



State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

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February 25, 2002

TO: Internal File

THRU: Susan M. White, Sr. Reclamation Specialist/Biology, Team Lead. *SMD*

FROM: Peter H. Hess, Sr. Reclamation Specialist/Engineering *PHH by AN*

RE: Phase 1 Reclamation Plan, PacifiCorp, Des-Bee-Dove Mine, C/015/017-01A-4

SUMMARY:

The permittee submitted revised as well as additional information to Appendix XIV on February 4, 2002 to address deficiencies that were aired on November 9, 2001. This technical memorandum will address the response to the deficiency aired in the engineering discipline, R645-301-553.500.

BACKFILLING AND GRADING

Regulatory Reference: 30 CFR 785.15, 817.102, 817.107; R645-301-234, -301-537, -301-552, -301-553, -302-230, -302-231, -302-232, -302-233.

Analysis:

The permittee updated Appendix XIV by inserting Volume 2, Part 4 on February 4, 2002. This included the revisions that were felt to be necessary to address deficiencies that had been previously aired relative to Phase 1.

Appendix XIV makes the commitment to reclaim the portal areas and portal terrace and its associated access road to approximate original contour. However, the Des-Bee-Dove Mine meets the criteria of a "continuously mined area, (CMA)", as defined by the R645 coal rules. Thus, R645-301-553.610 gives the Division authorization to not require the Permittee to completely eliminate the highwalls in the area, if insufficient spoil exists on site or the safety factor requirements cannot be met.

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The permittee has submitted a slope stability analysis for the upper pad portals and their associated reclamation. The Phase 1 Reclamation Plan, as submitted on September 24, 2001 contains a study performed by Rollins, Gunnell and Brown at Profile B and longitudinal cross section 3+00, as depicted on drawing # CS1817C. The toe of Profile B intersects Profile A at cross section 3+00. Thus Profile B is for the upper pad area as it is situated between the Beehive portals and the Little Dove portals. The analysis contains two options for the backfilling of Profile B.

Option 1 (See Figure 2) assumes that a layer of foundation soil exists below the present surface elevation, and that these soils consist of loose to medium dense granular fill weighing 125 pounds /ft³ with an inherent internal angle of friction of 32 degrees. A cohesion factor of 0 pcf is assumed. A recommended vertical radius of seventy-two feet (concave slope surface) will provide a long-term static factor of safety of 1.33, which meets the minimum requirements of R645-301-553.130. The area to be backfilled may consist of either rock fill or earth fill, varying from 1.25H:1V to 2H:1V or flatter. The characteristics of the suggested rock fill are that the material be less than thirty inches in diameter, with less than 20% of the volume being minus one inch. Rock fill material should also have a total unit weight of 140 pcf with an internal friction angle of 45 degrees. Earth fill material should have a gradation of minus six inch; with less than thirty percent consisting of minus 200 mesh material. Earth fill material should consist of material having a total unit weight of 125 pcf with an internal friction angle of 34 degrees.

Option 2 for Profile B, (Figure 5), consists of backfilling the slopes on bedrock material having a total unit weight of 140 pcf with an internal angle of friction of 45 degrees and a cohesive strength of 1000 pcf. This option requires a much greater volume of material to reach the 2H:1V proposed slope than is required by Option 1. A minimum long-term static safety factor of 1.38 has been calculated for the vertical radius fill line of 103 feet. Other design criteria include the placement of ten feet of loose to medium dense granular fill (total unit weight of 125 pcf, internal friction angle of 32 degrees).

The slope stability analysis conducted by Rollins, Brown and Gunnell contains specific design criteria that are recommended to ensure the long-term static safety factors calculated for the various backfill designs for Profile B. These include the following:

- 1) The RB&G report suggests that the material that currently exists at the site can be used as backfill material for the slope restoration. However, the stability analysis also recommends that this material be processed by separating the minus 4" to 8" material from the oversize material prior to placement. This will require additional hauling and handling costs.
- 2) The RB&G report recommends that all minus 4" to 8" granular material be placed in lifts not exceeding one foot in thickness. A compaction requirement of at least 90% of the maximum laboratory density as determined by ASTM D 1557-91 for

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- the fill material has been recommended. The resulting granular fill will obtain a resulting friction angle equal to or greater than 34 degrees.
- 3) The RB&G report recommends that all rock fills utilizing +4" to 8" material be placed in lifts not exceeding three feet in thickness. Maximum material size must be limited to thirty inches with less than 20% smaller than one inch. The recommended compaction on this type of fill is to be accomplished by conducting "at least 4 passes of a D-9 (crawler compaction) or equivalent dozer." The friction angle of the rock fill after this is completed will be equal to or greater than 45 degrees.
 - 4) The RB&G report recommends that all earth fills be constructed to be equal to or greater than 2H: 1V. Rock fills can be constructed at 1.25H:1V.
 - 5) The RB&G report indicates that the safety factors which have been calculated for greater than 1.3 assume that no pore pressures will develop within the fill. Thus, it is recommended that all earth fill embankments be constructed with rock fill or drain fill beneath them.

Recommendation #5 is of particular importance where drainages must be constructed through areas that have been backfilled. Three drainages will require construction through the Phase 1 reclamation area of the Des-Bee-Dove Mine.

In closing, the RB&G report states that conservative shear strength parameters were estimated to analyze the proposed finished slopes. The estimates were based upon visual classification of the surface materials. The RB&G report recommends that a geotechnical engineer observe the fill during construction, and that compaction testing be performed under that engineer's supervision. This is necessary to ensure that the design requirements previously mentioned are adhered to, such that the minimum long-term static safety factor of 1.3, as required by the R645 coal rules, can be met.

The addition of the Rollins, Gunnell and Brown slope stability analysis to Appendix XIV, Phase 1 reclamation plan now makes that document adequate relative to the requirements of R645-301-553. The permittee's February 4, 2002 submittal revises the Des-Bee-Dove Phase 1 reclamation plan to commit to meeting adequate compaction and lift thickness requirements as recommended by the RB&G slope stability analysis. This revision also commits the permittee to utilizing the expertise of a certified geotechnical engineer to verify and certify these requirements that are critical in ensuring an adequate long-term static safety factor of 1.3, as required by R645-301-553.130. The Phase 1 plan is felt to adequately address the R645 requirements relative to backfilling and grading.

The permittee's February 4, 2002 revisions to Appendix XIV, section 500 ENGINEERING (R645-301-500), pages 9, 10 and 11 commit to utilizing a geotechnical engineer to verify and certify that adequate compaction requirements and lift thickness are implemented during the reclamation of Phase 1. This will ensure that design requirements have been met, which will ensure that the designed static safety factor will be implemented in the

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field. Knowing that all design requirements have been implemented will give both the permittee and the Division peace of mind relative to the stability of all the reclamation work performed at the Des-Bee-Dove site.

Findings:

Information provided in the application is considered adequate to meet the minimum Backfilling and Grading requirements of the R645 regulations.

RECOMMENDATIONS:

The Phase 1 Reclamation Plan relative to the requirements for Backfilling and Grading should be approved.