APPENDIX B

RECLAMATION PLAN

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Introduction

This section describes the lease applicant's proposed reclamation plan for the Rocky Butte Mine. This plan would be implemented as a part of the activities that would take place under the Proposed Action. The reclamation plan, as with the mining plan, has not yet been approved by the Wyoming DEQ and OSM and therefore may be subject to change during the mine permitting process.

The goal of reclamation at the Rocky Butte Mine would be to establish a diverse and sustainable ecological system that is compatible with proposed postmining land uses and with adjacent lands. Erosion control, establishment of self-regenerating native plant communities and productive hay and croplands, restoration of wildlife habitat, and conformance with landowner requests would be the principal objectives of reclamation. To assist in reaching these objectives, reclamation activities would be initiated as soon as practical after an area is mined. Final reclamation would be required to meet state reclamation success standards.

This plan describes postmining land use objectives and presents generalized reclamation procedures that would be used at the Rocky Butte Mine. The scope of this plan includes topsoil storage and replacement, short and long term erosion control, seedbed preparation, seed mixtures and seeding methods, post-seeding maintenance, and development of diverse wildlife habitat.

Postmining Land Use

The proposed postmining land use would be similar to premining and historic uses of land within and adjacent to the Rocky Butte project area (Table 3-10). Cropland, grazingland, pastureland, and wildlife habitat would be the principal postmining land uses.

Three native and two tame vegetation types would be established during reclamation. The combined area occupied by the big sagebrush, silver sagebrush, and saline big sagebrush types (2,154 acres of the proposed disturbed area) would be reclaimed as sagebrush shrubland. Upland grass and lowland grass types would be restored to the approximate acreages existing prior to mining. Acreage occupied by pasture would be converted to haylands. Approximately 3,752 acres of land would be restored to cropland capable of producing hay and small grain crops.

Recreational land use, which is primarily big game hunting, would be restored with restoration of wildlife habitat. Stockponds and reservoirs would be constructed throughout the project area during reclamation. The distribution and dimensions of these water sources would be designed to maximize potential use by livestock and wildlife and to meet the requirements of landowners.

Occupants of residences within the proposed affected area have agreed to move permanently. Thus, there are no plans to reestablish a residential land use. None of the premining industrial-commercial/lands or transportation systems would be reestablished during reclamation.

Reclamation Plan

Surface Preparation

Prior to construction and mining of each mine unit, all topsoil suitable for plant growth would be stripped to a maximum depth of 60 inches and either stockpiled for later use during reclamation or backhauled directly to areas prepared for reclamation. If topsoil is to be stockpiled for more than six months, a temporary cover of grasses and forbs would be established on stockpiles to minimize erosion.

After mining pits are backfilled, surfaces would be graded and smoothed to conform, as much as possible, with the surrounding landscape. Final slopes would be 5:1 (horizontal:vertical) or less. Headwalls would be benched and terraced to reduce erosion potential and promote establishment of vegetation. Graded slopes would be ripped to

roughen surfaces and promote cohesion between topsoil and subsurfaces.

Topsoil spreading and seedbed preparation would be completed before April 15 or after October 1 prior to the ground freezing (Parker and Alden, 1978). Topsoil would be spread evenly over prepared surfaces. The minimum depth of topsoil replacement would be 18 inches. Seedbeds would be disked to scarify soils and to incorporate soil amendments, if needed. Tillage and seeding operations would be conducted along contour wherever possible.

Topsoil would be analyzed for nutrient content and potential toxicity to determine the need for soil amendments. Toxic or otherwise unsuitable soils would be buried below the rooting zone and above the water table. If soil analyses indicate the need for amendments such as fertilizer or lime, additions would be incorporated into soils during seedbed preparation.

Seed Mixtures and Seeding Methods

Three permanent native seed mixtures, two permanent tame mixtures, and three temporary mixtures would be used to revegetate affected areas (Table B-1). Species included in the native seed mixtures were selected to provide erosion control, forage for livestock and wildlife, and wildlife habitat and to promote vegetative diversity and sustainability. The species are well adapted to the climate and the variety of soil characteristics that are encountered in the project area (Cook et al., 1974, and SCS, 1982, 1988).

Permanent Seed Mixtures and Seeding Methods

Erosion control and soil and water conservation are primary considerations in reclamation planning in the region (Cook et al., 1974, and Monsen and Plummer, 1977). After seedbed preparation, a preparatory crop of an annual grain (Table B-1) would be planted to assist in mitigating both of these problems. The preparatory crop would be planted before April 15 or after October 1 before the ground freezes, depending on when seedbed preparation is completed and the type of crop planted. Seeding would take place within 14 days after topsoil is spread to reduce soil losses due to wind and/or water erosion. If it becomes impossible to plant seeds within 14 days, exposed soil surfaces would be roughened to reduce erosion.

The preparatory crop would be mowed at the end of the first growing season, prior to seedhead development. Stubble and mulch would be left in place to prevent erosion, reduce soil moisture loss due to evaporation, and to reduce soil compaction due to raindrop impact. An additional benefit of using a cover crop is the input of organic matter into soils from the decaying roots of annuals (Barbour et al., 1980).

Because postmining topography and drainage control the distribution of runoff, snow capture, and therefore soil moisture, characteristics of the postmining landscape would be used to determine where each permanent seed mixture should be applied. Hayland and cropland would be established on gently sloping surfaces that are easily accessible with farming equipment. Tame mixtures would be planted, maintained, and harvested using conventional farming techniques.

The upland and lowland grass mixtures include a variety of grasses (cool season, warm season, sod-forming and bunch grasses) which would stabilize soils and provide substantial forage for livestock and wildlife. Several forbs and shrubs would be included to provide important quality forage for wildlife and improve the visual quality of reclaimed areas. Shrubs also provide additional erosion control and snow catchment. Legumes would be included as forage species and to enhance nitrogen availability in soils.

The upland grass mixture would be applied to approximately 835 acres of the reclaimed area. This mixture would be used to revegetate drier sites, including but not limited to hilltops, ridges, and/or upland and south-facing slopes. The lowland grass mixture would be applied to approximately 124 acres. This mixture would be used to revegetate banks of channels, stockponds, reservoirs, and other areas with high potential for elevated soil moisture.

Table B-1. Comparison of Premining and Proposed Postmining Acreage of Vegetation Types, Rocky Butte Mine

Vegetation Type	Approximate Acreage Affected	Percent of Project Area	Vegetation Type	Approximate Acreage to be Restored	Percent of Project Area
Big Sagebrush	1,066	11	Sage Shrubland	2,154	22
Silver Sagebrush	789	8			
Saline Big Sagebrush	299	3			
Upland grass	835	9	Upland grass	835	9
Lowland grass	124	1	Lowland grass	124	1
Cropland	3,752	39	Cropland	n.a.[1]	n.a.
Pasture	327	3	Pasture	327	3
Riparian	52	1	Riparian	52	1
Disturbed	89	1	Disturbed	0[2]	0
Total Affected Acreage	7,333		Total Reclaimed Acreage	7,333	

[1] 3752 acres would be restored to a condition capable of supporting cropland. During the life-of-mine, these areas would be planted to upland grass, lowland grass, pasture, crops and/or a temporary plant cover.

[2] The 89 acres of disturbed land would be reclaimed with the seed mixtures used to reclaim surrounding areas.

There has been marginal to good success establishing shrubs on reclaimed areas at other coal mines in the Eastern Powder River Basin (personal communication, October 11, 1991, with Paige Smith, WDEQ/LQD, Cheyenne; October 16, 1991, with Scott Rexcoat, Carter Mining Co., Gillette). Because shrub seedlings are less drought tolerant and develop more slowly than many grasses and forbs, competition for water often prevents good shrub establishment (Monsen and Plummer, 1977). Shrub-dominated communities would be created using shrub mosaic mixtures. Establishment of shrubs included in the upland and lowland grass mixtures would improve the overall distribution of shrubs in the project area.

The shrub mosaic mixture would be applied in areas where there is good potential for the higher soil moisture required for shrub establishment. These areas would include the banks of ephemeral drainages, swales, toeslopes, north-facing slopes, or other areas where water and/or snow may accumulate.

Approximately 2,154 acres of the reclaimed area would be seeded with the shrub mosaic mixture. To enhance the quality of wildlife habitat of reclaimed areas, the mixture would be planted in patches that conform with the anticipated rolling topography, rather than in trapezoidal patches. Final shrub density within patches would be one shrub per square meter.

Permanent native seed mixtures would be planted directly into the preparatory crop stubble in the spring (before April 15) or fall (after October 1 but before the ground is frozen) of the year following crop growth (Parker and Alden, 1978). Seeds,

except winterfat, would be planted 0.25 to 0.5 inch deep with a rangeland or similar drill equipped with an agitator and two seed boxes to ensure uniform distribution of seeds. Because winterfat seed is too fluffy to drill, it would be broadcast prior to drill-seeding other species.

Table B-2. Seed Mixtures for Permanent and Temporary Reclamation, Rocky Butte Mine

	Permanent[1]					Temporary[2]		
	Upland Grass	Lowland Grass	Shrub Mosaic	Pasture	Cropland	Upland Grass[3]	Lowland Grass[4]	Preparator y Crop
Agropyron smithii	4.00	3.00	1.50			8.00	6.00	
Agropyron dasystachyum	2.00	1.00	0.50			6.00		
Agropyron riparium		3.00	1.00				6.00	
Bouteloua gracilis	2.00	2.00	1.00					
Poa sandbergii	3.00	2.00	1.00			4.00		
Sporobolus airoides		1.00	0.50				4.00	
Stipa viridula		3.00						
Spartina pectinata		1.00	0.50					
Elymus cinereus		1.00	0.50				2.00	
Calamovilfa longifolia	2.00					2.00		
Achillea millifolium	0.50							
Psoralea argophylla	0.50	0.50	0.25					
Sphaeralcea coccinea	1.00	1.00	0.50					
Onobrychis viciaefolia	.50	.50						
Thermopsis spp.	0.25	0.25	0.25					
Pentstemon spp.	0.25	0.25	0.25					
Artemisia cana	0.25	0.25	4.00					
Artemisia tridentata wyomingensis	0.25	0.25	4.00					
Artemisia frigida	0.25	0.25	1.00					
Krascheninnikovia lanata	1.00[5]	1.00[5]	2.00[5]					
Chrysathamnus nauseosis			1.00[5]					
Atriplex canescens	0.50	0.50	0.25					
Rosa woodsii	0.25	0.25	0.25					
Ribes cereum			0.25					
Agropyron cristatum				10.00				
Medicago sativa				1.00		0.50	0.50	
Triticum spp.					30.00[6]			12.00[7]
Avena spp.					30.00[6]			12.00[7]
Hordeum spp.					30.00[6]			12.00[7]
TOTAL PLS/ACRE	19.50	21.00	20.75	11.00	30.00	20.50	18.50	12.00

[1] Pounds Pure Live Seed (PLS) drilled per acre.
[2] Pounds PLS broadcast per acre.
[3] To be used on stockpiles, around facilities, and along rights-of-way.
[4] To be used around sediment ponds and stream diversions or ditches.
[5] Broadcast seed prior to drill seeding other species.
[6] One of these grains or other appropriate crops would be planted as a cash crop.
[7] One of these grains would be planted as a preparatory crop.

If the terrain to be revegetated is unsuitable for drill-seeding, no annual crop would be planted, and a temporary or permanent mixture would be planted immediately following seedbed preparation. Seeding rates would be doubled and seeds would be broadcast and surfaces raked with a chain or harrow to cover seed. Areas that have been broadcast seeded would be mulched with two tons per acre straw or hay mulch to reduce erosion and soil moisture loss due to evaporation (Kay, 1978). Mulch would be anchored by crimping. It would be free of mold, undesirable weed seeds, and insects.

Drill-seeding, broadcast-seeding and hydroseeding each may be an effective technique for planting the shrub mosaic mixture (personal communication, October 16, 1991, with Scott Rexcoat, Carter Mining Company). Success rates obtained using each of these planting techniques would be evaluated as reclamation progresses, and shrub establishment procedures would be modified as necessary.

Temporary Seed Mixtures and Seeding Methods

Temporary seed mixtures would be used to stabilize soils in certain areas. The upland grass temporary mixture will be used on the grounds of administrative facilities, slopes along the grade for the railroad spur, topsoil stockpiles, haul road rights-of-way, the Four Corners Road relocation, and any other upland areas requiring immediate stabilization. The lowland grass temporary mixture would be used to stabilize areas such as the banks of disturbed channels, ditches, sediment ponds, and dewatering facilities.

Temporary mixtures would be broadcast over the areas to be stabilized as soon as construction or mining activities permit. The surface would then be raked with a chain or harrow to cover seeds. If the temporary cover should fail to stabilize soils, mitigation measures such as reseeding and/or application of mulches, netting, or other erosion control devices would be applied so that soil loss is minimized. At the close of mining, or as mining activities allow, areas seeded with temporary mixtures would be reclaimed with permanent vegetation.

Trees

Several species of trees would be established around selected stockponds and reservoirs. Root-stock or containerized saplings of peachleaf willow *(salix amygdaloides)*, plains cottonwood *(populus deltoides)*, green ash *(fraxinus pennsylvanicus)*, and box elder *(acer negundo)* would be planted around water resources to develop windbreaks for livestock and wildlife. If feasible, larger trees may be transplanted to developed ponds to provide immediate shelter and habitat for local fauna. Approximately 688 trees (Section 3.4) would be planted at densities ranging from three to 20 individuals per acre.

Post-Seeding Maintenance

Fences would be constructed around newly seeded areas to prevent damage by cattle and vehicular use. Fences may be constructed around tree saplings until they are mature enough to withstand the presence of livestock. Signs would be posted to discourage incidental trespass by humans. Reclamation success would be evaluated according to WDEQ/LQD rules and regulations. State laws require reclamation efforts to be repeated if standards are not met.

Wildlife Habitat Diversity

Establishment of grasses, forbs, shrubs, and trees would provide forage, browse, and shelter for wildlife. Essential structural elements of wildlife habitat would be created during reclamation by providing diversity in the landscape itself (i.e., lowlands, uplands, shrublands, ponds, drainages, and rockpiles). This diversity of landscape and vegetation would promote the reestablishment of wildlife species and numbers found in the premining project area. Establishment of a landscape/vegetation mosaic similar to premining patterns also creates habitat edges important for many species. Construction of stockponds and reservoirs would create key habitat for waterfowl and provide a primary resource for many other animals inhabiting the project area. Carefully situated rockpiles would provide cover and resting, denning, and nesting sites for numerous wildlife species. One rockpile would be established per 100 acres of reclaimed land.

Raptor nests occurring within the areas scheduled for disturbance would be moved to appropriate locations outside the project area. In some instances artificial nest structures may be used. Trees planted during reclamation should reach heights suitable for raptor nesting in 10 to 20 years.

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