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TO: File

THRU: Joe Helfrich, Permit Supervisor

THRU: Daron Haddock, Permit Supervisor

FROM: Robert Davidson, Soils Reclamation Specialist RAD

RE: Five Year Permit Renewal Changes, Cyprus Plateau Mining Corporation, Star Point Mine, ACT/007/006-96C, File #2, Carbon County, Utah

SYNOPSIS

As part of the five-year renewal for the Star Point Mine, Cyprus Plateau Mining Corporation (CPMC) made several changes in their Mining and Reclamation Plan (MRP). These changes included a new reclamation plan for the refuse pile. The permit was renewed independent of the renewal changes within the MRP. The permit changes were reviewed and analyzed by the Division with a subsequent submittal by CPMC addressing the deficiencies. The Division responded with an updated Technical Analysis on August 25, 1997. CPMC resubmitted changes on November 14, 1997. This review analyzes the soils and the toxic/acid-forming issues.

The following two items remain as stipulations:

- The proposed topsoil borrow site (SW 1/4, SW 1/4 Section 2, T.15 S. R. 8 E) will be permitted by January 1, 1999.
- Coal waste used as backfill within the main channel and/or channel side slopes will be tested for acid forming and toxic characteristics. The monitoring scheme will consist of three samples taken every 100 feet, one each on either side of the channel and one within the channel itself. Analysis will include Acid Base Potential, soluble Se and B, pH, EC, SAR, and available water capacity.

ENVIRONMENTAL RESOURCE INFORMATION

SOILS RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 783.21, 817.200(c); R645-301-220, -301-411.

Analysis:

Soil Survey and Soil Characterization

Numerous soil surveys have been conducted for the CPMC permit area. These include the

following:

- The Soil Conservation Service (SCS) conducted an Order-III survey on all private and public domain lands east of the forest boundary in 1978, 1979 and 1980. Portions of these surveys were extracted and integrated in the MRP.

- In 1981, Endangered Plant Studies, Inc. (EPS) conducted an Order-I soil survey of areas adjacent to the Refuse Pile Expansion Area, the Unit Train Loadout site, and the Gentry Mountain Air Shaft site.

- In 1982, Utah State University Soil Science Department, under the direction of Dr. Al Southered, conducted an Order-I soil survey for the Corner Canyon Breakout Fan site.

- In 1983, field soil sampling studies were conducted within the Unit Train Loadout and associated conveyor areas.

- During 1984-1986, the U. S. Forest Service conducted Order-III soil surveys for lands located within CPMC Permit Area lying within the Manti-La Sal National Forest. Portions of these surveys were extracted and integrated in the MRP.

- Potions of the SCS's Carbon County 1988 Soil Survey (Order-III) were extracted and integrated in the MRP.

- In 1991, IME conducted an Order-I soil survey of the Little Park Canyon Breakout area.

- On May 6, 1997, EarthFax conducted an extensive soils investigation of the Star Point No. 1 Mine Haul Road and the coal load-out area near Pond #3. The soil survey is contained in Exhibit 241b. This survey investigates soils and coal waste qualities within the pre-SMCRA disturbed area.

Soil sampling locations listed in Table 230.200 (a through i) are shown on soil maps 222.100 (a through f). Soil pit locations are difficult to locate on the soil maps and correlate with the text. Confusion exits between soil survey pits and other soil sampling points as listed in the MRP. However, with persistence, correlation can be made for each sampling point. Detailed soil profile descriptions and field notes are not found in the MRP for most sampling points. In fact, for all soil profile descriptions listed in Exhibit 222.300a, not a single referenced soil survey pit is located within Star Point's permit boundaries.

The MRP correlates soil resource information between the Order-I and Order-III soil surveys. This correlated information aids in the delineation and interpretation of soils data for the purpose of identifying on-site soils. However, a complete assessment of soil quality and volumes is not possible without actual on-site soil surveys. To help rectify this problem, CPMC conducted a 1997 soil investigation of the Star Point No. 1 Mine Haul Road and coal load-out area near Pond #3. This survey quantifies the quality and location of soil and coal waste materials within this pre-SMCRA disturbed area. In general, soils in this area meet the Division's guidelines for soils; soils along the road edges where road salt is used during the winter contain elevated SAR values. The coal waste in the area of TP-8 and TP-2 contain elevated levels of water extractable selenium at 0.28 and 0.12 ppm, respectively.

With respect to all sample sets, including the 1997 study, several samples show toxic and acid forming characteristics. Toxic levels of selenium and boron are both discussed and shown in several overburden, refuse, and coal waste samples. Acid-base potential values based on sulfide material show several overburden and refuse samples having acid forming potentials. Specifically, the Wattis Split (Boney) sample substantiates the resulting acid forming potential (-40 tons $CaCO_3$/1000 tons) by having a 4.4 pH value.

Refuse Pile - Toxic and Acid Forming Characteristics

Exhibit 231.200a, "An Evaluation of the Toxic and Acid Forming Properties of Overburden and Coal Refuse Materials" by Kent Crofts, IME, evaluates soils and refuse with respect to reclamation suitability. In the report, CPMC requested that the Division provide documentation on how the requested information relates to the determination of the reclamation suitability or protection of the environmental resources of the area. The report actually provides a suitable response for this request with the following statement: "Examination of the cited Tables documents the overburden is a 'cleaner' plant growth medium than is the native topsoil with respect to pH, EC, texture and percent clay, and equal to topsoil in suitability with respect to SP and SAR. Only with respect to the parameters of sand, selenium, boron and acid base potential does the overburden possess a lower reclamation suitability than the 'control' native soils."

With respect to selenium, the 1987 evaluation showed 15 percent of the refuse samples were classified as unsuitable and exceeded the 0.10 mg/Kg standard. During 1989, 18 percent of the refuse samples were classified unsuitable. As the 1987 report states, the potential for elevated selenium values to exceed the recommended standard exists within the refuse material. The Division concurs with this statement and is the basis for maintaining the four feet cover minimum requirement.

A complete evaluation of the 1989 selenium data is given in a report submitted to CPMC on February 26, 1992 entitled "An Evaluation of Plant and Soil Selenium Concentrations in Coal Refuse and Undisturbed Soils" by Kent Crofts, IME. The literature review is an excellent source of information on selenium with the report discussion focusing on many notable and relevant points. Based on the literature review and data analysis, several significant factors were presented in this report:

- Strong statistical correlations between selenium and other soil properties were shown to be critical considerations when determining potential plant selenium toxicity. Factors other than selenium should be considered when determining potential plant selenium toxicities. New standards need to be shown and substantiated by data.

- Salinity and sulfate levels dramatically influence plant selenium uptake. Numerous studies document an inverse relationship of plant selenium levels with increasing levels of sulfate. Since sulfur and selenium chemistries are similar, plants will uptake available selenium if sulfates are low. Likewise, if sulfates are abundant, even in the presence of high selenium, plant selenium uptake will likely be lower. High levels of sulfate in seleniferous soils and waters should be considered when determining the availability and selenium phytotoxicity.

- 1989 data analysis conclude that elevated selenium occurs at the surface layer of refuse exposed to the atmosphere. The distribution of selenium in the experimental refuse plots show that uniform levels of elevated selenium occur at the zone that was originally the

uppermost refuse layer prior to topsoil placement. Before topsoil placement, the oxidization of selenium in the surface refuse exposed to the atmosphere is probably the critical factor for finding elevated levels of extractable selenium within the refuse surface.

Plant selenium concentrations were statistically compared between native plants and plants grown on the refuse research plots. Conclusions showed that no statistical difference exists between native and refuse grown plants. However, these conclusions are not accurate for several reasons:

- Statistical comparisons and conclusions using less than values are not only inappropriate but invalid. A striking observation is the data comparison of native and refuse affected plots. Excluding the Prince's Plume samples, virtually all of the plant selenium concentrations for the undisturbed native sites were below the analytical detection limits. On the Refuse affected plots, data show that many of the plants contained detectable selenium, although none of the refuse plants produced forage with selenium levels exceeding the toxic 5 ppm level.

- Conclusions were made on data sets containing different plant species and distribution between the native and reclaimed soils. Such data is biased and negates the statistical assumption of unbiased data. Unpaired data cannot be used with T-test comparisons.

Based on the 1989 report, CPMC submits that the existing regulatory selenium standard of 0.1 mg/Kg is unsupported by scientific literature and that this lack of support results in gross exaggeration. The Division submits that selenium issues are not easily rectified because the selenium cycle is a highly dynamic system involving biological, chemical and physical pathways which add to the complexity of the system. These issues need clarification before a new standard is adopted by regulatory agencies. The ubiquitous presence of selenium found in overburden waste and coal refuse therefore makes these selenium issues highly pertinent and relevant for protecting the environment. It appears that the lack of available four feet of cover for the refuse pile is the justification for preparing the reports and the motivation for conclusions reached. Justification for DOGM's selenium standard is protecting the environment from mining induced problems of selenium solubilization, leaching and toxicity. Therefore, before DOGM alters the current selenium standard to allow less than four feet of cover, CPMC needs to show by data and scientific research that a different standard value is substantiated.

Findings:

The requirements of this section of the regulations are considered adequate.

OPERATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

Analysis:

Table 233.100, Section 233, Topsoil Substitutes and Supplements, clearly outlines reclamation soil balance results in fulfilment of Stipulation 817.24-(1)-(DD) from the 1987 Technical

Analysis. Available soil is correlated with topsoil stockpile sites that are identified on Maps 222.200 (a through f).

As indicated in Table 233.100, a topsoil deficiency of approximately 147,238 CY currently exists. CPMC proposes to supplement soil volumes available for reclamation by using any available excess fill as growth media or substitute soil found during demolition of the surface facilities. If suitable substitute soils in quantities equal to the deficiency are not found during reclamation, then CPMC will utilize an alternate borrow area. The borrow area will be on property currently owned by CPMC and is located in the SW 1/4, SW 1/4 Section 2, T.15 S. R. 8 E. Soils in this area are identified as SCS soils map unit 113, Strych soil series (see Exhibit 222.300a). CPMC commits to permitting this area prior to implementation of reclamation activities.

Findings:

As determined in the analysis section of this TA, approval of the plan is subject to the following Permit Conditions. Accordingly, the permittee has committed to comply with the requirements of the following Permit Conditions, as specified, and in accordance with the requirements of:

R645-301-232.720 and R645-300-112.400, The proposed topsoil borrow site (SW 1/4, SW 1/4 Section 2, T.15 S. R. 8 E) will be permitted during 1998 with completion by January 1, 1999.

RECLAMATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.

Analysis:

Soil Redistribution

The Reclamation Plan, Soil Redistribution section generally states the following:

- CPMC commits to placing four feet of cover over the Refuse Pile.
- Any toxic or acid forming material and coal waste material used as fill or left in place, will be covered by four feet of growth media.
- In areas where coal waste is not present, the area will receive at least 17 inches of substitute soils.
- CPMC proposes to supplement soil volumes available for reclamation by maximizing the use of in-place fill materials as substitute soils and growth media.
- Whenever buried topsoil is encountered, they will be used for topsoiling.

- For areas where little or no topsoil existed prior to disturbance, CPMC will strive to return these locations to AOC using locally available previously disturbed materials and recover as much potential growth media within the individual disturbed areas as possible.

- If suitable substitute soils in quantities equal to soil deficits are not found during reclamation, then CPMC will utilize an alternate borrow area currently owned by CPMC and located at SW 1/4, SW 1/4 Section 2, T.15 S. R. 8 E.

Specific comments for reclamation are given for the following areas: Corner Canyon Fan, Unit Train Loadout, Refuse Expansion and Lower Facilities, Lion Deck Portal Access, Lion Deck, Star Point No. 1 and 2 Mine, Main Channel Restoration, and Subsoil Stockpile.
Reclamation concerns within the Star Point No.1 and 2 Mine area are specifically addressed in Exhibit 241b.

With regards to the Main Channel Restoration Area, the plan states that prior to any coal waste being used as backfill within the main channel or it's side slopes, the coal waste will be tested for acid- and toxic-forming characteristics in accordance with Division guidelines. However, the plan gives no specifics to sampling procedures. CPMC commits to a monitoring scheme which consists of taking three randomly located samples every 500 feet within the channel bottom where leaching will likely occur. Analysis will include Acid Base Potential, soluble Se and B, pH, EC, and SAR.

Soil Stabilization

The Soil Stabilization section includes discussion concerning ground preparation, soil placement, and soil stabilization methods. Section 244 thru 244.320, Soil Stabilization, discusses special treatment consideration for reclaiming the Badland-Rubble Complex based soils. These high salt, high clay content, and very basic (pH) soils are highly erosive and difficult to reclaim. Areas where Mancos Shale soils have been disturbed at the Star Point Mine include the lower facilities and conveyor systems associated with the Unit Train Loadout, and the abandoned rail spur west of the subsoil stockpile.

PacificCorp research conducted on Mancos based soils within the Cottonwood/Wilberg area shows that soil-surface treatments using coal waste were highly effective for reestablishing successful vegetation. It is theorized that the coal-waste treatment resulted in altering the soil chemistry of the Mancos material by lowering the pH and leaching sodium from the root zone. Additional plots using sandstone cover mixed with coal waste were also equally effective. The latter adds greater longevity by protecting the soil surface from erosion.

The stockpiled soils that were originally removed from these areas will be returned. Soil treatment will include deep gouging, mulching, crimping and application of tackifier. Prior to commencement of final reclamation of these Badland-Rubble Complex based soils, CPMC commits to investigate enhancement treatments to improve the success of revegetation. These enhancement methods may include, but will not be limited to the application of pH lowering substances such as gypsum, acidic coal waste, imported soils, etc., or enhancement of the soil through other chemical or mechanical means.

Findings:

As determined in the analysis section of this TA, approval of the plan is subject to the following Permit Conditions. Accordingly, the permittee has committed to comply with the

requirements of the following Permit Conditions, as specified, and in accordance with the requirements of:

R645-301-746.110 and R645-301-746.120, With regards to the Main Channel Restoration Area, the plan states that prior to any coal waste being used as backfill within the main channel or it's side slopes, the coal waste will be tested for acid- and toxic-forming characteristics in accordance with Division guidelines. However, the plan gives no specifics to sampling procedures. CPMC commits to a monitoring scheme which consists of taking three randomly located samples every 500 feet within the channel bottom where leaching will likely occur. Analysis will include Acid Base Potential, soluble Se and B, pH, EC, and SAR.