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State of Utah

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TO: Daron Haddock, Permit Supervisor

FROM: Paul Baker, Reclamation Biologist 

DATE: January 25, 1993

RE: Response to Permit Renewal Technical Deficiency Review, U. S. Fuel Co., Hiawatha Mine, Folder #2, ACT/007/011, Carbon County, Utah

SUMMARY

U. S. Fuel has responded to the deficiencies noted in the March 4, 1992, permit renewal technical deficiency review. The response includes analysis of the refuse area and borrow site test plots. Much of the reclamation plan has been changed and clarified according to recommendations and requirements made in the review. Because of the additional information available, however, limited further changes will be needed to the seed mixes and the methods of measuring the standard for success. Also, the appropriateness of the reference areas, particularly PJR5 and SBR3, should be evaluated when Soil Conservation Service monitoring information is received. These sites may be in poor condition, and reference areas need to be in fair or better condition when comparing them to reclaimed areas for bond release.

ANALYSIS

R645-301-321

Vegetation Information

Original Deficiency:

1. *The Applicant must provide subspecific and specific information for sagebrush (Artemisia tridentata) and sedges (Carex sp.) occurring in the reference areas and disturbed areas.*

Response and Analysis:

The response letter states that it was determined at a June 18, 1992, meeting that the information requested under this deficiency would not be required. For the Carex, it was decided that the riparian area would be planted with species that are available from traditional plant and seed sources and that, if the area is properly managed, sedges

would invade on their own. Therefore, species information would not be needed. Most or all of the sagebrush near the town of Hiawatha is basin big sage, but reclamation plans need to identify which subspecies will be the most desirable for final reclamation planting.

Deficiencies:

None.

Original Deficiency:

- 2. The reference areas must be evaluated by the Soil Conservation Service for range condition and productivity during the next growing season, and an evaluation of alternatives for improving their condition must be made if any are still in poor condition. See also deficiency 6 under R645-301-222.*

Response and Analysis:

The response letter states that U. S. Fuel contacted the Price office of the SCS several times but that they have not responded to this request.

The Division's "Vegetation Information Guidelines" state that reference areas need to be in fair or better range condition at the time of bond release. It is unclear what the condition of the Hiawatha reference areas is now. Based on vegetative cover data, previous SCS evaluations of a sagebrush area near Mohrland, and the productivity of the pinyon juniper reference area contained in the plan, it is suspected that reference areas SBR3 and PJR5 could be in poor condition. In Table 55 of Appendix III-2, the productivity of PJR5 is shown as 300 lbs. per acre which is only half of the 600 lbs per acre that the "Soil Survey of Carbon Area, Utah" says is unfavorable production for map unit 113. Although SBR3 had good productivity, 1500 lbs. per acre, much of this is from basin big sage which is not a very palatable species. A similar site near Mohrland also had 1500 lbs. productivity per acre but was rated as being in poor condition.

SBR3 is on a portion of the town of Hiawatha where there are numerous foundations of old buildings. Near this reference area, however, are sagebrush sites that have a greater diversity of grasses and forbs than the current reference area. If an area such as this had fair or better range condition, the reference area could probably be changed without gathering all of the baseline data that is normally required for a reference area. A site with a little more diversity would be much more comparable to the diversity obtained in the refuse pile test plots.

It may be possible to eliminate PJR5 as a reference area altogether. Much of the area that was disturbed to create the refuse piles probably had a sagebrush community. Some probably contained pinyon juniper, but the area will not be reclaimed to pinyon juniper. It will more closely resemble sagebrush although, hopefully, there will be a good variety of grasses, broadleaf forbs, and shrubs other than sagebrush.

The other reference areas are probably in fair or better condition.

The SCS will not be able to check the reference areas until mid- to late June at the earliest, but this evaluation needs to be made. Because an assessment will need to be made of whether or not the pinyon juniper and sagebrush reference areas can still be used as revegetation standards for success, a representative of the Division should be present when the sites are being evaluated.

Deficiencies:

1. The reference areas must be evaluated by the Soil Conservation Service for range condition and productivity during the next growing season, and an evaluation of alternatives for improving their condition needs to be made if any are in poor condition. It may also be necessary to change one or more reference areas if some are not in fair or better condition.

Original Deficiencies:

3. *The plan must include baseline vegetative cover data by species for reference areas MBR1, MCR2, and PJR5.*
4. *Complete woody species density figures must be provided for reference areas MBR1, MCR2, and PJR5.*
5. *Reference area RR13 must be evaluated for woody species density, species and cover composition, and productivity. Alternatively, the Applicant may propose changing sampling site RA13 to a reference area if this area has not and will not be disturbed and if it can be shown to be representative of other riparian areas.*

Response and Analysis:

All of the required information was included in the plan. Some of it was information from the original Biowest studies that had not been included in the plan, and some was gathered by Mt. Nebo Scientific in 1992.

Sampling site RA13 has been changed to a reference area as suggested. This change is acceptable if it is in fair or better range condition. This should be evaluated by the SCS during the 1993 growing season. The area generally has a good mix of species and good cover, but some undesirable weeds are present, such as houndstongue and bull thistle. It might be necessary to fence the area and/or perform limited weed control.

Deficiencies:

None.

Original Deficiency:

6. *The vegetation in topsoil borrow sites must be correlated with vegetation sampling areas and reference areas or new sampling in these areas must be performed.*

Response and Analysis:

The response letter states that it was determined at the June 18, 1992, meeting that reference area SBR3 could be used to represent the vegetation in the topsoil borrow areas. A large part of the topsoil borrow areas was burned and seeded a few years ago, so the vegetation there is not natural and would probably not correlate with any reference areas. After seeing the soils and the surrounding vegetation, however, reference area SBR3 is probably most representative of the site.

Deficiencies:

None.

R645-301-322

Fish and Wildlife Information

Original Deficiencies:

1. *The Applicant must include all available information on raptor nests in the permit area, particularly in the area of surface disturbance.*
2. *The Applicant must identify populations of canyon sweetvetch (Hedysarum occidentale var. canone) within and near areas that have been disturbed.*

Response and Analysis:

U. S. Fuel has complied with both of these requirements.

The information submitted shows several populations of canyon sweetvetch along the Middle and South Fork Roads. This plant was also found in one location along the North Fork Road that U. S. Fuel was not aware of. This species is not listed as being threatened or endangered, and its taxonomy is questionable. However, it is listed as a candidate for threatened status, and it should be avoided whenever possible.

Deficiencies:

None.

R645-301-323

Maps and Aerial Photographs

Original Deficiency:

Exhibit III-3 must be revised to give expanded names of the abbreviations in the legend.

Response and Analysis:

U. S. Fuel has revised the map as required.

Deficiencies:

None.

R645-301-341.100

Revegetation Timing

Original Deficiency:

The planting schedule or methods must be revised to show dormant season planting of tree and shrub nursery stock or must show other methods to establish transplants, such as irrigation during the late spring and summer.

Response and Analysis:

recommends one seed mix with a greater diversity of species.

Another question is what to do with sagebrush and rabbitbrush. These are both native species that provide cover and erosion protection, but rabbitbrush and basin big sage are not very palatable to livestock or wildlife. Rabbitbrush did very well, possibly too well, in some of the test plots. Since rabbitbrush tends to invade very quickly on its own and because of its relatively low palatability, it is not included in the recommended seed mix below. If U. S. Fuel decides to include this species, it should be planted at a reduced rate.

Basin big sage is well-adapted to deep alluvial soils, but it is not usually present on upland sites. Therefore, a more desirable and palatable subspecies, Wyoming big sage, is recommended for the refuse piles. This subspecies is recommended in the "Interagency Forage and Conservation Planting Guide for Utah" for basin big sage sites as well as the upland sites. Basin big sage should be avoided if possible. It will probably invade alluvial areas quickly enough on its own. Many areas near Hiawatha have near-monocultures of basin big sage.

Recommended seed mixture for areas near Hiawatha, including the refuse piles and soil borrow areas:

Species	Pounds PLS per Acre Broadcast
Shrubs	
Wyoming Big Sage	<u>Artemisia tridentata wyomingensis</u> 1.0
Fourwing Saltbush	<u>Atriplex canescens</u> 3.0
Winterfat	<u>Ceratoides lanata</u> 2.0
Fringed Sage	<u>Artemisia frigida</u> 0.25
Green Ephedra	<u>Ephedra viridis</u> 2.0
Broadleaf Forbs	
Lewis Flax	<u>Linum lewisii</u> 1.0
Cicer Milkvetch	<u>Astragalus cicer</u> 1.0
Palmer Penstemon	<u>Penstemon palmeri</u> 1.0
Northern Sweetvetch	<u>Hedysarum boreale</u> 2.0
Gooseberryleaf Globemallow	<u>Sphaeralcea grossulariifolia</u> 0.5
Yellow Sweet Clover	<u>Melilotus officinalis</u> 1.0
Grasses	

Basin Wild Rye	<u>Elymus cinereus</u>	2.0
Slender Wheatgrass	<u>Elymus trachycaulus</u>	2.0
Western Wheatgrass	<u>Elymus smithii</u>	2.0
Thickspike Wheatgrass	<u>Elymus lanceolatus</u>	2.0
Bluebunch Wheatgrass	<u>Elymus spicatus</u>	2.0
Indian Ricegrass	<u>Stipa hymenoides</u>	2.0
Needle and Thread Grass	<u>Stipa comata</u>	2.0

Seed and planting mixture 3 in Table III-7 is acceptable, but, as recommended in the technical deficiency review, U. S. Fuel may want to increase the number of trees planted on north-facing slopes in case mortality is greater than 10%.

The newly-designated riparian reference area RA13 contains 2448.44 trees and shrubs per acre. This is comprised mainly of sandbar or coyote willow (Salix exigua, hereafter called coyote willow) and Wood's rose. Seed and planting mixture 4 in Table III-8 consists primarily of riparian species. The area where this seed and planting mixture would be used is discussed below. Assuming that it will be used for riparian areas, this mixture proposes that only 800 trees be planted in the riparian areas in addition to 1 pound per acre of snowberry seed. In order to achieve the woody plant density standard for success, it will be necessary to plant more trees and shrubs than what is proposed. The technical deficiency review recommended that the planting mix from Table III-6 of the plan submitted in 1990 be included with the recommended seed mix. This would add red oisier dogwood, Wood's rose, and coyote willow so that a total of 3050 trees and shrubs would be planted per acre. Considering the nature of the reclaimed stream channels, this recommendation may not be the best alternative.

The reclaimed streams will be trapezoidal riprapped channels with 2h:1v side slopes and depths of about three feet (Exhibit V-11 and 12). The reclamation cross-sections show several areas both in Middle and South Forks where the slopes will be fairly gentle to nearly flat for some distance from the restored channels. Coyote willow and the sedges and rushes that are in some of the riparian areas normally grow in the actual floodplain area of a stream and therefore would probably not survive unless planted in the riprapped channel itself which is probably impractical. There are numerous tree and shrub species that would grow in the fairly flat areas near the channels, however. These include the three trees in seed and planting mixture 4. Others that could be included are saskatoon serviceberry, red oisier dogwood, Wood's rose, aspen, Douglas fir, blue spruce, and white fir. Most of these would probably establish better from transplants rather than from seed; however, degradation from big game could present some problems. Nevertheless, the following planting mix is recommended for use in riparian areas in addition to seed and planting mix 4 in Table III-8:

Species	Plants per Acre
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Wood's Rose	<u>Rosa woodsii</u>	600
Red Oisier Dogwood	<u>Cornus stolonifera</u>	750
Saskatoon Serviceberry	<u>Amelanchier alnifolia</u>	300
Aspen	<u>Populus tremuloides</u>	100

The additional woody plants needed to meet the standard for success would come from snowberry planted from seed.

U. S. Fuel is urged to make changes to these recommended seed and planting mixtures as they and their consultants feel appropriate.

Deficiencies:

1. The seed and planting mix(es) for the areas near Hiawatha must be revised to reflect results of the test plots and of species identification performed on big sagebrush.
2. The seed and planting mixture for riparian areas contained in Table III-8 needs to be revised so that it will be more likely to achieve the woody species standard for success for this area.

Original Deficiencies:

3. *U. S. Fuel must show where various seeding and planting treatments will be used, preferably on a map.*

Response and Analysis:

Exhibits II-4 and II-5 have been revised to show where the seed mixes will be used. Exhibit II-5 shows that seed mix 3 will be used on the north (south-facing) sides of stream channels in South and Middle Forks, and seed mix 4 will be used on the south (north-facing) sides. Although developing a plan to establish vegetation in compliance with the standards for success is primarily the Operator's responsibility, the following methods are suggested. For the riparian areas, R645-301-358.400, which requires that riparian vegetation be reestablished, applies.

In the recommendations given in the March 1992 technical deficiency review, it was intended that seed and planting mix 3 be used for most of the areas of South, Middle, and North Forks. The seed mix would be applied in all but riparian areas, and the planting mix would supplement the seed mix on north-facing slopes only. The north-facing slopes are a mixed conifer community that would probably best be reestablished

through using conifer transplants in addition to the seed mix. The south-facing slopes are mixed brush communities that can be established with just the seed mix, not the transplant mix, in mix 3.

Seed and planting mix 4 has species that are adapted to riparian areas. Although all of the species in the seed mix would probably do well on north-facing slopes as proposed in this submittal, the transplants other than chokecherry would not be expected to survive. This mix should be used for riparian areas, but the plan needs to discuss what criteria will be used for determining the limits of use of this mixture. For example, the plan might say that mix 4 will be used on gentle slopes, perhaps defined as being less steep than 10h:1v, within 40 feet of the sides of the stream channel. Where the slopes immediately adjacent to the restored stream channel are greater than 10h:1v, the mixture might be used within 10 feet of the sides of the channel.

In addition to these considerations, some of the species contained in Table III-8, the seed and planting mixture recommended for riparian areas, and the species recommended above for inclusion in this mixture would perform best if planted immediately next to the channel rather than scattered over an area perhaps 40 feet from the channel. The species that should only be planted very close to the channel include narrowleaf cottonwood, water birch, and red oisier dogwood. The other species could be scattered in clumps throughout the entire area that is planted with this mix.

Deficiencies:

3. The plan needs to include plans to restore riparian vegetation along the stream channels.

Original Deficiencies:

5. *The application must include transplant and seed handling procedures that will protect these materials until they are used.*
6. *U. S. Fuel must include a commitment not to accept seed sold in violation of the Utah Seed Act and to attempt to obtain adapted ecotypes through using origin verified seed, certified seed of adapted varieties, or seed labeled to show county and elevation of collection.*
7. *The Applicant must show methods to obtain adapted dormant nursery materials.*

Response and Analysis:

These commitments have been included in the plan.

It is very important that U. S. Fuel try to obtain adapted nursery stock and seed. There are several instances where species identical to those in nearby areas have been used but where ecotypes were not adapted to the local conditions. Under these circumstances, plants may survive, but they will not grow and produce the forage and ground cover needed for the postmining land use.

Deficiencies:

None.

R645-301-341.220. Planting and Seeding Methods

Original Deficiencies:

1. *This section of the application must include criteria for determining which planting method will be used.*
2. *Any references in the plan to mixing mulch or fertilizer with seed in hydroseeding mixtures must be deleted. Fertilizing, seeding, and mulching must be done in three separate operations.*

Response and Analysis:

The plan states that seed will be drilled where slopes are level enough and areas to be reclaimed are large enough. Otherwise, seed will be broadcast by hand or with hydroseeders. Where hydroseeding is used, fertilizer, seed, and mulch will be applied in three separate operations. These commitments satisfy the concerns of the deficiencies.

Deficiencies:

None.

Original Deficiency:

3. *The application must show how trees and shrubs will be clumped, including minimum and maximum sizes of clumps*

and spacing within clumps, for each habitat type.

Response and Analysis:

The plan says that clumps will be made up of 3 to 10 plants per group with clusters set at various distances apart.

On page 56, the plan discusses basing the tree and shrub planting densities on the reference area data. The plan discusses planting transplants so that the total plant density will match that of the corresponding reference area plus 10% to account for mortality. U. S. Fuel will need to follow the seed and planting mixes in Tables III-5 through III-8. These have been based on reference area and other baseline data, potential plant communities, test plot data, consultation with Wildlife Resources, and tree and shrub density standards for success.

Deficiencies:

None.

R645-301-341.230.

Mulching Techniques

Original Deficiencies:

2. *The application must include general criteria for determining which mulching technique will be used. Any site that will have hay or straw mulch crimp-disc'd to anchor it must not be scarified through discing beforehand.*

4. *The Applicant must use mulching methods which have been proven to be most successful at U. S. Fuel's test plots or in other similar areas. The use of 1.5 tons per acre of anchored straw or hay, or of 0.5 tons per acre of hydraulically-applied straw mulch overlain by nylon netting and 0.5 tons per acre of hydromulch are suggested methods that have been shown to be successful.*

Response and Analysis:

The mulching methods shown in the plan have been revised and clarified. Various mulches and application methods will be used, and the rates will be 2500 to 3000 pounds per acre.

Deficiencies:

None.

R645-301-341.240. Irrigation and Pest and Disease Control

Original Deficiency:

The application must contain contingency plans for disease and pest control and for irrigating transplants in case there are unforeseen problems with pests, diseases, or drought.

Response and Analysis:

The plan states that transplants will be irrigated by hand for the first growing season after planting and during exceptionally dry seasons. The purpose of the deficiency was that an irrigation plan would be in place for the first growing season in case the year was particularly dry and the transplants needed limited amounts of supplemental water to survive. Irrigation should only be used if absolutely necessary, particularly in years subsequent to the first year, because irrigation will extend the bond liability period.

U. S. Fuel should plan on having problems with musk thistle in reclaimed areas. There are large numbers of this noxious weed in areas adjacent to the mine, and it will almost certainly invade.

Deficiencies:

None.

Original Deficiencies:

1. *Typographical errors on pages 63 and 64 must be corrected.*
2. *The plan must include tree and shrub density standards as specified.*

Response and Analysis:

The typographical errors have been corrected.

The technical deficiency review stated that maximum sample sizes would probably be deleted from the "Vegetation Information Guidelines" Appendix A and that although reference to maximum sample sizes was not considered a deficiency at that time, it might become one in the future. There are no longer any maximum sample sizes in the approved guidelines, so statements on page 59 that Utah DOGM guidelines allow sampling to be considered adequate when 40 or 50 quadrats have been observed and that 15 to 40 clipped quadrats will be used for production estimates need to be modified accordingly. Although these are success standards that would not be changed no matter what the plan said, the plan should be accurate in its statements of what sampling methodology will be used.

The tree and shrub density standards were based on the baseline data in the plan and consultation with Wildlife Resources. Because further information is now available, these standards are being revised as follows:

Habitat Type	Success Standard for Trees and Shrubs (number per acre)
Mixed Conifer	484 trees 2000 shrubs
Pinyon-Juniper	
Mine pad areas	2590 shrubs, no trees
Other areas	2185 shrubs, no trees
Mountain Brush	2051 shrubs
Riparian	2448 trees and shrubs
Sagebrush	3000 shrubs

These standards are very similar to the reference area standards except for the sagebrush and mixed conifer sites.

The mixed conifer reference area has more trees and fewer shrubs than this standard. U. S. Fuel is planning to plant trees in accordance with Forest Service guidelines to achieve the 484 per acre standard for success. However, because there are fewer trees than the reference area, it is felt that there can be more shrubs. As the trees mature, the number of shrubs that the site can support will probably decrease, but this should not happen in the first ten years.

After further consideration including examining the test plot results, it was decided to reduce the standard for the areas that will be compared to the sagebrush reference area to a figure close to what was achieved in the test plots that had 16" of topsoil. This should allow plenty of woody plants for wildlife but also allow the site to have greater diversity of grasses and forbs.

The standard used for the mountain brush sites had been an arbitrary figure. The new standard is based on the new information contained in the plan.

Deficiencies:

1. The statements in the plan that there will be a maximum sample size for final bond release vegetation sampling should be deleted. The regulations do not allow a maximum sample size.
2. Because further baseline and other information has been received, the woody species standards for success in the plan need to be revised again to comply with the standards stated in this analysis.

Original Deficiency:

3. *The application must contain methods of evaluating the diversity, utility, effectiveness, and seasonality of reestablished vegetation including quantitative measures of diversity and similarity to reference areas.*

Response and Analysis:

Page 62 contains a commitment to evaluate the diversity, utility, effectiveness, and seasonality of reestablished vegetation in accordance with the Division's guidelines. The guidelines contain methods of comparing diversity, but they do not contain specific standards for the criteria listed. Also, the diversity section of the guidelines is not part of the rules.

There are two primary concerns in this deficiency. The first is to compare diversity and seasonality with a standard, such as a reference area, for the purpose of determining that the reestablished vegetation meets diversity and seasonality criteria and that it will be capable of plant regeneration and succession and compatible with the postmining land use and the plant and animal species of the area.

The second concern of the deficiency is evaluating erosion control. The regulations state that the vegetation must be capable of stabilizing the soil surface from erosion. It is often assumed that erosion will be controlled if vegetative cover is at least as great as the reference area, but this is not necessarily true. It is recognized that erosion is a natural process that will not be eliminated

There are several methods for measuring these parameters. Some of them are quite simple and straightforward, others are very complex. U. S. Fuel should contact the

Division to discuss some of the options available.

Deficiencies:

2. The application must contain methods of evaluating the diversity, utility, effectiveness, and seasonality of reestablished vegetation including quantitative measures of diversity and similarity to reference areas and methods for evaluating effectiveness of vegetation for erosion control.

R645-301-341.300.

Field Trials

Original Deficiency:

U. S. Fuel must either present results of seventh year test plot monitoring or the MRP must state that seventh year monitoring was not performed.

Response and Analysis:

The response clarified that seventh year monitoring was performed but that it was not a quantitative monitoring. Included in the latest submittal are the results of quantitative evaluations of the refuse pile and soil borrow site plots conducted in 1992.

Because the plots were not replicated, statistical evaluations could not be performed. There is a definite trend in the refuse plots toward greater cover with greater depth of topsoil, old refuse, and seed mix 2. The plots with 6" of topsoil had less vegetative cover than the other plots, and about 16% of the cover was from weeds (6.5% actual vegetative cover average). The 12" and 16" topsoil plots had about 1/4 and 1/6 as much cover from weeds as the 6" topsoil plots. Although there is less difference between the 12" topsoil plots and the 16" topsoil plots, the 16" plots should still be considered the best treatment.

The information from the borrow site plots shows a very clear difference between seed mix 1 and 2 with mix 1 performing the best. The plot planted with seed mix 1 has a good diversity of forbs, but there is more rabbitbrush than desirable. It was for this reason that rabbitbrush was not included in the recommended seed mixture. Other species recommended are based on those that did well in these plots.

Deficiencies:

None.

R645-301-350

Performance Standards

Original Deficiency:

The application must state the appropriate extended responsibility period under R645-301-357 and in Tables II-22 through II-25 and II-29.

Response and Analysis:

The plan states on page 63 that the average annual precipitation at Hiawatha is 12 inches and that the period of responsibility will continue for ten years. The tables in Chapter 2 were also modified.

Deficiencies:

None.

RECOMMENDATIONS

With this submittal, the plan has made a great deal of progress. Test plot and reference area information has been very useful in evaluating procedures and seed and planting mixes proposed for final reclamation. Some further changes to the plan need to be made now based on the additional information that was received.

If reference areas SBR3 and PJR5 are not in fair or better condition as determined by the SCS, it will be necessary to evaluate whether or not these reference areas should still be used for judging revegetation success. If new reference areas need to be chosen, it should not be necessary to make quantitative measurements of vegetative cover because the reclamation plan will have already been designed based on species lists and test plot information and because there is no way to compare whether or not the vegetation is similar to the disturbed areas prior to disturbance. An SCS evaluation of range condition and productivity would be sufficient.