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TO: Internal File

THRU: Susan M. White, Sr. Reclamation Specialist/Team Lead SMW

FROM: James D. Smith, Sr. Reclamation Specialist JDS

RE: Upper Pad Reclamation - Appendix 14, PacifiCorp, Des Bee Dove Mine, C/015/017-AM01A-2

SUMMARY:

The mines in the Des-Bee-Dove area pre-date SMCRA, mine operations having been documented by the USGS in 1922. Utah Power and Light purchased the mines in 1972. The mines were temporarily sealed in 1987. In 1999 the portals were backfilled and - except for guardrails, a large drop-inlet structure, and several culverts - the surface facilities were removed.

As the Beehive Mine and Little Dove Mines were developed, overburden was excavated and graded to make the mine pads. The disturbance was not planned with reclamation in mind, and disturbed soils were neither classified nor salvaged; however, soil surveys were done in 1980, 1983, 1990, 2000, and 2001. Overburden was used to expand the pad area for the two mines and to divert a small drainage at the south end of the pad. In the 1970's, bin walls and large boulders were placed below the pad to stabilize it and protect the Deseret Mine below. A narrow road was developed off the East Mountain Cattle Access Trail to provide access to a substation and water tank.

What the permittee refers to as Phase 1 disturbed area is the Beehive and Little Dove pad and portal area, the tank - substation access road, plus the road from this upper area down to the Deseret Mine pad. Reclamation of this Phase 1 area will involve removal of remaining structures, restoration to approximate original contour (AOC), revegetation of the recontoured surface, and reestablishment of four minor drainages - three at the mine pad and one near the water tank pad.

The initial submittal was on March 29, 2001 and the Division's initial TA, which identified several deficiencies, was dated April 19, 2001, and PacifiCorp submitted their response to those deficiencies on September 15, 2001. The Division prepared a second TA dated November 9, 2001. EnergyWest responded with a revised amendment on November 20, 2001. additional soil sampling was done in December 2001 and results were received by the Division on February 4, 2002.

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:

General

The Phase 1 Reclamation Area for the Beehive and Little Dove Mines is in a small, unnamed canyon that is tributary to Grimes Wash and part of the Cottonwood Canyon Creek drainage. Hydrologic resources of the entire East Mountain area, which includes the Cottonwood/Wilberg, Deer Creek, and Des-Bee-Dove Mines, are described in Volume 9 - Hydrologic Section.

No ground-water resources have been documented in the Phase 1 Reclamation Area, the strata east of the Deer Creek Canyon fault being essentially dry. There are some small springs farther down the canyon that will not be affected by this phase of the reclamation.

The pad for the Beehive and Little Dove Mines was built across three small, ephemeral channels at the head of this drainage. These drainages normally flow only in response to storm events. The channel at the south end was diverted around the Beehive and Little Dove pad by a berm. Flow from the other two channels crosses the Beehive and Little Dove pad, enters a 48-inch culvert that carries the flow down to the main tipple pad, and from there reports to the sedimentation pond below the minesite. Another small drainage by the water tank was disturbed but not diverted by construction of the road to the tank pad.

For reclamation of this Phase 1 area, channel and slope stability are more important than getting the fill all the way to the top of the cut slope. The channel and the filled slopes should be designed and built so that water cannot get from the channel into the fill and destabilize it. The proposed plan states that, because of the restricted site configuration, reconstruction of the drainages will dictate the actual extent to which fill can be placed (Section 553.110, page 15). This is a major concern at the Division, especially in drainage #3 (Drawings CS1817C and CS1814D) where the dip of the sandstone ledge above the Beehive portals will naturally divert water towards the placed fill and the drop from the ledge will concentrate erosive power at the base of the ledge. No purpose will be served in covering the entire cut to the top if water erodes the fill or saturates the fill and causes it to slide.

Materials used to construct the channels will be gradational from fine material at bottom to coarse at top, as shown in Drawing CS1819A, and on Plate 4 - 1 - sheet 2 of 5 in Volume 4. The engineered channels will be embedded into the fill. The plan states several times that boulders will be removed from fill materials so that proper compaction can be obtained, but beyond merely separating out boulders, some method will be needed on site to obtain adequately graded materials. Boulders and coarse materials need to be placed so as to be stable, not just dumped.

Diversions

All diversions and drainage control structures constructed for mine operations will be removed. Flows will be returned to reconstructed channels at the approximate locations of the original, natural channels.

Calculations for peak storm discharge and volume used to design these constructed channels are in Appendix A. Calculations were done using the STORM program, which is available through OSMRE's TIPS program. An SCS Upland Curve 7 - ephemeral channel - was used. The rest of the parameters are given in pages 22 to 26 and in Appendix A. Results are summarized in Table 7-1 on page 26.

Calculations for channel design, including filter design and riprap sizing, were done using FlowMaster (version 5.13), based on Manning's equation. Calculation methodology for the filter design and riprap-sizing is explained on pages 26 through 32, and the results of the calculations are in Appendix A. The best combination of water velocity and channel width and depth was sought through an iterative process that tried to balance the costs of constructing narrower but deeper channels against installing additional riprap in shallower but wider channels. Channel dimensions, expected flow characteristics, and D50 riprap requirements are summarized in Table 7-2 on page 29, and trapezoidal channel designs results are in Appendix A.

Channels 2 and 3 are to be lined with riprap, except where they lie on bedrock. The equations used for the filter design and riprap-sizing are on page 30, and the results of the

calculations are at the end of Appendix A. The Procedural Steps of Reclamation Table in Section 540 states that sieve analysis will be done to assure riprap gradation meets design criteria. Materials for constructing these channels are to be obtained on-site. Riprap sizes should be varied rather than uniform. Riprap should be angular rather than rounded: boulders that will be excavated on-site may be more rounded than is desirable and a method of breaking them into more angular material may be needed. The permittee states in the September 15, 2001 cover letter that they do not anticipate a need to crush or break boulders available on site to obtain appropriate angular material because most available boulders are the result of recent weathering and tend to be angular rather than rounded.

Drawing CS1819A (Appendix A) shows schematic cross-sections of channels 2 and 3. The soil immediately adjacent to the channel will overlap the uppermost riprap and cover the upper edge of the engineered channel. This will provide a transition from the constructed channel to soil and avoid a visible, hard edge. This transition will not only be visually more like the existing channels, but will promote vegetation growth in the coarser material, which helps anchor it; and eliminate an edge that could facilitate and concentrate erosion parallel to the channel.

The plan states that boulders, acquired on-site, will be placed along the channels as erosion protection. Consideration should be given to using the largest boulders to create ledges to break the uniformity of the channel gradient. These should be imbedded into the fill with the filter and riprap placed around them, rather than placing these large boulders on top of the filter material, which would allow flow to go under them. Using these large boulders as artificial ledges would require extra attention to the construction of the streambed on the downstream side, and such measures as extra riprap or drop-pools might be needed.

Channel designs are based on an average gradient along the length of the designed channel; however, the gradient down the face of the sandstone ledge immediately above the head of channel 3 is much greater that that used in the calculations (profile A - Drawing CS1817C), and flow may even form a waterfall under extreme conditions. A transitional apron has been designed and certified by a professional engineer, based on design criteria from Hansen, Allen and Luce, Inc. The design and calculations are in Appendix A and are discussed on pages 28 and 29. D50 for the apron will be 4.5 feet (pages 29 and 30)

Experience has shown that channels built on fill are subject to many problems, including failure, if not constructed correctly. Acknowledging that it is the permittee who has the authority to control, direct, and supervise construction of the reclamation channels, the Division would like to have a hydrologist or other Division representative present during placement of the filter and riprap. The permittee has stated, in the cover letter dated September 15, 2001, that they expect division representatives to be at the site as much as possible during construction to facilitate communication, and that they will make every effort to keep the division informed on progress and timing of construction.

Siltation structures

Basins, traps, straw bales, etc. are proposed for sediment control during the construction phase of reclamation. Weed-free alfalfa will be incorporated into the soil. When reclamation is complete, pocking or roughening of the surface and rock litter and boulders will assist in sediment control. When vegetation has become established, the sedimentation pond will be removed with the Division's approval (R645-301-541). (Seed mixture and seeding and planting techniques and methodologies are outlined in Volume 2, Part 4. Methods for maintenance and monitoring for the ten-year responsibility are in Section R645-301-300.)

Sediment levels above background levels are not expected (R645-301-242.130). Background levels for this site are not known. The USDA's Revised Universal Soil Loss Equation (RUSLE) or similar methods can provide a calculated estimate of sediment contribution from reclaimed and undisturbed watersheds (as was done at the nearby Deer Creek Mine). The accuracy of predicting sediment yield diminishes with increasing slope, and research has not been done on slopes exceeding 50 to 60 percent: PacifiCorp discussed this with the program authors and was told output from RUSLE is considered acceptable if comparison between areas is based on similar criteria.

In Tables 1 and 2 of Appendix 700-B of the amended Des-Bee-Dove Reclamation Plan, the permittee has provided the values for the parameters used in RUSLE to estimate annual sediment contributions from undisturbed and reclaimed watersheds. Appendix 700-B includes a 3.5" computer disc with version 1.06 of RUSLE and the information used to determine sediment loss for the undisturbed and disturbed areas.

The nearby Deer Creek Mine and Des-Bee-Dove are at similar elevations, so cover management factors from undisturbed areas at Deer Creek were used: this information is in Volume 1, Part2 of the Deer Creek Mine MRP. The vegetative community at Des-Bee-Dove and Deer Creek is best described as cold-desert shrubs, so the cold-desert shrub community was used to calculate effective root mass in RUSLE.

The R-factor was determined using the data in the CITY database within RUSLE for the nearby Hiawatha area. Hiawatha is #44399 in the applicant's data base, found on the 3.5" disc (Hiawatha is not in the standard database that comes with RUSLE: PacifiCorp used twelve years of precipitation and temperature data from the town of Hiawatha to approximate conditions similar to those at Des-Bee-Dove).

The estimation of the K-factor for the undisturbed areas was based on characteristics of the Kennilworth series (KeE2) of the Soil Survey of the Carbon-Emery Area. Soils samples collected at the Des-Bee-Dove site were used in determining values for K for the disturbed areas. The size analyses for silt plus very-fine sand that were not initially reported have been included in Exhibit B of the Soils section and used in calculating the K-values for the disturbed areas.

Determination of the C-factor for the undisturbed and disturbed areas is not described. At nearby Deer Creek Mine, values ranging from 0.027 to 0.042 were obtained for the disturbed areas. These values were based on using maximum roughness from the planned pocking, no root mass, no canopy cover, no interception of rainfall by vegetation, and conservative entries for ground covers such as rock fragments and vegetative residue. The values used at Des-Bee-Dove are an order of magnitude smaller for the undisturbed areas (0.0016 to 0.0020) but are comparable for the disturbed areas (0.038 to 0.042).

The hillslope lengths and gradients used in determining the LS-factor for input to RUSLE are shown on Drawing CS-1854D in Appendix B.

The P-factor calculations in RUSLE yield not only the conservation planning value of the system (the P-factor itself), but also the Sediment Delivery Ratio (SDR). Both values are calculated in RUSLE and shown in the Spreadsheet Table generated by RUSLE. P is to be used for conservation planning, while the SDR is to be used to estimate off-slope impact. When R * K * LS * C are multiplied by P, the result is the A value (estimated soil loss) in the RUSLE Spreadsheet Table, while multiplying R * K * LS * C by SDR gives an estimate of the sediment yield (SY).

R*K*LS*C*P	= A (estimated soil loss)
R*K*LS*C*SDR	= SY (estimated sediment yield)

A value of 1 was calculated for both P and SDR for the undisturbed areas at Des-Bee-Dove because no control practices are used to modify or reduce the amount of runoff: this also results in a A and SY being equal. For the disturbed areas, 0.029 was calculated for P and 0.002 for SDR. These values are comparable to those used at Deer Creek, and indicate the pocking and other treatments are expected to greatly modify runoff characteristics and reduce the amount and rate of runoff.

Tables 1 and 2 tabulate the input and calculation results for both SDR and SY. The largest value for A is 0.09 tons/acre/year (Table 2) at disturbed area A11D, at the south end of the Beehive and Dove pad. Values for other reclaimed areas are 0.03 to 0.05 tons/acre/year, comparable to the 0.05 tons/acre/year calculated for the undisturbed areas (Table 1),

There is a commitment on page 33 in Section 763 to retain and maintain all temporary sedimentation structures, including the berm along the access road, until completion of sequenced reclamation beginning at the south end of the pad, proceeding north to the main portal pad area, and finally to the access road.

Reclaimed areas will continue to report to the sedimentation pond (R645-301-553.100, p. 12). The sedimentation pond will remain until vegetation is established (R645-301-541) and the Division approves its removal.

Henry Austin of OSM has expressed his opinion that if the sedimentation pond is to be used for sediment control, the entire drainage between the mine-site and the pond needs to be permitted. The Division maintains that the unpermitted reach from the disturbed area boundary to the sedimentation pond was allowed when the mine was permitted by OSM over twenty years ago, that the site has been regulated and inspected for over twenty years with this gap in the permit area, and that the sedimentation pond is and will continue to be the primary sediment control method until it can be demonstrated that sediment is retained on-site and the pond is no longer needed.

Findings:

The information in this section is sufficient to meet the requirements of the coal mining rules.

RECOMMENDATION:

The Des-Bee-Dove mine was not planned with reclamation in mind, and soils and other resources were not preserved. Because of this, the proposed reclamation plan is less than desirable; however, it is a feasible plan based on available resources. This revision of the Reclamation Plan should be approved.