

0052

**KAISER
COAL**

KAISER COAL CORPORATION
Sunnyside Coal Mines
P.O. Box D
Sunnyside, Utah 84539
Telephone (801) 888-4421

Mine file
J. Whitehead
W. Hedberg

May 6, 1986

RECEIVED
MAY 07 1986

Mr. Lowell P. Braxton
Division of Oil, Gas & Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

DIVISION OF
OIL, GAS & MINING

RE: Relocation of the Soil Borrow
Area 1 and Pinyon-Juniper/Grass
Reference Area, ACT/007/007,
Sunnyside Mines, Carbon County

Dear Mr. Braxton

Please find enclosed Appendix III-11 of the Sunnyside Permit which is a report on the relocation the Soil Borrow Area 1 and the Pinyon-Juniper/Grass reference area. If you or your staff have questions on this document, please contact myself or Ms. Susan D. Hasenjager at the above address and telephone number.

Sincerely,
Kaiser Coal Corporation

Douglas C Pearce
Mine Engineer

RECEIVED
MAY 07 1986

APPENDIX III-11

DIVISION OF
OIL, GAS & MINING

EXPANSION OF THE SOIL BORROW AREA AND RELOCATION OF VEGETATION REFERENCE AREA

INTRODUCTION

Kaiser Coal plans to expand soil borrow area 1 in order to provide additional soil material for use in final reclamation. The additional borrow material will be needed for final reclamation of the coarse refuse, slurry ponds, and other surface area disturbances. The material within this borrow area generally contains good soil material, and it contains fewer rocks and boulders making haulage and reclamation efforts easier. The salvagable material is relatively deep in borrow area 1. Consequently, less surface area would be disturbed to obtain the soil material needed for final reclamation. Studies and testing of the soils within the proposed expansion area were conducted to determine the suitability of the material for use in final reclamation. The results of those studies are described in this Appendix.

The Pinyon-Juniper/Grass vegetation reference area is currently located within borrow area 1 and must therefore be relocated to another site. Vegetation studies were conducted on the old reference area and on the proposed new reference area in early September, 1985, to determine similarity and suitability of the new reference area as a reclamation standard. Results of these vegetation studies are contained in this Appendix.

Information concerning the soil borrow area is contained in the first portion of this Appendix; information concerning the vegetation reference areas is contained in the second portion of this Appendix.

PART 1 - RECLAMATION SOIL BORROW AREA 1 INFORMATION

INTRODUCTION

An intensive Order 2 soil survey was conducted to conform with DOGM guidelines and with the Soil Conservation Service recommendations during early September, 1985, on Sunnyside Mines property.

This soil investigation includes a soil survey to locate suitable borrow material, soil sampling, a study of revegetation on coal mine spoil, and a soils report. A determination was made on the soil physical and chemical properties, its susceptibility to erosion, suitability for topsoil and the soils feasibility for reclamation. The soils report includes mapping unit descriptions, series descriptions, laboratory analyses, and interpretations.

METHODOLOGY

A literature review was conducted on the geology, soils, climatology, and biology of the Sunnyside Mines area. An intensive Order 2 soil survey was conducted to conform with the DOGM and SCS guidelines. Distribution of the soil mapping units were identified and a number of soil profiles were

examined to determine the nature and extent of soils in the mapping unit. The genetic horizons were examined for color, texture, structure, and other characteristics in hand-dug holes, along road cuts, and within three - 10 to 13 feet deep - test pits dug with heavy equipment. One soil was sampled by collecting a composite sample along a 6 foot road cut.

Within each profile, continuous, representative one quart samples were collected in holes dug by a backhoe, or by shovel and hand auger. Whenever possible the samples were taken in the major genetic horizons. However in the subsurface, horizons were separated for laboratory analyses and not for morphological differences. The layers were identified by numbering each subdivision consecutively, starting at the top. Generally the layers were split so most samples did not represent a layer greater than 12 inches thick. The soil samples were bagged and sent to a soils testing laboratory.

The DOGM "Guidelines for Preparation of Topsoil Management Plan" and Schafer guides (1979) were used to rank suitability of topsoils. Four suitability categories were used to rate material for topsoil suitability (good, fair, poor, and unsuited), and were used to determine the salvage depths of each mapping unit. Limiting factors were noted for each component soil series phase. Soils with more than 35 percent coarse fragments have an unsuitable rating, but can be improved by removing the stones and boulders. It should be noted that Kaiser will remove the large stones and boulders from the borrow material prior to applying it on areas to be reclaimed. These rocks will be used in drainage areas, for rip-rap, and other mine related purposes. Since boulders are the only limiting factor, the volume of total soil suitable for use as topsoil in reclamation were obtained by multiplying the acreage of each soil mapping unit within the boundaries of the study area by the minimum depth to limiting characteristics for each mapping unit.

RESULTS AND DISCUSSION

The soils that are found within the borrow area are very bouldery or very stony Strych soils (formerly designated as IEE soils, Plate VII-1). In the vicinity of the Sunnyside Mines, these soils are very deep, well drained soils on dissected alluvial fans and fan terraces. They are formed in alluvium and glacial outwash derived dominantly from sandstone and shale.

Typically, the Strych soil has a brown very bouldery or stony sandy loam surface. The underlying layer is a pale brown, calcareous very stony, sandy loam. Deeper in the soil profile, the soil becomes stratified with sandy loam and sandy clay loam layers. There are also some very thin lenses of sand and gravel that may occur in the profile.

The coarse fragments are the limiting soil characteristics for revegetation. Boulders, stones, and the calcareous horizon occur in the surface 2 to 3 feet. The soil quality improves deeper in the soil profile. Below 36 inches there is a decrease in coarse fragment and calcium carbonates. There is an increase in salts as indicated by a higher sodium adsorption ratio (SAR) and electrical conductivity below 100 inches. However the soil is in the fair rating for borrow material and should be suitable for vegetation establishment.

No chemical constituents were found in high concentrations that would pose a potential hazard to plants or animals. All tested soil samples contained low concentrations of selenium and boron. Soils indicated a higher accumulation of salts whenever shale had a dominant influence on the parent material or the soil was actually overlying shale.

Plate III-23 shows the current limits of soil borrow area 1, and the area proposed for expansion. Summaries of soil mapping unit data with topsoil suitability data are presented in Table 1. The topsoil material suitability rating with depths are shown in Table 2. As shown in Table III-43 of the permit, 30.14 acres are available to be used as borrow material. Since at least 12 feet of material are suitable for use once the boulders are removed, approximately 550,726 cu yd of material are available. Mapping unit descriptions and salvage depths are presented in Exhibit A.

PART 2 - REFERENCE AREA RELOCATION INFORMATION

INTRODUCTION

Vegetation data were collected at the Sunnyside Mines in 1981, and reference areas were established at that time. Because mining activities at the Sunnyside Mines have been continuous since the 1890's, the actual original vegetation composition was not known, and reference areas for the disturbed areas were selected based on the expected or potential vegetation. The reference areas were not selected based upon data comparisons with native communities. Consequently, the reference areas that have been selected and approved by DOGM may or may not represent the vegetation communities that occurred prior to mining.

The new Pinyon-Juniper/Grass reference area was subjectively located utilizing available ecological information and aerial photographs. The vegetation map (Plate XI-1) was used to identify potential sites for the proposed reference area. The new reference area was located based on (1) similarity of vegetation, soil, and topographic characteristics to those found on the old reference area, (2) location in areas that will not be affected by mining activities, and (3) Kaiser control of the surface rights. Both of the reference areas, the old and the new, are located within the Pinyon-Juniper/Grass vegetation type.

It should be noted that few suitable areas exist for the relocation of the Pinyon-Juniper/Grass reference area. Plate IX-1 in the Vegetation Information Chapter, illustrates the extent of the Pinyon-Juniper/Grass vegetation type within the permit area. These potential areas were examined and most were found to be unsuitable for the following reasons: the vegetation was sparse or in poor condition, the areas were too close to mining activities and would be in danger of being disturbed, or the surface was controlled by the BLM or the city of East Carbon and human or livestock activities could not be controlled. It was felt then that the new reference area was placed in the best possible location, and reflects the best possible condition of the Pinyon-Juniper/Grass vegetation type. The new reference area is on land owned by Kaiser Coal which is fenced, and is thereby protected from unauthorized activities. The area has not been grazed since at least 1979, and is in fair range condition. Additional information concerning the placement

Table 1. Physical and Chemical Properties of Borrow Area Soils

Soil Unit	Depth (in)	Permeability (in/hr)	Water Cap.	pH	Salinity (mmhos/cm)	Erosion Factor	
						K	T
Strych very stonny, sandy loam, 3-8%	0-6	2.5-7.5	1.2	7.4	0.65	.32	4
	6-18	2.5-7.5	1.2	8.1	1.48	.28	
	18-34	2.5-7.5	1.2	8.0	1.78	.32	
	34-60	2.5-7.5	1.2	8.3	3.62	.32	
Strych very stonny, sandy loam, 9-15%	0-5	2.5-7.5	1.2	7.4	0.83	.32	4
	5-17	2.5-7.5	1.2	8.2	3.39	.28	
	17-29	2.5-7.5	1.2	8.7	0.82	.28	
	29-43	2.5-7.5	1.2	8.7	0.71	.28	
	43-60	2.5-7.5	1.2	8.6	0.64	.28	

TABLE 2. TOPSOIL MATERIAL SUITABILITY RATINGS

SOIL SERIES	TOPSOIL RATING AND DEPTH				
	Good	Fair	Poor	Unsuited	Limitation
Strych(1) very stony sandy loam, 3 - 8% slopes				0 - 34"	Stones and cobbles, remove 15% coarse fragments(2)
		34-157"			
⁵ Strych(1) very stony sandy loam, 9 - 15% slopes				0 - 43"	Stones and cobbles, remove 15% coarse fragments(2)
		43-131"			

(1) Strych soils were formerly classified as IEE soils by the SCS (Plate VIII-1).

(2) When the stones are removed, they will be used for rip-rap. Soils will then be rated as fair.

and condition of the reference area is contained in the Results Section.

METHODOLOGY

Vegetation studies were conducted within both the old and the new proposed reference areas. The purpose of these vegetation studies was to: (1) describe the plant species composition with respect to cover, density, and tree basal area within each reference area; (2) identify and delineate any threatened, endangered, or sensitive species; and (3) establish the proposed reference areas for use in determination of reclamation success.

The new reference area boundary was then marked in the field and sampled for cover, shrub and tree density, and tree basal area using the sampling methods described in the following sections. One corner of the reference area was delineated as the starting point, distances were selected from a random numbers table, and the distance to the sampling starting point was paced. An adequate number of samples were collected for the cover and density sampling parameters, or the maximum number of samples were collected as recommended by the DOGM vegetation guidelines (Utah DOGM 1982).

Additionally, the SCS in Price conducted a range survey on both reference areas and determined the range condition, trend, and estimated production.

The following sections discuss the methods used in 1985 to sample the vegetation characteristics and to analyze data.

Sample Types and Purposes

Quantitative sampling of the vegetation was undertaken to characterize vegetation canopy cover, shrub and tree density, and basal area. The following sections describe the methods that were employed. An adequate number of samples were taken for the cover and density parameters discussed as follows.

Cover: The point-intercept method of sampling cover was used. This method has the advantage of minimizing the danger of observer bias. Points were observed at every meter along a transect 50 m in length. Points were observed using a scope with cross-hairs attached to a tripod; the scope was stationed perpendicular to the ground. The fifty point sample was used to calculate sample adequacy for each of the vegetation types. Fifteen cover transects--an adequate sample--were sampled in each of the reference areas.

Shrub and Tree Density: Shrub and tree densities were estimated using a 0.02 ha macroplot. These Lindsey elbow macroplots were in the shape of an elbow or "L", with two 3 x 30 meter plots at a right angle to each other (Woodin and Lindsey 1954). This shape helps to account for the significant variability in the pinyon-juniper vegetation zone. All individual shrubs and trees found in the plots were counted; seedlings--trees less than 12 inches tall, and shrubs less than 6 inches tall--were counted and recorded separately from adult plants. A total of 50 macroplots were taken within each reference area for shrub density. A total of 15 macroplots were sampled for tree density in each of the reference areas.

Basal Area: Basal areas for all trees were determined by measuring the

diameter at breast height of each adult tree that occurred within the Lindsey elbow plot. Sample adequacy was not determined, as an adequate number of samples were collected for the tree density parameter.

Data Analysis

Sample Adequacy Calculations: To determine the number of transects required to adequately sample the vegetation on each reference area, the formula presented in the Utah DOGM vegetation guidelines was used. This formula is:

$$n_{\min} \leq \frac{t^2 s^2}{(d \bar{x})^2}$$

Where n_{\min} = the minimum number of samples needed,
t = t value for a 2-tailed test,
s = sample standard deviation,
d = the desired change in the mean, and
x = sample mean

Since all of the vegetation types that were sampled are defined as forests or woodlands, an 80% confidence with a 10% change in the mean was used to determine sample adequacy levels for cover and density parameters. Sample adequacy was reached for cover and density parameters, or a maximum number of samples were taken according to DOGM guidelines. Results of sample adequacy tests are shown on Table 3. Only the vegetation cover values were used in the cover parameter sample adequacy calculations.

Cover: Percent cover was recorded separately for each species, litter, rock, and bareground for each transect sampled. The 50 points along a transect were considered to be one sample. The data for all transects within a vegetation type were averaged together to provide mean cover values for that vegetation type. A summary table shows the average percent cover by general cover class (e.g., litter, rock, bareground, foliage cover), by species, the standard deviation (S.D.), the frequency of occurrence, and the constancy for each species (Table 4). Field cover data sheets for the old reference area are contained in Exhibit D; field cover data sheets for the new reference area are contained in Exhibit E.

Density: Shrub and tree density counts were recorded separately for each species for each Lindsey elbow sampled; each elbow was considered to be one sample. Density calculations for each elbow were made, and are presented in Table 5. The average number of stems/acre and stems/hectare are also presented in that Table.

Basal Area: Basal areas were recorded for each tree species that occurred within the Lindsey elbow. Basal area calculations were made and are presented in Table 6.

Vegetation Species Composition

The plant species lists for the two reference areas were obtained by noting all species identified during quantitative sampling. Botanical nomenclature

Table 3. Sample Adequacy Information

	OLD REFERENCE AREA				NEW REFERENCE AREA			
	<u>N</u>	<u>X</u>	<u>S.D.</u>	<u>NMIN</u>	<u>N</u>	<u>X</u>	<u>S.D.</u>	<u>NMIN</u>
COVER	15	9.1	5.62	11.11	15	11.2	2.81	10.36
SHRUB DENSITY	50	8.98	7.64	119.67	50	11.12	7.81	80.66
∞ TREE DENSITY	15	14.4	2.53	5.06	15	6.53	1.13	4.86

Table 4. 1985 Herbaceous Cover Data Summary for the Pinyon-Juniper/Grass Old and New Reference Areas for the Sunnyside Mines

	OLD REFERENCE AREA				NEW REFERENCE AREA			
	COVER	S.D.	FREQ.	CONST.	COVER	S.D.	FREQ.	CONST.
GRASSES								
<u>Aristida purpurea</u>	-	-	-	-	2.00	2.39	0.02	0.60
<u>Bromus tectorum</u>	-	-	-	-	0.13	0.52	<0.01	<0.1
<u>Oryzopsis hymenoides</u>	4.27	2.60	0.04	1.00	6.00	3.70	0.06	0.87
<u>Stipa comata</u>	-	-	-	-	0.27	1.03	<0.01	0.07
Subtotal	4.27				8.40			
FORBS								
<u>Astragalus mollissimus</u>	-	-	-	-	1.17	1.49	0.01	0.40
<u>Crypthantha spp.</u>	0.92	1.03	<0.01	0.47	0.23	0.52	<0.01	0.07
<u>Hymenoxys richardsonii</u>	0.80	1.82	<0.01	0.20	-	-	-	-
<u>Senecio multilobatus</u>	0.92	1.03	<0.01	0.47	-	-	-	-
Subtotal	2.64				1.40			
SHRUBS AND SUBSHRUBS								
<u>Cercocarpus montanus</u>	0.27	0.70	<0.01	0.13	-	-	-	-
<u>Leptodactylon pungens</u>	-	-	-	-	0.20	0.71	<0.01	0.13
<u>Fraxinus anomala</u>	-	-	-	-	0.21	0.52	<0.01	0.07
<u>Xanthocephalum sarothrae</u>	0.13	0.52	<0.01	0.07	-	-	-	-
Subtotal	0.40				0.40			
SUCCULENTS								
<u>Opuntia polycantha</u>	0.13	0.52	<0.01	0.07	0.10	0.52	<0.01	0.07
Subtotal	0.13				0.10			

Table 4. 1985 Herbaceous Cover Data Summary for the Pinyon-Juniper/Grass Old and New Reference Areas for the Sunnyside Mines (cont.)

NEW REFERENCE AREA	OLD REFERENCE AREA				NEW REFERENCE AREA			
	COVER	S.D.	FREQ.	CONST.	COVER	S.D.	FREQ.	CONST.
TREES								
<u>Juniperus osteosperma</u>	0.53	0.92	0.01	0.27	0.10	0.52	<0.01	0.07
<u>Pinus edulis</u>	1.13	1.46	0.02	0.40	0.80	1.26	0.01	0.33
Subtotal	1.66				0.90			
VEGETATION	9.10	2.37			11.20	2.81		
LITTER	43.65	7.90			33.93	12.60		
ROCK	19.14	5.51			19.56	7.27		
BARE	28.11	6.82			35.31	8.64		

Table 5. 1985 Shrub and Tree Density Data Summary for Pinyon-Juniper/Grass Old and New Reference Areas on Sunnyside Mines, Utah.

	Old Reference Area		New Reference Area	
	MEAN #/ACRE	MEAN #/HECTARE	MEAN #/ACRE	MEAN #/HECTARE
SHRUB SPECIES				
<u>Cercocarpus montanus</u>	25.50	63	-	-
<u>Chrysothamnus nauseosus</u>	0.40	1	4.86	12
<u>Fraxinus anomala</u>	0.40	1	78.94	195
<u>Leptodactylon pungens</u>	-	-	100.39	248
<u>Xanthocephalum sarothrae</u>	155.44	384	40.88	101
TOTAL	181.74	449	225.07	556
TREE SPECIES				
<u>Pinus edulis</u>	124.07	306.50	107.88	266.50
<u>Juniperus osteosperma</u>	167.38	413.50	24.29	60.00
TOTAL	291.45	720.00	132.17	326.50

Table 6. 1985 Tree Basal Area Summary for the Pinyon-Juniper/Grass Old and New Reference Areas

SPECIES	OLD REFERENCE AREA		NEW REFERENCE AREA	
	CM/HECTARE	IN/ACRE	CM/HECTARE	IN/ACRE
<u>Juniperus osteosperma</u>	2,399	151	175	11
<u>Pinus edulis</u>	821	51	1,127	71
TOTAL	3,220	202	1,302	82

follows Welsh and More (1973, 1985). Some plants lacking complete structures needed for identification, were designated as unknowns. Collected specimens, plants that have not been previously collected for the Sunnyside Mines, were mounted and are retained at the Sunnyside Mines herbarium. Plant species that occur within the old reference area are identified in Table IX- _____. Plant species that were found to occur within the new reference area are listed in Table 7.

Threatened and Endangered Plant Species

Literature searches and consultations with Dr. Stanley Welsh and the U.S. Fish and Wildlife Service Threatened and Endangered Species Division (USFWS) indicated that the only plant species of concern in the Sunnyside Mines area is western sweetvetch (Hedysarum occidentale canoe). Although this species is not on the official USFWS threatened and endangered species list, the BLM considers this species to be sensitive, and treats it as a listed species. This species does not occur within either of the Pinyon-Juniper/Grass reference areas.

RESULTS

The new reference area was relocated to an area south and west of the old reference area on lands owned and controlled by Kaiser Coal. This new reference area was selected taking into account potential mining activities and surface controls. It should again be noted that areas suitable for the location of reference areas within the Pinyon-Juniper/Grass vegetation type are limited. Areas located near the old reference area were found to be unsuitable due to the extreme bouldery nature of the soils and the significant reduction in vegetation cover. Other areas near the mine have been or may be impacted by mining or other human activities such as heavy grazing, old town sites, old roads, dumps, burns, etc. Surface control was taken into account since many of the areas near the towns of Sunnyside and East Carbon are heavily grazed, or incur other activities. The new reference area, while somewhat different in species composition is still within the Pinyon-Juniper/Grass vegetation type for the region, and exhibits the best quality and quantity of vegetation available for use as a reclamation standard in the local area.

This new reference area has been protected from grazing since at least 1979, and no plans exist for grazing to be initiated. The area in which the reference area is located is fenced along the south and west sides; a railroad track is located along the east side. This area is effectively protected from mining and other human activities.

The soils on the new reference area are similar to those found on the old reference area, although those on the new area are somewhat more sandy and less bouldery. Complete soil descriptions are provided in Exhibits A and B. Soils on the old reference area are identified as Strych very stony loam, 3 to 15 percent slopes under the revised Carbon County soil survey. Soils on the new reference area are identified as Strych very stony loam, dry, 3 to 30 percent slopes.

The SCS in Price conducted a range survey for both of the reference areas. The range site condition, trend, and descriptions for each of the two reference areas is given in Exhibit C. This survey concluded that the old reference

TABLE 7
 PLANT SPECIES LIST FOR PROPOSED PINYON-JUNIPER/GRASS REFERENCE AREA

SCIENTIFIC NAME	COMMON NAME
TREES	
<u>Juniperus osteosperma</u>	Utah Juniper
<u>Pinus edulis</u>	Pinyon Pine
SHRUBS	
<u>Artemesia tridentata</u>	Big Sagebrush
<u>Chrysothamnus nauseosus</u>	Rubber Rabbitbrush
<u>Fraxinus anomala</u>	Singleleaf Ash
<u>Leptodactylon pungens</u>	Granite Pricklygilia
<u>Xanthocephalum sarothrae</u>	Snakeweed
FORBS	
<u>Astragalus mollissimus</u>	Wooly Milkvetch
<u>Caulanthus crassicaulis</u>	Thickstem Wildcabbage
<u>Chenopodium spp.</u>	Goosefoot
<u>Crypthantha spp.</u>	Crypthantha
<u>Euphorbia fendleri</u>	Fendler Spurge
<u>Lappula occidentalis</u>	Stickweed
<u>Lithospermum incisum</u>	Narrowleaf Gromwell
<u>Machaeranthera canescens</u>	Hoary Tansyaster
<u>Penstemon pachyphyllus</u>	Thickleaf Penstemon
<u>Senecio multilobatus</u>	Lobeleaf Groundsel
<u>Tragopogon dubius</u>	Goatsbeard
GRAMINOIDS	
<u>Aristida purpurea</u>	Three-awn grass
<u>Bromus tectorum</u>	Cheatgrass
<u>Oryzopsis hymenoides</u>	Indian Ricegrass
<u>Sitanion hystrix</u>	Bottlebrush Squirreltail
<u>Stipa comata</u>	Needle-and-threadgrass

area is in poor range condition and has an annual production rate of 200 lbs/acre. The new reference area is in fair range condition and has an annual production rate of 1,000 lbs/acre.

DATA RESULTS

Field sheets for the collection of herbaceous cover data are submitted with this Appendix. A summary of the cover data is presented in Table 4. The shrub and tree density data are presented in Table 5. Tree basal area data are presented in Table 6.

Herbaceous cover for the old reference area averaged 9.10 percent. Litter, rock, and bareground each comprised 43.65, 19.14, and 28.11 percent cover, respectively. Herbaceous cover within the new reference area averaged 11.20 percent cover, with litter, rock, and bareground comprising 33.93, 19.56, and 35.31 percent of the total cover, respectively.

Within the old reference area, grasses composed the highest percentage of the total vegetative cover with 4.27 percent. The only grass species that was sampled was Indian Ricegrass (Oryzopsis hymenoides). It should be noted however, that other species that occur within this area include Western Wheatgrass (Agropyron smithii), several Aristida spp. (three-awn), Cheatgrass (Bromus tectorum), Bottlebrush Squirreltail (Sitanion hystrix), and Needle-and-threadgrass (Stipa comata). These species occur virtually at trace percentages (see Chapter IX, Vegetation Information, Sunnyside Mines Permit Application ACT 007/007), and were probably not encountered for that reason.

As with the old reference area, the predominant vegetative lifeform within the new reference area were graminoids, with 8.40 percent cover. The dominant grass within this area is also Indian Ricegrass with 6.00 percent cover. Other grasses encountered include Three-Awn grass (Aristida purpurea) with 2.00 percent, Needle-and-threadgrass with 0.27 percent, and Cheatgrass with 0.13 percent cover.

Forbs were the second most dominant lifeform group for both reference areas; forbs within the old reference area comprised 2.64 percent, while forbs comprised 1.40 percent within the new reference area. It is likely that because these areas were not sampled until late in the growing season, many of the species that occur within the area had already senesced. Important forb species that were encountered within the old reference area include Crypthantha spp. at 0.92 percent cover, Pingue Hymenoxys (Hymenoxys richardsonii) with 0.80 percent, and Lobeleaf Groundsel (Senecio multilobatus) with 0.92 percent cover. Important forb species that occur within the new reference area include Woolly Milkvetch (Astragalus mollissimus) with 1.17 percent cover, and Crypthantha spp. with 0.23 percent cover.

Tree cover for both reference areas comprised the third most dominant lifeform with 1.66 percent cover sampled within the old reference area, and 0.90 percent cover sampled within the new reference area. Pinyon pine (Pinus edulis) was the dominant species in both the old and new reference areas, with 1.13 and 0.80 percent cover, respectively. Utah Juniper (Juniperus osteosperma) comprised 0.53 percent cover within the old reference area, and 0.10 percent cover within the new area.

Shrub density and subshrub cover was the same for both reference areas at 0.40 percent cover. Within the old reference area, the dominant shrubs were Mountain Mahogany (Cercocarpus montanus) with 0.27 percent cover, and Snakeweed (Xanthocephalum sarothrae) with 0.13 percent cover. The dominant shrubs within the new reference area, both with about 0.20 percent cover included Single-leaf Ash (Fraxinus anomala) and Granite Pricklygilia (Leptodactylon pungens).

Succulents comprised approximately the same percentage cover within both of the reference areas at 0.10 percent. Plains Picklypear (Opuntia polyantha) was the only succulent that was sampled on either area.

Shrub density is higher on the new area than on the old reference area. Shrub density on the old area was approximately 182 shrubs per acre (449 shrubs per hectare). Of this, Snakeweed comprised the largest portion with about 155 shrubs per acre. Mountain Mahogany comprised about 25 shrubs per acre. Other shrub species that occurred include Rubber Rabbitbrush and Single-leaf Ash, both at 0.40 percent cover. Total shrub density on the new reference area was estimated at 225 shrubs per acre (556 shrubs per hectare). Important shrubs within the new area include Granite Pricklygilia, Single-leaf Ash, and Snakeweed with 100, 79, and 41 shrubs per acre, respectively. Rubber Rabbitbrush also occurred at 5 shrubs per acre.

Tree density is higher on the old reference area than on the new reference area with 291 and 132 trees per acre, respectively. Utah Juniper is the dominant species on the old reference area, while Pinyon pine is dominant on the new area. This may be due in part to the increased moisture availability found on the new reference area, and other differences in soil characteristics.

Tree basal area is higher on the old reference area with 202 in/acre (3,220 cm/ha). The new reference area has a basal area total of about 82 in/acre (1,302 cm/ha).

EXHIBIT A
SOIL MAPPING UNIT DESCRIPTION FOR SOIL BORROW AREA AND OLD REFERENCE AREA

Strych very stony loam, 3 to 15 percent slopes

This very deep, well drained, undulating sloping soil is on alluvial fans and terraces. This soil formed in glacial outwash and alluvium derived dominantly from sandstone and shale. Slopes are 300 to 400 feet in length and are single to concave-convex. The present vegetation is mainly pinyon, Utah juniper, salina wildrye, Indian ricegrass, black sagebrush, and birchleaf mountain mahogany. Elevation is 5,800 to 7,200 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 45 to 47 degrees F, and the average freeze-free period is 100 to 120 days.

Typically, the surface layer is pinkish gray very stony loam about 6 inches thick. The underlying layer is light gray calcareous very sandy loam about 32 inches thick. Deeper in the profile, the soil is stratified with layers of very pale brown and brown cobbly sandy loam and sandy clay loam. There is a decrease in stones deeper in the profile, but there sometimes is an increase in salts below 100 inches deep.

Included in this unit are about 15 percent Chupedera fine sandy loam, small areas of a weakly developed soil similar to Strych except with a cobbly surface layer; Atrac very fine sandy loam; and Hernandez family very fine sandy loam.

Permeability of this Strych soil is moderately rapid. Available water capacity is about 3.75 to 5.0 inches to a depth of 60 inches. Water supplying capacity is 5 to 6 inches. The organic matter content of the surface layer is 0.9 to 4.0 percent. Effective rooting depth is greater than 60 inches. Surface runoff is medium and the hazard of water erosion is moderate. The Erosion Condition Class is slight (32), and the wind erodability group is 8.

This unit is used for rangeland and wildlife habitat.

The potential vegetation on the Strych soil is an overstory of pinyon and Utah juniper with canopy of 30 percent. The understory vegetation is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are birchleaf mountain mahogany, black sagebrush, salina wildrye, and needle-and-thread.

The site index for pinyon and Utah juniper is 65. The average productivity is moderate. Average yields are 9 cords of wood per acre. The potential is good for post or Christmas tree production.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing system and proper location of water developments. When pinyon and Utah juniper are thinned, desirable plant species present can be expected to increase for a short period of time. Then pinyon and Utah juniper can be expected to re-occupy the site. Suitable brush management practices include prescribed burning, chaining, dozing,

and cutting.

Suitability for rangeland seeding is poor. The main limitation for rangeland seeding is stoniness of the soil surface.

The Strych soil is in capability subclass VIIs, nonirrigated. It is in the Upland Stony Loam (Pinyon-Utah Juniper) woodland site.

Soil Salvage: The dominant soil limitation is the very stony soil. Stones and some of the cobble must be removed from the top 32 to 42 inches to make the Strych soils suitable borrow material. If 10 to 15 percent of the stones and cobble are removed, there would be 10 to 15 feet of fair to good salvagable soil material to use for revegetation. Soils below 42 inches have less than 5 percent stones and is rated mostly fair, but with some soil rated good for salvage.

EXHIBIT B
SOIL MAPING UNIT DESCRIPTION FOR NEW REFERENCE AREA

Strych very stony loam, dry, 3 to 30 percent slopes

This very deep, well drained soil is on alluvial fans and terraces. It is located at the foot of the Book Cliffs from Horse Canyon to the town of Wattis. This soil formed in alluvium and glacial outwash derived dominantly from sandstone and shale. Slopes are 300 to 400 feet in length and single to concave-convex. The present vegetation is mainly Utah juniper, pinyon pine, Salina wildrye, Indian ricegrass, and Mormon-tea. Elevation is 5,400 to 6,400 feet. The average annual precipitation is about 8 to 12 inches, the mean annual air temperature is 47 to 49 degrees F, and the average freeze-free period is 110 to 135 days.

Typically, the surface layer is pale brown very stony loam about 3 inches thick. The underlying layer is pale brown very stony loam about 21 inches thick. The next layer to a depth of 60 inches or more is light yellowish brown very cobbly sandy loam.

Included in this unit are about 10 percent Mivida gravelly fine sandy loam and 5 percent Hernandez family loam.

Permeability of this Strych soil is moderately rapid. Available water capacity is about 3.5 to 7 inches. Water supplying capacity is 4 to 6 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is medium and the hazard of water erosion is moderate.

This unit is used for rangeland and wildlife habitat.

The potential vegetation on the Strych soil is an overstory of Utah juniper and pinyon with a canopy of 25 percent. The understory vegetation is 35 percent grasses, 15 percent forbs, and 50 percent shrubs. Important plants are Utah juniper juniper, black sagebrush, galleta, and needle-and-threadgrass.

The site index for Utah juniper and pinyon is 40. The average productivity is good. Average yields are 6 cords of wood per acre. The potential is good for post or Christmas tree production. Suitability of harvesting wood products on slopes is fair.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing system and proper location of water developments. When Utah juniper and pinyon are thinned, desirable plant species present can be expected to increase for a short period of time; then Utah juniper and pinyon will reoccupy the site.

Suitability for rangeland seeding is poor. The main limitations for rangeland seeding are rock fragments on and in the soil, possible low annual precipitation, and competition from regrowth of Utah juniper and Pinyon. Broadcast seeding, followed with surface dragging of an anchor chain or drag rail to cover the seed, is recommended. Plants that may be suitable for seeding are pubescent

wheatgrass, crested wheatgrass, and native species.

This map unit is in capability subclass VIIIs, nonirrigated. It is in the Semidesert Stony Loam (Utah Juniper-Pinyon) woodland site.

EXHIBIT C
RANGE SITE INFORMATION

350 north 400 east
Price Utah 84501

11/27/85

Susan Hasenjager
Kaiser Steel
Sunnyside Utah 84539

Dear Susan

The site near the old Carbon County rail station is an Upland Stony Loam P.J. This site is comparable with the old site, but differs in total production and condition. The station site is in fair condition and produces 1000 lb/ac while the old site is in poor condition and produces 200 lb/ac.

The Horse canyon sites are in fair condition with the west side being a Upland Very Shallow Loam P.J. producing 750 lb/ac and the east side being a Upland Shallow Clay Loam P.J. producing 500 lb/ac.


Range Conservationist S.C.S.

Site Name Upland stony loam P.J. Ranch Kaiser
 Soil Taxonomic Unit IEE Profile No. _____
 Elevation 6200 ft Exposure Western Vegetative Aspect Pinyon
 Field Office Price Location: T.145 R.14E Sec. 7 1/4 SW 1/4 NW
 Range Conservationist: D. Andrews Date: 11/21/85

(1)	(2)	(3)	(4)	(5)	(6)
Plant Group	Symbol or Common Plant Names	% Present by wt.	% Climax by wt.	Proper use factor	Weighted PUF
% Grasses and Grass-like Plants	<u>ORHY</u>	<u>55</u>	<u>5</u>		
	<u>ARPL9</u>	<u>15</u>	<u>3</u>		
	<u>BRTE</u>	<u>5</u>	<u>2</u>		
	<u>STCO4</u>	<u>5</u>	<u>5</u>		
% Forbs or Weeds	<u>SEMU3</u>	<u>3</u>	<u>3</u>		
	<u>ASMO7</u>	<u>2</u>	<u>2</u>		
% Trees and Shrubs	<u>LEPU</u>	<u>4</u>	<u>2</u>		
	<u>FRAN2</u>	<u>8</u>	<u>2</u>		
	<u>OPPO</u>	<u>3</u>	<u>2</u>		
	<u>PIEO } overstory</u>				
	<u>JUOS }</u>				
	<u>TOTAL</u>	<u>100</u>	<u>26</u>		

CONDITION CLASS INDICATORS:
 Evaluate each indicator in relation to climax for the site. (Circle those that apply).

% Climax Vegetation	Accelerated Erosion	Population Density	% Plant Diversity	Condition Rating
100-76	None	3/4 to full	100-76	Excellent (Climax)
75-51	<u>Slightly Active</u>	<u>1/2 to 3/4</u>	75-51	Good (Late seral)
<u>50-26</u>	Moderately Active	1/4 to 1/2	<u>50-26</u>	<u>Fair (Mid seral)</u>
25-0	Severely Active	0 to 1/4	25-0	Poor (Early seral)

TREND INDICATORS:
 Plant Vigor: Good
 Seedlings and young plants: Few
 Litter and mulch: adequate
 Condition of soil surface: Good
 Apparent Trend: Improving Declining Static

EROSION COMPUTATION DATA

Bare Ground	<u>35</u> %	
Surface Fragments	<u>20</u> %	= 100%
Ground Cover	<u>45</u> %	
(Litter and vegetation within 1 inch of soil surface)		
Height of canopy:	0 <u>0.5m</u> 2m 4m	
Canopy Cover:	0 <u>25</u> % 50% 75%	
Slope	<u>5</u> %	Slope Length <u>20</u> ft.

R _____ K _____ LS _____ C _____ T _____

Wind Erosion Data: Climate _____ Soil WEG _____
 Unsheltered distance _____ Veg. Cover _____

Soil Loss (sheet and rill) _____ tons/acre/year
 Soil Loss (gully erosion) _____ tons/acre/year
 Soil Loss (wind) _____ tons/acre/year

USE DATA

Use History: Non use
 Kind of Animal: W. life (Deer rabbits)
 Season of Use: winter
 Burning History: unknown

Present Utilization 5% of ORHY (key species)
 Estimated Utilization Efficiency: 65 %

Notes:
 This area shows signs that indicate a transition zone from semi desert to upland. This area is more upland Condition is fair because it lacks ^{important} upland species. (ex. CEMO)

Total Annual Yield 1000 lbs/Ac. air-dry
 (Understory if woodland)

Site Name Upland Stony loam P.J. Ranch Kaiser
 Soil Taxonomic Unit IEE Profile No. _____
 Elevation 6500 Exposure Western Vegetative Aspect Pinon Juniper
 Field Office Price Location: T. 155 R. 14E Sec. 7 1/4 NE 1/4 NE
 Range Conservationist: D. Andrews Date: 11/21/85

(1)	(2)	(3)	(4)	(5)	(6)
Plant Group	Symbol or Common Plant Names	% Present by wt.	% Climax by wt.	Proper use factor	Weighted PUF
Grasses and Grass-like Plants % 77	ORHY	77	5		
Forbs or Weeds % 3	CRYPT	1	1		
	HYRI	1	1		
	SEMU3	1	1		
Trees and Shrubs % 20	PIED } overstory				
	JUOS }				
	TOTAL	100	22		

CONDITION CLASS INDICATORS:
 Evaluate each indicator in relation to climax for the site. (Circle those that apply).

% Climax Vegetation	Accelerated Erosion	Population Density	% Plant Diversity	Condition Rating
100-76	None	3/4 to full	100-76	Excellent (Climax)
75-51	Slightly Active	1/2 to 3/4	75-51	Good (Late seral)
50-26	Moderately Active	1/4 to 1/2	50-26	Fair (Mid seral)
25-0	Severely Active	0 to 1/4	25-0	Poor (Early seral)

TREND INDICATORS:
 Plant Vigor: Fair
 Seedlings and young plants: Few
 Litter and mulch: adequate
 Condition of soil surface: Fair
 Apparent Trend: Improving Declining Static

EROSION COMPUTATION DATA
 Bare Ground 30%
 Surface Fragments 20% = 100%
 Ground Cover 50%
 (Litter and vegetation within 1 inch of soil surface)

Height of canopy: 0 0.5m 2m 4m
 Canopy Cover: 0 25% 50% 75%
 Slope 3% Slope Length 20 ft.

R _____ K _____ LS _____ C _____ T _____

Wind Erosion Data: Climate _____ Soil WEG _____
 Unsheltered distance _____ Veg. Cover _____

Soil Loss (sheet and rill) _____ tons/acre/year
 Soil Loss (gully erosion) _____ tons/acre/year
 Soil Loss (wind) _____ tons/acre/year

USE DATA
 Use History: Heavy but under no use now
 Kind of Animal: wild life Deer rabbit
 Season of Use: winter
 Burning History: unknown probably none
 Present Utilization 5% of ORHY (key species)
 Estimated Utilization Efficiency: 35%

Notes:
 This is a true upland stony loam but is in poor condition. There is a big production difference because of the ORHY that is in site #1

Total Annual Yield 200 lbs/Ac. air-dry
 (Understory if woodland)

Ecological Site Description
SCS-BLM Utah
May 1981

Site Number: D34-330
Site Name: UPLAND STONY LOAM (PINYON-
UTAH JUNIPER)
Habitat Type: PIED-JUOS/ARARN/AGSP

I. Physical Characteristics

A. Physiographic Features

1. This site occurs on pediment back slopes, alluvial fans and fan terraces. Slopes are mostly 15 to 50 percent, but may occasionally be as gentle as 2 percent or as steep as 60 percent. Elevations range from 1,800 meters (5,900 ft.) on north aspects to 2,300 meters (7,600 ft.) on south and west aspects.

B. Soils

1. Characteristic soils in this site are deep and well drained. They formed in alluvium and colluvium derived mainly from mixed sedimentary parent materials. Soils are usually calcareous to the surface and have more than 50 percent rock fragments throughout the profile. Some non-skeletal soils with very rocky surfaces are also included in this site. Permeability is moderately slow and runoff is rapid, especially from steep slopes. The water supplying capacity is 8 to 20 cm. (3 to 8 inches). Average annual soil loss in potential is approximately 1 to 2 tons/acre. The soil surface factor (SSF) in potential is moderate (59).
2. Soil taxonomic units representative of this site:

<u>Taxonomic Unit</u>	<u>Classification</u>	<u>Soil Survey</u>
Clapper GRV-L, north severely eroded	Loamy-skeletal, mixed, mesic Ustollic Calciorrhids	Vernal
Grobutte GRX-L, severely eroded	Loamy-skeletal, mixed (calc), frigid Ustic Torriorthents	Vernal
Grobutte GRV-L, eroded	Loamy-skeletal, mixed (calc), frigid Ustic Torriorthents	Vernal/Carbon
Ironco CBV-SL, eroded	Loamy-skeletal, mixed Typic Argiborolls	Vernal
Tridell GRV-L	Loamy-skeletal, mixed Aridic Calciborolls	Vernal

2. (Continued)

<u>Taxonomic Unit</u>	<u>Classification</u>	<u>Soil Survey</u>
Tridell CB-L, eroded	Loamy-skeletal, mixed Aridic Calciborolls	Vernal
Veatch STV-FSL, dry, eroded	Loamy-skeletal, mixed Aridic Haploborolls	Vernal
Whetrock GRX-L, dry	Loamy-skeletal, mixed Aridic Calciborolls	Vernal
Ildefonso STV-L	Loamy-skeletal, mixed, mesic Ustollic Calciorthids	Carbon
Ildefonso STV-L, eroded	Loamy-skeletal, mixed, mesic Ustollic Calciorthids	Carbon
Ildefonso GR-L	Loamy-skeletal, mixed, mesic Ustollic Calciorthids	Carbon
Ildefonso CB-FSL	Loamy-skeletal, mixed, mesic Ustollic Calciorthids	Carbon

3. Other soils presently grouped into this site:

<u>Taxonomic Unit</u>	<u>Classification</u>	<u>Soil Survey</u>
Beenom Variant GRV-L, eroded	Fine-loamy, mixed Typic Argiborolls	Vernal
Luhon GR-L, severely eroded	Fine-loamy, mixed Borollic Calciorthids	Vernal
Sinkson CBV-L, severely eroded, gravelly substratum	Fine-loamy, mixed (calc.) frigid Ustic Torriorthents	Vernal
Southace GRV-L, severely eroded, north	Fine-loamy, mixed Borollic Calciorthents	Vernal
Sheepcan Variant GR-L, eroded, low rainfall	Fine-loamy, mixed (calc.), mesic Typic Ustorthents	Vernal
Sheepcan Variant GR-L, dry	Fine-loamy, mixed (calc.), mesic Typic Ustorthents	Vernal

C. Climate Features

1. Average annual precipitation is 30 to 40 cm (12 to 16 in.). Approximately 60% occurs as rain from March through October. Much of this summer precipitation occurs as convection thunderstorms. On the average, November through February are the driest months and July through October are the wettest months. The mean annual air temperature is ___°C and the soil temperatures are in the mesic and frigid regime. The average freeze-free period is 85 to 110 days. In average years, plants begin growth around March and April and end growth in October. Plants usually remain green until frost in October except in drier than average years. There is usually an active greenup period in the fall. The most rapid growth occurs during April, May and June.

D. Potential Natural Plant Community

1. The dominant aspect of the plant community is pinyon and Utah juniper. The composition by air-dry weight is approximately 30 percent grasses, 10 percent forbs and 60 percent shrubs.
2. Community Composition
(Understory = 100% by wt. if a woodland site)

<u>Plant Symbol</u>	<u>Common Name</u>	<u>Percent by weight (air-dry)</u>
<u>Grass and Grass like</u>		<u>(25-35)</u>
AGSP	Bluebunch wheatgrass	20-25
ORHY	Indian ricegrass	1-5
STCO4	Needleandthread	1-5
KOCR	Prairie junegrass	1-5
	Other Perennial Grasses	1-5
CAGE2	Elk sedge	
SIHY	Bottlebrush squirreltail	
POA++	Bluegrass	
ELSA	Salina wildrye	<i>dominate in Carbon Co.</i>
<u>Forbs</u>		<u>(5-10)</u>
ASTRA	Milkvetch	1-2
ERIOG	Eriogonum	1-2
DEPI	Pinnate tansymustard	1-2
PHLO2	Longleaf phlox	1-2
PEPU7	Rock goldenrod	1-2
	Other Perennial Forbs	1-2
ERPU2	Low fleabane	
MACA2	Hoary macarantnera	

2. (Continued)

<u>Plant Symbol</u>	<u>Common Name</u>	<u>Percent by weight (air-dry)</u>
<u>Grass and Grass like</u>		(25-35)
<u>Shrubs</u>		(55-65)
ARARN	Black sagebrush	20-30
CEM02	Birchleaf mountainmahogany	10-15
ERMI4	Slenderbush eriogonum	1-5
TESP2	Spiny horsebrush	1-2
EPVI	Green Mormon-tea	1-5
JUOS	Utah juniper	2-5
PIED	Pinyon	2-5
OPPO	Plains pricklypear	1-2
PUTR2	Antelope bitterbrush	1-2
	Other Shrubs	1-2
ARTRW	Wyoming big sagebrush	
QUGA	Gambel oak	

3. Trees (Overstory)

<u>Plant Symbol</u>	<u>Common Name</u>	<u>Average Diameter @ 1 ft.</u>	<u>Density (#/Ac.)</u>	<u>Percent Canopy Cover</u>	<u>Site Index</u>
PIED	Pinyon	10.4"	92	36	60
JUOS	Utah juniper	12.6"	82		

There are approximately 12 to 15 cords of firewood per acre in the potential natural plant community when the average tree diameter is 5 inches at one foot. About 12 to 15 posts and 10 to 12 Christmas trees are produced per acre.

4. Total Annual Air-Dry Production (Understory if a woodland site)

	<u>Kg/ha</u>	<u>Lbs/Ac</u>
Favorable years	1,100	1,000
Normal years	900	800
Unfavorable years	550	500

5. Ground cover in potential is approximately 30 percent. Total canopy cover in potential is approximately 40 percent.

6. Density of major species (>10% composition by weight)

<u>Common Name</u>	<u>#/Acre</u>
Utah juniper	82
Pinyon	96

7. Seral Communities

- a. Grazing disclimax. As ecological condition deteriorates due to over grazing and fire suppression, understory vegetation will decrease while pinyon and Utah juniper will increase to dominate the site.
- b. Fire disclimax. When the potential natural plant community is burned, pinyon, Utah juniper and black sagebrush decrease temporarily, while bluebunch wheatgrass, salina wildrye and birchleaf mountainmahogany increase.
- c. Cheatgrass and annual forbs are most likely to invade this site.

8. The above vegetation description is based on estimates.

- E. Other sites that are commonly associated with this site include: Upland Shallow Loam (Pinyon-Utah juniper) and Upland Loam (Basin big sagebrush).
- F. Location of typical example of this site:

EXHIBIT D
COVER DATA FOR OLD REFERENCE AREA

Vegetation type/Gratic # SS-PS-REF

Mine SS

Page 1

Plot Number 3 Slope 15%

Aspect W

Elevation 6500'

1/1 Mapping Unit _____

Date 9-17-85

Stand Vegetative Cover

Parameter: % COVER - HITS

Notes: _____

\bar{x}	s	s ²

Collector: _____

Herbaceous or Canopy Cover

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
sk e und ter	✓		✓	✓	✓	✓		✓	✓					✓												4
		✓					✓			✓		✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	14
PIED											✓															2
ORHY																								✓		2

Vegetation type/Grid # SS-PJ-REF
 Plot Number 9 Slope 16%
 Mapping Unit _____

Mine SS
 Aspect W
 Date 9-19-85

Page 1
 Elevation 6500'
 Stand Vegetative Cover

Parameter: % COVER - HITS Notes: _____
 Collector: _____ Herbaceous or Canopy Cover

\bar{x}	s	s ²
-----------	---	----------------

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	✓		✓	✓					✓	✓	✓					✓										14
Number					✓		✓	✓				✓	✓	✓			✓	✓	✓			✓	✓	✓	✓	25
Area		✓													✓					✓	✓					8
LYRI						✓																				2
Vegetation	8																									

Station Type/Grid # SS-PJ-REF
 Plot Number 14 Slope 12%
 Mapping Unit _____

Mine SS
 Aspect W
 Date 9-19-85

Page _____
 Elevation 6500'
 Stand Vegetative Cover

\bar{x}	s	s^2
-----------	---	-------

Diameter: % COVER - Hits _____ Notes: _____
 Director: _____ Herbaceous or Canopy Cover

Species	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	
PIED			✓			✓	✓	✓	✓					✓								✓				22
SEM				✓	✓											✓		✓	✓	✓		✓	✓	✓	✓	20
ORHY	✓	✓								✓			✓		✓		✓									44
ROCK											✓															4
BARE													✓													2
LTR														✓												2
VEG																										

EXHIBIT E
COVER DATA FOR NEW REFERENCE AREA

Vegetation type/Gratic # (REPL) SS - PJ - REF

Mine SS

Page 1

Stand Number 3 Slope 2%

Aspect NW

Elevation

Soil Mapping Unit

Date 9-20-85

Stand Vegetative Cover

Parameter: % COVER - HITS

Notes:

\bar{x}	s	s ²
-----------	---	----------------

Collector:

Herbaceous or Canopy Cover

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
ck									✓					✓											4	
re				✓		✓	✓																			14
ound				✓		✓	✓								✓	✓	✓		✓							16
ter		✓	✓		✓			✓		✓		✓	✓					✓			✓	✓	✓	✓		6
ORHY	✓																									2
FRAN											✓															2
PIED																				✓						2

Station type/Gratic # (REPL) SS PJ REF

Mine SS

Page 1

Stand Number 8 Slope 2%

Aspect NW

Elevation

1 Mapping Unit

Date 9-20-85

Stand Vegetative Cover

Parameter: % COVER - HITS

Notes:

\bar{x}	s	s ²
-----------	---	----------------

Collector: Herbaceous or Canopy Cover

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
ROCK	✓				✓	✓											✓								8	
BARE		✓	✓					✓	✓	✓	✓				✓	✓										13
LITR				✓			✓					✓		✓				✓	✓	✓		✓	✓	✓		2
PTED													✓													2
FSMA																					✓					2

Vegetation type/Grid # (REPL) SS - P) - REF

Mine SS

Page 1

Stand Number 12 Slope 3%

Aspect NW

Elevation _____

Soil Mapping Unit _____

Date 9-23-85

Stand Vegetative Cover

Parameter: % COVER - HITS Notes: _____

\bar{x}	s	s ²
-----------	---	----------------

Collector: _____ Herbaceous or Canopy Cover

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
ROCK		✓		✓																		✓			6
BARE			✓		✓	✓		✓		✓			✓			✓							✓	✓	18
LITR							✓		✓		✓				✓		✓		✓			✓			16
ORHY	✓											✓		✓						✓					8
CAPP																			✓						2

Vegetation type/Gratic # (REEL)-SS-PJ-REF

Mine SS

Page 1

Land Number 14 Slope 3%

Aspect NW

Elevation _____

Soil Mapping Unit _____

Date 9-23-85

Stand Vegetative Cover

Parameter: % COVER - HITS

Notes: _____

\bar{x}	s	s ²

Collector: _____

Herbaceous or Canopy Cover

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
ROCK					✓		✓						✓	✓	✓					✓						12	
BARE			✓			✓		✓						✓					✓				✓			✓	14
LITR	✓	✓		✓					✓	✓	✓	✓											✓			16	
ONLY																	✓	✓			✓					6	
ASMO																								✓		2	

