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WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

February 16, 2011

TO: Internal File

THRU: Daron Haddock, Permit Supervisor DRH

FROM: James D. Smith, Environmental Scientist III JDS 02/16/11

RE: 2010 Third Quarter Water Monitoring, Canyon Fuel Company, LLC, Skyline Mine, C0070005, Task ID # 3635

The Skyline Mine is an operating longwall mine. Current operations are in the North Lease area of the mine. Many mined-out areas of the mine have been sealed-off. Water monitoring requirements can be found in Section 2 of the MRP, especially pages 2-36, 2-36a, 2-36b, 2-37, 2-38, and 2-39.

1. Were data submitted for all of the MRP required sites? YES ☒ NO ☐

Second, Third, and Fourth Quarter monitoring requires regular information from 76 sites. Additional locations on streams in the North Lease are monitored for one year before, during, and for one year after their being undermined.

Note: Samples are analyzed for tritium at several sites, plus deuterium, carbon-14, and oxygen-18 at JC-1. Because determinations of isotopic concentrations can require several months, these values are often reported later than those from field measurements and routine laboratory analyses. The Permittee has always been prompt at getting the isotopic data to the Division as soon as they are received from the lab.

In-mine

The MRP requires sampling at 6 sites categorized as "other" or "in-mine, roof drippers" for all four quarters. All 6 are monitored at the surface: *CS-12, CS-14, MD-1, and SRD-1* are mine discharge stations; *CS-13* is a French drain; and *ELD-1* is the combined output of JC-1 and JC-3. The Permittee submitted all required information for these sites for the Third Quarter 2010.

Springs

No springs are monitored during the First Quarter, but 27 springs are monitored during the Second, Third, and Fourth Quarters: *36-1, S10-1, S12-1, S13-2, S13-7, S14-4, S15-3, S17-2, S22-5, S22-11, S23-4, S24-1, S24-12, S26-13, S34-12, S35-8, S36-12, 2-413, 3-290, 8-253, WQ1-*

1, WQ1-39, WQ3-6, WQ3-26, WQ3-41, WQ3-43, and WQ4-12 Except for tritium values at S15-3, S24-1, 2-413, and 8-253 (See Note above), the Permittee submitted all required information for the springs.

Streams

The MRP requires First Quarter sampling at only 4 stream-sites: *CS-6, VC-6, VC-9, and VC-10,* but at 29sites during the Second, Third, and Fourth Quarters: *CS-3, CS-6, CS-7, CS-8, CS-9, CS-10, CS-11, CS-16, CS-17, CS-18, CS-19, CS-20, CS-21, CS-22, CS-23, CS-25, F-10, UPL-10, VC-6, VC-9, VC-10, VC-11, VC-12, WRDS-1, WRDS-2, WRDS-3, WRDS-4, EL-1, and EL-2.* The parameters measured at each site vary: see Table 2.3.7-1. EL-1 and EL-2 are for tritium analysis only, and except for EL-1 and EL-2 (See Note above), the Permittee submitted all required information for these stream sites for the Third Quarter 2010.

The Permittee monitors additional stream sites in the North Lease (designated as NL-1 through NL-42) monthly for 12 months before, during, and 12 months after their being undermined by the longwall. Monitoring results are reported in the Annual Hydrologic Report (Sec. 2.4.4) and submitted to the database. The Permittee commits to measuring the flow monthly in June through October, and measuring flow during other months if the sites are accessible. Twelve NL sites were monitored during the Third Quarter 2010.

Wells

Water levels are measured at 15 wells during the Second, Third, and Fourth Quarters: *8-5-1, W79-10-1B, W79-14-2A, W79-26-1, W79-35-1A, W79-35-1B, W2-1, W20-4-1, W20-4-2, W99-4-1, W99-21-1, W20-28-1, 91-26-1, W91-35-1, and 92-91-03.* Operational parameters are also measured at 92-91-03. None of these wells are monitored during the First Quarter.

Monthly flow measurements are required year round at JC-1 and JC-3. During the Second, Third, and Fourth Quarters, the Permittee also measures all field parameters, TDS, TSS, and Total Phosphorous at both sites once per quarter, plus isotopes ^{14}C, Tritium, Deuterium, and ^{18}O at JC-1 once per quarter.

ELD-1 is reported with the "other" or "in-mine, roof drippers" sites.

Well JC-3 is permitted as a UPDES point by PacifiCorp. That permit requires PacifiCorp to report flow, oil & grease, TDS, NH3, N as nitrate + nitrite, plus total and dissolved As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Ag, Zn, and P. Since July 2004, JC-3 has discharged only once, in October 2007.

Except for isotopic data at JC-1 (See Note above), the Permittee submitted all required information for the well sites for the Third Quarter 2010.

UPDES

The UPDES Permit and MRP require weekly monitoring of 3 outfalls: *001, Sedimentation Pond Discharge to Eccles Creek at the Portal; 002, Sedimentation Pond*

Discharge to Eccles Creek at the Loadout; and 003, the Sedimentation Discharge at the Waste Rock Disposal Site. DMR parameters (total Fe, TDS, pH, TSS, flow, oil and grease, and specific conductivity, and temperature) are reported to the database as operational parameters. Total Fe is analyzed twice per month rather than weekly. Parameters that are not included in the operational parameter lists in the MRP - such as sanitary wastes, visible foam, and floating solids - are not reported in the electronic submittal to the Division.

Well JC-3 is permitted as a UPDES point by PacifiCorp. For JC-3, Skyline reports only monthly flow during the First Quarter, and monthly flow and quarterly field parameters, TDS, TSS, and T-P during the Second, Third, and Fourth Quarters. (The UPDES permit for JC-3 requires PacifiCorp to report flow, oil & grease, TDS, NH3, N as nitrate + nitrite, plus total and dissolved As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Ag, Zn, and P.) Since July 2004, JC-3 has discharged only once, in October 2007.

The Permittee submitted all required information for the UPDES sites for the Third Quarter. Outfall 001 flowed throughout the quarter but Outfalls 002 and 003 reported no flow during the entire quarter.

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

Beginning in 2010 and every five years thereafter, baseline analyses are to be done on samples collected during the Third Quarter (MRP p. 2-44).

Due to a lab error acidity was not analyzed during the 3rd Quarter 2010. The Permittee committed to analyze for acidity during the 4th Quarter 2010.

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

Listed parameters were more than two standard deviations from the mean. Parameters in bold typeface were also more than two standard deviations from the mean during the last quarter when monitoring was done. Underlined and bolded parameters have been more than two standard deviations from the mean during two or more consecutive monitoring events. An asterisk indicates the parameter is not required.

As shown in the following table, many sites had cation-anion balances that were outside two standard deviations from the mean; however, except for VC-6 (6.3%), CS-9 (9.6%), WQ1-1 (10%), and S35-8 (11%), cation-anion balances were within 5% for the samples that were analyzed for the appropriate ions.

Site Name	Type	Parameters
CS-13	Other	Total alkalinity, bicarbonate as CaCO3
CS-14	Other	Cation - anion balance
CS-3	Stream	Field electric conductivity, Cl
CS-6	Stream	Bicarbonate as CaCO3

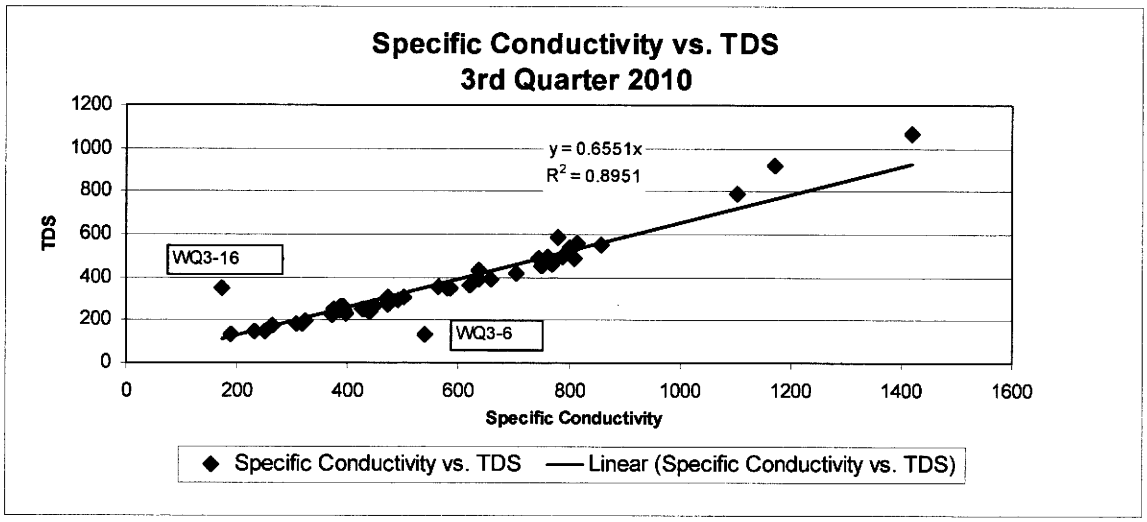
CS-7	Stream	T-Mg
CS-9	Stream	Total alkalinity, cation - anion balance
CS-10	Stream	Cation - anion balance
CS-11	Stream	Cation - anion balance, T-Ca
CS-18	Stream	Cation - anion balance
CS-19	Stream	Cation - anion balance
CS-21	Stream	Cation - anion balance, bicarbonate as CaCO3
F-10	Stream	Field electric conductivity, D-K
UPL-10	Stream	Cation - anion balance, bicarbonate as CaCO3
VC-6	Stream	Cation - anion balance, bicarbonate as CaCO3
VC-9	Stream	Cation - anion balance, **bicarbonate as CaCO3**
VC-10	Stream	Bicarbonate as CaCO3
S13-7	Spring	Cation - anion balance
S17-2	Spring	Cation - anion balance, total hardness, bicarbonate as CaCO3
S22-5	Spring	TDS
S22-11	Spring	Total hardness, NO2+NO3 N
S43-12	Spring	D-Ca, total hardness, TDS, T-Ca*, T-Mg
S35-8	Spring	TSS, Total alkalinity, NO2+NO3 N, TDS, SO4, T-Mg, T-K
S36-12	Spring	NO2+NO3 N
WQ1-39	Spring	Bicarbonate as CaCO3
WQ3-6	Spring	TSS, Total alkalinity, total cations*, total anions*, D-Ca, D-Mg, **total hardness**, TDS, bicarbonate as CaCO3, D-Na, D-K, Cl
WQ3-26	Spring	TSS, Total alkalinity, total cations*, total anions*, D-Ca, D-Mg, total hardness, TDS, bicarbonate as CaCO3, D-Na, Cl
WQ3-41	Spring	Bicarbonate as CaCO3
WQ3-43	Spring	Water temperature, bicarbonate as CaCO3
WQ4-12	Spring	Bicarbonate as CaCO3
W20-4-2	Well	Depth
W91-35-1	Well	**Depth** (meter problems)
92-01-03	Well	Cation - anion balance, bicarbonate as CaCO3

The Division calculated the following Reliability Checks, based on previous Water Quality Reports for the Skyline Mine (for further information on Reliability Checks, see Chapter 4, *Water Quality Data: Analysis and Interpretation* by Arthur W. Hounslow.)

- TDS/Conductivity
  - Out of 49 samples for which both field specific-conductivity and TDS were determined, 45 have a TDS/Conductivity ratio in the expected range between

0.55 and 0.76.

- S26-13 is just outside the bottom of that range at 0.53, and 92-91-3 is just outside at the top at 0.78.
- The other two sites (the two leftmost points on the chart) - have more extreme values: WQ3-6 (0.25) and WQ3-26 (2.01).
- The linear trendline has a slope of 0.66 (see chart).



- The 43 samples for which both field specific-conductivity and total cations were determined, 41 have Conductivity/Cations ratios from 74 to 108; this ratio should be close to 100. The values are extreme at WQ3-26 (28) and WQ3-6 (299), the same sites as for TDS/Specific-conductivity

- For 45 samples, the Division calculated Reliability Checks that involve dissolved Ca, Mg, K, Na, Cl, and SO4. There were not data on dissolved ions at other sites.

  - **K/(K+ Na) ratio**
    - The K/(K+ Na) ratio should be ≤20%.
    - For 28 of 45 samples, the ratio is >21%.
    - At the other sites, the ratio ranges from 4 to 20%.
    - These values are consistent with recent results.

  - **Mg/(Ca + Mg) ratio**
    - Ideally the Mg/(Ca + Mg) ratio is ≤ 40%.
    - All 45 samples have ratios ≤ 40%.
    - The CS-12 ratio is 39%; CS-12 frequently has the highest ratio, very close to 40%.
    - These results are consistent with results from recent quarters (see summary comment below).

  - **Ca/(Ca + SO4) ratio**
    - Ideally the Ca/(Ca + SO4) ratio is ≥ 50%.

- Of the 45 samples, 7 have a Ca/(Ca + SO4) ratio < 50%.
- The lowest ratio is 16%.
- Because Mg/(Ca + Mg) values are within the expected range, SO4 values may bear watching; however, these results are consistent with results from recent quarters.

- **Na/(Na + Cl) ratio**
  - The Na/(Na + Cl) ratio should be ≥ 50 %.
  - The ratio ranges from 51% to 92% at 16 sites of 44 sites.
  - These are the very similar to the results from previous quarters

When these Reliability Checks do not meet the target value, it does not necessarily mean that the analyses are in error; however, it does indicate the collection and analysis procedures might benefit from some extra scrutiny by the Permittee. The Permittee should work with the lab to make sure that samples pass all quality checks so that the reliability of the samples does not come into question. However, the consistent results of these reliability checks from quarter to quarter probably indicates that local conditions do not match those upon which these Reliability Checks were formulated.

UPDES

UPDES permit UT0023540 (effective December 1, 2009) allows for a DML for TDS of 1,200 mg/L and a 30-day average of 500 mg/L. There is no tons/day DML unless the 30-day average exceeds 500 mg/l; then a 7.1 tons/day limit is imposed. For the Third Quarter of 2010, the discharge at Outfall 001 did not exceed the DML for TDS of 1,200 mg/L; however, the 30-day average was 524 mg/L (471 to530 mg/L) and the tons/day load (calculated from the weekly values for TDS and flow in the database) during the Third Quarter averaged over 10 tons/day, ranging from 8.9 to 15.1 tons/day. Because of ongoing exceedences, particularly at outfall 001, Canyon Fuel Company participates in the Salinity Offset Plan that was approved by DWQ on January 5, 2005 (retroactive to September 2004).

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

Beginning in 2010 and every five years thereafter, baseline analyses are to be done on samples collected during the Third Quarter (MRP p. 2-44).

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

As regards Third Quarter 2010 water quality sampling and analysis, there is no recommendation for further action by the Division.

6. Does the Mine Operator need to submit more information to fulfill this quarter's monitoring requirements? YES ☒ NO ☐

Due to a lab error, acidity was not analyzed as part of the 5-year baseline analysis during the 3rd Quarter 2010. The Permittee has committed to analyze for acidity during the 4th Quarter 2010.

The Permittee needs to submit the isotope data for the Second and Third Quarter 2010 - when they become available - and the associated field parameters for S15-3.

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

Other than the submission of isotope and associated data when they become available, there is no follow-up from last quarter.

8. Did the Mine Operator submit all missing and/or irregular data?

Except for the missing acidity data, the Permittee was able to provide all the required data not included in the initial submittal.

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