

# WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

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June 23, 2014

TO: Internal File

THRU: Daron Haddock, Permit Supervisor

FROM: Steve Christensen, Environmental Scientist 

RE: 2013 4<sup>th</sup> Quarter Water Monitoring, West Ridge Resources, West Ridge Mine, Task ID #4488

The West Ridge Mine is currently operational in the Book Cliff Mountain range of Carbon County, UT. Water monitoring data is submitted quarterly to the Division EDI database. Beginning on page 7-36 of the approved Mining and Reclamation Plan (MRP), water monitoring protocols and sampling requirements are provided for surface water, ground water, monitoring wells and UPDES outfalls in Tables 7-1, 7-2, 7-3 and 7-4 respectively.

**1. Was data submitted for all of the MRP required sites?** YES  NO

## Springs

The approved MRP outlines the monitoring of 8 springs (SP-8, SP-12, SP-13, SP-101, SP-0102, Road Spring, Section 5 Spring and SP-80). Two of the monitored springs (SP-12 and SP-13) discharge from the lower slopes of West Ridge in Whitmore Canyon. Spring SP-8 discharges in the upper drainage of C Canyon. Hanging Rock Spring (S-80) is located near the northwest corner of the permit area and discharges from the east slopes of Whitmore Canyon.

None of the 8 spring monitoring sites could be accessed this quarter due to snow cover.

## Streams

The approved MRP outlines the monitoring of nine stream sites (ST-3, ST-6, ST-8, ST-15, Patterfore, LF-1, LF-2, RF-1 and RF-2). Until the 2<sup>nd</sup> quarter of 2011, the surface water monitoring plan had included twelve stream monitoring sites; however, an amendment was submitted and approved by the Division (Task ID #3738) in March of 2011 that eliminated five of the sites. The amendment eliminated the monitoring of ST-5, ST-6A, ST-7, ST-11, ST-12 and ST-13. As a result, the monitoring of these stream sites was discontinued the 2<sup>nd</sup> quarter of 2011.

Grassy Trail Creek is the only intermittent/perennial stream in the permit and adjacent areas. The upper drainages of Grassy Trail Creek (i.e. the Left and Right Fork) are monitored quarterly. Four monitoring sites have been established on the Left Fork (LF-1, LF-2, ST-3 and ST-15). Monitoring sites LF-1 and LF-2 are flume sites where continuous monitoring data is obtained during

mid- to high-flow periods. During the late summer months, the flows of the Left and Right Forks of Whitmore Canyon decrease to a volume that cannot be measured accurately by the flumes. Site ST-15 monitors flow from the Spring Canyon drainage (tributary to the Left Fork).

Three monitoring sites have been established on the Right Fork (RF-1, RF-2 and Patterfore Stream). RF-1 and RF-2 are flume sites where continuous monitoring data is obtained during mid- to high-flow periods. The Patterfore Stream is a tributary to the Right Fork and was established as a monitoring site in the spring of 2011 in order to obtain additional data on the Right Fork drainage.

Data was submitted for one of the required stream/surface water monitoring points. Only surface water monitoring point ST-6 could be accessed due to snow cover. ST-6 was frozen and not able to be sampled/measured.

Continuous flow readings on the Left and Right Forks of Whitmore Canyon (LF-1, LF-2, RF-1 and RF-2) could not be obtained this quarter. Flows are typically obtained during the high-flow (late spring/early summer months i.e. 2<sup>nd</sup> quarter) and during the summer (3<sup>rd</sup> quarter) when flows are of sufficient volume to produce an accurate measurement (given the limitations of the flume). During the winter months, access to the sites is not possible due to snow cover.

## **Wells**

Quarterly operational sampling is required for one groundwater-monitoring well (Site DH 86-2).

Monitoring well DH 86-2 was not sampled during this quarter. The Permittee indicated that the water was frozen and thus unable to be sampled.

## **Underground Mine-Water Sample**

Monthly samples of the underground, pre-treatment mine water are required. The requirement was established on August 24<sup>th</sup>, 2010.

The required monthly samples were submitted for this quarter.

## **UPDES**

Operational sampling is required monthly for two active UPDES sites (Permit # UT0025640). Site D001 is the mine sites primary sediment pond discharge to the ephemeral 'C' Canyon drainage. Site D002 is the mine-water discharge to the ephemeral 'C' Canyon drainage. Specific limitations and self-monitoring requirements as outlined in the UPDES permit are presented in the table below:

<b>Effluent Characteristics</b>	<b>Effluent Limitations</b>
Flow, MGD (million gallons per day)	1.0

Total Suspended Solids (TSS), ppm	70
Total Iron, ppm	1.0
Oil & Grease, ppm	10
Total Dissolved Solids (TDS), ppm	2,000
pH	9

Outfall 001 did not report a discharge this quarter. Data was submitted for UPDES Outfall 002.

2. Were all required parameters reported for each site? YES  NO

**Spring Monitoring Sites:** None of the spring monitoring sites were accessible this quarter. A flow value for spring SP-80 was not reported the previous quarter (3<sup>rd</sup> quarter 2013). The Permittee simply missed submitting the flow. The flow value (6.5 gpm) was submitted to the Division.

**Surface Water Monitoring Sites:** Only one of the 9 stream monitoring sites was accessible this quarter (ST-6). ST-6 was frozen and could not be sampled.

**Well Monitoring Site DH 86-2:** The monitoring well was frozen this quarter. Sampling could not be performed.

**UG-1:** All required parameters were reported for underground mine-water monitoring site UG-1.

**UPDES:** Outfall 001 did not report a discharge this quarter. The required water quality data was reported for Outfall 002 was reported.

3. Were any irregularities found in the data? YES  NO

#### Surface Water Monitoring Sites-

As discussed above, only surface water monitoring site ST-6 could be accessed this quarter and it was frozen (unable to sample).

For several consecutive quarters, several surface water monitoring sites have been exhibiting fairly significant fluctuations for a numerous parameters: notably surface water monitoring sites ST-3 and ST-6.

In the case of ST-3, there has been a strong upward trend in concentrations for dissolved magnesium (D-Mg), dissolved sodium (D-Na), sulfate (SO<sub>4</sub>), total hardness (T-Hdns), total dissolved solids (TDS) and total anions and total cations (T-Cats/T-Anis). Surface water monitoring site ST-3 showed an increase in concentration for numerous parameters for 2<sup>nd</sup> quarter 2013 (continuing the trend from the last sampling event). The upward trend for these parameters continued this quarter (see below).

The data for surface water monitoring site ST-6 has exhibited a wide fluctuation in numerous parameters. In the 2<sup>nd</sup> quarter of 2012, the data showed a significant drop (well outside 2 standard deviations from the mean) for field conductivity, dissolved calcium (D-Ca), D-Mg, dissolved potassium (D-K), D-Na, Cl, SO<sub>4</sub>, T-Alk, T-Hdns, TDS, Bcrb, T-Cats and T-Anis. The following quarter (3<sup>rd</sup> quarter 2012), the data showed elevated concentrations for D-Ca, D-Mg, SO<sub>4</sub>, T-Alk, T-Hdns, TDS, Bcrb, T-Anis and T-Cats. ST-6 could not be accessed during the 4<sup>th</sup> quarter of 2012, 1<sup>st</sup> quarter of 2013 and 2<sup>nd</sup> quarter 2013. This quarter, the site reported 13 parameters outside of two standard deviations from the mean. The parameters were considerably lower than the historical average.

The following irregularities were identified for the surface water monitoring sites that were accessible and sampled during the 3<sup>rd</sup> quarter of 2013. As access to the stream monitoring sites was not possible due to snow-cover, no data is available to determine if the concentrations below are developing a trend. Continued monitoring will be conducted.

Site	Type	Date	Parameter	Value	Std. Dev.	Average
RF-1	Stream	9/30/2013	f-cond	387 umhos/cm	2.22	608.43 umhos/cm
Patterfore	Stream	9/30/2013	f-cond	470 umhos/cm	3.22	662.60 umhos/cm
Patterfore	Stream	9/30/2013	TDS	372 ppm	3.38	417.6 ppm
Patterfore	Stream	9/30/2013	Bcrb	230 ppm	3.22	270 ppm
LF-1	Stream	9/29/2013	TSS	36 ppm	2.31	16.4 ppm
ST-3	Stream	9/29/2013	D-Mg	58.6 ppm	2.99	40.7 ppm
ST-3	Stream	9/29/2013	D-Na	47.04 ppm	3.86	24.9 ppm
ST-3	Stream	9/29/2013	Cl	5 ppm	2.37	2.77 ppm
ST-3	Stream	9/29/2013	SO <sub>4</sub>	124 ppm	4.19	54.9 ppm
ST-3	Stream	9/29/2013	T-Hdns	381 ppm	2.76	293.80 ppm
ST-3	Stream	9/29/2013	TDS	509 ppm	3.25	364.63 ppm
ST-3	Stream	9/29/2013	T-Cats	9.71 ppm	3.20	7.03 ppm
ST-3	Stream	9/29/2013	T-Anis	9.55 ppm	2.19	7.13 ppm
ST-6	Stream	9/27/2013	f-cond	982 umhos/cm	3.7	2076 umhos/cm
ST-6	Stream	9/27/2013	Flow	2100 gpm	2.62	390.98
ST-6	Stream	9/27/2013	D-Ca	28.35 ppm	2.81	72.84 ppm
ST-6	Stream	9/27/2013	D-Mg	29.99 ppm	3.14	62.38 ppm
ST-6	Stream	9/27/2013	D-K	6.38 ppm	3.31	11.15 ppm
ST-6	Stream	9/27/2013	D-Na	152.47 ppm	3.25 ppm	341.35 ppm
ST-6	Stream	9/27/2013	SO <sub>4</sub>	306 ppm	2.91	699.18 ppm
ST-6	Stream	9/27/2013	T-Alk	231 ppm	4.21	427.29 ppm
ST-6	Stream	9/27/2013	T-Hdns	194 ppm	3.13	438.75 ppm
ST-6	Stream	9/27/2013	TDS	687 ppm	3.16	1499.97 ppm
ST-6	Stream	9/27/2013	Bcrb	221 ppm	4.16	429.21 ppm

ST-6	Stream	9/27/2013	T-Cats	10.68 meq/l	3.38	23.82 meq/l
ST-6	Stream	9/27/2013	T-Anis	11.6 meq/l	3.29	23.87 meq/l

**UPDES Sites- (UPDES Permit #UT0025640)**

**Site D001-** *UPDES outfall D001 (primary sediment pond at mine site) did not report a discharge this quarter.*

**Site D002-** *UPDES Outfall 002 water quality data was obtained each month this quarter. The average flow value for the 3<sup>rd</sup> quarter of 2013 was 909 gpm for (which was down from the 2<sup>nd</sup> quarter 2013 average of average of 1,414 gpm. The average flow for 4<sup>th</sup> quarter 2013 was 2,151.67 gpm.*

*During 2<sup>nd</sup> quarter of 2012, the June 25<sup>th</sup> sample reported a total iron (T-Fe) concentration of 1.41 ppm. The concentration exceeded the UPDES standard for T-Fe of 1.0 ppm. A non-compliant T-Fe sample was again obtained on December 12<sup>th</sup>, 2012 (T-Fe: 1.23 ppm). All of the T-Fe concentrations were within the 1.0 ppm level for the 1st quarter of 2012. The 1.0 ppm limit for T-Fe was again exceeded during the 2<sup>nd</sup> quarter of 2013 (1.39 ppm on May 31<sup>st</sup>, 2013). The Utah Division of Water Quality was alerted to the exceedences for T-Fe. Each of the three monthly T-Fe concentrations was within the compliant limit of 1.0 for 3<sup>rd</sup> quarter and 4<sup>th</sup> quarter 2013.*

*The following irregularities were identified at Outfall 002 for 4th quarter 2013. Significant reductions in the concentrations for field conductivity and TDS were reported during this quarter.*

Site	Type	Date	Parameter	Value	Std. Dev.	Average
002	UPDES outfall	10/29/2013	f-cond	962 umhos/cm	2.55	1,984.59 umhos/cm
002	UPDES outfall	10/31/2013	f-cond	945 umhos/cm	2.59	1,984.59 umhos/cm
002	UPDES outfall	10/31/2013	TDS	458 ppm	2.93	1,459.74 ppm
002	UPDES outfall	11/26/2013	f-cond	995 umhos/cm	2.47	1,984.59 umhos/cm
002	UPDES outfall	11/30/2013	f-cond	987 umhos/cm	2.49	1,984.59 umhos/cm
002	UPDE outfall	11/30/2013	TDS	277 ppm	3.46	1,459.74 ppm
002	UPDES outfall	12/30/2013	f-cond	1,007 umhos/cm	2.44	1,984.59 umhos/cm
002	UPDES outfall	12/31/2013	f-cond	967 umhos/cm	2.54	1,984.59 umhos/cm
002	UPDES outfall	12/31/2013	TDS	444 ppm	2.97	1,459.74 ppm

**Spring Monitoring Sites**

The following data irregularities were identified with the spring monitoring sites during the 3<sup>rd</sup> quarter of 2013. As access to the spring monitoring sites was not possible due to snow-cover, no data is available to determine if the concentrations below are developing a trend. Continued monitoring will be conducted.

Site	Type	Date	Parameter	Value	Std. Dev.	Average
SP-101	Spring	9/29/2013	f-cond	433 umhos/cm	4.59	724.18 umhos/cm
SP-101	Spring	9/29/2013	D-Mg	87.38 ppm	7.53	53.55 ppm
SP-101	Spring	9/29/2013	D-K	2.28 ppm	2.37	1.68 ppm
SP-101	Spring	9/29/2013	D-Na	69.82 ppm	9.99	35.45 ppm
SP-101	Spring	9/29/2013	Cl	8 ppm	9.99	2.99 ppm
SP-101	Spring	9/29/2013	SO4	241 ppm	9.99	93.36 ppm
SP-101	Spring	9/29/2013	T-Alk	395 ppm	3.06	343 ppm
SP-101	Spring	9/29/2013	T-Hdns	497 ppm	5.33	365.51 ppm
SP-101	Spring	9/29/2013	TDS	712 ppm	7.9	464.06 ppm
SP-101	Spring	9/29/2013	Bcrb	395 ppm	3.06	343 ppm
SP-101	Spring	9/29/2013	T-Cats	13.02 meq/l	6.21	8.89 meq/l
SP-101	Spring	9/29/2013	T-Anis	13.14 meq/l	3.8	8.89 meq/l
SP-80	Spring	9/27/2013	SO4	182 ppm	2.32	118.84 ppm
SP-80	Spring	9/27/2013	T-Alk	323	3.09	425.94 ppm
SP-80	Spring	9/27/2013	Bcrb	283 ppm	3.47	408.73
SP-102	Spring	9/29/2013	f-cond	488 umhos/cm	3.3	674.65 umhos/cm
SP-102	Spring	9/29/2013	D-Ca	54.57 ppm	9.9	36.13 ppm
SP-102	Spring	9/29/2013	D-Mg	87.23 ppm	9.99	54.58 ppm
SP-102	Spring	9/29/2013	D-Na	69.85 ppm	6.76	43.87 ppm
SP-102	Spring	9/29/2013	Cl	8 ppm	3.07	5.51 ppm
SP-102	Spring	9/29/2013	SO4	240 ppm	9.99	87.19 ppm
SP-102	Spring	9/29/2013	T-Alk	39.2 ppm	7.25	314.29 ppm
SP-102	Spring	9/29/2013	T-Hdns	495 ppm	9.99	315 ppm
SP-102	Spring	9/29/2013	TDS	704 ppm	9.99	426.06 ppm
SP-102	Spring	9/29/2013	Bcrb	392 ppm	7.88	308.24 ppm
SP-102	Spring	9/29/2013	T-Cats	13 meq/l	9.99	8.25 meq/l
SP-102	Spring	9/29/2013	T-Anis	13.07 meq/l	5.67	8.25 meq/l
SP-8	Spring	9/27/2013	f-cond	933 umhos/cm	2.07	1,685.5 umhos/cm
SP-8	Spring	9/27/2013	D-Ca	59.53 ppm	2.32	76.22 ppm
SP-8	Spring	9/27/2013	D-Mg	61.74 ppm	3.93	140.03 ppm
SP-8	Spring	9/27/2013	D-K	1.62 ppm	3.38	4.08 ppm
SP-8	Spring	9/27/2013	D-Na	48.36 ppm	3.18	181.94 ppm
SP-8	Spring	9/27/2013	Cl	6 ppm	2.6	15.64 ppm
SP-8	Spring	9/27/2013	SO4	182 ppm	3.22	542.45 ppm
SP-8	Spring	9/27/2013	T-Alk	403 ppm	3.3	583.366 ppm

SP-8	Spring	9/27/2013	T-Hdns	403 ppm	3.85	767 ppm
SP-8	Spring	9/27/2013	TDS	560 ppm	3.6	1,328.03 ppm
SP-8	Spring	9/27/2013	Bcrb	292 ppm	2.71	578.78 ppm
SP-8	Spring	9/27/2013	T-Cats	10.19 meq/l	3.66	23.34 meq/l
SP-8	Spring	9/27/2013	T-Anis	10.43 meq/l	3.31	23.36 meq/l

*Monitoring well DH 86-2 has produced elevated D-K concentrations for the past two quarters (i.e. 13-2 and 13-3). However, as the well was frozen this quarter, continued monitoring will need to be conducted to see if the elevated D-K concentrations persist.*

*The following irregularity was identified at underground water monitoring point UG-1 for 4<sup>th</sup> quarter 2013.*

Site	Type	Date	Parameter	Value	Std. Dev.	Average
UG-1	Underground monitoring	10/31/2013	T-Alk	546 ppm	2.25	476.79 ppm
UG-1	Underground monitoring	10/31/2013	Bcrb	546 ppm	2.08	477.17 ppm
UG-1	Underground monitoring	11/30/2013	T-Alk	583 ppm	3.45	476.79 ppm
UG-1	Underground monitoring	11/30/2013	TDS	1,541 ppm	2.12	89.93 ppm
UG-1	Underground monitoring	11/30/2013	Bcrb	583 ppm	3.19	477.17 ppm
UG-1	Underground monitoring	12/31/2013	SO4	406 ppm	2.78	562.82 ppm
UG-1	Underground monitoring	12/31/2013	T-Alk	387 ppm	2.92	476.79 ppm
UG-1	Underground monitoring	12/31/2013	TDS	983 ppm	4.08	1,350.29 ppm
UG-1	Underground monitoring	12/31/2013	Bcrb	387 ppm	2.72	477.17 ppm

**4. On what date does the MRP require a five-year re-sampling of baseline water data.**

*On page 7-36 of the approved MRP, the Permittee commits to collecting baseline samples “from each spring in the monitoring program during the low flow (fall) sampling and from each stream monitoring sites during low flow every five years beginning with the first mid-term review.”*

*Baseline sampling of ground and surface water sites will be required during the 3<sup>rd</sup> quarter of 2016.*

**5. Based on your review, what further actions, if any, do you recommend?**

*Continue to monitor the data irregularities cited above for any trends.*

**6. Does the Mine Operator need to submit more information to fulfill this quarter's monitoring requirements?**

YES  NO

**7. Follow-up from last quarter, if necessary.**

YES  NO

