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TO: Daron Haddock, Permit Supervisor

FROM: Paul Baker, Reclamation Biologist PRB

RE: Draft Review, Preliminary Phase I Bond Release Application for Sowbelly Gulch, Castle Gate Mine, Amax Coal Company, ACT/007/004, Working File, Carbon County, Utah

Folder #2

SYNOPSIS

On November 2, 1994, the Division conducted a preliminary Phase I bond release inspection of regraded areas in Sowbelly Gulch. Before considering Phase I bond release, Amax will need to advertise a bond release inspection. The Division received as-built plans for the Sowbelly reclamation February 22, 1995.

R645-301-880.210 requires the Division to consider the degree of difficulty to complete remaining reclamation. This memorandum considers the probability of achieving revegetation success. It also analyzes the grading of the area and other surface features from the standpoint of achieving the postmining land use.

ANALYSIS

REVEGETATION SUCCESS STANDARDS

Regulatory Reference: R645-301-350

Analysis:

The probability of revegetation success is related to several factors, including consistent and adequate moisture, soil conditions, slope and aspect, weed competition, depredation by wildlife, seed quality, mulch, and others. This memorandum only considers factors related directly to backfilling and grading.

Since this site was disturbed prior to 1977, the revegetation success standards include erosion control, vegetation diversity, and achieving the postmining land use. They do not include a direct comparison of vegetation cover. The reclaimed areas will be compared for these parameters with reference areas consisting of reclaimed abandoned mines in the Spring Canyon area. Revegetation at the abandoned sites has been relatively successful with good diversities of shrubs, grasses, and broadleaf forbs. In fact, the species established in these

areas are generally more palatable to livestock and wildlife than species in adjacent undisturbed areas. The amount of vegetative cover is not quite as good as in undisturbed areas, however.

Topography and soils in the disturbed area are generally similar to those at some of the reclaimed abandoned mines. This would tend to indicate favorable chances for vegetation establishment. However, some reclamation practices used decrease the possibilities for success.

Soils

In 1993, six soil samples were taken and analyzed for certain chemical and physical parameters. These samples were not analyzed for all parameters enumerated in the mining and reclamation plan. In addition, the plan calls for one sample to be taken for every 2.3 acres. The total disturbed area in the area reclaimed is approximately 19.7 acres. This means at least three samples still need to be taken.

The six 1993 samples were taken from both graded and ungraded areas, but precise sampling locations were not documented. Also, it is unknown from how deep in the soil profile these samples were taken.

Amax needs to sample at least nine locations to a depth of four feet and have these samples analyzed for the parameters in the mining and reclamation plan. If Amax can document that the 1993 samples were taken to a depth of four feet, they may only need to take three more samples. However, Amax would still need to submit complete results, according to the mining and reclamation plan parameter list, for the six 1993 samples.

The Division is aware of one location that showed extremely high sodium salt levels in pre-grading soil sampling. Amax did not special handle soil from this area, and its disposition is unknown. Additional samples may locate this material.

The incomplete 1993 data show only one potential problem. (The samples were analyzed for total selenium rather than hot water extractable selenium. Total selenium concentration is not a useful figure when determining whether the material is potentially toxic.) The texture of one of the samples is clay loam. Three of the other samples, although they have a texture classified as loam, border clay loam. Clayey soils tend to restrict water infiltration and reduce vegetation establishment.

Although the texture of the soils may reduce the amount of vegetation establishment, the Division should not withhold bond release on this basis. The Division's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining" indicate a clay loam texture is "fair" for reclamation. Incomplete soil sampling, however,

particularly when the Division is aware of a location of potentially toxic material, is cause for not releasing the bond for backfilling and grading.

Exhibit 3.2-14, an as-built drawing, indicates a variance in the slope of channel SBRD-4 due to coal refuse material in the embankment. It is unknown to what degree coal refuse is buried in this area or just mixed with the spoil, but a fair amount of the surface near the upper parts of SBRD-4 is covered with coal. R645-301-553.250 requires coal refuse to be buried at least four feet deep unless the Division allows less cover based on chemical and physical tests indicating revegetation requirements can be met using less cover. The operator has submitted no information about the nature of refuse materials in the area of SBRD-4.

Surface preparation techniques may not have been adequate for vegetation establishment. Although most of the soils were ripped, the Division's soils specialist found highly compacted soil below about twelve to eighteen inches when he was taking samples. Compacted soil has been shown in several studies to reduce plant growth through root growth restriction. In Sowbelly, the soils may not have been ripped deeply enough, or the rippers may have been spaced too widely. In addition, the operator used contour furrowing to both control erosion and help establish vegetation. The Division's experience is that other water harvesting techniques are more effective than contour furrowing.

For permit approval, R645-300-133.700 requires the Division to make a finding that the applicant has demonstrated that reclamation as required by the State Program can be accomplished according to information given in the permit application. While there is good reason to suspect the soil in reclaimed areas of Sowbelly Gulch is overly compacted below twelve to eighteen inches and that the water harvesting methods used will fail to adequately promote vegetation establishment and growth, there is no definitive or empirical evidence to this effect. Therefore, although these techniques may ultimately prove to be unsuccessful for vegetation establishment, there is no regulatory requirement to use different methods.

Slopes

Slopes created in the grading process are not extremely steep, but some very steep cut slopes were not reclaimed. As much as possible, these slopes were seeded, but it is not anticipated that much vegetation will become established on them.

An attempt was made to determine what proportion of the area consists of very steep cut slopes where limited vegetation will become established and where wildlife and livestock will not be able to use vegetation because of the steepness. This is difficult to ascertain because Exhibit 3.2-14 does not show which parts of the area actually disturbed by mining were not regraded. Also, there are discrepancies between Exhibit 3.2-14 and 3.2-5 in the boundary of the disturbed area. Some areas shown on Exhibit 3.2-14 as having been

regraded were not.

According to Exhibit 3.2-5, about 1.8 acres were to be left as cut slopes. About 0.28 acres of this area were actually graded and blended in with surrounding topography. However, a few areas, such as the top of the highwall and the top of the cut on the road to the water tank, were not graded. The extent of these areas is probably similar to the area that was actually graded but was not proposed to be graded. This assumption, that 1.8 acres were left as cut slopes, is made for the following discussion.

The area where vegetation will need to meet success standards is approximately 18.2 acres. This figure comes from the area graded according to Exhibit 3.2-14 (16.4 acres) and the area left as cut slopes according to Exhibit 3.2-5 (assumed to be about 1.8 acres). Not all of the remaining cut slopes will be totally unusable for the postmining land use, and limited vegetation will become established on them. However, the majority of the remaining cut slopes are about 1h:1v or steeper. According to guidelines used by the Bureau of Land Management, this precludes use by livestock. Very few wildlife would use these slopes. A worst-case scenario is that there is no usable vegetation on the cut slopes.

Since cut slopes comprise about 10% of the disturbed area, if vegetation is established on all graded areas equal in extent of cover to the reference area and if there is no vegetation on the cut slopes, the total amount of vegetation over the entire disturbed area would be 90% of the reference area vegetation cover. Vegetation should be adequate to control erosion on regraded areas assuming the cover will be the same as at nearby abandoned mines and that vegetation is controlling erosion in these areas. Remaining cut slopes have been in place for many years and should be stable according to information presented in the mining and reclamation plan.

The approved mining and reclamation plan says the diversity index used to compare reference and reclaimed areas will be used to show revegetation success for the parameters of diversity, seasonal characteristics, permanence, and utility for the postmining land use. As discussed above, soil conditions are probably not optimal, but they are unlikely to vary significantly from conditions at the reference areas. The seed mix used is similar to what was used on the abandoned mines and should give diversity in the reclaimed areas similar to the reference areas. Even with a reduction in vegetative cover of 10% over the entire reclaimed area (since some cut slopes will not be useable and will probably have little/no vegetative cover), Amax should be able to meet its revegetation success standards. However, if there are potentially toxic materials near the surface or if the subsoil is overly compacted, the success standards may not be met.

Findings:

Amax has not met the requirements of its mining and reclamation plan to sample soils

in the reclaimed area. At a minimum, three more samples must be taken and analyzed for the parameters listed in the mining and reclamation plan. These samples should be taken from the soil profile to a depth of four feet. Samples taken in 1993 were not analyzed for all parameters listed in the mining and reclamation plan, and sample locations and depths were not documented. Amax needs to supply complete test results for these samples and should also show whether they were taken from the upper four feet of the soil profile.

Other problems that could reduce vegetation establishment include soil compaction and the lack of effective water harvesting. The amount of vegetation cover averaged over the entire disturbed area will probably be reduced because some slopes are very steep and not conducive to either vegetation establishment or the postmining land use. However, these areas comprise only about 10% of the total disturbed area. If Amax can establish vegetation on regraded area equal in extent of cover to the reference areas, they should be able to achieve revegetation success standards. These standards include diversity, seasonal characteristics, erosion control, and utility for the postmining land use.

POSTMINING LAND USE

Regulatory Reference: R645-301-412, R645-301-413

Utility for the postmining land use is a revegetation success standard and will be met if Amax achieves diversity similar to the reference areas. This is discussed under "Revegetation Success Standards" above.

Ancillary road A-2 was built in Phase II reclamation as outlined in the mining and reclamation plan. The plan says this road is considered temporary and that it will be scarified and seeded as part of Phase III reclamation (when runoff control structures are removed). As discussed below, the road is not needed for the postmining land use. In addition to plans to scarify and reseed this road, the operator should take other steps to ensure it is not used. This might include placing large rocks on the road or grading parts or all of it to make it impassable. These are not considered Phase I bond release issues, however, since the plan shows the road is needed to maintain the site until Phase III reclamation.

The county road that leads up Sowbelly Gulch ends just before the substation. Beyond this point, prior to reclamation, it continued though the disturbed area into the two forks above the mine. The portion of the road going up the right fork ends at a drill pad. The road going up the left fork continues to the top of the plateau and apparently connects with other roads there.

It might be considered that a road through the reclaimed area connecting to the road in the left fork would be valuable for the postmining land use. However, the left fork road

does not appear to have been used since at least 1992. Rocks and other debris appear to have been blocking the road since the winter of 1992-1993. Since the road above the mine has probably not been used in nearly three years, there does not appear to be a good reason to retain any road through the reclaimed area for the purpose of connecting the Sowbelly Gulch county road to the road to the top of the plateau.

A problem that needs to be addressed before the Division can consider Phase I bond release is that neither portal was adequately backfilled. Both of them were covered, but they have reappeared, probably as a result of settling and water piping into them. Air coming from the fan portal probably resulted in the deaths of two birds. These portals present dangers if left in their current condition, and the Division cannot release Phase I bond until they have been adequately sealed and backfilled.

A hole was found above pond 16 that appeared to connect to mine workings. However, the contractor that did the grading work said the hole was only about four feet deep and that it was probably for a utility pole. The hole has been backfilled, but it needs to be watched for signs of redeveloping.

Findings:

Amax proposes to reclaim ancillary road A-2. This road does not appear to be needed for the postmining land use.

Before the Division can release bond for grading, Amax will need to properly backfill the No. 5 mine portals.

RECOMMENDATIONS

Release of Phase I bond is not recommended based on the following:

1. Amax has yet to adequately sample resoiling materials according to requirements of the mining and reclamation plan.

2. The portals need to be properly backfilled.

In addition, there are reservations about how well vegetation will establish and grow considering the surface preparation techniques used. Soil may be overly compacted, and, in the Division's experience, contour furrows have not performed as well as other water harvesting methods.