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April 24, 1996

TO: File  
THROUGH: Daron Haddock, Permit Supervisor  
FROM: Paul Baker, Reclamation Biologist  
RE: Crandall Canyon Mining and Reclamation Plan, Castle Gate Mine, Amax Coal Company, ACT/007/004-95D, Working File, Carbon County, Utah

*DRH*  
*PKB*

**SYNOPSIS**

The majority of Division Order 94A concerned revising the Crandall Canyon mining and reclamation plan. The portion dealing with soils is item number 2 which says:

- 2) **R645-301-200. Soils.** The Permittee must demonstrate that adequate topsoil is available for the currently approved 6" final cover depth over the disturbed areas in Crandall Canyon. Mass balance calculations for topsoil as well as a discussion of the total acreage to receive topsoil and the volume of topsoil available within the disturbed area should be provided in the text of the plan. Any disturbed areas within the Crandall Canyon area or the access road area which will not receive topsoil as part of reclamation must be clearly delineated on the maps, and adequate reclamation treatments must be described for those areas in the plan. The Permittee must provide plans to show adequate soil/spoil preparation plans (i.e. deep ripping to 18-24 inches) prior to the application of borrow soils or hydroseeding. Testing of the regraded spoil for fertilization requirements (1 sample/2.5 acres) or other approvable methodology must be included in the reclamation plan. A field sampling program must be proposed and should be undertaken to determine the nature of the top four feet of material remaining in the location of the Crandall Canyon facilities after backfilling and grading to determine that the material is not acid/toxic forming. Spoil materials remaining on the site must be characterized for their acid/toxic forming potential. Testing parameters proposed should be in accordance with Division "Guidelines for Topsoil and Overburden Management." Any alternate plans or treatments regarding designs and demonstration of compliance with the requirements of this section for the Crandall Canyon area must also include any changes to other sections of the plan as such alternatives may necessitate.

The application has been modified in accordance with Division requirements and can be approved.



## **ANALYSIS**

### **TOPSOIL AND SUBSOIL OPERATION PLAN**

Regulatory Reference: 30 CFR Sec. 817.22. UCA R645-301-200; R645-301-230

#### **Analysis:**

##### **Substitute Topsoil Suitability**

The 1984 Technical Analysis discusses soils salvaging in Crandall Canyon. According to this analysis, about 53,000 to 58,000 cubic yards of material was salvaged from 28 acres resulting in an average salvage depth of 15 inches. About 8,000 cubic yards of this was stored in Crandall Canyon, and the balance was presumably taken to Gravel Canyon. The plan, however, indicates about 40,000 cubic yards of soil was taken to Gravel Canyon. This leaves a discrepancy of 5000-10,000 cubic yards of soil. The reason for this discrepancy is unknown.

Section 3.6 of the mining and reclamation plan says a total of about 97,000 cubic yards of soil is in Gravel Canyon. This would include the soil from Crandall Canyon and also some substitute material available in Gravel Canyon.

The topsoil piles in Crandall Canyon were surveyed in 1995, and they contain a total of about 7890 cubic yards of soil. Of this, only 6680 cubic yards is currently considered usable because of noxious weeds on the lower stockpile.

The permittee intends to use nearly all of the soil in Gravel Canyon for reclamation of the Schoolhouse Canyon refuse pile. According to the plan, the soil stored in Crandall Canyon could be used in Crandall Canyon in the area between Shafts 1 and 2.

Appendix 3.7S of the plan is a letter from EarthFax Engineering to Amax Coal Company and describes 1995 soil sampling in Crandall Canyon. Seven soil pits were excavated to evaluate topsoil and alternate topsoil conditions in Crandall Canyon. Topsoil stockpiled near the mouth of the canyon was also sampled. The samples were taken at various depth increments and analyzed according to the Division's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining." The plan also gives narrative descriptions of the profiles and maps showing sampling locations.

Test pits EF-1 through EF-3 were in the lower pad area between Shaft 1 and pond 14. Pits EF-4 through EF-6 were in the upper pad area between pond 15 and the propane tanks. Pit

EF-7 was south of Shaft No. 1 near the fans.

The letter from EarthFax Engineering to Amax Coal Company identifies a few problems with using pad materials for topsoil substitutes. Coal fines were abundant from 30 to 48 inches in pit EF-1, and pit EF-2 had about 2% coal in the form of coarse fragments near the surface. Sample EF-1-3 had a hot water soluble selenium concentration of 0.11 mg/kg which is slightly above the Division's standard of 0.1 mg/kg.

Soils in the lower pad area had an average rock fragment content of 57%, and soil in the middle and upper pads averaged 32% rock fragment content. The Division's guidelines indicate more than 30% rock fragments is considered unacceptable, but the EarthFax letter says the Division will sometimes permit the use of soils with excessive rockiness in the event that all other parameters meet Division requirements. This statement is correct and would apply to soil materials in the middle and upper pad areas. Rocky soils can provide increased surface protection from erosion; however, soils with too many rock fragments will inhibit root growth.

Soil textures ranged from loam to loamy sand. The highest clay content value was 16.3%, but most samples had about 10% clay.

With the exception of some low values for plant nutrients and the one sample with a slightly elevated selenium content, soil chemical analyses indicate that the parameters fell within acceptable ranges. However, the procedures used were not according to Division guidelines. Since the methods in the guidelines are recommended and not required, the results were used to preliminarily determine the suitability and quantity of substitute topsoil in Crandall Canyon. Prior to reclamation, the permittee will thoroughly resample the soils and analyze them using approved methods. The plan includes recommendations for soil amendments to correct nutrient deficiencies.

The plan gives some discussion of the amount of vegetation in the areas of the soil test pits. The lower pad area has relatively little vegetation. It was seeded for two consecutive years in 1992 and 1993 using a mixture of primarily introduced grasses. These grasses are vigorous and should have produced good growth if other conditions were right. Although the soils in this pad are compacted, they were loosened through discing before being seeded.

The upper pad areas have moderate vegetative cover, but it does not appear to be as great as that in adjacent undisturbed areas or in the associated reference area. The amount of cover is approximately 30-40%, while the reference area had 53% cover when it was measured in 1981. This indicates a potential problem with using this soil either in place or as substitute topsoil for the lower pad.

R645-301-233 says selected overburden materials may be substituted for, or used as a

supplement to topsoil if the operator demonstrates to the Division that the resulting soil medium is equal to, or more suitable for sustaining vegetation on nonprime farmland areas than the existing topsoil and results in a soil medium that is the best available in the permit area to support revegetation. The question is whether the material in the upper shaft area will provide a soil medium at least equal to what existed before mining or if the Division should require the permittee to use the topsoil stored in Gravel Canyon for Crandall Canyon reclamation rather than using it for the Schoolhouse Canyon refuse pile.

The permittee has committed to conduct a vegetation field study in 1996 and qualitatively assess the vegetation in selected areas of the middle and upper pads. Based on this assessment, a vegetation sampling program will be implemented to compare the vegetation in these areas with appropriate reference areas. If the results indicate vegetative cover and production on the pads are truly less than in the reference areas, field trials may be conducted to establish the proper reclamation techniques to be used in those areas where substitute soil from the middle and upper pads is to be used for final reclamation.

Before mining, there was a jeep road in Crandall Canyon. This road was widened and improved for the mining operations. There is no discussion in the plan about what happened to topsoil from the road area. It is assumed no topsoil was salvaged. The plan says access road development disturbed primarily the Curecanti and Uinta formation except for one stretch of "made land" near Highway 6.

The Soil Conservation Service *Soil Survey of Carbon Area, Utah* lists many chemical and physical characteristics of the soils in the area. Although the information is not specific to Crandall Canyon, the only factors that appear to have a potential of limiting revegetation success are the slopes and the amount of rocks in the soils. However, considering the information in the soil survey and the amount of vegetation growing on the road outcrops, the soils to be used to revegetate the road can be considered suitable for revegetation.

### **Topsoil Protection**

The plan says topsoil is stored in designated areas in stable piles. They were seeded with a mixture shown in the plan then mulched. Chapter 8 of the existing plan says all stockpiled resoiling materials will be protected from wind and water erosion by various means, including diverting runoff from storage areas, locating the piles in naturally-protected areas, and seeding, mulching, crimping, and using jute matting in extreme cases. A chain link fence will be installed at Gravel Canyon if unauthorized borrow becomes a problem.

Table 7-8 includes the two Crandall Canyon topsoil piles and the stockpile in Gravel Canyon among the areas where drainage would not report to a sediment pond. The sediment control for these areas is listed as "vegetation." Division personnel have not seen problems with

topsoil loss at any of these piles.

The lower topsoil pile in Crandall Canyon has an infestation of whitetop, a noxious weed, and there is also a lot of field bindweed in the area near it. The permittee has been trying since 1992 to control the whitetop but has not yet been successful. Until the whitetop is controlled, this topsoil should not be used. The permittee must continue its efforts to control this weed and should also try to control the nearby bindweed since it is a potential problem.

**Findings:**

This portion of the plan is considered complete and accurate.

**TOPSOIL AND SUBSOIL RECLAMATION PLAN**

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

**Analysis:**

The permittee anticipates that only the facilities area will require application of additional topsoil during reclamation. It would require 14,520 cubic yards of topsoil to cover the area six inches deep, but only 6680 cubic yards is considered usable for reclamation. An additional 1210 cubic yards would become available if whitetop was controlled on the lowermost stockpile. The deficit could be made up if soils in the middle and upper pads were shown to be suitable and were used in the lower pad area. Part of the deficit might also be made up if suitable soils were found in the lower pad area.

The permittee proposes to grade the lower pad area then take at least three samples based on vegetative cover and apparent coarseness of the soils. These would be analyzed for various parameters as shown in the plan. Soils found to be unacceptable for use as substitute topsoil would be used as backfill against cutslopes. If none of the soils in the lower pad area are considered acceptable, the permittee would cover the area with soil from stockpile No.2. It appears that the area could be covered about 12 inches deep.

Soils present west of Shaft No. 1 and east of the LP tanks (middle and upper pads) appear to sustain moderate vegetation growth and the results of the soil study indicate they could be considered as substitute topsoil. The plan contains a commitment to sample soils in the middle and upper pads on 100-foot centers and to analyze these samples according to a group of parameters listed in the plan. It says suitable topsoil identified in the upper and lower pad areas will be used to supplement the existing 6680 cubic yards of soil.

During reclamation construction, soil samples would be taken at a rate of one for every two and one-half acres and analyzed for pH, electrical conductivity, texture, total nitrogen, available phosphorous, and potassium. Soil amendments would be added based on the results of these analyses. This sampling would include soils placed on the access road.

Soil tests performed in 1995, together with brief descriptions of the vegetation, already give a good idea of what conditions will be encountered in grading and for reclamation. As discussed under "Topsoil and Subsoil Operation Plan," soils in the upper pad area are probably suitable for reclamation. However, since vegetation does not appear to be as great as would be needed for reclamation, the plan needs to contain a demonstration that the soils are adequate to achieve revegetation success.

The lower pad area may contain some areas with suitable substitute soil material, but it appears a large part of the area has too many rock fragments. The proposed testing regime should serve to identify those areas with less reclamation potential where topsoil or substitute topsoil should be applied. The substitute topsoil from the upper pad area should only be used to cover the lower pad if field trials or other data indicate this substitute soil can be successfully revegetated. Areas of soil with suitable characteristics in the lower pad should be similar to the soils in the upper pad area. This would be shown in testing at the time of reclamation.

Section 3.7-5(4)(6) discusses alternative sediment control measures that include seedbed preparation. Possible measures to be used include surface ripping, contour furrowing, mulching, and surface roughening with mulch incorporation. Soil preparation will include loosening the soils to 18-24 inches.

Mulch will be applied at the rate of two tons per acre prior to roughening the surface. The area will be roughened by gouging the soil to a depth of 12 to 18 inches using the bucket of a track-mounted backhoe. Chapter 9 says wildlife habitat will be created by development of microtopographic features, such as swales and rises. Following seeding and fertilization, the site will be mulched again at a rate of two tons per acre.

**Analysis:**

This portion of the plan is complete and accurate.

**RECOMMENDATIONS**

Amx has satisfied all requirements of the soils portion of the Division Order.