

# WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

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December 31, 2013

TO: Internal File

THRU: Daron Haddock, Permit Supervisor

FROM: Steve Christensen, Environmental Scientist 

RE: 2013 2<sup>nd</sup> Quarter Water Monitoring, West Ridge Resources, West Ridge Mine, Task ID #4361

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.

*Data was submitted for six of the 8 spring monitoring sites (SP-80, SP-101, SP-102, SP-12, SP-13 and SP-8).*

## 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 all the required stream/surface water monitoring points that produced a measurable flow. Stream monitoring sites ST-15, ST-8 and LF-2 did not produce a measurable flow.*

*Due to access issues as a result of snow cover, the 4 flumes installed on the Left and Right fork drainages of Whitmore Canyon (LF-1, LF-2, RF-1 and RF-2) could not be accessed during the 1<sup>st</sup> quarter of 2013. As part of the approved monitoring plan, continuous flow recording devices were installed in the aforementioned locations. Due to the physical constraints of the flumes in which the continuous flow recording devices were installed, accurate flow measurements can only be obtained when during snow/ice free periods and during periods when the flow is of sufficient volume to produce an accurate reading given the dimensions of the flumes themselves.*

*As a result, a reasonable expectation is that continuous flow readings be 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). The Permittee provided the Division with three 2<sup>nd</sup> quarter 2013 spreadsheets of continuous flow data on December 19<sup>th</sup>, 2013 for flume sites LF-1, RF-1 and RF-2. According to the Permittee, the data for LF-2 was not provided as the flow was of insufficient volume for the continuous recording device to detect.*

*Upon review of the three spreadsheets (for LF-1, RF-1 and RF-2, issues were identified. The data was not formatted and as a result, it was not possible to analyze it. The Permittee was informed of the formatting issue on December 30<sup>th</sup>, 2013. At that time, the Permittee was instructed to provide the data in a format that could be analyzed as well as provide the flow data collected from flume LF-2 in order to verify the low-flow conditions that rendered continuous recording of the flow impossible. As of December 31<sup>st</sup>, 2013, the Permittee has not provided that information.*

## **Wells**

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

*Monitoring well DH 86-2 was sampled during this quarter and the data provided.*

## **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:

Effluent Characteristics	Effluent Limitations
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:** *All required data was submitted for six of the 8 spring monitoring sites (SP-80, SP-101, SP-102, SP-12, SP-13 and SP-8). Two of the spring monitoring sites reported ‘no observable flow’ (Road Spring and Section 5 Spring).*

**Surface Water Monitoring Sites:** *All required data was submitted for all the required stream/surface water monitoring points that produced a measurable flow. Stream monitoring sites ST-15, ST-8 and LF-2 did not produce a measurable flow.*

*The Permittee provided the Division with three 2<sup>nd</sup> quarter 2013 spreadsheets of continuous flow data on December 19<sup>th</sup>, 2013 for flume sites LF-1, LF-2, RF-1 and RF-2.*

**Well Monitoring Site DH 86-2:** *All required parameters were reported for well monitoring site DH 86-2.*

**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.*

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

**Surface Water Monitoring Sites-**

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, ST-6 and ST-8. ST-8 did not produce a measurable flow this quarter.

In the case of ST-3 and ST-8, there has been a strong upward trend in concentrations for dissolved magnesium (D-Mg), dissolved sodium (D-Na), chloride (Cl), sulfate (SO4), total alkalinity (T-Alk), total hardness (T-Hdns), total dissolved solids (TDS), bicarbonate (Bcrb), total anions and total cations (T-Cats/T-Anis) as well as conductivity.

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, SO4, T-Alk, T-Hdns, TDS, Bcrb, T-Cats and T-Anis. The following quarter (3<sup>rd</sup> quarter 2013), the data showed elevated concentrations for D-Ca, D-Mg, SO4, T-Alk, T-Hdns, TDS, Bcrb, T-Anis and T-Cats.

ST-3, ST-6 and ST-8 could not be accessed in the 4<sup>th</sup> quarter of 2012 due to winter conditions. ST-3 and ST-8 were again not accessible due to winter conditions in the 1<sup>st</sup> quarter of 2013. However; ST-6 was accessible during 1<sup>st</sup> quarter 2013. Numerous irregularities were noted with the ST-6 data. With the exception of flow, thirteen water quality parameters showed a reduction in concentration outside of two standard deviations from the mean for 1<sup>st</sup> quarter 2013. The reduction in concentrations for numerous parameters continued for ST-6 during 2<sup>nd</sup> quarter 2013.

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 following irregularities were identified for the surface water monitoring sites that were accessible this quarter.

Site	Type	Date	Parameter	Value	Std. Dev.	Average
RF-1	Stream	6/26/2013	f-cond	402 umhos/cm	2.07	608.43 umhos/cm
RF-1	Stream	6/26/2013	Cl	4 ppm	3.89	1.86 ppm
Patterfore	Stream	6/26/2013	f-cond	482 umhos/cm	3.01	662.60 umhos/cm
Patterfore	Stream	6/26/2013	D-Ca	46.49 ppm	3.73	62.26 ppm

Patterfore	Stream	6/26/2013	D-Mg	33.24 ppm	2.48	41.87 ppm
Patterfore	Stream	6/26/2013	T-Alk	211 ppm	4.86	271 ppm
Patterfore	Stream	6/26/2013	T-Hdns	253 ppm	4.23	327.8 ppm
Patterfore	Stream	6/26/2013	TDS	316 ppm	7.53	417.6 ppm
Patterfore	Stream	6/26/2013	Bcarb	211 ppm	4.75	270 ppm
Patterfore	Stream	6/26/2013	T-Cats	6.16 ppm	2.17	7.71 ppm
LF-1	Stream	6/26/2013	Temp	20 deg's C	2.03	8.12 deg's C
LF-1	Stream	6/26/2013	Cl	6 ppm	2.16	4.40 ppm
LF-1	Stream	6/26/2013	T-Alk	301 ppm	3.84	356.40 ppm
LF-1	Stream	6/26/2013	TDS	465 ppm	3.55	499.6 ppm
LF-1	Stream	6/26/2013	Bcarb	301 ppm	4.78	351.6 ppm
ST-3	Stream	6/26/2013	D-Mg	57.45 ppm	2.8	40.7 ppm
ST-3	Stream	6/26/2013	D-Na	46.43 ppm	3.75	24.90 ppm
ST-3	Stream	6/26/2013	Cl	6 ppm	3.43	2.77 ppm
ST-3	Stream	6/26/2013	SO4	121 ppm	4.01	54.90 ppm
ST-3	Stream	6/26/2013	TDS	460 ppm	2.15	364.63 ppm
ST-3	Stream	6/26/2013	T-Cats	9.04 ppm	2.40	7.03 ppm
ST-6	Stream	6/24/2013	f-cond	994 umhos/cm	3.66	2,076.05 umhos/cm
ST-6	Stream	6/24/2013	D-Ca	35.38 ppm	2.37	72.84 ppm
ST-6	Stream	6/24/2013	D-Mg	33.46 ppm	2.8	62.38 ppm
ST-6	Stream	6/24/2013	D-K	6.98 ppm	2.89	11.15 ppm
ST-6	Stream	6/24/2013	D-Na	182.3 ppm	2.74	341.35 ppm
ST-6	Stream	6/24/2013	Cl	19 ppm	2.37	29.0 ppm
ST-6	Stream	6/24/2013	SO4	365 ppm	2.47	699.18 ppm
ST-6	Stream	6/24/2013	T-Alk	234 ppm	4.15	427.39 ppm
ST-6	Stream	6/24/2013	T-Hdns	226 ppm	2.72	438.75 ppm
ST-6	Stream	6/24/2013	TDS	768 ppm	2.85	1,499.97 ppm
ST-6	Stream	6/24/2013	Bcarb	202 ppm	4.54	429.21 ppm
ST-6	Stream	6/24/2013	Carb	31 ppm	5.37	11.50 ppm
ST-6	Stream	6/24/2013	T-Cats	12.63 meq/L	2.88	23.82 meq/L
ST-6	Stream	6/24/2013	T-Anis	12.79 meq/L	2.97	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.*

*Flow values continue to rise. The average flow value for the quarter was 909 gpm down from the previous quarter's average of 1,414 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.*

*The following irregularities were identified at Outfall 002 for 4<sup>th</sup> quarter 2012.*

Site	Type	Date	Parameter	Value	Std. Dev.	Average
002	UPDES outfall	10/08/2012	TDS	765 ppm	2.35	1,494 ppm
002	UPDES outfall	11/19/2012	Flow	2,150 ppm	2.23	759.98 ppm
002	UPDES outfall	11/19/2012	f-cond.	1,310 umhos/cm	2.29	2,076.98 umhos/cm
002	UPDES outfall	11/28/2012	TDS	559 ppm	3.01	1,494.8 ppm
002	UPDES outfall	12/12/2012	Flow	2,365 gpm	2.57	759.98 gpm
002	UPDE outfall	12/31/2012	Flow	2,350 gpm	2.55	759.98 gpm
002	UPDES outfall	12/31/2012	f-cond.	1,290 umhos/cm	2.35	2,076.98 umhos/cm

*The following irregularities were identified at Outfall 002 for 1<sup>st</sup> quarter 2013.*

Site	Type	Date	Parameter	Value	Std. Dev.	Average
002	UPDES outfall	01/26/2013	Flow	2,100 gpm	2.15	759.98 gpm
002	UPDES outfall	01/31/2013	Flow	2,220 gpm	2.34	759.98 gpm
002	UPDES outfall	01/31/2013	f-cond	1,365 umhos/cm	2.13	2,076.98 umhos/cm
002	UPDES outfall	01/31/2013	TDS	663 ppm	2.68	1,494.80 ppm
002	UPDES outfall	02/25/2013	Flow	2,065 gpm	2.09	759.98 gpm
002	UPDES outfall	02/25/2013	f-cond	1,249 ppm	2.48	2,076.98 ppm
002	UPDES	02/25/2013	TDS	618 ppm	2.82	1,494.80

	outfall					ppm
002	UPDES outfall	02/26/2013	Flow	2,160 ppm	2.24	759.98 ppm
002	UPDES outfall	02/26/2013	f-cond	1,301 umhos/cm	2.32	2,076 umhos/cm
002	UPDES outfall	03/30/2013	f-cond	1,380 umhos/cm	2.08	2,076.98 umhos/cm
002	UPDES outfall	03/31/2013	TDS	665 ppm	2.67	1,494.80 ppm

*The following irregularities were identified at Outfall 002 for 2<sup>nd</sup> quarter 2013.*

Site	Type	Date	Parameter	Value	Std. Dev.	Average
002	UPDES outfall	4/27/2013	f-cond	1,350 umhos/cm	2.14	2,076.98 umhos/cm
002	UPDES outfall	5/29/2013	f-cond	1,336 umhos/cm	2.22	2,076.98 umhos/cm
002	UPDES outfall	5/31/2013	f-cond	1,280 umhos/cm	2.38	2,076.98 umhos/cm
002	UPDES outfall	6/24/2013	f-cond	973 umhos/cm	3.30	2,076.98 umhos/cm
002	UPDES outfall	6/27/2013	f-cond	1,012 umhos/cm	3.19	2,076.98 umhos/cm

### Spring Monitoring Sites

The following data irregularities were identified with the spring monitoring sites during the 4<sup>th</sup> quarter of 2012. The spring monitoring sites could not be accessed 1<sup>st</sup> quarter 2013 due to snow/wintery conditions.

Site	Type	Date	Parameter	Value	Std. Dev.	Average
SP-101	Spring	12/3/2012	D-Ca	42.18 ppm	3.55	58.41 ppm
SP-101	Spring	12/3/2012	D-Mg	64.64 ppm	2.5	53.35 ppm
SP-101	Spring	12/3/2012	Cl	4 ppm	2.18	2.99 ppm
SP-101	Spring	12/3/2012	SO4	133 ppm	4.49	93.36 ppm
SP-102	Spring	12/3/2012	D-Ca	40.32 ppm	2.72	36.13 ppm
SP-102	Spring	12/3/2012	D-Mg	61.79 ppm	2.72	54.58 ppm
SP-102	Spring	12/3/2012	D-Na	36.02 ppm	2.04	43.87 ppm
SP-102	Spring	12/3/2012	SO4	126 ppm	5.92	87.19 ppm
SP-102	Spring	12/3/2012	T-Alk	290 ppm	2.27	314.29 ppm
SP-102	Spring	12/3/2012	T-Hdns	355 ppm	2.91	315 ppm

SP-13	Spring	12/3/2012	T-Alk	279 ppm	2.02	368.14 ppm
SP-13	Spring	12/3/2012	Bcarb	279 ppm	2.28	389.71 ppm

*The following spring monitoring site irregularities were identified at Outfall 002 for 2<sup>nd</sup> quarter 2013.*

Site	Type	Date	Parameter	Value	Std. Dev.	Average
SP-101	Spring	6/29/2013	f-cond	413 umhos/cm	4.9	724.18 umhos/cm
SP-101	Spring	6/29/2013	D-Ca	49.69 ppm	2.46	58.41 ppm
SP-101	Spring	6/29/2013	D-Mg	78.74 ppm	5.62	53.35 ppm
SP-101	Spring	6/29/2013	D-Na	62.52 ppm	8.36	35.45 ppm
SP-101	Spring	6/29/2013	Cl	8 ppm	9.99	2.99 ppm
SP-101	Spring	6/29/2013	SO4	208 ppm	9.99	93.36 ppm
SP-101	Spring	6/29/2013	T-Alk	378 ppm	2.06	343.00 ppm
SP-101	Spring	6/29/2013	T-Hdns	448 ppm	3.34	365.51 ppm
SP-101	Spring	6/29/2013	TDS	649 ppm	5.89	464.06 ppm
SP-101	Spring	6/29/2013	Bcarb	378 ppm	2.06	343 ppm
SP-101	Spring	6/29/2013	T-Cats	11.73 ppm	4.27	8.89 ppm
SP-101	Spring	6/29/2013	T-Anis	12.09 ppm	2.86	8.89 ppm
SP-102	Spring	6/29/2013	f-cond	502 umhos/cm	3.05	674.65 umhos/cm
SP-102	Spring	6/29/2013	D-Ca	44.27 ppm	5.29	36.13 ppm
SP-102	Spring	6/29/2013	D-Mg	69.8 ppm	5.75	54.58 ppm
SP-102	Spring	6/29/2013	D-Na	55.66 ppm	3.07	43.87 ppm
SP-102	Spring	6/29/2013	SO4	180 ppm	9.99	87.19 ppm
SP-102	Spring	6/29/2013	T-Hdns	398 ppm	6.04	315 ppm
SP-102	Spring	6/29/2013	TDS	557 ppm	7.19	426.06 ppm
SP-102	Spring	6/29/2013	T-Cats	10.42 meq/L	4.74	8.25 meq/L
SP-102	Spring	6/29/2013	T-Anis	10.37 meq/L	2.49	8.25 meq/L
SP-12	Spring	6/29/2013	D-Mg	83.96 ppm	2.92	63.86 ppm
SP-12	Spring	6/29/2013	D-Na	65.92	5.50	38.93 ppm
SP-12	Spring	6/29/2013	SO4	208 ppm	2.78	109.98 ppm
SP-12	Spring	6/29/2013	T-Hdns	478 ppm	2.65	373.20 ppm
SP-12	Spring	6/29/2013	TDS	652 ppm	2.75	476.83 ppm
SP-12	Spring	6/29/2013	T-Cats	12.47 meq/L	3.27	9.18 meq/L
SP-12	Spring	6/29/2013	T-Anis	11.77 meq/L	2.49	9.27 meq/L
SP-8	Spring	6/25/2013	D-Ca	54.18 ppm	4.23	77.53 ppm
SP-8	Spring	6/25/2013	D-Mg	59.31 ppm	9.99	144.71 ppm

SP-8	Spring	6/25/2013	D-K	1.52 ppm	6.99	4.23 ppm
SP-8	Spring	6/25/2013	D-Na	48.32 ppm	5.53	189.53 ppm
SP-8	Spring	6/25/2013	Cl	5 ppm	4.3	16.35 ppm
SP-8	Spring	6/25/2013	SO4	183 ppm	6.36	565.70 ppm
SP-8	Spring	6/25/2013	T-Alk	287 ppm	6.53	599.09 ppm
SP-8	Spring	6/25/2013	T-Hdns	380 ppm	9.99	789.51 ppm
<b>Site</b>	<b>Type</b>	<b>Date</b>	<b>Parameter</b>	<b>Value</b>	<b>Std. Dev.</b>	<b>Average</b>
SP-8	Spring	6/25/2013	TDS	534 ppm	8.89	1,375.16 ppm
SP-8	Spring	6/25/2013	Bcarb	258 ppm	6.26	612.26 ppm
SP-8	Spring	6/25/2013	T-Cats	9.72 meq/L	8.98	24.13 meq/L
SP-8	Spring	6/25/2013	T-Anis	9.68 meq/L	7.44	24.17 meq/L
SP-80	Spring	6/25/2013	D-Ca	45.14 ppm	3.37	78.07 ppm
SP-80	Spring	6/25/2013	T-Alk	244 ppm	5.46	435.94 ppm
SP-80	Spring	6/25/2013	T-Hdns	315 ppm	4.03	445.29 ppm
SP-80	Spring	6/25/2013	TDS	448 ppm	3.33	588.53 ppm
SP-80	Spring	6/25/2013	T-Cats	8.08 meq/L	3.59	11.09 meq/L
SP-80	Spring	6/25/2013	T-Anis	8.07 meq/L	2.30	11.10 meq/L

*The following irregularity was identified for monitoring well DH 86-2.*

Site	Type	Date	Parameter	Value	Std. Dev.	Average
DH 86-2	Monitoring Well	6/25/2013	D-K	16.55 ppm	2.17	10.92 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

