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Price

Moab District
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3482
UTU-64263
(UT-066)

S.W. Felt

APR 25 1994

Mr. Lowell Braxton
Utah Coal Regulatory Program
State of Utah
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

ACT/007/006

Re: Request for Review of Subsidence Calculations, Federal Lease Addition, ~~Castle Valley~~ Ridge Lease UTU-64263, Starpoint Mine, Cyprus Plateau Mining Corporation, ACT/007/006

#2 M

Dear Mr. Braxton:

The Bureau of Land Management (BLM) received the subject request on March 4, 1994, and has reviewed the mining plan with respect to the requested information. The Manti-LaSal National Forest has concerns of the possible subsidence impacts incident to underground mining. Our comments follow:

The mining plan for the Castle Valley Ridge lease (UTU-64263) calls for a set of main entries to run east/west underneath the north side of Little Park Canyon, but not directly under the drainage. The main entries are planned to be a four-entry set on 100x80-foot entry and crosscut centers. Barrier pillars will be left on both sides of these main entries for protection from the adjacent planned longwall panels. These entries could be used for additional ventilation of the mine, if needed, by adding breakouts to the canyon. These main entries will be under 250 feet of overburden at the west end of the entries and under 800+ feet under the east end. These entries are planned using standard industry practices for pillar designs.

Cyprus hired J. F. T. Agapito and Associates, a geotechnical consulting firm, to evaluate the subsidence potential for the Little Park area, given the planned mining scenario. This evaluation is found in Appendix 523a of the Starpoint Mining and Reclamation Plan (MRP). Pillar stability of the main entries under the Little Park area were calculated at a safety factor of 2.3. This calculation used an average pillar stress, for 800 feet of overburden and a tributary area load, as 1400 psi, and a coal strength of 3,200 psi. The tributary area load estimation is a standard estimation of the amount of stress through rock at a point of given depth.

To evaluate Cyprus's pillar design and Agapito's subsidence potential assessment, we have used another accepted method to substantiate their conclusions that these pillars will remain stable and

Brent Nathan 4/22/94

that no subsidence should take place in the Little Park drainage. From Rock Mechanics and the Design of Structures in Rock, by Obert and Duvall, a design equation for the average pillar stress is:

$$Sp = \frac{Sv}{1-Ra}$$

Sp = average pillar stress (lbs./sq. in.)
Sv = average vertical stress (lbs./sq. in.)
Ra = recovery rate (%)

An estimation of the vertical stress has been shown to approximate the gravitational force on the amount of rock above the opening. Hence:

$$Sv = r\,h \div 144 \text{ sq. in./sq. ft.}$$

r = density of the overburden (lbs./cu. ft.)
h = height of overburden (ft.)

This assumption is accepted by industry and rock mechanic experts, though exact vertical stresses are very complex due to changes in geologic structures. For simplicity, the density of the overburden is 144 lbs./cu. ft., which is a reasonable average of the various rock (sandstones and shales) strata above. Hence, the vertical stress is nearly a direct relationship to the amount of overburden. The overburden of the Little Park drainage is 200 feet at the west end and 800 feet at the east end. Using a 40 percent recovery rate for the proposed room-and-pillar design, the stress on the pillar will range from 300 to 1,300 psi.

The strength of the pillar to resist the vertical stresses can be estimated by compressive tests on core samples of the coal. The Wattis Seam has been tested at about 3,400 psi. If the vertical stress is greater than the strength of the pillar, failure will occur. Hence:

$$F = \frac{Cp}{Sp}$$

F = factor of safety
Cp = strength of the coal pillar
Sp = pillar stress

Factors of safety greater than 1 will reflect stability. We calculate a safety factor for the proposed pillars in the Little Park main entries from 2.5 to 10. This substantiates the Agapito report. From observations and experience in the coal fields of the region, main entries of old mines under shallow cover have held up over time. Without exception, the old mines in the Spring Canyon area west of Helper, Utah, have intact pillars just inby the portals.

The Agapito report examined case studies of areas around the country of sinkhole subsidence. In each case, sinkhole or plug-type subsidence only occurred in areas where the overburden was less than 150 feet. Documented instances of sinkhole subsidence in this region have only occurred in the Clear Creek/Pleasant Valley area where there was shallow cover, fracture and

shear zones from faulting, and inadequately sized pillars. None of these factors are planned or known to exist in the Little Park area. As to the possibility of pillar failure over time from water or air oxidation, we have determined that possibility to be negligible. The dip of the structure is to the south, draining any water inflow away from the entries. Also, standard mine closure requirements will seal off the entries from air exposure.

In summary, our review concurs with the Agapito report and determines that the potential for any surface expressions over time from the proposed mining plan is negligible. The mining plan, as proposed, meets the requirements of the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, the lease terms and conditions, and will achieve MER of the Federal coal. Our recommendation for approval of the mining plan for the Castle Valley Ridge lease addition remains as documented in our September 19, 1991, letter to the Office of Surface Mining.

If you have any questions or need further information, please contact Stephen Falk at 637-4584.

Sincerely,

/s/ Roger Zortman
District Manager

cc: UT-066, Price River Resource Area
UT-921, Utah State Office, Branch of Solid Minerals
Manti-LaSal National Forest, Price, Utah
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