 41 Human Health Standard
Nitrite (as N)	mg/L	1.0	Reg. 41 Human Health Standard
Selenium	mg/L	0.02	Reg. 41 Agricultural Standard
Sulfate	mg/L	**997**	**Pre-1994 Data Background UTL**
Total Dissolved Solids	mg/L	**1,840**	**Pre-1994 Data Background UTL**
Zinc	mg/L	2	Reg. 41 Agricultural Standard

Notes:
mg/L = milligrams per liter
s.u. = standard units
UTL = upper tolerance limit
Bold values represent upper tolerance limits calculated using pre-1994 baseline data from Gossard Well and NGSW.

Figure 2: Volume 2C, Exhibit 7, Item 19, Table 16: Applicable standard at LGSW-1 and LCWC-1 POC wells

Data from the 2021, 2022 and 2023 AHRs was reviewed and analyzed. Several parameters of interest are discussed below.

<u>Good Spring Creek</u>

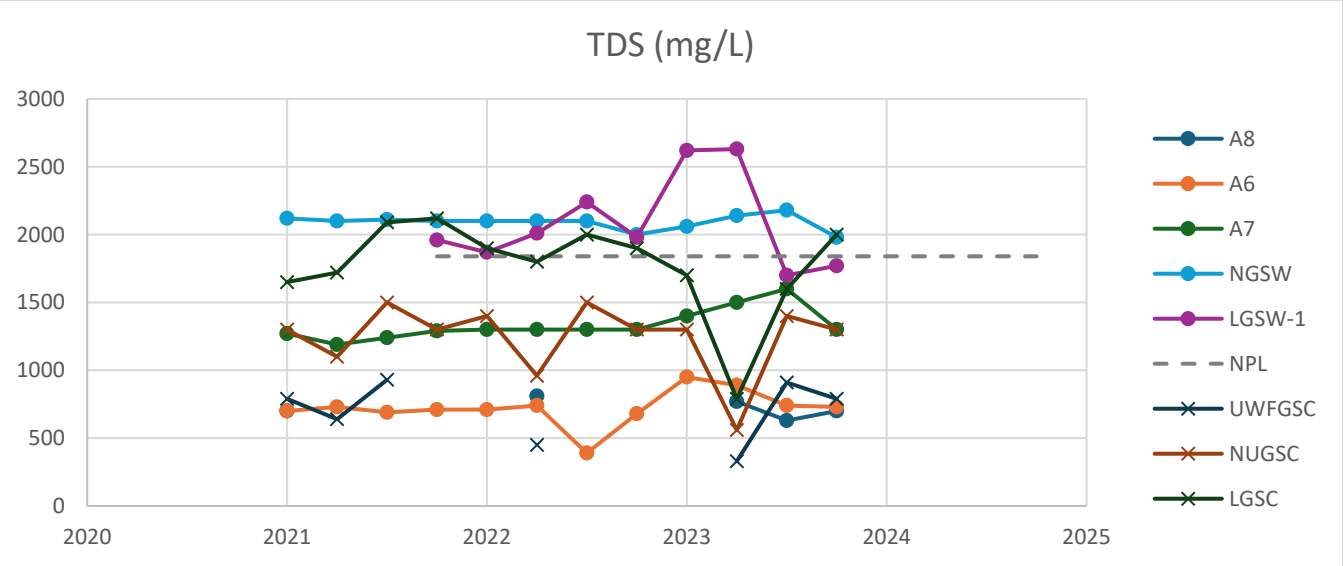
Surface Water quality in Good Spring Creek is measured at three locations:

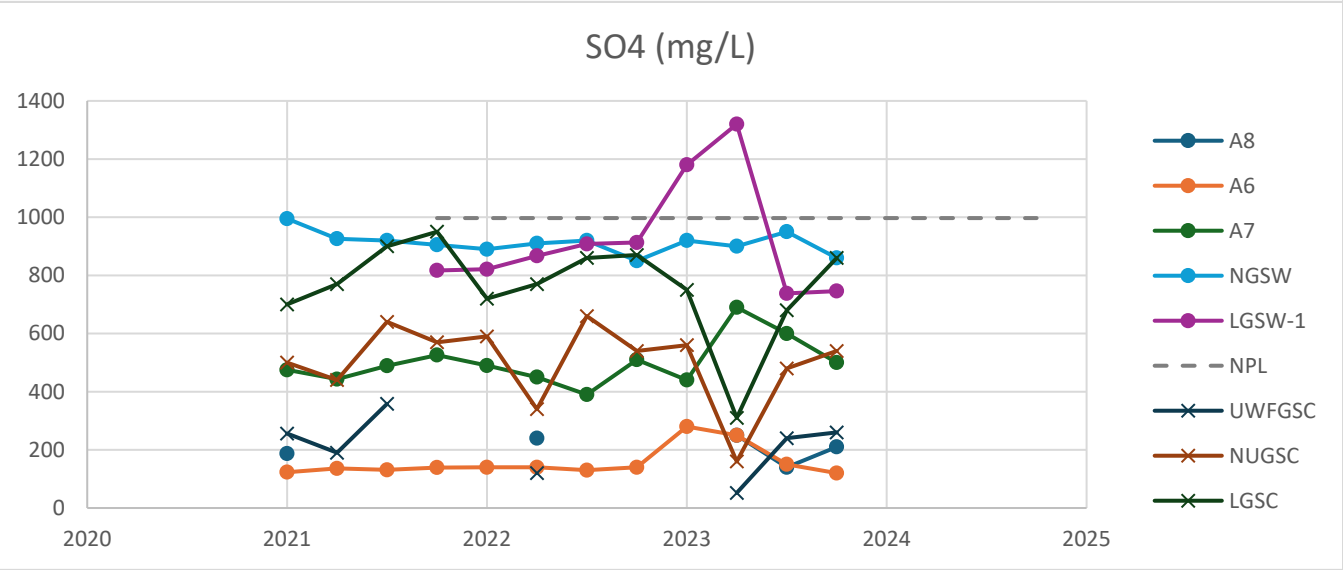
1. LGSC (downstream of Streeter Fill)
2. NUGSC (upstream of Streeter Fill, but downstream of the South Taylor Pit and of the confluence of the West Fork of Good Spring Creek)
3. UWFGSC (upstream of mine disturbance, on the West Fork of Good Spring Creek)

(Two additional monitoring locations EFGSC and LWFGSC are used to collect flow measurements only)

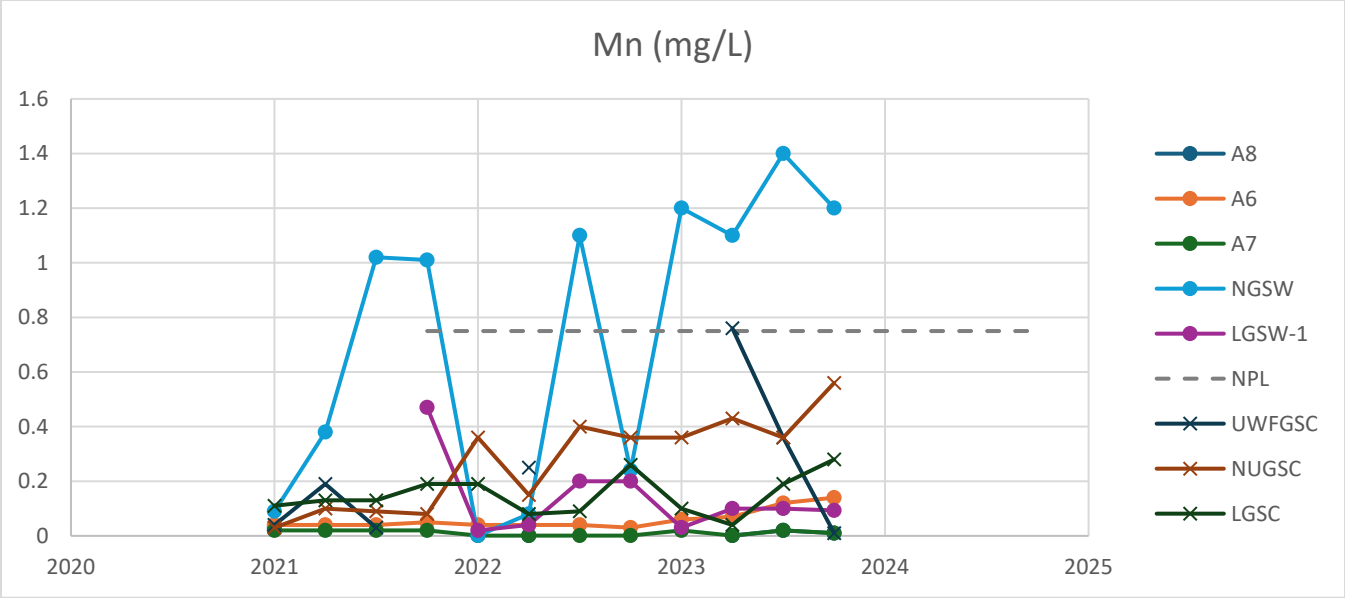
Groundwater parameters in the Good Spring Creek alluvium are measured at five locations:

1. **LGSW-1 (Point of Compliance)**
2. NGSW (downgradient of mine disturbance, slightly downgradient of LGSC)
3. A-7 (upgradient of Streeter Fill, but downgradient of the South Taylor Pit)
4. A-6 (upgradient of mine disturbance, on East Fork)
5. A-8 (upgradient of mine disturbance, on West Fork)

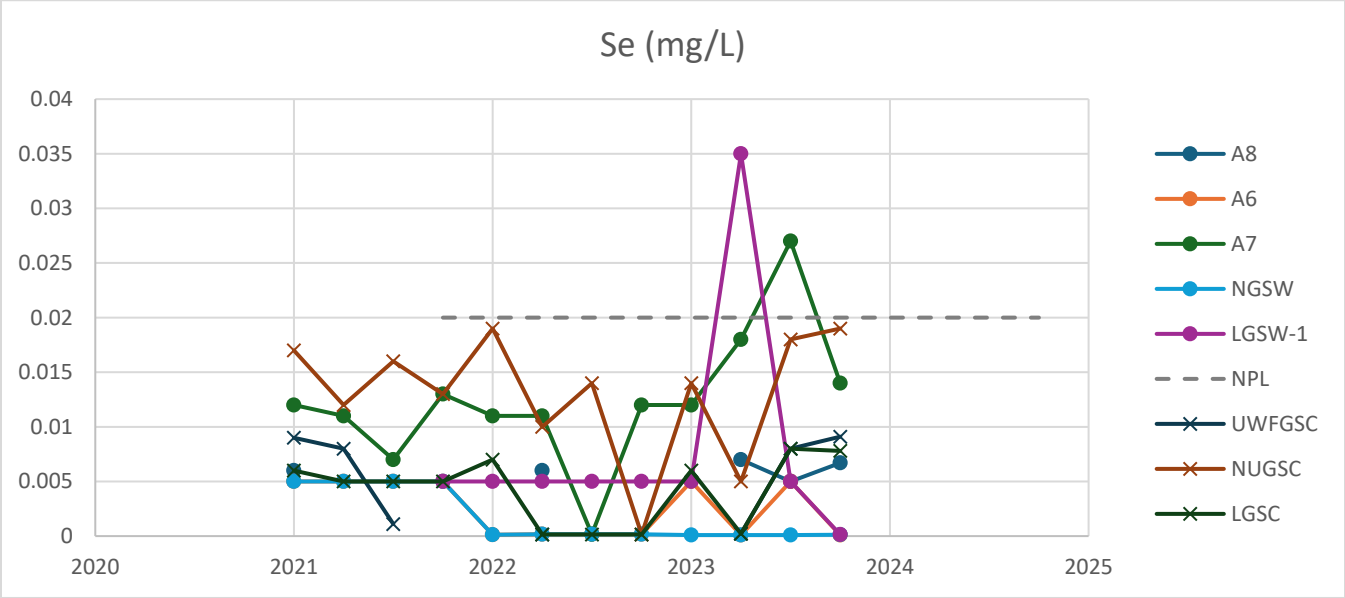




Total Dissolved Solids and Sulfate concentrations follow similar patterns in Good Spring Creek. Firstly, the concentration of each generally increases from upstream/upgradient to downstream/downgradient. There is considerable variability in the data from the three surface water monitoring locations, and much less variability in the groundwater data; the new groundwater monitoring point, LGSW-1, is the exception – it shows a large spike in both parameters in early 2023, followed by a sharp drop in the third and fourth quarters. It will be necessary to continue monitoring for trends, and to assess long-term water quality against the standard. For now it should be noted that both parameters have exceeded the compliance standard multiple times over the relatively short monitoring period, but were in compliance at the end of 2023.



Manganese concentrations at NGSW have been notably high at times, and also quite variable. It is interesting to note that elevated Manganese levels have not been observed at LGSW-1 to date.



An exceedance of the Selenium NPL was reported at LGSW-1 in the second quarter of 2023, but this appears to be an anomaly. The Selenium NPL (based on table values from Reg. 41 The Basic Standards for Groundwater) is quite low, and the scale used on the y-axis is such that very small variations in sampling or analysis procedures lead to variability in the data. The data shown does not suggest either an increasing trend or a chronic exceedance.

The CDPS outfall at Streeter Pond was terminated from monitoring requirements by CDPHE, as is mentioned in the AHR .

On page 2.05-36 of the PAP, the following statement is made to summarize the prediction of probable hydrologic consequences: "*In summary, the Colowyo Mine will not significantly affect the hydrologic balance or water quality of the general area or the permit area and the affect to the hydrologic balance within the permit*

area will be insignificant. Temporary increases in TDS and associated common ions are expected to affect quality in backfilled spoils within the permit area"

I understand that CCC is seeking Phase III bond release of the Streeter Pond and Ditch, which are in the Good Spring Creek watershed. If, in the future, it should become apparent that water quality impacts in Good Spring Creek or the alluvium are not decreasing as predicted, or that significant off-site impacts are occurring, a treatment and/or mitigation strategy may need to be developed; that is not the case at this time. Although hypothetical, it is not likely that any such activity in the future would involve re-disturbing the Streeter Pond or Ditch. There is no reason, based on my analysis of the AHR, to deny the bond release application due to water quality impacts.

Taylor Creek and Wilson Creek

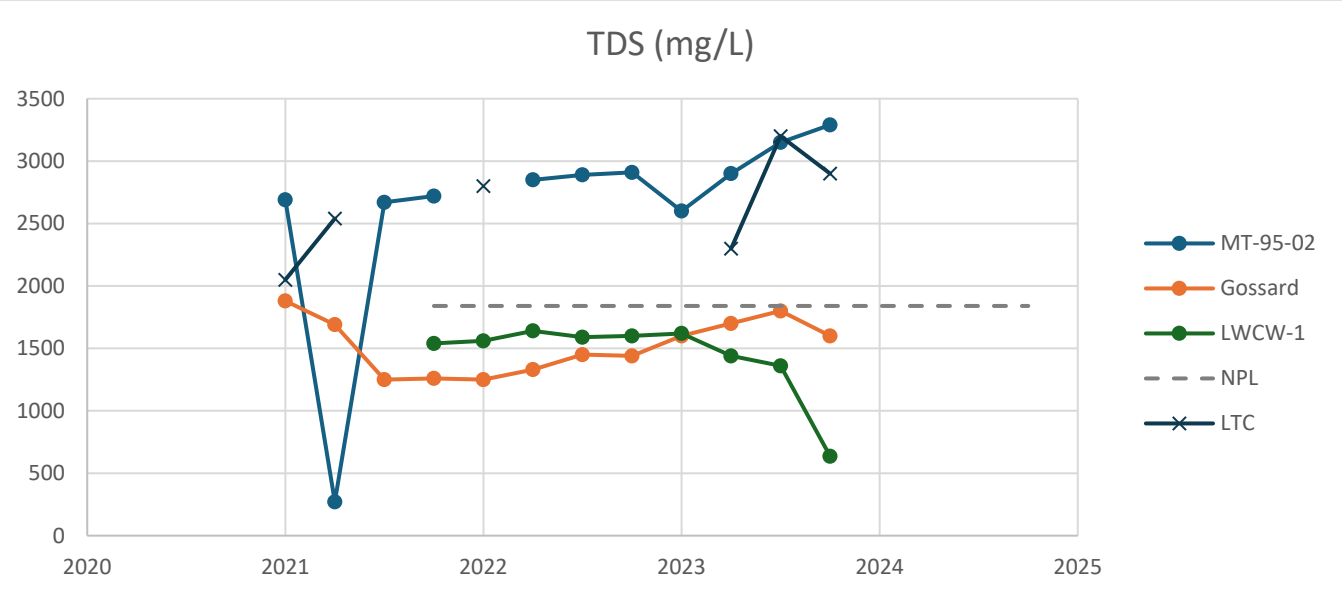
Taylor Creek is an ephemeral stream. Surface Water quality is measured at a single location:

1. LTC (immediately upstream of the confluence with Wilson Creek)

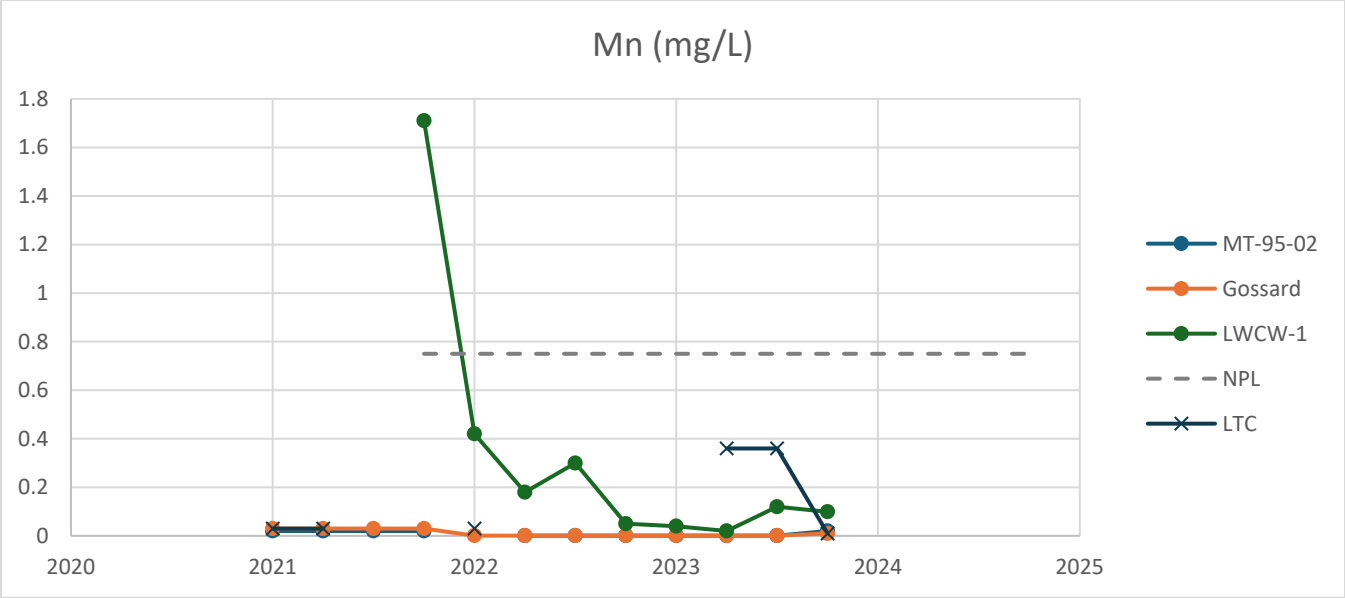
There are no active surface water monitoring points on Wilson Creek, although three future monitoring locations are identified in the PAP (UWC, UMWC and LWC). These are to be monitored prior to mining at Lower Wilson.

Groundwater is monitored in the alluvium of Taylor and Wilson Creeks at three locations:

1. **LWCW-1 (Point of Compliance)**
2. Gossard Well (at rail loop)
3. MT-95-02 (downgradient of mine disturbance in Taylor Creek)



TDS in Wilson/Taylor Creek shows an interesting trend, with very high values in the ephemeral Taylor Creek and its alluvium (at MT-95-02), and lower values in the Wilson Creek alluvium at the Gossard Well. At the most downstream location (LWCW-1, the Point of Compliance), the measured values have remained below the NPL, and show a decreasing trend throughout 2023.



A significant exceedance of the NPL for Manganese was reported at LWCW-1 in Q4 of 2021, but since then the levels have dropped and remained well below the standard of 0.75 mg/L. No other upstream monitoring locations have shown elevated Manganese over the period.

Jubb Creek

Surface Water quality in Jubb Creek is measured at two locations:

1. CJC (downstream of mine disturbance, below the confluence of the East and West Forks of Jubb Creek)
2. WFJC (adjacent to mine disturbance, in the West Fork of Jubb Creek)

Groundwater is monitored in the alluvium of Jubb Creek at two locations:

1. MJ-95-03 (downgradient of mine disturbance, below the confluence of the East and West Forks of Jubb Creek)
2. **MJ-95-01 (downgradient of mine disturbance, in the West Fork of Jubb Creek. Point of Compliance)**

Graphs of the data collected in Jubb Creek presented in the AHR show no noteworthy trends or exceedances at this point. CCC note in their analysis an increasing trend in Iron at CJC.

Little Collom Gulch

Little Collom Gulch is an ephemeral stream. Surface water quality is measured at a single location:

1. LLCG (downstream of mine disturbance)

Groundwater is monitored in the alluvium of Little Collom Gulch at a single location:

2. **MLC-04-01 (downgradient of mine disturbance. Point of Compliance)**

Two quarters of monitoring data were reported from LLCG in 2023, but the site was dry for all of 2021 and 2022 (according to the narrative it has been dry since monitoring began in 2011). Flow was reported as 11.5 cfs in Q2 of 2023 (and just a trickle in Q3). The reported values of several parameters including Arsenic, Iron, Manganese and Selenium were remarkably high. Little can be learned from a single data point, but the site should be monitored closely at times of high run-off in the future.

Collom Gulch

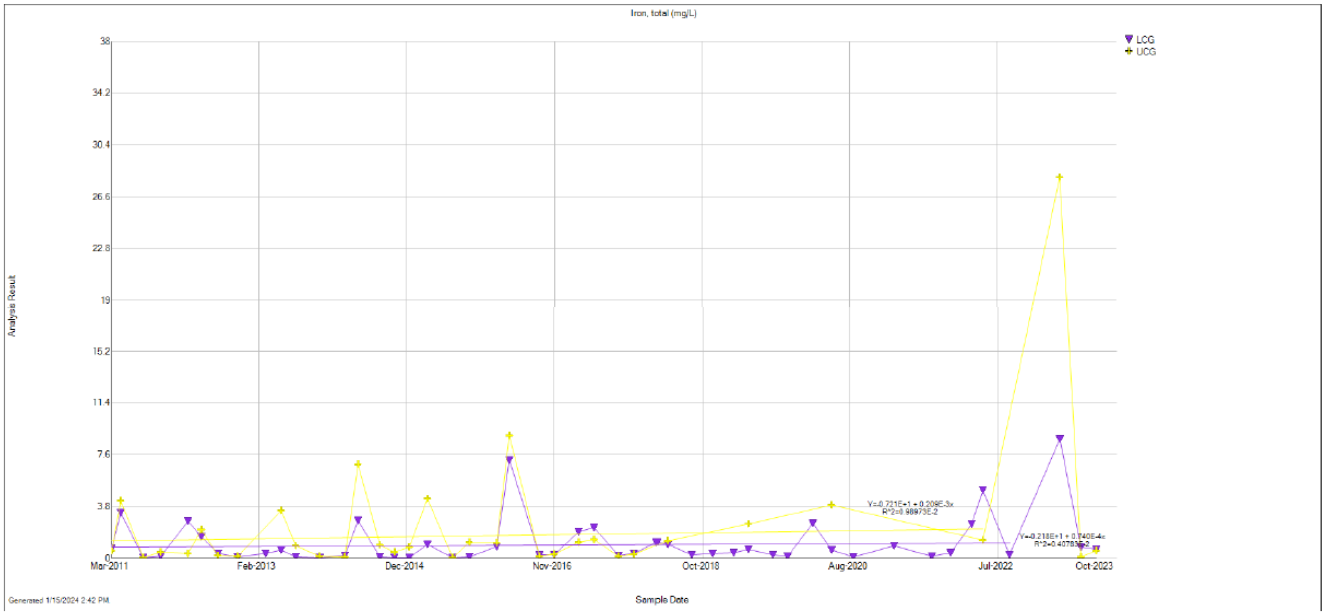
Surface water quality in Collom Gulch is measured at two locations:

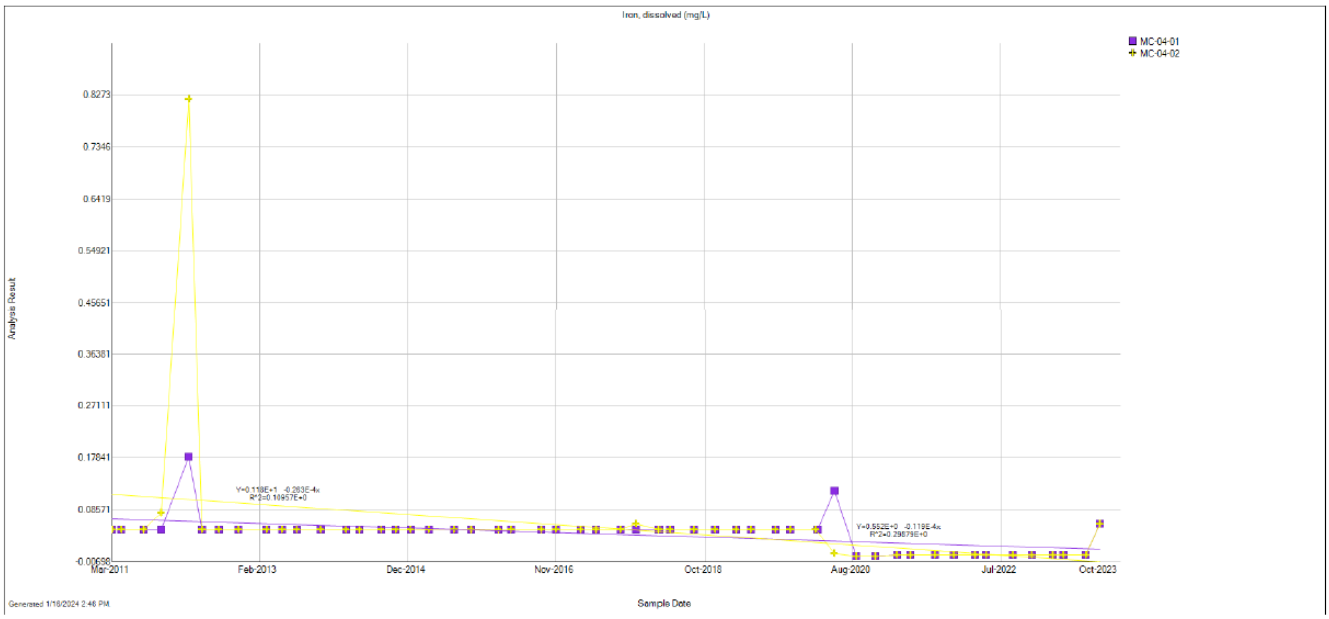
1. LCG (downstream of mine disturbance)
2. UCG (upstream of mine disturbance)

Groundwater is monitored in the alluvium of Collom Gulch at two locations:

3. **MC-04-02 (downgradient of the Collom Pit. Point of Compliance)**
4. MC-04-01 (adjacent to the Collom Pit)

A significant spike in Iron was reported at both Collom Gulch surface water monitoring locations in 2023, as is obvious on the graph presented in the AHR (copied below). The same spike was not seen in the groundwater data.





Trout Creek Sandstone

Monitoring data from the Trout Creek Well continues to support the assumption that the bedrock sandstone aquifer is isolated from the impacts of mining above it.

Spoil Springs

Three spoil springs were reported.

In conclusion, following my review of the 2023 AHR there are no major concerns to highlight. The monitoring program is adequate. The report itself is thorough and includes some analysis of the data, which is greatly appreciated.