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TECHNICAL MEMORANDUM

Utah Coal Regulatory Program

December 15, 2009

TO: Internal File

THRU: Steve Christensen, Hydrologist SC DS 12/21/09

FROM: James Owen, Reclamation Engineer JO

RE: Mine Discharge Water Iron Treatment Facility, Genwal Resources, Crandall Canyon Mine, C/015/0032, Task ID # 3455, Internal File

SUMMARY:

On December 2nd, 2009, the Division of Oil, Gas and Mining (the Division) received an application to amend the Crandall Canyon Mining and Reclamation Plan (MRP) from Genwal Resources, Inc. (the Permittee). The Permittee proposes to include a Mine Discharge Water Iron Treatment Facility for addressing the mine water currently discharging from the north portals at the mine site. The submittal is a response to deficiencies that were identified in an original amendment submittal.

The amendment meets the requirements of the State of Utah R645-Coal Mining Rules and should be approved.

TECHNICAL ANALYSIS:

OPERATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

Analysis:

Impoundments

The amendment meets the Impoundments requirements of the State of Utah R645-Coal Mining Rules.

The Permittee has submitted settling pond design considerations that reference the calculation and analysis of an adequate safety factor (1.3). The Permittee has included an attachment to the submittal (Appendix 7-65, Attachment 7) that provides safety factor determination and stability analysis for the impoundment used for mine water treatment. Material characteristics were conducted to determine the density, and cohesion and angle of internal friction. These parameters, along with maximum slope height and angles were used for safety factor calculations. The lowest estimated safety factors calculated from dry conditions and saturated conditions are 7.66 and 6.02, respectively.

Shear strength available to resist failure and the shear stress present along the possible failure surface are included in the analysis of the factor the safety. The shear strength is characterized by the cohesion and the friction angle. Failure would be assumed to occur on a circular failure slope, which is based on the angle of internal friction. These analyses have been addressed and verified using the Hoek Method (Hoek, Evert, And J.W. Bray, "*Rock Slope Engineering" Spon Press, 270 Madison Ave. New York, NY, 1974).* This information was plotted and circular failure charts. Safety factors were calculated for both dry and saturated conditions and for embankment heights of 7' and 10'.

The Permittee included soil analysis for berm construction material or "granular borrow material" (Appendix 7-65, Attachment 7, Appendix 1). Multi-stage consolidated tri-axial compression tests were conducted to generate effective and total stress failure envelopes. The

soil analysis and corresponding appendix provides the geotechnical information and data collection required by State of Utah R645-Coal Mining Rules.

The foundation description and analysis provided satisfies the regulation requirements. The geotechnical analysis of the "foundation fill and material" is well demonstrated in the soil analysis of Appendix 7-65, Attachment 7, Appendix 1. This information, along with the bedrock mapping and analysis in the "General Map" in Attachment 8, and pit liner stability details in Attachment 3 should provide adequate foundation information.

Findings:

The application meets the requirements of the State of Utah R645-Coal Mining Rules.

RECOMMENDATIONS:

The application is recommended for approval at this time.

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