Colorado Department of Public Health and Environment

COLORADO DISCHARGE PERMIT SYSTEM (CDPS)
FACT SHEET FOR MODIFICATION 3
PERMIT NUMBER CO0000003
OURAY SILVER MINES, INC. – OURAY SILVER MINE
OURAY COUNTY

Lori Mulsoff
11/23/2015

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I. TYPE OF PERMIT

A. Permit Type: Modification 3 - Major Amendment
Industrial minor, mine

B. Discharge To: Surface Water

II. FACILITY INFORMATION

A. SIC Code: 1044 (Silver Ores), 1031 (Lead and Zinc Ores), 1041 (Gold Ores)

B. Facility Location: 6208 County Road 26, Ouray,
in Ouray county; 37° 58’ 25” latitude North and 107° 45’ 00” longitude West

C. Permitted Feature: 001A, after lined retention pond, which discharges to Sneffels Creek,
37° 58.535’ N, 107° 44.965' W

III. PURPOSE OF AMENDMENT

In a modification request received by the Division on August 6, 2015, the permittee requested that the name of the company be changed to Ouray Silver Mines Inc and the facility be known as Ouray Silver Mine. This change was also completed with this modification.

In a modification request received by the Division on May 19, 2015, the permittee made three requests:

1. **The permittee requests that the division use additional hardness data (12 data points), associated with the “low flow” months October through March and sampled from 11/15/2011 through 3/31/2015, to calculate water quality standards and WQBELs.**

   Full request:
   Upon additional collection of hardness data downstream, it is requested that the hardness used in calculating water quality standards as well as WQBELs be revised. Please see Table 1 below for existing data as well as the most recent hardness data and flow data that has been collected since the last discharge permit modification. Additionally, it is requested that the time period used as “low flow months” be slightly altered to include the months of October through March. Although this date range is a month later than the range used in the original discharge permit, it is believed that it more accurately represents low flow months due to the high altitude of the site along with flow data recently collected (see Table 1). As shown in the table,

including only data collected during the altered low flow months, the modified hardness to be used in TVS calculations for in-stream standards and WQBELs is 101.42 mg/L as $CaCO_3$.

Table 1: Existing and Recently Collected Hardness and Flow Data

Average Hardness for "x" Dates			101.42
Date	Hardness (mg/L as $CaCO_3$)	Flowrate (gpm)	October through March
11/15/2011	84	700	x
1/16/2012	95	700	x
6/24/2012	56	5,000	
9/18/2012	88	1,500	
12/6/2012	106	850	x
2/6/2013	105	2,149	x
6/20/2013	57	4,300	
7/18/2013	73	2,700	
7/25/2013	82	2,780	
8/1/2013	71	3,330	
8/8/2013	60	4,550	
9/26/2013	73	2,950	
12/26/2013	93	500	x
2/12/2014	135	425	x
4/2/2014	106	740	
6/11/2014	44	16,150	
7/22/2014	61	10,680	
12/4/2014	101	2,543	x
2/12/2015	107	838	x
3/5/2015	110	976	x
3/12/2015	111	2,199	x
3/30/2015	85	5,027	x
3/31/2015	85	N/A	x
4/9/2015	84	5,453	

2. **The permittee requests that the division revise the ambient upstream water quality used in the WQA, based on site-specific data provided by the permittee (7 data points; samples collected from 7/22/2014 through 4/9/2015) from Sneffels Creek above the Ruby Trust Mine.**

   Full request:
   The background pollutant concentrations used in the original water quality assessment were based on data submitted by representatives of a nearby historic mine (Upper Mountain Top Mine) on upper Sneffels Creek, according to the Water Quality Assessment of Sneffels Creek conducted by the CDPHE [1]. Because this data does not represent site-specific upstream quality (on Sneffels Creek above Ruby Trust Mine), additional water quality data was collected at this location. It is requested that ambient upstream quality for Sneffels Creek be revised due to the availability of more accurate, site specific data. This data can be found below in Table 2. As shown in the table, the background concentration values that should be used for WQBELs are indicated with yellow highlighting, according to the CDPHE's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limitations (WQP-19 [2]. This policy states that for dissolved and potentially dissolved metals, the 50th percentile value should be used as the ambient concentration [2]. For total or total recoverable metals, the 85th percentile should be used [2].

Table 2: Ambient Water Quality Data Collected on Sneffels Creek Upstream of Ruby Trust Mine

Percentile (ug/L)		Parameter	Concentration (mg/L)						
85th	50th		7/22/14	12/4/14	2/12/15	3/6/15	3/12/15	3/30/15	4/9/15
	0.4	Arsenic, total	0.0007	0.0012	0.0004	0.0004	0.0004	0.0006	0.0004
0		Cadmium, dissolved	0	0	0	0	0	0	
0		Cadmium, potentially dissolved	0	0	0	0	0	0	
	0	Cadmium, total	0	0	0	0	0	0	
0		Copper, dissolved	0	0	0	0	0	0	
0		Copper, potentially dissolved	0	0	0	0	0	0	
0.76	0	Copper, total	0	0	0	0.0007	0.0006	0	0.0013
5		Iron, dissolved	0	0	0	0	0	0.02	
12.5	0	Iron, total	0.05	0	0	0	0	0	
50	10	Iron, total recoverable	0.08	0.04	0	0	0	0.02	
0.4		Lead, dissolved	0.0004	0.0001	0	0	0	0.0004	0.0001
	0.3	Lead, total	0.0009	0.0003	0.0003	0.0002	0.0002	0.0005	0.001
0		Manganese, dissolved	0	0	0	0	0	0	
0		Manganese, potentially dissolved	0	0	0	0	0	0	
	0	Mercury, total	0	0	0	0	0	0	
		pH	7.5	7.9	7.9	7.9	7.7	7.9	7.9
		Residue, Filterable (TDS) @180C	50	118	124	152	136	78	56
		Residue, Non-Filterable (TSS) @105C	0	0	0	0	0	0	
0		Silver, dissolved	0	0	0	0	0	0	
0		Silver, potentially dissolved	0	0	0	0	0	0	
30		Zinc, dissolved	0.03	0	0.02	0.02	0.03	0.02	0.01
0		Zinc, potentially dissolved	0	0	0	0	0	0	
	20	Zinc, total	0	0.01	0.02	0.02	0.03	0.02	0.02

3. **The permittee requests that the division modify the low flows for Sneffels Creek upstream of the Ouray Silver Mine discharge based on weekly flows, measured at a location directly above the Ouray Silver Mine (16 data points, sampled over ~4 ½ months [11/19/2014 through 3/30/2015]).**

   Full request:
   The flow of the receiving stream included in the original permit's WQBEL calculations can be modified as accurate data on upstream flow has been collected. The low flow analysis used in the original permit was based on an estimate provided by a previous local water commissioner due to the absence of a flow measuring device upstream of mining operations. As stated in the original water quality assessment, "discussions with the current local water commissioner yielded no additional quantitative information" [1]. Although the Ouray Silver Mine was originally modeled alongside Ruby Trust Mine in the water quality assessment, the two mines had separate ambient low flow analyses (a value of 0.25 cfs was used as ambient for Ruby Trust Mine according to their discharge permit and was then added with the water commissioner's estimate of 0.1 cfs as the contribution from Upper Sneffels Creek as upstream low flow for the Ouray Silver Mine). Because the low flow used in the original discharge permit calculations was based off of qualitative information rather than quantitative, upstream flow samples have been measured directly above the Ouray Silver Mine. The upstream flow measurements were taken using a velocity flowmeter directly above the Ouray Silver Mine. The flowmeter was used in a relatively uniform cross section of Sneffels Creek to insure the collection accurate flow information. As the creek is constantly flowing, the cross section used varied between samples; however, the cross sectional area of the creek was measured on each sample date and noted in sampling notation. These flow rates were collected on a weekly basis (with rare exceptions due to weather constrains) dating back to November 19th, 2014 – the beginning of the low flow season. Although it was recognized that daily flow data would be ideal, it was not feasible for this data to be collected due to the limited time availability of qualified field samplers as well as weather conditions associated with the high altitude of the site. A summary of the low flow data collected can be found below in Table 3. An appendix of the full data collected along with sampling observations, weather information,

temperatures, sampled by, and upstream activity can be found at the end of this document in Table 5. As daily data is not present, the 30-day average flow harmonic mean method cannot be applied to calculate critical flow. The permittee has thus estimated flow flows based on the monthly date range as proposed for the low-flow hardness calculation (the months of October through March). This estimation can be seen blow in Table 3. According to this date range, the average critical low flow for the Sneffels Creek stream segment upstream of the Ouray Silver Mine would be 1.72 cfs.

Table 3: Ambient Low Flow Data Collected on Sneffels Creek Upstream of the Revenue Mine

UPSTREAM LOW FLOW		October through March	
AVERAGE (gpm)		849.53	
AVERAGE (cfs)		1.89	
Date	**Flow (gpm)**	**October through March**	
11/15/11	500	x	*Note that flow measurements were taken visually and not using velocity flow meter during these dates
1/16/12	500	x	
6/24/12	3500		
9/18/12	1000		
12/6/12	500	x	
2/6/13	673	x	
6/20/13	2750		
7/18/13	1190		
7/25/13	1520		
8/1/13	1850		
8/8/13	2200		
9/26/13	1900		
12/26/13	150	x	
2/12/14	150	x	
4/2/14	650		
6/11/14	8250		
7/22/14	118		
11/19/14	1,760	x	*Note that flow measurements were taken using velocity flow meter during these dates
11/25/14	1,760	x	
12/4/14	955	x	
12/12/14	590	x	
1/10/15	533	x	
1/16/15	533	x	
3/5/15	472	x	
1/29/15	491	x	
2/5/15	490	x	
2/11/15	462	x	
2/19/15	495	x	
2/26/15	435	x	
3/12/15	601	x	
3/19/15	670	x	
3/27/15	1,169	x	
3/30/15	3,066	x	
4/9/15	1,785		

UPSTREAM LOW FLOW		October through March	
AVERAGE (gpm)		849.53	
AVERAGE (cfs)		1.89	
Date	**Flow (gpm)**	**October through March**	
4/16/15	2,004		
4/23/15	2,047		
4/30/15	2,564		

4. **The permittee provided updated WQBELs for consideration.**

Full request:
Taking all of the above changes into consideration, the permittee has drafted updated WQBEL calculations for permit modifications (shown below in Table 4). These calculations include the updated hardness for TVS in-stream standard calculations, updated ambient water quality concentrations, and lastly updated upstream critical low flow values. The permittee recognizes that the division may require their own calculations for the modified WQBELs but hopes that the provided calculations will aid in this process.

Table 4: WQBEL Estimations based on Data Submitted in this Modification

In-Stream Water Quality Standards			
Hardness	mg/L	101.42	
Parameter	Units	Hardness Based Chronic In-Stream Water Quality Standard (M3)	Water Quality Standard (Non-Variable with Hardness) (M3)
Arsenic, total recoverable	ug/L	-	7.6
Cadmium, dissolved	ug/L	*0.43*	-
Trivalent Chromium, dissolved	ug/L	*75*	-
Copper, dissolved	ug/L	*9.1*	-
Iron, total recoverable	ug/L	-	*1000.0*
Lead, dissolved	ug/L	*2.6*	-
Manganese, dissolved	ug/L	*1657*	-
Silver, dissolved	ug/L	*0.08*	-
Zinc, dissolved	ug/L	*123*	-

WQBELs							
Parameter	Q1 (cfs)	Q2 (cfs)	Q3 (cfs)	M1 - Ambient Concentration (ug/L)	M3 - Quality Standard (ug/L)	M2 - Permit Limit (ug/L)	Notes
Arsenic, total recoverable	1.72	2.8	4.52	0.4	7.6	Report	
Cadmium, dissolved	1.72	2.8	4.52	0	0.43	0.69	
Trivalent Chromium, dissolved	1.72	2.8	4.52	0	74.98	Report	
Copper, dissolved	1.72	2.8	4.52	0	9.06	14.63	
Iron, total recoverable	1.72	2.8	4.52	10	1000.00	1608.14	
Lead, dissolved	1.72	2.8	4.52	0.4	2.56	3.88	
Manganese, dissolved	1.72	2.8	4.52	0	1657.36	2675.45	
Silver, dissolved	1.72	2.8	4.52	0	0.08	0.12	
Zinc, dissolved	1.72	2.8	4.52	30	122.75	179.73	

IV. CHANGES MADE AS A RESULT OF THE AMENDMENT

General Overview of Approach

In order to recalculate the WQBELs for Ouray Silver Mine, the division reviewed the segmentation and the contributions of Ruby Mine, the upstream facility with Ouray Silver Mine.

The Ruby Mine discharges to Sneffels Creek, which is stream segment COGUUN05, upstream of the Ouray Silver mine. This means the Gunnison River Basin, Uncompahgre River Sub-basin, Stream Segment 05. This segment is composed of the "All tributaries to the Uncompahgre River, including all wetlands, from the source to a point immediately below the confluence with Dexter Creek, except for specific listings in Segments 1, 6a, 6b and 7 through 9." Stream segment COGUUN05 is classified for Aquatic Life Cold 2, Recreation Class E, Water Supply and Agriculture.

Approximately 2 miles downstream from Ruby Mine, Sneffels Creek becomes stream segment COGUUN09. This means the Gunnison River Basin, Uncompahgre River Sub-basin, Stream confluence with Sneffels Creek. Mainstem and all tributaries of Sneffels Creek from a point 1.5 miles above its confluence with Imogene Creek at 37.974979, -107.753960 (WGS84) to its confluence with Imogene Creek. Mainstem of Canyon Creek from its inception at the confluence of Imogene Creek and Sneffles Creek to the confluence with the Uncompahgre River." Stream segment COGUUN09 is classified for Aquatic Life Cold 2, Recreation Class P, and Agriculture.

The stream segment change on Sneffels Creek from COGUUN05 to COGUUN09 coincides with the confluence of the Atlas Mine drainage into Sneffels Creek. This area of the Gunnison Basin is a historic mining area, with several areas of mine related contributions to low water quality in some areas. Both Upper Sneffels Creek and the Atlas mine drainage contribute metals from some of these historic mine drainage areas into Sneffels Creek, segments COGUUN05 and COGUUN09. Thus, the upstream ambient water quality submitted by the permittee in this modification request was evaluated and incorporated into the re-calculation of the WQBELs for the entire segment COGUUN09, which includes a direct discharge from the Ouray Silver mine and an upstream discharge from the Ruby mine. The Division also included a consideration of the other contributions to Sneffels Creek (Atlas mine) in this calculation, as shown in the mass-balance equation.

The Atlas Mine discharge into Sneffels Creek exhibits measurable and elevated amounts of arsenic, cadmium, copper, iron, lead, manganese, silver, and zinc. In order to account for these pollutant contributions to Sneffels Creek from the Atlas Mine drainage, the division flow weighted these parameters into the mass balance equation to account for assimilative capacity used by the Atlas mine. Water quality data from the Atlas Mine drainage includes data from November 2011 through August 2013. At that time, the permittee also estimated the flow from the drainage to be approximately 0.72 MGD. Details will follow in the section *Request 4: Recalculations of WQBELs.*

Request 1: Revision to hardness

As provided in Regulation 35.6(3), the hardness values used in calculating the appropriate metal standards should be determined from a regression analysis of site-specific data. Where a regression analysis is not appropriate, a site-specific method should be used.

In the original 2013 WQA and the 2014 modification of the permit, insufficient hardness data were available for Sneffels Creek near the point of Ouray Silver's discharge to conduct a regression analysis based on the low flow condition. Therefore, the division's alternative approach to calculating hardness was used, which involves computing a mean hardness. The division originally calculated the mean hardness for Sneffels Creek, below the Ouray Silver Mine discharge, to be 78 mg/l. In Modification No. 1 of the permit, the permittee submitted additional hardness data, and refined the low-flow months to September through March, which resulted in a calculated hardness of 96 mg/l versus the original 78 mg/l.

In June 2015, the permittee provided additional hardness data via email from samples collected immediately downstream from the discharge point. The permittee also provided flow data to further refine the "low flow months" and requested that the division use hardness data only from September through March.

The division contacted the local water commissioner, Colorado Division of Water Resources on June 10, 2015, who advised that the months of low flow for this area is limited to only January through March. Therefore, the division updated the mean hardness previously calculated, using only data from January through March from both the recently submitted data and previous data, which resulted in a calculated mean for hardness of **104 mg/l**. Hardness values used in the calculation are listed in the table below. The resulting TVS value table follows.

Hardness values used in calculating the mean hardness for Modification No. 3		
Date	***Hardness (mg/L as CaCO3)***	***Flowrate (gpm)***
3/31/2015	85	NA
3/30/2015	85	5027
3/12/2015	111	2199
3/5/2015	110	976
2/15/2015	107	838
2/12/2014	135	425
2/6/2013	105	850
1/16/2012	95	700

Parameter	***In-Stream Water Quality Standard***			***TVS Formula: Hardness (mg/l) as CaCO3 = 104***
Cadmium, Dissolved	Acute	1.8	µg/l	$[1.136672-0.041838\ln(\text{hardness})]e^{(0.9151(\ln(\text{hardness}))-3.6236)}$
	Chronic	0.44	µg/l	$[1.101672-0.041838\ln(\text{hardness})]e^{(0.7998(\ln(\text{hardness}))-4.4451)}$
Trivalent Chromium, Dissolved	Acute	588	µg/l	$e^{(0.819(\ln(\text{hardness}))+2.5736)}$
	Chronic	77	µg/l	$e^{(0.819(\ln(\text{hardness}))+0.5340)}$
Hexavalent Chromium, Dissolved	Acute	16	µg/l	Numeric standards provided, formula not applicable
	Chronic	11	µg/l	Numeric standards provided, formula not applicable
Copper, Dissolved	Acute	14	µg/l	$e^{(0.9422(\ln(\text{hardness}))-1.7408)}$
	Chronic	9.3	µg/l	$e^{(0.8545(\ln(\text{hardness}))-1.7428)}$
Lead, Dissolved	Acute	67	µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-1.46)}]$
	Chronic	2.6	µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-4.705)}]$
Manganese, Dissolved	Acute	3025	µg/l	$e^{(0.3331(\ln(\text{hardness}))+6.4676)}$
	Chronic	1671	µg/l	$e^{(0.3331(\ln(\text{hardness}))+5.8743)}$
Nickel, Dissolved	Acute	484	µg/l	$e^{(0.846(\ln(\text{hardness}))+2.253)}$
	Chronic	54	µg/l	$e^{(0.846(\ln(\text{hardness}))+0.0554)}$
Selenium, Dissolved	Acute	18.4	µg/l	Numeric standards provided, formula not applicable
	Chronic	4.6	µg/l	Numeric standards provided, formula not applicable
Silver, Dissolved	Acute	2.2	µg/l	$\frac{1}{2}\, e^{(1.72(\ln(\text{hardness}))-6.52)}$
	Chronic	0.08	µg/l	$e^{(1.72(\ln(\text{hardness}))-10.51)}$
Zinc, Dissolved	Acute	166	µg/l	$0.978e^{(0.9094(\ln(\text{hardness}))+0.9095)}$
	Chronic	126	µg/l	$0.986e^{(0.9094(\ln(\text{hardness}))+0.6235)}$

Request 2: Revision to ambient water quality

In the 2013 WQA, Ouray Silver Mine was modeled with Ruby Mine (located upstream of Ouray Silver Mine) to determing WQBELs for Segment COGUUN09. Therefore, the ambient water quality, if available, would be used from upstream Ruby Mine. No upstream water quality data on Sneffels Creek was available and, consistent with division' practice, a comparable receiving stream was used. The data provided by Upper Mountain Top mine on Upper Sneffels Creek were determined to be representative of the ambient water quality upstream of Ruby Mine. Data points were available in 2009 and 2010.

In this modification request, the permittee submitted data from a sampling point located at latitude 37.97519 North and longitude 107.75332 West. This location is approximately 50 feet upstream of Ruby Trust Mine, which is upstream of the confluence of Upper Sneffels Creek, the Atlas mine, and the Ouray Silver mine. The Division evaluated this data and determined that the data is representative of ambient water conditions upstream of the Ruby Trust mine. The data, as submitted in the modification request, is provided in section II.2 of this document.

The following table provides a summary of this data for the parameters identified in the current permit (i.e., the summary does not

address those parameters that are not identified in the permit). Please note that parameters included in the permit due to an applicable federal ELG (i.e., total cadmium, total copper, total lead, total mercury, and total zinc) are not calculated based on a mass balance equation and therefore are not impacted by the new data provided in the modification request. These parameters are not included in the following table. Total recoverable chromium will be used for calculations for total recoverable trivalent chromium.

Summary of Ambient Water Quality for Sneffels Creek, upstream of Ruby Mine

Parameter	*Number of Samples*	*15th Percentile*	*50th Percentile*	*85th Percentile*	*Mean*	*Maximum*	*Chronic Stream Standard*	*Notes*
As, TR (µg/l)	7	0.4	0.4	0.6	0.46	0.6	7.6	
Cd, Dis (µg/l)	7	0	0	0	0	0	0.45	1
Cr, TR (µg/l)	7	0	0	0	0	0	NA	1
Cu, Dis (µg/l)	7	0	0	0	0	0	9.6	1
CN, Tot (µg/l)	7	0	0	0	0	0	NA	1
Fe, TR (µg/l)	7	0	0	20	5.7	20	1000	1
Pb, Dis (µg/l)	7	0	0	0.45	0.2	0.9	2.70	1
Mn, Dis (µg/l)	7	0	0	0	0	0	1692	1
Hg, Tot (µg/l)	7	0	0	0	0	0	0.01	1
Ag, Dis (µg/l)	7	0	0	0	0	0	0.086	1
Zn, Dis (µg/l)	7	10	20	21	19	30	130	

Note 1: When sample results were below detection levels, the value of zero was used in accordance with the Division's standard approach for summarization and averaging purposes.

As a result of this analysis, the Division used the new ambient water quality supplied by the permittee for total recoverable arsenic, potentially dissolved cadmium, total recoverable trivalent chromium, potentially dissolved copper, cyanide, total recoverable iron, potentially dissolved lead, potentially dissolved manganese, total mercury (low level), potentially dissolved silver, and potentially dissolved zinc ambient quality and revised the WQBELs for the Ouray Silver (and Ruby) mine.

Request 3: No revision to low flows

Regarding the additional flow data supplied by the permittee, the Division acknowledges that the permittee has collected weekly (instantaneous) flow measurements from immediately upstream of the discharge at Ouray Silver Mine to Sneffels Creek. However, when determining critical low flow conditions for permit effluent limits, the Division follows the methodology required by Regulation No. 31.9(1)(a) and 31.9(2), as follows;

> 'The empirically based 30-day average low flow with an average 1-in-3 year recurrence interval (30E3) for chronic standards and the empirically based 1-day low flow with an average 1-in-3 year recurrence interval (1E3) for acute standards, or the equivalent statistically-based flow.'
>
> 'The period of record for determining low flows shall be based on a minimum (underline added) of ten years of flow data, except that, when ten years of data is not available, low flows may be determined, on a case by-case basis, using a period of record of less than ten years. If more than ten years of flow data is available, it may be more appropriate to establish low flow conditions based on a longer period of record to more accurately reflect site specific conditions.'

The division uses the EPA's DFLOW model to obtain a 30 day low flow, with a 1 in 3 year recurrence interval. This model establishes a biologically based annual low flow. The model calculates a harmonic mean for each consecutive, forward rolling, 30-day period. This method establishes an annual low flow which is expected to occur no more than once every three years (e.g. 30E3). Thus, daily flow, typical of flow stations available from a USGS station, is needed to represent the river flow regime. One instantaneous sample each week for 17 weeks is not sufficient to represent daily low flow conditions over a period of ten years. Further, even if data are used on a case-by-case basis where less than 10 years of date is available, the data must be *measured* daily. Qualitative observational estimates are not appropriate for calculating hydrologic low flows.

The permittee acknowledged that no daily flow is available and offered estimates on low flows; however, absent the necessary data as described above, the subsequent two procedures for estimating low flows are either watershed ratios, or estimates provided to the

division by the local water commissioner. A reexamination of Sneffels Creek revealed no downstream stations that had the period of record or the representative daily flow data necessary to complete a watershed ratio. Therefore, because the WQA was completed in 2013, no significant changes to the low flows would result from including a data set since that time (2014/half of 2015). At that time, the Division coordinated with the State Office of the Engineer via the local water commissioner for low flow assessments for the 2013 WQA. The State Office of the Engineer administers water rights, associated allocations, and conducts regular field visits. Thus, the values provided by the Office remain valid and the low flow estimates in the 2013 WQA will not be modified at this time. **No changes will be made as a result of this request.**

Request 4: Recalculation of the WQBELs

Based on the new hardness and ambient water quality data provided by the permittee, and acknowledging the Atlas Mine drainage contributions, the division recalculated the WQBELs for COGUUN09 and applied the new limitations in the permit. A summary of the revised acute and chronic WQBELs, including a comparison with the previous permit WQBELs, follows the mass balance calculation discussion.

The Sneffels Creek portion of stream segment COGUUN09 receives discharges from Ouray Silver Mine, Ruby Mine, and the Atlas Mine drainage. Therefore all three contributors are modeled together to determine the assimilative capacity (the WQBELs) for Ruby Mine and for Ouray Silver mine for the Sneffels Creek portion of stream segment COGUUN09 for total arsenic, dissolved cadmium, dissolved copper, total recoverable iron, dissolved lead, dissolved manganese, dissolved silver, and dissolved zinc.

Permitted Design flows are:

- Ruby Mine design flow is 0.054 MGD (0.08 cfs)
- Ouray Silver Mine Mine is 1.75 MGD (2.7 cfs)

Additional flows are:

- Atlas Mine drainage is 0.72 MGD (1.1 cfs)

The flow contributions for Upper Sneffels Creek are those from the Low Flow Analysis in the 2013 WQA. Flow contributions for the Atlas Mine drainage were provided to the Division during the the 2013 permit renewal. The permittee submitted water quality data from the Atlas Mine drainage as a part of a previous permitting action.

The following table summarizes the Atlas Mine drainage data set.

Arsenic, total			Cadmium, dissolved			Copper, dissolved		
Date	**Result**	**Qual**	**Date**	**Result**	**Qual**	**Date**	**Result**	**Qual**
11/15/2011	0.0030		11/15/2011	0.0015		11/15/2011	0.0041	
1/16/2012	NS		1/16/2012	NS		1/16/2012	NS	
6/24/2012	0.0027		6/24/2012	0.0003	B	6/24/2012	0.0005	B
9/18/2012	0.0018		9/18/2012	0.0012		9/18/2012	0.0000	U
12/6/2012	0.0013		12/6/2012	0.0008		12/6/2012	0.0000	U
2/6/2013	NS		2/6/2013	NS		2/6/2013	NS	
6/20/2013	0.0023		6/20/2013	0.0000	U	6/20/2013	0.0012	B
7/18/2013	0.0048		7/18/2013	0.0000	U	7/18/2013	0.0000	U
7/25/2013	0.0023		7/25/2013	0.0011		7/25/2013	0.0009	B
8/1/2013	0.0037		8/1/2013	0.0000	U	8/1/2013	0.0000	U
8/8/2013	0.0031		8/8/2013	0.0000	U	8/8/2013	0.0000	U
Iron, total			Lead, dissolved			Manganese, dissolved		
Date	**Result**	**Qual**	**Date**	**Result**	**Qual**	**Date**	**Result**	**Qual**
11/15/2011	0.6100		11/15/2011	0.0001	B	11/15/2011	1.2000	
1/16/2012	NS		1/16/2012	NS		1/16/2012	NS	
6/24/2012	0.1000		6/24/2012	0.0005		6/24/2012	0.1830	
9/18/2012	0.3400		9/18/2012	0.0003	B	9/18/2012	0.7040	
12/6/2012	0.2200		12/6/2012	0.0003	B	12/6/2012	0.4130	
2/6/2013	NS		2/6/2013	NS		2/6/2013	NS	
6/20/2013	0.1200		6/20/2013	0.0004	B	6/20/2013	0.1600	
7/18/2013	0.3600		7/18/2013	0.0013		7/18/2013	0.3910	
7/25/2013	0.3500		7/25/2013	0.0015		7/25/2013	0.6310	
8/1/2013	0.4900		8/1/2013	0.0007		8/1/2013	0.5280	
8/8/2013	0.4400		8/8/2013	0.0009		8/8/2013	0.6390	
Silver, dissolved			Zinc, dissolved					
Date	**Result**	**Qual**	**Date**	**Result**				
11/15/2011	0.0000	U	11/15/2011	0.6300				
1/16/2012	NS		1/16/2012	NS				
6/24/2012	0.0000	U	6/24/2012	0.1500				
9/18/2012	0.0000	U	9/18/2012	0.3200				
12/6/2012	0.0000	U	12/6/2012	0.3600				
2/6/2013	NS		2/6/2013	NS				
6/20/2013	0.0000	U	6/20/2013	0.1500				
7/18/2013	0.0000	U	7/18/2013	0.1900				
7/25/2013	0.0002	B	7/25/2013	0.2700				
8/1/2013	0.0000	U	8/1/2013	0.2400				
8/8/2013	0.0000	U	8/8/2013	0.2300				

B Below PQL
U Nondetect (Below MDL)
NS Not Sampled
All values in mg/L

The Division's standard analysis consists of steady-state, mass-balance calculations for metals. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow, effluent flow and the water quality standard.

The Atlas Mine drainage contributes measurable amounts of several parameters, and therefore the division modified the standard steady-state mass-balance equation to account for the drainage via a flow weighted average as follows;

$$M_{final} = \frac{(M_{wqs}*Q_{ds}) - (M_{us}*Q_{us}) - (M_2*Q_2)}{(Q_1+Q_3)}$$

Where,

Q_{us} = Upstream flow

Q_1 = Ruby Mine permitted capacity

Q_2 = estimated Atlas Mine drainage

Q_3 = Ouray Silver Mine permitted capacity

Q_{ds} = Downstream flow, $-Q_{us}+Q_1+Q_2+Q_3$

M_{us} = ambient water quality (from upstream of Ruby Mine)

M_2 = Maximum concentration of parameter recorded from Atlas Mine drainage

M_{wqs} = Water Quality Standard

The upstream background pollutant concentrations used in the mass-balance equation will vary based on the regulatory definition of existing ambient water quality. For most pollutants, existing quality is determined to be the 85th percentile. For metals in the total or total recoverable form, existing quality is determined to be the 50th percentile.

Chronic WQBELs for Sneffels Creek COGUUN09 for Ouray Silver Mine and Ruby Trust Mine and the Atlas Mine Drainage

Parameter	*Qus*	*Q1*	*Q2*	*Q3*	*Qds*	*Mus*	*M2*	*Mwqs*	*Mfinal NEW WQBEL*	*OLD WQBEL*
Cd, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0	1.5	***0.44***	*0.2****	***0.41*****
Cu, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0	4.1	9.3	***12***	***8.6*****
Pb, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0.45	4.8	***2.6***	*2.2****	***2.4****
Mn, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0	1200	1671	***1960***	***1627*****
Ag, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0	0.22	***0.08***	*0.047****	***0.08*****
Zn, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	21	630	***126***	*-9.5**** *(126)*	***117*****
As, TR (µg/l)	0.35	0.12	1.1	3.7	5.27	0.4	4.8	7.6	***9.1***	***7.6* (Report)***
Fe, TR (µg/l)	0.35	0.12	1.1	3.7	5.27	0	610	1000	***1204***	***1000****

*2013 WQA
**2014 Modification
***Calculated limitation is less than the Water Quality Standard. Limitation will be set to the Water Quality Standard

Acute WQBELs for Sneffels Creek COGUUN09 for Ouray Silver Mine and Ruby Trust Mine and the Atlas Mine Drainage

Parameter	*Qus*	*Q1*	*Q2*	*Q3*	*Qds*	*Mus*	*M2*	*Mwqs*	*Mfinal NEW WQBEL*	*OLD WQBEL*
Cd, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0	1.5	1.8	***2.1***	*1.6***
Cu, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0	4.1	14	***18***	*13*** (Report)*
Pb, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0.45	4.8	67	***91***	*62***
Mn, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0	1200	3025	***3828***	*2945***
Ag, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	0	0.22	2.2	***3.0***	*2.1*** (Report)*
Zn, Dis (µg/l)	0.35	0.12	1.1	3.7	5.27	21	630	***166***	*46****	*154***

*2013 WQA
**2014 Modification

***Calculated limitation is less than the Water Quality Standard. Limitation will be set to the Water Quality Standard

For the parameters not contributed by the Atlas mine, the Division's standard analysis (steady-state, mass-balance calculations) for metals was performed to determine the WQBELs for Ouray and Ruby mines. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard.

The mass-balance equation is expressed as:

$$M_2 = \frac{M_3 Q_3 - M_1 Q_1}{Q_2}$$

Where,

Q_1 = Upstream low flow (1E3 or 30E3)
Q_2 = Average daily effluent flow (design capacity)
Q_3 = Downstream flow ($Q_1 + Q_2$)
M_1 = In-stream background pollutant concentrations at the existing quality
M_2 = Calculated WQBEL
M_3 = Water Quality Standard, or other maximum allowable pollutant concentration

Chronic WQBELs for Sneffels Creek COGUUN09 for Ouray Silver Mine and Ruby Trust Mine – Mass Balance Equation							
Parameter	***Q_1 (cfs)***	***Q_2 (cfs)***	***Q_3 (cfs)***	***M_1***	***M_3***	**M_2 NEW WQBEL**	***OLD WQBEL***
Cr+3, TR (µg/l)	0.35	2.8	3.15	0	100	***113***	***113****
Hg, Tot (µg/l)	0.35	2.8	3.15	0	0.01	***0.011***	***0.011***

*2013 WQA

Acute WQBELs for Sneffels Creek COGUUN09 for Ouray Silver Mine and Ruby Trust Mine – Mass Balance Equation							
Parameter	***Q_1 (cfs)***	***Q_2 (cfs)***	***Q_3 (cfs)***	***M_1***	***M_3***	***M_2 NEW WQBEL***	***OLD WQBEL***
CN, Free (µg/l)	0.35	2.8	3.15	0	5	***5.6***	*5.6**

*2013 WQA
**2014 Modification

For total recoverable arsenic, the report only requirement will remain in the permit and no changes will be made.

For dissolved cadmium, the new limitation of 0.44 µg/l (chronic) and 2.1 µg/l (acute) for dissolved cadmium has been added to the permit in place of the current permit limit of 0.41 µg/l chronic and 1.6 µg/l acute.

For total recoverable trivalent chromium, the report only requirement will remain in the permit and no changes will be made.

For dissolved copper, the new limitation of 12 µg/l (chronic) and report only for acute for dissolved copper has been added to the permit in place of current permit limit of 8.6 µg/l chronic and report only acute.

For total recoverable iron, the new limitation of 1204 µg/l for total recoverable iron has been added to the permit in place of the current permit limit of 1000 µg/l chronic.

For free cyanide, as the new limitation of 5.6 µg/l for cyanide has not changed from current permit limit of 5.6 µg/l acute, no changes to the permit will be made for this parameter.

For dissolved lead, the new limitations of 2.6 µg/l (chronic) and 91 µg/l (acute) for dissolved lead will be effective immediately in place of current permit limit of 2.4 µg/l chronic and 62 µg/l acute.

For dissolved manganese, the new limitations of 1960 µg/l (chronic) and 3828 µg/l (acute) for dissolved manganese will be effective

immediately in place of current permit limit of 1627 µg/l chronic and 2945 µg/l acute.

For low level total mercury, the supplied information did not change the WQBEL. The Division notes that the one DMR result from March 2015 was at 11.9 µg/l. Such a result warrants the inclusion of a permit limitation for low level total mercury. The 30 day limitation of 0.011 µg/l will be placed in the permit, replacing the monitor only requirement. However, considering this is a new limitation, a compliance schedule will be included in the permit. A compliance schedule until January 1, 2018 has been included in the permit. Interim limits will be set to 1 µg/l (the Federal ELG) for mercury. Note that due to the final limitation, low-level analyses remains a permit requirement for this parameter.

For dissolved silver, as the current permit limit is the same as the new the new limitation of 0.08 µg/l (chronic), no changes will be made for dissolved silver.

For dissolved zinc, the new limitation of 126 µg/l (chronic) and 166 (acute) for dissolved zinc will be effective immediately in place of current permit limit of 117 µg/l chronic and 154 µg/l acute.

V. PUBLIC NOTICE COMMENTS

The public notice period was from October 16, 2015 to November 16, 2015. No comments were received during the public notice period.