

**Castle Gate Holding Company
Castle Gate Mine
Hardscrabble Canyon
C/007/004**

Phase II Bond Release Application

May 2002

**PLATEAU
MINING
CORPORATION**

Willow Creek Mine
PO Box 30
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Helper, Utah 84526
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An affiliate of **RAG**

July 22, 2003

Ms. Pamela Grubaugh-Littig
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

RE: Clean Copies, Phase II Bond Release, Hardscrabble Canyon, Castle Gate Holding Company, Castle Gate Mine, ACT/007/004, Carbon County, Utah

Dear Ms. Grubaugh-Littig:

Castle Gate Holding Company is herewith submitting 5 clean copies of the aforementioned. If you have any questions or need additional information, please do not hesitate to contact me.

Sincerely,



Johnny Pappas
Sr. Environmental Engineer

Enclosures

File: Hardscrabble Canyon -Phase II Bond Release Application
Chrono: JP030704.ltr

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change New Permit Renewal Exploration Bond Release Transfer

Permittee: Castle Gate Holding Company

Mine: Castle Gate Mine

Permit Number: C/007/004

Title: Clean Copies, Hardscrabble Canyon Reclamation Phase II Bond Release

Description, Include reason for application and timing required to implement:

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

- Yes No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ increase decrease.
- Yes No 2. Is the application submitted as a result of a Division Order? DO# _____
- Yes No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
- Yes No 4. Does the application include operations in hydrologic basins other than as currently approved?
- Yes No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
- Yes No 6. Does the application require or include public notice publication?
- Yes No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
- Yes No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
- Yes No 9. Is the application submitted as a result of a Violation? NOV # _____
- Yes No 10. Is the application submitted as a result of other laws or regulations or policies?

Explain: _____

- Yes No 11. Does the application affect the surface landowner or change the post mining land use?
- Yes No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
- Yes No 13. Does the application require or include collection and reporting of any baseline information?
- Yes No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
- Yes No 15. Does the application require or include soil removal, storage or placement?
- Yes No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
- Yes No 17. Does the application require or include construction, modification, or removal of surface facilities?
- Yes No 18. Does the application require or include water monitoring, sediment or drainage control measures?
- Yes No 19. Does the application require or include certified designs, maps or calculation?
- Yes No 20. Does the application require or include subsidence control or monitoring?
- Yes No 21. Have reclamation costs for bonding been provided?
- Yes No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
- Yes No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you. (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

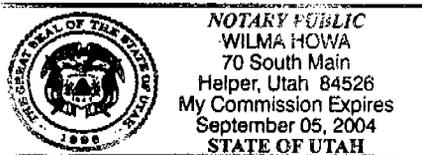
JOHNNY PAPPAS
Print Name

[Signature] - Sr. Env. Engineer - 7/22/03
Sign Name, Position, Date

Subscribed and sworn to before me this 22nd day of July, 2003

Wilma Howa
Notary Public

My commission Expires: 9/05, 2004
Attest: State of Utah } ss:
County of Carbon



For Office Use Only: 	Assigned Tracking Number: 	Received by Oil, Gas & Mining
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**Application for Phase II Bond Release
Hardscrabble Canyon No. 3 and 4 Mines
Castle Gate Holding Company
Castle Gate Mine
C/007/004**

May 2002

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Introduction

Castle Gate Holding Company, formerly AMAX Coal Company, completed backfilling, grading, seeding and mulching on about 36.5 acres of the Hardscrabble Canyon disturbed area in 1984, 1985, and 1993 through 1999. The Utah Division of Oil, Gas and Mining approved Phase I Bond Release in 1985 and on February 14, 2001.

All earthwork and revegetation have been completed in Hardscrabble, except for the removal of an electrical substation. Reclamation of this area will be completed when they are no longer necessary.

The bonded or disturbed area in Hardscrabble is 39 acres. Actual disturbance is 36.76 acres and 2.24 acres accounts for a buffer zone of five feet around the circumference of the site between the limit of reclamation and the actual disturbed area boundary. Less than a half acre is associated with the substation which has not been reclaimed, 8.79 acres of the Goose Island refuse pile, and the road through the site is 1.21 acres. There were 27.7 acres in Hardscrabble that received Phase I bond release in 2001.

Intensive mining has occurred in Hardscrabble Canyon since the 1880's, when Teacum Pratt opened the first operation for house coal and continued until Price River Coal Company closed the mines in 1989.

Since the 36.76 acres in Hardscrabble Canyon were disturbed by mining prior to the enactment of SMCRA, no topsoil or soil resource material was salvaged from the site. The existing and undisturbed soils at the site were used for reclamation as topsoil and substitute soil material. The existing soil resource materials were evaluated using DOGM's guidelines for topsoil and overburden.

Reclamation grading started in Hardscrabble Canyon with the Goose Island refuse area in 1984. Phase 1 bond release was given later in 1985. Limited regrading was done in this area in 1999.

The Canyon containing the portal for the No. 4 Mine was graded and seeded in 1993. In 1995, additional work was done in this canyon to cover the coal seam and portal and to improve the channel. Demolition of the building in the rest of the canyon began in 1995, and reclamation grading started in 1996. This continued through 1999 with additional areas being graded, seeded, and planted each year.

In 1997, AMAX Coal Company received an Earth Day Award from the Board of Oil, Gas and Mining for "outstanding final reclamation and site restoration". The company was cited for enhancing the postmining land use by restoring the canyon to a more natural configuration and paying particular attention to wildlife habitat while providing more stable water flow channels and better downstream water quality.

Most of the soils in Hardscrabble Canyon were gouged to decrease the amount of sedimentation and increase water retention and plant growth. This technique has been used successfully in Sowbelly Gulch (Canyon), and appears to be promoting good vegetation establishment and growth.

Vegetation should be adequate to control erosion assuming the cover will be the same as at nearby abandoned mine reference area where the existing vegetation is controlling erosion. The mining and reclamation plan said the diversity index used to compare reference and reclaimed areas will be used to show revegetation success for the parameters of diversity, seasonal characteristics, permanence, and utility for the postmining land use. The seed mix used should result in diversity at least as great as in the reference area.

Vegetation Information

Vegetation sampling (Appendix 1) on the reclaimed and reference area in Hardscrabble Canyon was conducted during the growing season of 2001 as a means to monitor the success of the revegetation and to determine whether on not Phase II bond release was possible.

The vegetation sampling report presents the methodology and data as required by the mining and reclamation plan. The data show that the revegetation at Hardscrabble Canyon is progressing well and with the statistical, similarity, and diversity comparisons Phase II bond release is justifiable.

Comparing background conditions (approved Reference Area), it is shown that the cover value, so important to erosion control, of the reclaimed area is not statistically dissimilar that the reference area.

Sediment Yield Information

To demonstrate that the reclaimed area in Hardscrabble Canyon will generate the same amount or less sediment than the undisturbed condition, the revised universal soil loss equation (RUSLE) was used (Appendix 2).

The revised universal soil loss equation takes into several factors in determining the sediment yield for an area. The factors involved are: 1) rainfall-runoff erosivity, 2) soil erodibility, 3) length of slope, 4) cover management (vegetation), and 5) support practice.

The RUSLE demonstrates that the reclaimed area sediment yield in Hardscrabble Canyon is less than the sediment yield under undisturbed conditions.

Conclusion

As authorized by R645-301-880.300, Phase II Bond Release should be approved based on the Permittee meeting vegetation and water quality requirements in accordance with the mining and reclamation plan.

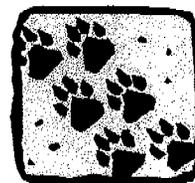
Appendix 1

**Vegetation Monitoring
For Phase II Bond Release
In Hardscrabble Canyon**

**VEGETATION MONITORING
FOR PHASE II BOND RELEASE
IN HARDSCRABBLE CANYON**

2001

**FOR THE
PLATEAU MINING CORPORATION**



Prepared by

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for

PLATEAU MINING CORPORATION

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Patrick Collins, Ph.D.



Fieldwork: August 2001

Report: January 2002

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VEGETATION MONITORING FOR PHASE II BOND RELEASE IN HARDSCRABBLE CANYON

INTRODUCTION

Objectives for Monitoring

Hardscrabble Canyon in Carbon County Utah has a rich history in coal mining activities. Coal mining areas previously disturbed by these mining activities have been reclaimed and reseeded with the 'final' plant seed mixture. Vegetation in the reclaimed areas was sampled in the growing season of 2001 as a means to monitor the success of final revegetation efforts. A certain degree of success could determine whether or not Phase II bond release would be possible. Phase II bond release applications are sought through the State of Utah, Division of Oil, Gas and Mining (DOGMI).

A Reference Area, or an area previously chosen to be a standard of success for the revegetation at Hardscrabble Canyon, has also been sampled for comparisons.

General Site Description

The average elevation of the Reclaimed Area of Hardscrabble Canyon was approximately 6,700 ft

above sea level. The canyon sides are dominated by pinyon-juniper and Gambel's oak-grass plant communities. Most of the Reclaimed Area were located near the canyon bottoms that, prior to disturbance, were probably once dominated by Gambel's oak, sagebrush and grass communities. The Reclaimed Areas were seeded with native plant seeds.

Reference Area

A general Reference Area to be used as a standard for final revegetation success standards was chosen at a much earlier date by representatives of the mining company and the State of Utah, Division of Oil, Gas & Mining (DOGGM). The Mining and Reclamation Plan (MRP) states that "the AML Reference Areas shown on Exhibit 9-6 will be used to evaluate previously mined areas". Because the AML (Abandoned Mined Lands) areas are relatively extensive, at least to be sampled as one Reference Area, a biologist from DOGGM along with an official from Plateau Mining Corp., chose a subset portion of the AML areas that would be representative and therefore be used as the Reference Area. This area was located in a nearby canyon called Sowbelly Canyon. More specifically, the Reference Area was located down-canyon (or south) and very close to the previously disturbed mined areas that have also been reclaimed in Sowbelly Canyon. In fact, it is the same Reference Area that was used for a standard for revegetation success of the reclaimed areas in Sowbelly Canyon.

METHODS

Quantitative and qualitative data were taken from the vegetation of the Reclaimed Area in Hardscrabble Canyon and the Reference Area in Sowbelly Canyon. Sampling was conducted in August 2001. Methodologies used for sampling were performed in accordance with the guidelines supplied by DOGM.

Transect and Quadrat Placement

Random/regular placement of sample quadrats were designed as an attempt to provide unbiased accuracy of the data compiled. This was accomplished by establishing one long transect line along the entire length of the Reclaimed Area. This line was placed in the lowest portion of the reclaimed drainage system. At regular intervals along the drainage transect line, random numbers were generated and used to measure distances at right angles from the drainage and to determine sample locations. Whether these random numbers were odd or even determined which side of the drainage a given quadrat was placed. The random number selected would be high enough to place quadrats to the lateral limits of the Reclaimed Area and all areas in-between. This insured that the sample quadrats were placed randomly over the entire study area in an attempt to adequately represent the site as a whole. The sample points that were placed randomly in the drainage were marked on the raw data sheets so they could be studied separately if desired.

Cover, Frequency and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Additional information recorded on the raw data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes. Plant nomenclature follows "A Utah Flora", (Welsh et al. 1993).

Sample Size & Adequacy

Sampling adequacy was calculated using the formula given below.

$$nMIN = \frac{t^2 s^2}{(dx)^2}$$

where,

nMIN = minimum adequate sample
t = appropriate confidence t-value
s = standard deviation
x = sample mean
d = desired change from mean

The values used for "t" and "d" insured that sample adequacy was met with 90% confidence within a 10% deviation from the true mean.

Diversity & Similarity Indices

There are several well-documented methods to assess diversity and similarities in plant communities. The "Motyka Index" is a modified form of the "Sorenson Index", both similarity indices. This index was used on the data and the equation is shown below:

$$IS_{MO} = \left(\frac{2MW}{MA+MB} \right) \times 100$$

where,

MW = \sum of the smaller quantitative values of species of two communities,

MA = \sum of the quantitative values of all species in one community,

MB = \sum of the quantitative values of all species in another community.

Two diversity indices have been reported in this document for the Reclaimed and Reference Areas. MacArthur's Diversity Index is an effective diversity measurement and is computed using the following equation:

$$1/\sum p_i^2$$

where,

p_i is the proportion of sum frequency contributed by the i th species in the sample area of concern.

The proportional contribution of each species is then squared and the values for all species in the sample areas are summed. This index integrates the number of species and the degree to which frequency of occurrence was equitably distributed among those species.

Another diversity measurement was provided that shows the average number of species encountered at each quadrat, providing a value for species diversity.

Photographs

Color photographs of each sample area were taken at the time of sampling and submitted with this report.

Raw Data

The raw data for total cover, cover by species, frequency and composition were also submitted in the Appendix of this report which should facilitate future scrutiny of the data and further statistical testing if desired.

RESULTS

Reclaimed Area

The total living cover of the Reclaimed Area in Hardscrabble Canyon was 44.82%, 44.31% of which came from understory cover (Table 1). Rock cover was also a major component of the ground cover at 25.19%. Grasses dominated the living cover and was calculated to be 61.00% of the total understory cover followed by forbs and woody species at 26.56% and 12.45%, respectively (Table 1).

As shown on Table 2, the most common plant species as indicated by cover and frequency was thickspike wheatgrass (*Elymus lanceolatus*) followed by western wheatgrass (*Elymus smithii*) and Indian ricegrass (*Stipa hymenoides*). Although several forbs were present in the sample quadrats, the most common by a narrow margin was Pacific aster (*Aster chilensis*) followed by Palmer penstemon (*Penstemon palmeri*). Rubber rabbitbrush (*Chrysothamnus nauseosus*) and big sagebrush (*Artemisia tridentata*) were the most common understory shrub species. Several other woody species were also present in the Reclaimed Area (see Table 2).

Reference Area

As noted previously, the Reference Area for Hardscrabble Canyon was located in Sowbelly Canyon. The total living cover here was 45.63% (Table 3). Most of this cover was from the understory cover. Again, rock was a major component of the ground cover at 19.33%.

Like the Reclaimed Area, grasses comprised the majority of the understory cover at 70.55% (Table 3). However, unlike the Reclaimed Area, shrubs were the next most important lifeform, followed by grasses (but not by a very wide margin).

The most common plant species in the Reference Area were the same grasses as were found in the Reclaimed Area – western wheatgrass and thickspike wheatgrass (Table 4). Unlike the Reclaimed Area, fourwing saltbush (*Atriplex canescens*), a shrub, was the next most common species. Also, and very dissimilar to the Reclaimed Area, there were only two forb species present in the sample

quadrats. The two forbs were blue-leaf aster (*Aster glaucodes*) and yellow sweetclover (*Melilotus officinalis*).

Data Set Comparisons

Comparisons were made between the data of the Reclaimed Areas at Hardscrabble Canyon and its Reference Area. To begin, statistical

tests were implemented comparing the total living plant cover of the two areas. A "Student's t-test" analysis suggested there was *no significant difference between the Reclaimed Area cover when it was compared to the Reference Area* (Fig. 1).

FIG. 1. STUDENT'S T TEST - A
Comparison Between the Reclaimed Area at Hardscrabble Canyon and its Reference Area.

Reclaimed Area: \bar{x} =44.82; s=13.31; n=80

Reference Area: \bar{x} =45.63; s=12.41; n=40

t = -0.321; df = 118; SL = N.S.

Next, although achievement of final diversity standards are not required for Phase II Bond Release, regulatory agencies usually require some type of discussion about diversity as a means of monitoring trends, hopefully toward greater species diversity. The Motyka Index was recommended to be used to compare species diversity in the Plateau's Mining and Reclamation Plan (MRP). Although this index is more of a 'similarity index' than a 'diversity index', it has been employed here to compare the data sets. Language in the MRP assigned the following categories to be used for comparisons with the Motyka Index:

Non-Weedy Shrub Cover,
Weedy Shrub Cover,
Native Perennial Grass Cover,
Introduced Perennial Grass Cover,
Non-Weedy Forb & Grass Cover,
Weedy Forb & Grass Cover.

FIG. 2. MOTYKA INDEX - A Comparison Between the Reclaimed Area at Hardscrabble Canyon and its Reference Area.

$$IS_{MO} = \left(\frac{2MW}{MA + MB} \right) \times 100 = 70.206$$

When using the above categories and employing the Motyka Index, the similarity value between the two communities was 70.21% (Fig. 2).

MacArthur's Diversity Index was also employed to the data sets of the Reclaimed

and Reference Area. This comparison suggested that the total diversity of the Reclaimed Area was greater than that of the Reference Area by quite a wide margin (Fig. 3).

Still another method of comparing species diversity of the two areas is to simply calculate the mean number of species present in the sample quadrats. Results from this method also

suggested that the Reclaimed Area was more diverse with respect to species when compared to the Reference Area (Fig. 4).

FIG. 3. MacARTHUR'S INDEX - A Comparison Between the Reclaimed Area at Hardscrabble Canyon and its Reference Area.

$$1/\sum p_i^2 =$$

Reclaimed Area: 16.433

Reference Area: 6.430

FIG. 4. AVERAGE NUMBER OF SPECIES PER SQUARE METER- A Comparison Between the Reclaimed Area at Hardscrabble Canyon and its Reference Area.

$$\bar{x} \text{ NO. SPP/M}^2 =$$

Reclaimed Area: 3.93

Reference Area: 3.03

DISCUSSION

Approval by the State of Utah for Phase II Bond Release is dependent on several factors. One of the most important conditions is probably whether or not the reclaimed site is controlling erosional sediments. It states in the State Rules that: "*No part of the bond or deposit will be released under this paragraph so long as the lands to which the release would be applicable are contributing suspended solids to streamflow or runoff outside the permit area in excess of the requirements set by UCA 40-10-17(j) of the Act and by R645-301-751*". Comparing "background" conditions (or in this case the approved Reference Area), it has been shown that the cover values, so important for erosion control, of the Reclaimed Area is not statistically dissimilar than the Reference Area.

The State of Utah also encourages the collection of quantitative data that can indicate which plant species are growing on the Reclaimed Area, along with a quantified amount of each of the species that are becoming established. Reporting cover by species and frequency enables one to portray this information as well as calculate community similarity, community diversity, and species diversity. One community similarity index suggested that the Reclaimed Area are relatively similar to the Reference Area with respect to cover of shrubs, perennial grasses, combined herbaceous species, and weeds (Motyka). Two diversity indices suggested that the Reclaimed Area had greater diversity than the Reference Area (MacArthur's Diversity Index and Average Number of Species Present).

These data analyses presented in this report suggest that the revegetation at Hardscrabble Canyon is progressing well. It is therefore proposed that with the statistical, similarity, and diversity comparisons described above, Phase II bond reduction through the State of Utah is probably warranted.

TABLE 1: Total cover and composition summary for the Reclaimed Areas in Hardscrabble Canyon.

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover (o)	0.50	4.44	80
Living Cover (u)	44.31	13.29	80
Living Cover (o+u)	44.82	13.31	80
Litter	11.11	6.90	80
Bareground	19.39	13.01	80
Rock	25.19	14.69	80
COMPOSITION (u)			
Trees/shrubs	12.45	21.46	80
Forbs	26.56	26.08	80
Grasses	61.00	28.17	80

o = overstory
u = understory

TABLE 2: Species cover and frequency summary for the Reclaimed Areas in Hardscrabble Canyon.

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
OVERSTORY				
<i>Populus fremontii</i>	0.50	4.44	80	1.25
UNDERSTORY TREES & SHRUBS				
<i>Artemisia nova</i>	0.06	0.56	80	1.25
<i>Artemisia tridentata</i>	1.28	4.57	80	11.25
<i>Atriplex canescens</i>	0.94	4.81	80	6.25
<i>Ceratoides lanata</i>	0.38	1.54	80	6.25
<i>Chrysothamnus nauseosus</i>	1.96	5.56	80	18.75
<i>Gutierrezia sarothrae</i>	0.13	0.78	80	2.50
<i>Quercus gambelii</i>	0.94	8.33	80	1.25
<i>Rosa woodsii</i>	0.25	2.22	80	1.25
FORBS				
<i>Achillea millefolium</i>	0.06	0.56	80	1.25
<i>Artemisia dracunculus</i>	1.06	3.42	80	13.75
<i>Aster chilensis</i>	2.75	7.70	80	22.50
<i>Capsella bursa-pastoris</i>	0.06	0.56	80	1.25
<i>Grindelia squarrosa</i>	0.13	1.11	80	1.25
<i>Hedysarum boreale</i>	1.54	5.99	80	12.50
<i>Kochia scoparia</i>	0.31	1.99	80	2.50
<i>Linum lewisii</i>	0.06	0.56	80	1.25
<i>Machaeranthera canescens</i>	1.04	2.16	80	20.00
<i>Medicago sativa</i>	0.19	0.95	80	3.75
<i>Melilotus officinalis</i>	1.69	6.42	80	10.00
<i>Penstemon palmeri</i>	2.03	5.24	80	20.00
<i>Penstemon</i> sp.	0.19	0.95	80	3.75
<i>Salsola pestifer</i>	0.06	0.56	80	1.25
<i>Sisymbrium altissimum</i>	0.50	3.92	80	2.50
<i>Viguiera multiflora</i>	0.06	0.56	80	1.25

TABLE 2: (continued)

GRASSES

<i>Agropyron cristatum</i>	0.31	1.45	80	5.00
<i>Bromus carinatus</i>	0.31	1.45	80	5.00
<i>Bromus tectorum</i>	1.50	5.50	80	8.75
<i>Dactylis glomeratus</i>	0.38	2.47	80	2.50
<i>Elymus cinereus</i>	2.75	5.80	80	30.00
<i>Elymus hispidus</i>	0.19	0.95	80	3.75
<i>Elymus lanceolatus</i>	8.85	10.57	80	55.00
<i>Elymus salinus</i>	1.38	5.30	80	8.75
<i>Elymus smithii</i>	4.44	8.87	80	36.25
<i>Elymus spicatus</i>	2.19	4.10	80	26.25
<i>Elymus trachycaulus</i>	0.25	1.56	80	2.50
<i>Poa pratensis</i>	0.19	0.95	80	3.75
<i>Poa secunda</i>	1.00	4.06	80	8.75
<i>Stipa hymenoides</i>	2.94	6.340	80	27.50

TABLE 3: Total cover and composition summary for the Reference Area for Hardscrabble Canyon (located in Sowbelly Canyon).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover (o)	0.50	2.18	40
Living Cover (u)	45.13	12.52	40
Living Cover (o+u)	45.63	12.41	40
Litter	27.38	13.78	40
Bareground	8.18	7.14	40
Rock	19.33	15.86	40

COMPOSITION			
Shrubs	17.75	19.02	40
Forbs	11.69	19.96	40
Grasses	70.55	23.02	40

o = overstory
u = understory

TABLE 4: Species cover and frequency summary for the Reference Area in Hardscrabble Canyon (located in Sowbelly Canyon).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
OVERSTORY				
<i>Quercus gambelii</i>	0.50	2.18	40	5.00
UNDERSTORY				
TREES & SHRUBS				
<i>Artemisia tridentata</i>	0.38	1.73	40	5.00
<i>Atriplex canescens</i>	4.48	8.37	40	32.50
<i>Chrysothamnus nauseosus</i>	3.70	7.53	40	27.50
<i>Quercus gambelii</i>	0.25	1.56	40	2.50
FORBS				
<i>Aster glaucodes</i>	4.55	8.01	40	32.50
<i>Melilotus officinalis</i>	0.70	2.57	40	10.00
GRASSES				
<i>Bromus carinatus</i>	0.75	3.27	40	7.50
<i>Bromus tectorum</i>	0.13	0.78	40	2.50
<i>Dactylis glomerata</i>	0.50	1.87	40	7.50
<i>Elymus cinereus</i>	0.88	5.46	40	2.50
<i>Elymus hispidus</i>	0.25	1.56	40	2.50
<i>Elymus lanceolatus</i>	11.58	12.73	40	70.00
<i>Elymus smithii</i>	15.13	12.07	40	77.50
<i>Elymus trachycaulus</i>	0.88	5.46	40	2.50
<i>Poa pratensis</i>	0.25	1.56	40	2.50
<i>Stipa hymenoides</i>	0.75	2.11	40	12.50

COLOR PHOTOGRAPHS

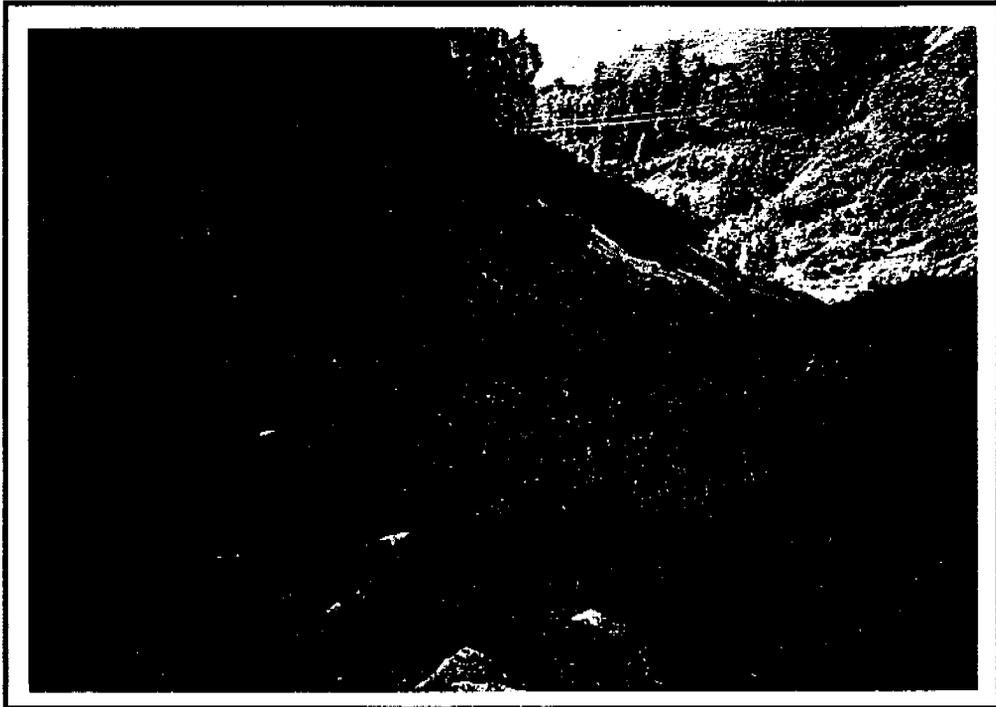
Reclaimed Areas in Hardscrabble Canyon



Reclaimed Areas



Reference Area for Hardscrabble Canyon



APPENDIX

Raw Data

PLATEAU MINING CORP

Hardscrabble (Sowbelly)

Reclaimed Area

Exposure: Variable

Slope: Variable

Sample Date: 29 Aug '01

	1.00	2.00	3.00	4.00	5.00	6.00
OVERSTORY COVER						
<i>Populus fremontii</i>	0.00	0.00	0.00	0.00	0.00	0.00
UNDERSTORY COVER						
TREES & SHRUBS						
<i>Artemisia nova</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Artemisia tridentata</i>	0.00	0.00	30.00	0.00	0.00	10.00
<i>Atriplex canescens</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Ceratoides lanata</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Chrysothamnus nauseosus</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Gutierrezia sarothrae</i>	5.00	0.00	0.00	0.00	0.00	0.00
<i>Quercus gambelii</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Rosa woodsii</i>	0.00	0.00	0.00	0.00	0.00	0.00
FORBS						
<i>Achillea millefolium</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Artemisia dracunculul</i>	5.00	0.00	25.00	10.00	0.00	0.00
<i>Aster chilensis</i>	0.00	15.00	0.00	0.00	10.00	10.00
<i>Capsella bursa-pastoris</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Grindelia squarrosa</i>	0.00	0.00	0.00	0.00	10.00	0.00
<i>Hedysarum boreale</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Kochia scoparia</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Linum lewisii</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Machaeranthera canescens</i>	0.00	0.00	0.00	0.00	0.00	5.00
<i>Medicago sativa</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Mellilotus officinalis</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Penstemon palmeri</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Penstemon sp.</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Salsola pestifer</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Sisymbrium altissimum</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Viguiera multiflora</i>	0.00	0.00	0.00	0.00	0.00	5.00
GRASSES						
<i>Agropyron cristatum</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Bromus carinatus</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Bromus tectorum</i>	0.00	0.00	15.00	0.00	20.00	0.00
<i>Dactylis glomeratus</i>	0.00	0.00	0.00	10.00	0.00	0.00
<i>Elymus cinereus</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Elymus hispidus</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Elymus lanceolatus</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Elymus salinus</i>	0.00	0.00	0.00	0.00	0.00	5.00
<i>Elymus smithii</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Elymus spicatus</i>	0.00	0.00	0.00	20.00	0.00	0.00
<i>Elymus trachycaulus</i>	0.00	10.00	0.00	0.00	0.00	0.00
<i>Poa pratensis</i>	5.00	0.00	0.00	0.00	0.00	0.00
<i>Poa secunda</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Stipa hymenoides</i>	20.00	0.00	0.00	10.00	10.00	0.00

COVER						
Overstory Cover (o)	0.00	0.00	0.00	0.00	0.00	0.00
Understory Cover (u)	35.00	25.00	70.00	50.00	50.00	35.00
Litter	5.00	5.00	25.00	35.00	4.00	5.00
Bareground	40.00	5.00	1.00	5.00	45.00	40.00
Rock	20.00	65.00	4.00	10.00	1.00	20.00
% UNDERSTORY COMPOSITION						
Shrubs	14.29	0.00	42.86	0.00	0.00	28.57
Forbs	14.29	60.00	35.71	20.00	40.00	57.14
Grasses	71.43	40.00	21.43	80.00	60.00	14.29
TOTAL LIVING COVER (o+u)						
	35.00	25.00	70.00	50.00	50.00	35.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	40.00	40.00	40.00	15.00	30.00	25.00	30.00	30.00	30.00	30.00	30.00	45.00
5.00	5.00	10.00	15.00	5.00	10.00	5.00	10.00	10.00	10.00	5.00	10.00	15.00
10.00	50.00	10.00	10.00	30.00	30.00	45.00	30.00	30.00	30.00	45.00	25.00	25.00
35.00	5.00	40.00	35.00	50.00	30.00	25.00	30.00	30.00	30.00	25.00	35.00	15.00
80.00	0.00	0.00	0.00	0.00	33.33	0.00	33.33	33.33	33.33	0.00	16.67	44.44
0.00	0.00	37.50	0.00	33.33	16.67	60.00	16.67	16.67	16.67	60.00	0.00	0.00
20.00	100.00	62.50	100.00	66.67	50.00	40.00	50.00	50.00	50.00	40.00	83.33	55.56
50.00	40.00	40.00	40.00	15.00	30.00	25.00	30.00	30.00	30.00	25.00	30.00	45.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	65.00	70.00	40.00	25.00	60.00	30.00	45.00	55.00
5.00	5.00	10.00	10.00	10.00	10.00	20.00	10.00	20.00
35.00	15.00	10.00	20.00	20.00	5.00	15.00	25.00	20.00
25.00	15.00	10.00	30.00	45.00	25.00	35.00	20.00	5.00
20.00	7.69	14.29	0.00	100.00	16.67	16.67	11.11	0.00
0.00	53.85	28.57	12.50	0.00	0.00	16.67	33.33	9.09
80.00	38.46	57.14	87.50	0.00	83.33	66.67	55.56	90.91
35.00	65.00	70.00	40.00	25.00	60.00	30.00	45.00	55.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	65.00	65.00	65.00	45.00	45.00	50.00	50.00	65.00
5.00	10.00	20.00	10.00	10.00	15.00	10.00	10.00	15.00
10.00	5.00	5.00	15.00	5.00	15.00	15.00	25.00	5.00
60.00	20.00	10.00	10.00	40.00	25.00	25.00	15.00	15.00
20.00	0.00	15.38	15.38	0.00	0.00	0.00	0.00	0.00
0.00	23.08	46.15	0.00	0.00	11.11	50.00	70.00	69.23
80.00	76.92	38.46	84.62	100.00	88.89	50.00	30.00	30.77
25.00	65.00	65.00	65.00	45.00	45.00	50.00	50.00	65.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	70.00	50.00	50.00	50.00	45.00	35.00	65.00	35.00	
25.00	10.00	10.00	35.00	5.00	10.00	5.00	10.00	10.00	
5.00	10.00	5.00	5.00	5.00	35.00	35.00	5.00	30.00	
25.00	10.00	35.00	10.00	40.00	10.00	25.00	20.00	25.00	
0.00	57.14	0.00	0.00	0.00	0.00	14.29	7.69	28.57	
44.44	0.00	100.00	10.00	50.00	11.11	28.57	0.00	14.29	
55.56	42.86	0.00	90.00	50.00	88.89	57.14	92.31	57.14	
45.00	70.00	50.00	50.00	50.00	45.00	35.00	65.00	35.00	

PLATEAU MINING CORP

Hardscrabble (Sowbelly)

Reclaimed Area

Exposure: Variable

Slope: Variable

Sample Date: 29 Aug '01

79.00	80.00	Mean	SDev	Freq	
					OVERSTORY COVER
0.00	0.00	0.50	4.44	1.25	<i>POPULUS FREMONTII</i>
					UNDERSTORY COVER
					TREES & SHRUBS
0.00	0.00	0.06	0.56	1.25	<i>Artemisia nova</i>
0.00	0.00	1.28	4.57	11.25	<i>Artemisia tridentata</i>
0.00	0.00	0.94	4.81	6.25	<i>Atriplex canescens</i>
0.00	0.00	0.38	1.54	6.25	<i>Ceratoides lanata</i>
0.00	0.00	1.96	5.56	18.75	<i>Chrysothamnus nauseosus</i>
0.00	0.00	0.13	0.78	2.50	<i>Gutierrezia sarothrae</i>
0.00	0.00	0.94	8.33	1.25	<i>Quercus gambelii</i>
0.00	0.00	0.25	2.22	1.25	<i>Rosa woodsii</i>
					FORBS
0.00	0.00	0.06	0.56	1.25	<i>Achillea millefolium</i>
0.00	0.00	1.06	3.42	13.75	<i>Artemisia dracuncululus</i>
5.00	0.00	2.75	7.70	22.50	<i>Aster chilensis</i>
0.00	0.00	0.06	0.56	1.25	<i>Capsella bursa-pastoris</i>
0.00	0.00	0.13	1.11	1.25	<i>Grindelia squarrosa</i>
0.00	0.00	1.54	5.99	12.50	<i>Hedysarum boreale</i>
0.00	0.00	0.31	1.99	2.50	<i>Kochia scoparia</i>
0.00	0.00	0.06	0.56	1.25	<i>Linum lewisii</i>
5.00	0.00	1.04	2.16	20.00	<i>Machaeranthera canescens</i>
0.00	0.00	0.19	0.95	3.75	<i>Medicago sativa</i>
5.00	0.00	1.69	6.42	10.00	<i>Melilotus officinalis</i>
0.00	0.00	2.03	5.24	20.00	<i>Penstemon palmeri</i>
0.00	0.00	0.19	0.95	3.75	<i>Penstemon sp.</i>
0.00	0.00	0.06	0.56	1.25	<i>Salsola pestifer</i>
0.00	0.00	0.50	3.92	2.50	<i>Sisymbrium altissimum</i>
0.00	0.00	0.06	0.56	1.25	<i>Viguiera multiflora</i>
					GRASSES
0.00	0.00	0.31	1.45	5.00	<i>Agropyron cristatum</i>
0.00	5.00	0.31	1.45	5.00	<i>Bromus carinatus</i>
0.00	0.00	1.50	5.50	8.75	<i>Bromus tectorum</i>
0.00	0.00	0.38	2.47	2.50	<i>Dactylis glomeratus</i>
5.00	0.00	2.75	5.80	30.00	<i>Elymus cinereus</i>
0.00	0.00	0.19	0.95	3.75	<i>Elymus hispidus</i>
5.00	35.00	8.85	10.57	55.00	<i>Elymus lanceolatus</i>
0.00	0.00	1.38	5.30	8.75	<i>Elymus salinus</i>
5.00	0.00	4.44	8.87	36.25	<i>Elymus smithii</i>
5.00	0.00	2.19	4.10	26.25	<i>Elymus spicatus</i>
0.00	0.00	0.25	1.56	2.50	<i>Elymus trachycaulus</i>
0.00	0.00	0.19	0.95	3.75	<i>Poa pratensis</i>
5.00	0.00	1.00	4.06	8.75	<i>Poa secunda</i>
5.00	0.00	2.94	6.40	27.50	<i>Stipa hymenoides</i>

				COVER
0.00	0.00	0.50	4.44	Overstory Cover (o)
45.00	40.00	44.31	13.29	Understory Cover (u)
10.00	10.00	11.11	6.90	Litter
35.00	20.00	19.39	13.01	Bareground
10.00	30.00	25.19	14.69	Rock
				% UNDERSTORY COMPOSITION
0.00	0.00	12.45	21.46	Shrubs
33.33	0.00	26.56	26.08	Forbs
66.67	100.00	61.00	28.17	Grasses
45.00	40.00	44.81	13.31	TOTAL LIVING COVER (o+u)

PLATEAU MINING CORP

Hardscrabble (Sowbelly)

Reference Area

Exposure: Variable

Slope: Variable

Sample Date: 29 Aug '01

	1.00	2.00	3.00	4.00	5.00	6.00
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OVERSTORY COVER

<i>Quercus gambelii</i>	0.00	0.00	0.00	0.00	0.00	0.00
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UNDERSTORY COVER

TREES & SHRUBS

<i>Artemisia tridentata</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Atriplex canescens</i>	10.00	0.00	25.00	7.00	0.00	0.00
<i>Chrysothamnus nauseosus</i>	10.00	8.00	0.00	0.00	0.00	25.00
<i>Quercus gambelii</i>	0.00	0.00	0.00	0.00	0.00	0.00

FORBS

<i>Aster glaucodes</i>	0.00	7.00	0.00	8.00	10.00	25.00
<i>Mellilotus officinalis</i>	0.00	0.00	5.00	0.00	0.00	0.00

GRASSES

<i>Bromus carinatus</i>	0.00	0.00	5.00	0.00	0.00	0.00
<i>Bromus tectorum</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Dactylis glomeratus</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Elymus cinereus</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Elymus hispidus</i>	0.00	10.00	0.00	0.00	0.00	0.00
<i>Elymus lanceolatus</i>	35.00	25.00	0.00	0.00	5.00	10.00
<i>Elymus smithii</i>	10.00	0.00	15.00	20.00	30.00	10.00
<i>Elymus trachycaulus</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Poa pratensis</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Stipa hymenoides</i>	0.00	0.00	5.00	0.00	0.00	0.00

COVER

Overstory Cover (o)	0.00	0.00	0.00	0.00	0.00	0.00
Understory Cover (u)	65.00	50.00	55.00	35.00	45.00	70.00
Litter	25.00	35.00	25.00	40.00	40.00	25.00
Bareground	5.00	5.00	5.00	5.00	5.00	4.00
Rock	5.00	10.00	15.00	20.00	10.00	1.00

% UNDERSTORY COMPOSITION

Shrubs	30.77	16.00	45.45	20.00	0.00	35.71
Forbs	10.77	10.00	14.55	28.57	55.56	21.43
Grasses	69.23	70.00	45.45	57.14	77.78	28.57

TOTAL LIVING COVER (o+u)

TOTAL LIVING COVER (o+u)	65.00	50.00	55.00	35.00	45.00	70.00
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	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	20.00	0.00	0.00	0.00	0.00	10.00	0.00	25.00	0.00
20.00	0.00	0.00	0.00	30.00	20.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

15.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	20.00	10.00	0.00	0.00	10.00	0.00	0.00	0.00
25.00	10.00	10.00	20.00	20.00	20.00	0.00	10.00	10.00	30.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	45.00	55.00	60.00	40.00	35.00	65.00	55.00	35.00	0.00
35.00	45.00	35.00	30.00	5.00	10.00	10.00	25.00	40.00	0.00
4.00	9.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1.00	1.00	5.00	5.00	50.00	50.00	20.00	15.00	20.00	0.00

33.33	44.44	0.00	50.00	50.00	42.86	0.00	45.45	0.00	0.00
0.00	55.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41.67	55.56	54.55	50.00	50.00	57.14	100.00	54.55	100.00	0.00

60.00	45.00	55.00	60.00	40.00	35.00	65.00	55.00	35.00	0.00
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16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
15.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	5.00	0.00	15.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	25.00	10.00	10.00	5.00	0.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	25.00	5.00	0.00	0.00	0.00	0.00	0.00	15.00
40.00	5.00	0.00	0.00	10.00	0.00	5.00	10.00	15.00
0.00	0.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00
55.00	65.00	50.00	45.00	30.00	30.00	30.00	60.00	55.00
25.00	25.00	40.00	35.00	60.00	5.00	10.00	25.00	20.00
10.00	5.00	5.00	5.00	5.00	30.00	15.00	5.00	5.00
10.00	5.00	5.00	15.00	5.00	35.00	45.00	10.00	20.00
27.27	53.85	10.00	0.00	33.33	50.00	0.00	25.00	0.00
0.00	0.00	50.00	22.22	33.33	16.67	0.00	41.67	27.27
72.73	46.15	90.00	44.44	33.33	16.67	83.33	75.00	54.55
55.00	65.00	50.00	55.00	40.00	30.00	30.00	60.00	55.00

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0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	2.18
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	1.73
0.00	0.00	0.00	10.00	0.00	0.00	5.00	4.48	8.37
0.00	0.00	0.00	0.00	0.00	0.00	5.00	3.70	7.53
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.56
0.00	0.00	2.00	0.00	0.00	0.00	0.00	4.55	8.01
0.00	0.00	0.00	0.00	5.00	15.00	0.00	0.70	2.57
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.75	3.27
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.78
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.87
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	5.46
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.56
5.00	0.00	8.00	5.00	10.00	15.00	30.00	11.58	12.73
40.00	35.00	30.00	25.00	15.00	0.00	0.00	15.13	12.07
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	5.46
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.56
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	2.11
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	2.18
45.00	35.00	40.00	40.00	35.00	30.00	40.00	45.13	12.52
40.00	45.00	10.00	10.00	10.00	10.00	35.00	27.38	13.78
5.00	10.00	5.00	10.00	25.00	15.00	5.00	8.18	7.14
10.00	10.00	45.00	40.00	30.00	45.00	20.00	19.33	15.86
0.00	0.00	0.00	25.00	0.00	0.00	25.00	17.75	19.02
0.00	5.71	0.00	12.50	42.86	0.00	13.13	11.69	16.96
100.00	100.00	95.00	75.00	85.71	50.00	75.00	70.55	23.02
45.00	35.00	40.00	40.00	35.00	30.00	40.00	45.63	12.41

PLATEAU MINING CORP
 Hardscrabble (Sowbelly)
 Reference Area
 Exposure: Variable
 Slope: Variable
 Sample Date: 29 Aug '01

Freq	
	OVERSTORY COVER
5.00	<i>Quercus gambelii</i>
	UNDERSTORY COVER
	TREES & SHRUBS
5.00	<i>Artemisia tridentata</i>
32.50	<i>Atriplex canescens</i>
27.50	<i>Chrysothamnus nauseosus</i>
2.50	<i>Quercus gambelii</i>
	FORBS
32.50	<i>Aster glaucodes</i>
10.00	<i>Mellilotus officinalis</i>
	GRASSES
7.50	<i>Bromus carinatus</i>
2.50	<i>Bromus tectorum</i>
7.50	<i>Dactylis glomeratus</i>
2.50	<i>Elymus cinereus</i>
2.50	<i>Elymus hispidus</i>
70.00	<i>Elymus lanceolatus</i>
77.50	<i>Elymus smithii</i>
2.50	<i>Elymus trachycaulus</i>
2.50	<i>Poa pratensis</i>
12.50	<i>Stipa hymenoides</i>
	COVER
	Overstory Cover (o)
	Understory Cover (u)
	Litter
	Bareground
	Rock
	% UNDERSTORY COMPOSITION
	Shrubs
	Forbs
	Grasses
	TOTAL LIVING COVER (o+u)

Appendix 2

**Phase II Bond Release
Sediment Yield Calculations
Hardscrabble Canyon**

Phase II Bond Release Sediment Yield Calculation
- Hardscrabble Canyon -

The purpose of these calculations is to demonstrate that the reclaimed areas in Hardscrabble Canyon will generate the same amount of or less sediment than the same site assuming undisturbed conditions.

To do this the Revised Universal Soil Loss Equation ("RUSLE") will be used.

Although the vegetation at the reclaimed site is fairly uniform there are other factors which affect the sediment yield for the sites. For example not all of reclaimed areas were gonged. To account for the variation the Sediment yield will be calculated under four conditions.

- 1) Assume the reclaimed area under undisturbed conditions. The site is Pre-SMERA and good Pre-mining topo does not exist thus, the reclaimed slopes will be used since pre-mining slopes are unavailable. However, this will result in an overall conservative estimate since natural slopes are generally steeper (more erosive) than the reclaimed slopes.
- 2) Worst case in gonged area
- 3) Ave sediment yield in gonged areas.
- 4) Sediment yield in non gonged areas.

$$A = R \cdot K \cdot LS \cdot C \cdot P$$

A = Sediment yield (tons/acre/yr)

R = Rainfall-Runoff erosivity factor (-)

K = Soil erodibility factor (-)

LS = Length-slope factor (-)

C = Cover management factor

P = Support practice factor.

Rainfall Factor (R)

This factor will be the same for all four conditions

$$R = 11 \quad (\text{Map R7 Israelsen et. al. 1984})$$

Soil Erodibility Factor (K)

Based on calculations in Appendix 3.3E:

The Soil Erodibility factor for Condition 1 (undisturbed) is:

$$K = 0.27$$

The Soil Erodibility factor for Conditions 2-4 is:

$$K = 0.30$$

See Page 2a for justification

Length - Slope factor (LS)

The average slope for the reclaimed area can be determined from the equation: $\text{Ave Slope} = (\text{Contour length} \times \text{Contour interval}) / \text{Area}$

$$\text{Ave slope} = (19920)(25\text{ft}) / 1589940 \text{ ft}^2 = 29.9\% \text{ assume } 30\%$$

The length will change for each condition. The length is defined as the distance runoff would travel before reaching a channel or something (like a depression) stops the runoff process.

Condition 1

Average flow distance across the reclaimed area is approximately.

$$L = 120'$$

$$LS = 5.51$$

Table 4-1 Renard et. al (1997)

Condition 2

During a site visit the greatest distance between depressions in the gaged area was measured to be 60'

$$L = 60'$$

$$LS = 3.92$$

Table 4-1 Renard et. al. (1997)

Soil Erodibility factor (K)

According to Appendix 3.3M soil to be used as growth media has the following gradation.

Sand (0.05 mm - 2mm) = 48%

Silt (0.002 - 0.05 mm) = 34%

clay (< 0.002 mm) = 18%

The K factor will be determined by using a nomograph. However, soil samples did not identify the percentage of very fine sand (0.05 mm - 0.1 mm) or the organic matter in the soil. Therefore, some conservative assumptions will need to be made.

Assume: 5% of the soil is very fine sand.

i.e. Sand (0.1 mm - 2mm) = 43%

Silt + very fine sand (0.002 - 0.1 mm) = 39%

Organic matter for Condition 1 is 1%

Organic matter for Conditions 2-4 is 0%

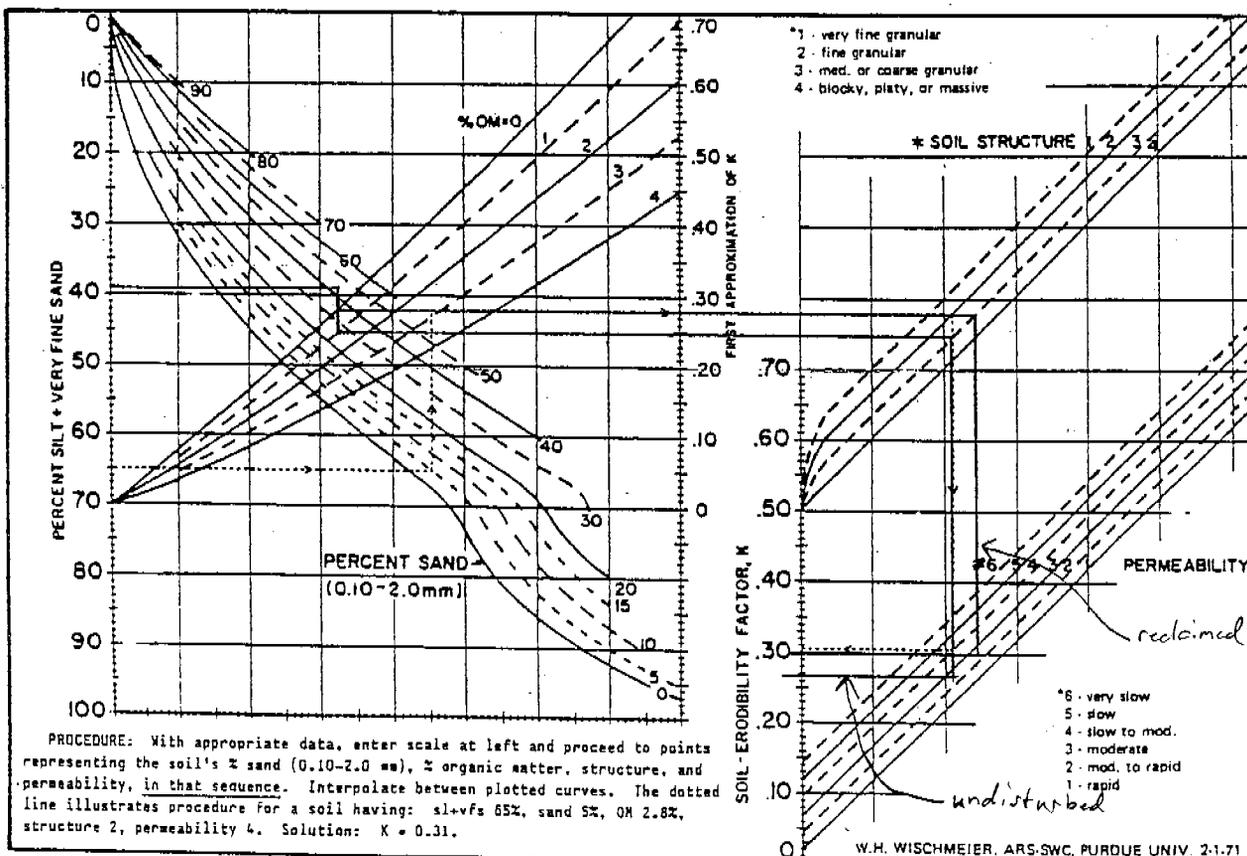


Figure 2. Nomograph for determining soil erodibility factor K.

Condition 3

Ave distance between gauges in the reclaimed area was
About 12'

$$L = 12'$$

$$LS = 1.75 \quad \text{Table 4-1 Renard et. al. (1997)}$$

Condition 4

The only area not gaged during reclamation was the
goose island area. The average flow distance over
the reclaimed surface is ~120'

$$L = 120$$

$$LS = 5.51 \quad \text{Same as condition 1}$$

Cover Management Factor (C)

Reference Area

$$\text{Vegetative Cover} = 45.63$$

of which

- grasses = 70.55%
- shrubs = 17.75%
- forbs = 11.69%

$$\text{Litter} = 27.38\% \quad \text{less than 2" deep.}$$

$$\text{Rock} = 19.33\%$$

$$\text{Bareground} = 8.18\%$$

$$\text{Total Cover} = 91.82\%$$

Condition 1 (Assume reference area conditions)

Cover that contacts the surface = 64.44% * does not include litter

$C = 0.036$ Interpolated from Table 8B.2
* Where litter is not considered
as cover unless it is at least 2"
deep. In this environment and
veg type litter does not accumulate
as it might in a forest,

Conditions 2-4

Vegetative cover = 44.82%

of which Trees/shrubs = 12.45%
 Forbs = 26.96%
 Grasses = 61.00%

Litter = 11.11 less than 2" deep.
Rock = 25.19
Bareground = 19.79

Total cover = 80.61
Cover that contacts ground (minus litter) = 69.5

$C = 0.028$ same veg. more rock at surface

In Table 8B.2 (pg 6) Litter is only considered to be "cover that contacts the surface" if it is over 2" deep. (which it is not) Hence the litter is subtracted when determining C.

Support Practice (P)

Since the site will be left undisturbed this factor does not apply

$\therefore P = 1$

Summary

Condition	R	K	LS	C	P	^A tons/ac/yr
1	11	0.27	5.51	0.036	1	0.59
2	11	0.3	3.92	0.028	1	0.36
3	11	0.3	1.75	0.028	1	0.16
4	11	0.3	5.51	0.028	1	0.51

The gouged areas produce far less sediment than the undisturbed areas. However, The Goose island area produces slightly less sediment. As the following calculations indicate The post reclamation sediment yield from the site is less than the same area of undisturbed land.

$$\text{Total Area} \cong 36.5 \text{ Ac}$$

$$\text{Gouged Area} \cong 27.5 \text{ Ac}$$

$$\text{Non Gouged Area} \cong 9.0 \text{ Acres}$$

$$\text{Undisturbed sediment yield} = (36.5)(0.59) = 21.5 \text{ tons/yr}$$

$$\text{Sediment yield Ave gouging distance} = (27.5)(0.16) = 4.4 \text{ tons/yr}$$

$$\text{Non-gouged Sediment Yield} = (9.0)(0.51) = 4.6$$

$$\text{Reclaimed Sediment yield} = 9.0 \text{ tons/yr} < 21.5 \text{ tons/yr}$$

The reclaimed site generates less sediment than the same site under undisturbed conditions.

Table 8B.2 C Factors for Permanent Pasture, Rangeland, Idle Land, and Grazed Woodlands (after Wischmeier and Smith, 1978)^a

Vegetal canopy			Cover that contacts the surface Percentage ground cover					
Type and height of raised canopy ^b	Canopy cover (%)	Type ^d	0	20	40	60	80	95-100
No appreciable canopy		G	0.45	0.20	0.10	0.042	0.013	0.003
		W	0.45	0.24	0.15	0.090	0.043	0.011
Canopy of tall weeds or short brush (0.5-m fall height)	25	G	0.36	0.17	0.09	0.038	0.012	0.003
		W	0.36	0.20	0.13	0.082	0.041	0.011
	50	G	0.26	0.13	0.07	0.035	0.012	0.003
		W	0.26	0.16	0.11	0.075	0.039	0.011
	75	G	0.17	0.10	0.06	0.031	0.011	0.003
		W	0.17	0.12	0.09	0.067	0.038	0.011
Appreciable brush or bushes (2-m fall height)	25	G	0.40	0.18	0.09	0.040	0.013	0.003
		W	0.40	0.22	0.14	0.085	0.042	0.011
	50	G	0.34	0.16	0.085	0.038	0.012	0.003
		W	0.34	0.19	0.13	0.081	0.041	0.011
	75	G	0.28	0.14	0.08	0.036	0.012	0.003
		W	0.28	0.17	0.12	0.077	0.040	0.011
Trees, but no appreciable low brush (4-m fall height)	25	G	0.42	0.19	0.10	0.041	0.013	0.003
		W	0.42	0.23	0.14	0.087	0.042	0.011
	50	G	0.39	0.18	0.09	0.040	0.013	0.003
		W	0.39	0.21	0.14	0.085	0.042	0.011
	75	G	0.36	0.17	0.09	0.039	0.012	0.003
		W	0.36	0.20	0.13	0.083	0.041	0.011

^aAll values shown assume: (1) random distribution of mulch or vegetation and (2) mulch of appreciable depth where it exists. Idle land refers to land with undisturbed profiles for at least a period of 3 consecutive years. Also to be used for burned forest land and forest land that has been harvested less than 3 years ago.

^bAverage fall height of waterdrops from canopy to soil surface in meters.

^cPortion of total surface area that would be hidden from view by canopy in a vertical projection (a bird's-eye view).

^dG, cover at surface is grass, grasslike plants, decaying compacted duff, or litter at least 2 in. deep. W, cover at surface is mostly broadleaf herbaceous plants (as weeds with little lateral root network near the surface) and/or undecayed residue.

References.

Barfield, B.J., R.C. Warner, and C.T. Haan. 1983 Applied Hydrology and Sedimentology for Disturbed Areas. Oklahoma Technical Press, Stillwater Oklahoma

Collins, P. 2004 Vegetation Monitoring for Phase II Bond Release in Hardscrabble Canyon. Mt. Nebo Scientific, Springville, UT

Israelson, C.E., J.E. Fletcher, F.W. Hays, and E.K. Israelson 1984 Erosion and Sedimentation in Utah A Guide for Control Utah Water Research Lab. UTAH State University, Logan, UT

Renard, K.G., G.R. Foster, G.A. Weesler, A.K. McCool and R.C. Yoder, 1997 Predicting Soil Erosion by Water: A Guide to Conservation Planning with the RUSLE. U.S. Government Printing Office, Washington, D.C.

Appendix 3

Public Notice

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Carbon,)

I, Ken Larson, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 16th day of July, 2002, and that the last publication of such notice was in the issue of such newspaper dated the 6th day of August, 2002.

Ken G. Larson

Ken G Larson - Publisher

Subscribed and sworn to before me this 6th day of August, 2002.

Linda Thayne

Notary Public My commission expires January 10, 2003 Residing at Price, Utah

Publication fee, \$ 533.12

LINDA THAYN
NOTARY PUBLIC - STATE of UTAH
845 EAST MAIN
PRICE, UTAH 84501
COMM. EXP. 1-10-2003

PUBLIC NOTICE

**APPLICATION FOR PHASE II BOND RELEASE
HARDSCRABBLE CANYON NO. 3 AND NO. 4 MINES
CASTLE GATE HOLDING COMPANY
CASTLE GATE MINE
PERMIT C/007/004, APPROVED 12/24/94
CARBON COUNTY, UTAH**

Castle Gate Holding Company, 999 Corporate Blvd., Linthicum Heights, MD 21090, has completed Phase II of the approved reclamation plan for Hardscrabble Canyon No. 3 and No. 4 Mine areas of the Castle Gate Mine. This is based on meeting the vegetation and water quality requirements for Phase II reclamation in accordance with the approved reclamation plan.

The reclamation of Goose Island (8.8 acres) was completed in 1984. The reclamation of the Castle Gate No. 4 Mine area (7.3 acres) was completed in 1995. The reclamation of the Castle Gate No. 3 Mine Main Canyon (20.4 acres) was completed in 1999. Resulting in a total of 36.5 acres of reclaimed area.

In accordance with the provisions of R645-301-880, of the State of Utah R645-Coal Mining Rules, notice is hereby given to the general public that Castle Gate Holding Company is applying for partial release of the performance bond posted for this operation.

The surety bond posted for the Castle Gate Mine is \$1,071,000 of which \$572,000 is designated for the Hardscrabble Canyon reclamation. Castle Gate Holding Company is seeking release of \$253,900 from the Hardscrabble Canyon portion of the bond. All earthwork and revegetation has been completed on site, except for the removal of an electrical substation. Reclamation of this area will be completed when transmission of power from the substation is no longer necessary. A permanent access road has been constructed through the site as per the approved reclamation plan.

The Hardscrabble Canyon area is located on the Standardville, Utah, U.S. Geological Survey 7.5 minute quadrangle map. The mine sites are located in Hardscrabble Canyon, approximately 4 miles northwest of Helper, Utah. Reclamation work was performed on approximately 36.5 acres of disturbed and affected area located on the following described lands:

- Township 13 South, Range 9 East, SLB&M, Utah
- Section 3: SE1/4 SW1/4
- Section 10: NW1/4NW1/4, NE1/4NW1/4, SE1/4 NW1/4, NW1/4NE1/4, SW 1/4 NE1/4, SE1/4 NE1/4

The Utah Division of Oil, Gas and Mining will now evaluate the proposal to determine whether it meets all the criteria of the Permanent Program Performance Standards according to the requirements of the Utah Coal Mining Rules.

Written comments, objections and requests for public hearing or information conference on this proposal may be addressed to:

- Utah Coal Program
- Utah Division of Oil, Gas and Mining
- 1594 West North Temple, Suite 1210
- P.O. Box 145801
- Salt Lake City, Utah 84114-5801

Closing date for submission of such comments, objections and requests for public hearing or information conference on this proposal must be submitted by September 5, 2002.

Published in the Sun Advocate July 16, 23, 30 and August 6, 2002.

Appendix 4

Letters

**PLATEAU
MINING
CORPORATION**
May 3, 2002

Willow Creek Mine
847 NW Hwy 191
Helper, Utah 84526
(435) 472-0475
Fax: (435) 472-4780

An affiliate of **RAG**

Mr. Kenneth E. McDonough
Real Estate Counsel
American Electric Power Service Corp.
One Riverside Plaza
Columbus, Ohio 54215

Re: Notification of Application for Phase II Bond Release, Hardscrabble Canyon No. 3 and No. 4 Mines, Castle Gate Holding Company, Castle Gate Mine, C/007/004, Carbon County, Utah

Dear Mr. McDonough:

Castle Gate Holding Company has completed Phase II of the approved reclamation plan for the Hardscrabble Canyon No. 3 and No. 4 Mine areas of the Castle Gate Mine. This is based on meeting the vegetation and water quality requirements for Phase II reclamation in accordance with the approved reclamation plan.

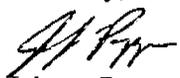
In accordance with the provisions of R645-301-880 of the State of Utah R645 Coal Mining Rules, this letter will serve as notification that Castle Gate Holding Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond posted for this operation.

The surety bond posted for the Castle Gate Mine is \$1,071,000 of which \$572,000 is designated for the Hardscrabble Canyon reclamation. Castle Gate Holding Company is seeking release of \$253,900 from the Hardscrabble Canyon portion of the bond. All earthwork and revegetation has been completed on site, except for the removal of an electrical substation. This area will be reclaimed when power transmission is no longer deemed necessary. A permanent access road has been constructed through the site as per the approved reclamation plan.

Comments concerning Phase II bond release from the legal or equitable owner of record of the surface areas to be affected and from the Federal, Utah and local government agencies which would have to initiate, implement, approve, or authorize the proposed use of the land following reclamation should be mailed to: Plateau Mining Corporation, Attention: Johnny Pappas, 847 NW Highway 191, Helper, Utah 84526.

If you have any questions or need additional information, please do not hesitate to contact me at (435) 472-4741.

Sincerely,



Johnny Pappas
Sr. Environmental Engineer

**PLATEAU
MINING
CORPORATION**

Willow Creek Mine
847 NW Hwy 191
Helper, Utah 84526
(435) 472-0475
Fax: (435) 472-4780

An affiliate of **RAG**

May 3, 2002

Mr. Mark Mackiewicz
Bureau of Land Management
125 South 600 West
Price, Utah 84501

Re: Notification of Application for Phase II Bond Release, Hardscrabble Canyon No. 3 and No. 4 Mines, Castle Gate Holding Company, Castle Gate Mine, C/007/004, Carbon County, Utah

Dear Mr. Mackiewicz:

Castle Gate Holding Company has completed Phase II of the approved reclamation plan for the Hardscrabble Canyon No. 3 and No. 4 Mine areas of the Castle Gate Mine. This is based on meeting the vegetation and water quality requirements for Phase II reclamation in accordance with the approved reclamation plan.

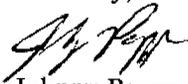
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If you have any questions or need additional information, please do not hesitate to contact me at (435) 472-4741.

Sincerely,



Johnny Pappas
Sr. Environmental Engineer

**PLATEAU
MINING
CORPORATION**

Willow Creek Mine
847 NW Hwy 191
Helper, Utah 84526
(435) 472-0475
Fax: (435) 472-4780

An affiliate of **RAG**

May 3, 2002

Mr. William D. Krompel
Commissioner
120 East Main Street
Price, Utah 84501

Re: Notification of Application for Phase II Bond Release, Hardscrabble Canyon No. 3 and No. 4 Mines, Castle Gate Holding Company, Castle Gate Mine, C/007/004, Carbon County, Utah

Dear Mr. Krompel:

Castle Gate Holding Company has completed Phase II of the approved reclamation plan for the Hardscrabble Canyon No. 3 and No. 4 Mine areas of the Castle Gate Mine. This is based on meeting the vegetation and water quality requirements for Phase II reclamation in accordance with the approved reclamation plan.

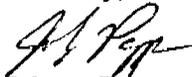
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Comments concerning Phase II bond release from the legal or equitable owner of record of the surface areas to be affected and from the Federal, Utah and local government agencies which would have to initiate, implement, approve, or authorize the proposed use of the land following reclamation should be mailed to: Plateau Mining Corporation, Attention: Johnny Pappas, 847 NW Highway 191, Helper, Utah 84526.

If you have any questions or need additional information, please do not hesitate to contact me at (435) 472-4741.

Sincerely,



Johnny Pappas
Sr. Environmental Engineer

PLATEAU MINING CORPORATION

Willow Creek Mine
847 NW Hwy 191
Helper, Utah 84526
(435) 472-0475
Fax: (435) 472-4780

An affiliate of



May 3, 2002

Mr. Ray Hanson
Carbon County Road Department
120 East Main Street
Price, Utah 84501

Re: Notification of Application for Phase II Bond Release, Hardscrabble Canyon No. 3 and No. 4 Mines, Castle Gate Holding Company, Castle Gate Mine, C/007/004, Carbon County, Utah

Dear Mr. Hanson:

Castle Gate Holding Company has completed Phase II of the approved reclamation plan for the Hardscrabble Canyon No. 3 and No. 4 Mine areas of the Castle Gate Mine. This is based on meeting the vegetation and water quality requirements for Phase II reclamation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the State of Utah R645 Coal Mining Rules, this letter will serve as notification that Castle Gate Holding Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond posted for this operation.

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If you have any questions or need additional information, please do not hesitate to contact me at (435) 472-4741.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Pappas', is written over the typed name 'Johnny Pappas'.

Johnny Pappas
Sr. Environmental Engineer

**PLATEAU
MINING
CORPORATION**

Willow Creek Mine
847 NW Hwy 191
Helper, Utah 84526
(435) 472-0475
Fax: (435) 472-4780

An affiliate of **RAG**

May 3, 2002

Mr. Dave Levanger
Carbon County Planning and Zoning
120 East Main Street
Price, Utah 84501

Re: Notification of Application for Phase II Bond Release, Hardscrabble Canyon No. 3 and No. 4 Mines, Castle Gate Holding Company, Castle Gate Mine, C/007/004, Carbon County, Utah

Dear Mr. Levanger:

Castle Gate Holding Company has completed Phase II of the approved reclamation plan for the Hardscrabble Canyon No. 3 and No. 4 Mine areas of the Castle Gate Mine. This is based on meeting the vegetation and water quality requirements for Phase II reclamation in accordance with the approved reclamation plan.

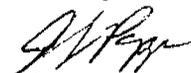
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Sincerely,



Johnny Pappas
Sr. Environmental Engineer

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Willow Creek Mine
847 NW Hwy 191
Helper, Utah 84526
(435) 472-0475
Fax: (435) 472-4780

An affiliate of **RAG**

May 3, 2002

Mr. Gary Harwood
Helper City
P.O. Box 221
Helper, Utah 84526

Re: Notification of Application for Phase II Bond Release, Hardscrabble Canyon No. 3 and No. 4 Mines, Castle Gate Holding Company, Castle Gate Mine, C/007/004, Carbon County, Utah

Dear Mr. Harwood:

Castle Gate Holding Company has completed Phase II of the approved reclamation plan for the Hardscrabble Canyon No. 3 and No. 4 Mine areas of the Castle Gate Mine. This is based on meeting the vegetation and water quality requirements for Phase II reclamation in accordance with the approved reclamation plan.

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If you have any questions or need additional information, please do not hesitate to contact me at (435) 472-4741.

Sincerely,



Johnny Pappas
Sr. Environmental Engineer

Map(s) is kept with this application located in the Public Information Center of our Salt Lake City office.