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State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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TO: Daron Haddock, Permit Supervisor

FROM:  Priscilla Burton, Reclamation Soils Specialist

RE: Technical Deficiency Review of Castle Gate Prep Plant Reclamation Plans. Castle Gate. AMAX Coal Co. ACT/007/004. Folder #2. Carbon Co. Utah.

SUMMARY:

A technical review conducted in October of 1990 pointed out a major deficiency with the reclamation plan for the Preparation Plant Refuse site. The issue is the depth of cover to be placed on the refuse. The following supporting evidence was requested: information concerning the physicochemical characteristics of the refuse, overburden, and proposed substitute topsoil material.

The present submittal (5/1/92 and 5/5/92) calls for 6 inches. Supporting documentation in the form of chemical analyses of the coal mine waste is provided in Appendix 8B. (The first three lifts of the Prep Plant Refuse site probably utilized 12 inches of substitute cover material in reclamation.)

TECHNICAL ANALYSIS:

- 224. **Substitute Topsoil.** Where the applicant proposes to use selected overburden materials as a supplement or substitute for topsoil, the application will include results of analyses, trials, and tests as described under R645-301-232.100 through R645-301-232.600, R645-301-234, R645-301-242, and R645-301-243. The Division may also require the results of field-site trials or greenhouse tests as required under R645-301-233.

Proposal:

In situ soils will be used as substitute topsoil for the Preparation Plant. Grading for overland drainage flow will provide the final seeding surface.

Eight samples were taken from the Preparation Plant (Appendix 8B). The

sample locations are no longer marked on Ex. 3.4-3 Reclamation Map, but were on this map in the June revision of Ex 3.4-3. Sample locations may be found on the Soil Survey map for Castle Gate.

Samples from location PP#3 and PP#4 were combined for analyses. Therefore, seven samples were analyzed from the 58 acre Preparation Plant (1 sample per 8.2 acres). All samples were composites taken from 0-4 feet.

Analysis:

A reference to the soils map and Chapter 8 appendix for the location and analysis of samples is required within the Castle Gate proposal. The texture of the Preparation Plant material is a sandy loam. The bulk densities reported are similar to those of a subsoil; this may create a difficult germination and growth medium.

The results indicate that at the majority of locations, the recommended level of coarse fragments is exceeded. Locations PP#6 and PP#7 have a high percentage of coarse fragments, but are within a tolerable range. The saturation percentages of samples PP#2 and PP#3/4 are reflective of the numerous macropores that exist in coarse material. This is confirmed by the moderate to low water holding capacities reported.

The organic carbon content lessens toward the northern end of the Preparation Plant. Sites PP#1 through PP#5 have greater than 5 ppm organic carbon. Overall the carbon to nitrogen ratio is quite high, 45:1 on the average.

The combination sample PP#3/#4 (at the location of the thickener) has a high Boron level, approaching the limit of acceptability. Attention should be paid to the Boron content of the soils which will remain as plant growth medium. The plan calls for retesting these soils prior to seeding. After testing results are known, prior to seeding, soil in areas that exceed the level of acceptability for Boron must be removed to the refuse site. Alternatively, four feet of non-toxic, non-acidic cover may be placed over the area of Boron accumulation.

In summation, the *in situ* soils of the Preparation Plant are very coarse to support plant germination and growth. The Division must require that at a minimum, a soil amendment is incorporated into the surface prior to seeding the *in situ* soils of the Preparation Plant. The amendments which are suggested are alfalfa hay (3T/ac) or composted/digested sewage sludge manure.

Deficiency:

1. The Division requires that a suitable soil amendment is incorporated into the surface prior to seeding of the Preparation Plant *in situ* soils.
2. The Castle Gate Preparation Plant reclamation submittal must reference the location of preparation plant soil sample analyses in the MRP's, Appendix 8B.

553.252. Following final grading of the refuse pile, the coal mine waste will be covered with a minimum of four feet of the best available, nontoxic and noncombustible material, in a manner that does not impede drainage from the underdrains. The Division may allow less than four feet of cover material based on physical and chemical analyses which show that the requirements of R645-301-244.200 and R645-301-353 through R645-301-357.

Proposal:

Page 16 of the MRP describes reclamation of the refuse site utilizing 6 inches of cover material. Supporting documentation is found in Appendix 8B. Sample locations are found on drawings in the Appendix of Sec 3.5 of the July 1990 submittal.

The seven Schoolhouse Canyon Refuse site samples were taken from the lifts where interim revegetation work has been completed. The lower three lifts were (probably) covered with one foot of cover in 1984 and 1985. Samples from the lifts were depth segregated.

Analysis:

AMAX Coal Company would like these analyses to serve as justification for the use of 6 inches of cover over the refuse during final reclamation. Consequently, the rooting depth would include refuse as substitute soil. The following discussion evaluates the qualities of wasterock (below 1' deep in the lower three lifts) for plant growth.

The textural class of the waste material is mainly loamy sand. The electrical conductivity of the material is between 3 and 4.0 mmhos/cm, within the acceptable range. Sodium Absorption Ratios range from 1.0 mmho/cm at location 3 to 10 mmhos/cm at

location 6. Due to the coarse nature of the refuse, the reported SAR values are within acceptable limits for substitute soil. The material is calcareous, not acidic. The waste is low in Boron.

The results presented describe a material that is high in coarse fragments (approximately 70% coarse fragments). A definite break occurs at the interface of interim soil cover and waste rock. The soil cover averages 30% coarse fragments, but below one foot, the coarse fragments rises to an average of 70%. This is an unacceptable level for substitute topsoil.

The laboratory could not report a bulk density for the waste material since no clods were present. If no clods are present, this indicates that the material has no aggregation and thus, very little water and nutrient holding capacity. This condition is unacceptable for plant growth.

The high saturation percentages reflect the large number of macropores, since the percentage of clay in all cases is low. This also indicates that the available water holding capacity is minimal, although without bulk density, the available water capacity can not be reported.

Organic carbon (reported erroneously as organic matter), likewise, steeply increases after the 1' depth at all sample locations to approximately 15%. Soil levels of organic carbon in the Pathead and Cucureanti series of soils range from 1.76 to 2.94%, organic carbon in the Gerst series ranges from 0.3-0.58%. ** The ratio of organic carbon (15%) in the waste rock to the total nitrogen (0.3%) is approximately 50:1. Carbon to nitrogen ratios in soils generally average 12:1. The waste rock is severely deficient in nitrogen.

Slightly elevated selenium levels at three sample locations: #2, #3, and #7 were reported. At location #2, and a depth between 1 and 2 feet, selenium is reported to be 0.14 ppm. At location #3, and a depth of 1.0 to 2.0 feet, selenium is 0.10 ppm. At location #7, each sample between 0.5 to 3.0 feet, selenium is reported at 0.06 to 0.08. These last figures are within the acceptable range.

** Figures derived by the Division, using the conversion factor of $OM = 1.7(OC)$ and the OM contents stated in the Carbon County Soil Survey for the soils mentioned.

The Utah guideline for maximum selenium concentrations within the plant rooting profile is 0.1 ppm. The figures reported do not deviate significantly from this level, especially given the accuracy of the test (Scott Fisher, personal communication 1992).

Overall, the results of the sampling of the Schoolhouse Refuse indicate that the material is not suitable for substitute topsoil. As a result, the refuse must be covered with a minimum of two feet of suitable soil cover material. This amount of cover is one-half the amount required by regulation, in recognition of the fact that very little cover is available within the disturbed area. Alternative sources of cover material must be explored.

Final reclamation is may not occur until the year 2015. In the intervening decade, a significant change in the pH, alkalinity and oxidation status of heavy metals may occur. Therefore, sampling of the refuse is recommended within a year prior to final covering and seeding of the School House Refuse site.

Deficiency:

1. The permanent disposal of refuse at the Castle Gate refuse site must be covered with a minimum of two feet of suitable substitute soil cover material.
2. The mining and reclamation plan must contain a commitment to resample the Schoolhouse Refuse site for a confirmation of its non-toxic, non-acidic characteristics within one year of the grading and seeding steps of final reclamation.

RECOMMENDATIONS:

The proposal to cover the refuse site at Castle Gate Preparation Plant with 6 inches of soil cover is not recommended for approval. The ability of the refuse to support plant growth is not supported by the chemical analyses. AMAX Coal Company must develop a plan to cover the refuse with a minimum of two feet of suitable substitute soil cover on the Refuse Disposal site. At the Preparation Plant, addition of a suitable soil amendment to the graded *in situ* soils is also requested.

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Technical Deficiencies
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A: TECHDEF.REV