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STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

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February 3, 1988

TO: John Whitehead, Permit Supervisor

FROM: Dan Duce, Soils Specialist *DD*
Richard V. Smith, Geologist *RVS*

RE: Plateau's Five-Year Permit Stipulation Response,
817.71-74-(1), Cyprus-Plateau Mining Corporation,
Starpoint Mine, ACT/007/006, Folder #2, Carbon County, Utah

BACKGROUND

Stipulation 817.71-74-(1) required PMC to submit for inclusion into the MRP, an operational plan for collection and analyses of each stratum of overburden to be removed, including the stratum immediately above and below each coal seam to be mined and materials presently in the refuse pile, to identify potential acid or toxic-forming, or alkalinity-producing materials. The plan was to include a discussion of the potential for, and mitigation of, water quality impacts and/or revegetation problems attendant to the refuse pile. Lastly PMC was to submit the calculated volume of waste rock to be generated during the permit term.

This stipulation encompasses four issues which can be better summarized as follows:

- (1) An in-mine operational sampling plan to characterize each stratum of overburden to be removed.
- (2) A sampling scheme for the existing refuse pile.
- (3) Identification of measures to address potential water quality and revegetation problems at the time of reclamation.
- (4) A projection of the volumes of waste rock to be generated during the permit term.

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ANALYSIS OF PMC RESPONSE

- (1) Operational in-mine sampling plan. A February 9, 1987, deficiency letter during the PMC permitting process, required Plateau to submit overburden/interburden/underburden chemical analyses to determine whether acid-forming, toxic-forming or alkalinity-producing materials are present. This included sampling material that would be encountered during the rock graben crossing penetrating the eastern boundary fault zones.

On October 26, 1987, Plateau submitted 35 samples of the roof, floor and split materials to characterize waste rock produced at Plateau.

After analysis of the data from the 35 samples it is apparent that the samples are sufficient to characterize the waste rock including the clay content analysis as required for all materials. From all available data submitted by Plateau, the Division has concluded that the operational plan to collect and analyze each stratum of overburden to be removed, as required under Stipulation 817.71-74-(1), will not be needed. Although 35 percent of the roof and floor and interburden samples were above suspect limits for selenium, the concentration was dissipated throughout all roof, floor and interburden materials of the 3 seams of coal being mined.

- (2) Sampling scheme for the refuse pile. Plateau submitted 29 additional refuse samples to characterize the refuse presently in the pile on October 26, 1987. Exhibit 51 of Plateau's response contends that the refuse is non-toxic or acid-forming. But, based on the data from the 29 additional refuse samples submitted by Plateau, 6 of the 29, or 21% of the samples, are above suspect levels for selenium, and five of the 10 sample holes characterizing the refuse had above-suspect levels at the surface. Also, 18 of the 29 samples, or 62% of the samples are potentially acid-forming according to current literature and academic understanding of acid-base accounting and sulfur forms in the West (Fisher and Munshower 1984, Dollhopf and Russell, 1984); Dollhopf personal communication, 1987, and Darwin Sorensen personal communication, 1987). Further, sample locations, age of samples and an estimate of coal to waste rock ratio were not provided in order to completely analyze the data provided.

The data indicates potential problems may occur to revegetation or to livestock feeding on vegetation growing in the refuse material.

The Division recognizes that Plateau does not have quantities of soil material available to cover the refuse, where suspect, to a depth that would prevent plant roots from coming into contact with this material. The Division is not recommending soil material be used to bury suspect material, but non-suspect refuse be used to bury (or mix) refuse to mitigate suspect levels of toxic or acid-forming material. In order to facilitate this approach, a monitoring plan to sample refuse prior to reclamation must be submitted. From the data submitted by Plateau, Selenium, Acid-Base Potential, Electrical Conductivity, Boron and pH are of concern and must be monitored in this plan.

In compiling the sampling plan PMC should incorporate the recommendations contained in the following discussion on analytical techniques.

In determining potential Acidity, the Division acknowledges the controversy in the scientific community and considers sulfate sulfur to be non-acid forming, this form should not be used in the total sulfur percentage. Organic sulfur may form acid depending on its form, but to date, there are not methods available to fractionate organic sulfur forms into acid- or non-acid forming forms. Therefore, the Division uses organic sulfur in determining potential acidity.

It also has been argued that neutralization potentials methods overestimate actual neutralization capacities. The Division believes that since the limit of -5 tons of CaCO_3 /1000 tons of material is used instead of 0 tons of CaCO_3 /1000 tons to determine acid-forming materials, and since the neutralization potential may be overestimated, acid-base accounting is the most reasonable method to determine acid-forming material.

In the applicant's report, it was pointed out that White et al. (1983) concluded that pH decreases with age of the refuse, but the applicant did not find this in their 18-year old refuse. The applicant's report did not point out that White, et al. (1983) concluded that a favorable pH of refuse materials may exist for up to 30-40 years. Since Plateau weathered refuse does not span these 30-40 year old refuse, Plateau has the option of performing weathering studies to help determine the actual acid-forming potential of the refuse. The Division is aware of several labs that can perform these studies. At this point in time, the Division will consider material acid-forming when using total sulfur minus sulfate sulfur in determining potential acidity and will use the -5 tons CaCO_3 /1000 tons as the limit for acid-forming material.

Selenium is above the Division's suspect value of 0.1 mg/kg in both the overburden and the refuse. The Division agrees that the best method to mitigate this problem is to monitor it in the refuse prior to reclamation and prevent it from being within the root zone. Until more research is available on actual soil selenium levels and plant uptake response including animal toxicity levels, the Division will consider 0.1 mg/kg hot water soluble selenium as suspect and should not be within the root zone. If the applicant proposes to sample post reclamation vegetation for selenium levels, which the Division is completely supportive of, Plateau must submit a plan which includes:

1. plant species and parts to be sampled;
 2. time of year of plant sampling;
 3. explanation if soil samples will be sampled in conduction; and
 4. a discussion of sample preparation and storage prior to analysis, along with discussion of quality control techniques.
- (3) Measures to address potential water quality and revegetation problems at the time of reclamation. Exhibit 52 of the Plateau stipulation response describes the potential impacts to surface and ground water by leachate or surface runoff from the refuse pile. This response has documented that the potential impacts to the quality of surface and and groundwater will be nominal. Exhibit 52 should be incorporated into the MRP.

Revegetation concerns will be adequately dealt with via the post mining refuse pile sampling program discussed in the previous sections of this memo. This will be submitted by PMC.

- (4) Projection of the volumes of waste rock to be generated during the permit term. The response to this portion of the stipulation was discussed in Pam Grugaugh-Littig's memo of December 3, 1987.

RECOMMENDATIONS

In order for the analysis of data submitted to date from the current refuse pile to be completed PMC must submit the following information:

- (1) Accurate locations of all refuse pile samples taken in February and May of 1987 must be documented on a map.

(Recommendations, Cont'd.)

- (2) The age of all refuse samples must be clearly documented and submitted.
- (3) A quantitative estimate must be provided for the percent of coal to waste rock that presently make up the refuse. This can be accomplished by analyzing percent organic carbon or through operator records.

To address the concerns regarding acid and/or toxic materials in the PMC refuse pile at the time of reclamation, a plan must be submitted for monitoring the refuse prior to reclamation. This plan shall include:

- a. sample spacing or grid spacing.
- b. depth intervals at each sample point.
- c. parameters to be analyzed (at the minimum, SE, Acid-Base potential, Electrical Conductivity, Boron and pH must be sampled)
- d. mitigation measures to be taken if acid-forming or toxic-forming materials are encountered as required under UMC 817.103.

Lastly, PMC will not be required to continue the in-mine sampling program for each stratum of overburden to be removed, including the stratum immediately above and below each coal seam to be mined.

Suggested References

- Fisher, S. E., F. F. Munshower, 1984. Extremely Acid Soils, Overburden, and Minesoils in the Great Plains. In: Proceedings Symposium on Surface Coal Mining and Reclamation in the Great Plains (page 186-200), March 1984.
- Dolhopf, P. J. and Russell, L. J., 1984. Assessment of Acid-Producing Materials in the Northern Plains. In Proceedings Symposium on Surface Coal Mining and Reclamation in the Great Plains (page 201-210), March 1984.
- White, S. M., Ostler, W. K. and McKell, C.. 1982. Coal Refuse - An Increasingly Serious Problem for Colorado Plateau Coal Production. Native Plant Resources Institute Report, Submitted to the U.S. Department of Energy, Division of Coal Mining. (62 pages)

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