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TO: Internal File

FROM: James D. Smith, Sr. Reclamation Specialist/Hydrogeology, Team Lead JDS

RE: Technical Analysis for Amending the Reclamation Plan – Lower Pad (Phase 2), Energy West Mining Company, Des-Bee-Dove Mine, C/015/017-AM01D-2

SUMMARY:

The Deseret, Beehive, and Little Dove Mines were temporarily sealed in 1987. The permit was taken out of temporary cessation in 1999 in order to begin reclamation. The reclamation plan is being modified because the Tipple pad, which was to be left basically unreclaimed under the old plan, has been excavated to recover the large volume of marketable coal that was incorporated during its construction.

Proposed amendment C/015/017-AM01D is for reclamation of what Energy West calls the Phase 2 area, which is the road from the permit area boundary (where the county road ends) to the Tipple pad, the remainder of the Tipple pad, the Deseret Mine portals and pad, the Bathhouse pad, and related roads within the permit area. The amendment is to become Appendix XV of the MRP, and it is self-contained in a three-ring binder.

Initial reclamation of the Phase 1 area – the Little Dove and Beehive pad, the water tank pad, the substation pad, and related roads – was completed in May 2002. Neither Phase 1 nor Phase 2 includes reclamation of the sedimentation pond.

Utah Coal Mining Rules require a coal-mine operator to demonstrate steps to be taken to minimize disturbance to the hydrologic balance within the permit and adjacent areas and to prevent material damage outside the permit area. This TA is for Phase 2 only.

TECHNICAL ANALYSIS:

RECLAMATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 784.14, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-301-512, -301-513, -301-514, -301-515, -301-532, -301-533, -301-542, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-733, -301-742, -301-743, -301-750, -301-751, -301-760, -301-761.

Analysis:

Hydrologic Reclamation Plan

Sediment control measures

Contouring, pocking, and vegetation are the methods to be used to keep sediment in place on reclaimed surfaces. Weed-free alfalfa hay will be incorporated into the soil at a rate of 2,000 lbs/acre (R645-301-341). Surfaces will be roughened by pocking or deep gouging to retain sediment and moisture and to mix the straw mulch into the upper portion of the soil. Hydroseeded areas will receive wood-fiber mulch. A soil tackifier will be applied to protect against erosion until vegetation is established (R645-301-244). Rock litter on the surface will also aid in sediment control, enhance vegetation establishment, create micro-habitats, and help provide a natural aesthetic appearance (R645-301-244). If erosion is identified during routine monitoring or monitoring after precipitation events, silt fence will be installed and, if needed, the surface will be enhanced and reseeded.

Revegetation that matches the characteristics of the undisturbed reference areas will be a major factor in determining successful reclamation sediment control. Sediment control measures will also be evaluated by field assessment of erosion and off-site transport of sediment. No other method or standard is proposed to directly determine the success of the reclamation sediment-control measures.

Sediment concentrations above background are not expected (R645-301-242.130); however, background levels for this site are not known. The only site monitored for water quality is the UPDES outfall of the sedimentation pond, so there are no water-quality or sediment load baseline data for this Des-Bee-Dove drainage that allow a comparison similar to the one done at Deer Creek Mine: this lack of baseline or background data will need to be considered in any evaluation of the effectiveness of sediment control measures. Such an evaluation may indicate that the measures are not adequate and more robust methods of sediment control are needed for this steep, dry, rocky, exposed site.

RUSLE Estimates of Soil Loss

In the following discussion, "Appendix B" and "Appendix C" refer respectively to:

- Appendix B of Section R645-301-700 – Hydrology in Appendix XIV - Phase 1 Reclamation Plan; and
- Appendix C of Section R645-301-200 - Soils in Appendix XIV - Phase 1 Reclamation Plan.

The Applicant used RUSLE, developed by the NRCS, to estimate sediment contribution from undisturbed and reclaimed watersheds at Des-Bee-Dove, similar to what was done at the nearby Deer Creek Mine. RUSLE is not intended for calculations of soil loss from steep slopes, but provides at least a calculated estimate of the expected sediment levels as a starting point should further evaluation be needed.

A brief discussion of RUSLE and the calculation results are found in Appendix B. The map in Appendix B shows two of the profiles used to calculate soil loss - DBDA31D and DBDA32D - are in the Phase 2 area.

One basic formula used by RUSLE is A = R*K*LS*C*P, where:

A	=	calculated annual soil loss in tons/year/acre;
R	=	rainfall /runoff erosivity;
K	=	soil erodibility factor;
LS	=	hillslope length and steepness;
C	=	cover management; and
P	=	support practices.

Because all input parameters except K remained the same during the various runs of RUSLE, only input parameter K and the resulting variation in A are discussed here. Input values used by the Permittee were checked and appear reasonable.

RUSLE - All Undisturbed Areas

For all undisturbed areas, a value of K = 0.206 was used in the RUSLE soil-loss calculations. This value was based on information for the Kenilworth Series in the Soil Survey of the Carbon – Emery Area. RUSLE calculated A to be 0.05 tons/year/acre for all undisturbed areas because there was little variation between undisturbed areas for any of the input parameters. K and A for the undisturbed areas are labeled K_U and A_U in the following tables.

RUSLE - All Disturbed Areas: K and A calculated without using the very-fine sand fraction from the soil analyses

For the disturbed areas, RUSLE calculated K based on input of other, detailed information. One input parameter needed by RUSLE to most accurately determine K is the very-fine sand fraction in the soil. The very-fine sand fraction in soils from the Des-Bee-Dove disturbed area was measured but was not initially reported in Exhibit B of Appendix C; therefore, the first run of RUSLE did not account for the effects of very-fine sand on soil loss. Table TA-1 summarizes the results of the initial RUSLE calculations.

TABLE TA-1
RUSLE Calculated Soil Loss based on information in Appendix B and soil analyses from the superseded version of Exhibit B of Appendix C that lacked the very-fine sand fraction.

K – RUSLE Soil Erodibility Factor
A - RUSLE Calculated Soil Loss in tons/year/acre

Disturbed Areas			Undisturbed Areas		
Soil Profile ID from Appendix B	K Calculated by RUSLE Using Soil Analysis Data Without the Very-fine Sand Fraction	A	K_U For All Undisturbed Areas	A_U For All Undisturbed Areas	Difference Between A and A_U in lbs/year/acre
DBDA11D	0.394	0.092	0.208	0.05	+84
DBDA21D	0.394	0.044	0.208	0.05	-12
DBDA22D	0.361	0.03	0.208	0.05	-40
DBDA23D	0.262	0.054	0.208	0.05	+8
DBDA31D	0.262	0.034	0.208	0.05	-32
DBDA32D	0.389	0.052	0.208	0.05	+4

Disturbed soil profiles DBDA11D shows a predicted sediment loss 84 lbs/year/acre greater than the undisturbed areas, but soil loss is predicted to be somewhat lower in DBDA22D and DBDA31D than in the undisturbed areas. Predictions for the other three areas show soil loss might be roughly equivalent to that in the undisturbed areas. Based on the input values listed in Appendix B, longer slope-length and cover management appear to be important factors where predicted soil-loss is greater in disturbed areas than in undisturbed areas; support practice (surface roughening) to be an important factor where it is less.

RUSLE - All Disturbed Area: A calculated using Dan Larsen's generalized K value

The very-fine sand fraction is included in the soil analyses in the current Exhibit B of Appendix C. However, based on a recommendation from Dan Larsen of EIS Environmental and Consulting, the Permittee used K = 0.36 for all disturbed areas in the RUSLE calculations in Appendix B. Mr. Larsen estimated this value for K based on generalized soil texture and permeability for the entire disturbed area. The results of the RUSLE calculations using this value are in the current Appendix B, and Table TA-2 below summarizes the results of the calculations.

TABLE TA-2
RUSLE Calculated Soil Loss based on Dan Larsen's estimated K
K – RUSLE Soil Erodibility Factor
A - RUSLE Calculated Soil Loss in tons/year/acre

Disturbed Areas			Undisturbed Areas		
Soil Profile ID from Appendix B	K Estimated by Dan Larsen of EIS	A	K_U For All Undisturbed Areas	A_U For All Undisturbed Areas	Difference Between A and A_U in lbs/year/acre
DBDA11D	0.36	0.09	0.208	0.05	+80
DBDA21D	0.36	0.04	0.208	0.05	-20
DBDA22D	0.361	0.03	0.208	0.05	-40
DBDA23D	0.36	0.07	0.208	0.05	+40
DBDA31D	0.36	0.05	0.208	0.05	±0
DBDA32D	0.36	0.05	0.208	0.05	±0

Disturbed soil profiles DBDA11D again shows a high predicted sediment loss, 80% greater than the undisturbed areas. DBDA23D and DBDA31D have predicted soil losses 32% greater than calculated initially. Prediction soil losses for the other three areas show little or no change. (Table TA-1)

RUSLE - Disturbed Areas DBDA31D and DBDA32D: K and A calculated using the very-fine sand fraction from the soil analyses

For profiles DBDA31D and DBDA32D in the Phase 2 area, the Permittee has done the RUSLE soil-loss calculations using the laboratory soil testing results as they are currently found in Exhibit B of Appendix C: these include the very-fine sand fraction. The calculation results are in the October 9, 2002 cover letter that accompanied the submittal, but they have not been incorporated into the MRP (mainly to avoid expanding this submittal to the amending of

Appendix B in Appendix XIV). As seen in comparing Table TA-2 and Table TA-3, there is no change in the values for Profile DBDA32D. The K value for Profile DBDA31D is 0.276 rather than 0.36, and the resulting value for A is 0.04. The Permittee feels that this difference, which equates to a loss of 20 lbs/year/acre less than from the undisturbed areas, is negligible, and that Mr. Larsen's estimate of K results in a more conservative soil-loss estimate. The Permittee therefore is satisfied with the RUSLE calculations currently in Appendix B, which are based on Mr. Larsen's estimate of K.

TABLE TA-3
DBDA31D and DBDA32D only
Based on information in Appendix B and October 9, 2002 cover letter

K – RUSLE Soil Erodibility Factor
A - RUSLE Calculated Soil Loss in tons/year/acre

Disturbed Areas			Undisturbed Areas		
Soil Profile ID from Appendix B	K Calculated by RUSLE Using Soil Analysis Data Including the Very-fine Sand Fraction	A	K_U For All Undisturbed Areas	A_U For All Undisturbed Areas	Difference Between A and A_U in lbs/year/acre
DBDA31D	0.276	0.04	0.208	0.05	-20
DBDA32D	0.36	0.05	0.208	0.05	±0

Findings:

Reclamation Hydrologic Information is adequate to meet the minimum requirements of the Coal Mining Rules.

RECOMMENDATIONS:

This revision of the Reclamation Plan should be approved.