0003

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August 12, 1997

State of Utah
Department of Natural Resources
Division of Oil, Gas, and Mining
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801
Attn: Joseph C. Helfrich, Permit Supervisor

RECEIVED
AUG 13 1997
DIV. OF OIL, GAS & MINING

ACT/015/007 #2
97B

Dear Mr. Helfrich:

Enclosed please find three copies of the proposed Amendment to Reclamation Plan, as revised, for the Hidden Valley Mine Site. This submittal is in response to your letter of July 31, 1997, with attachments. For ease of review and clarity, we are resubmitting the entire booklet with appropriate revisions made. We did not bind the slope cross sections requested by Mr. Davidson in the packet as this information can be determined by comparing pre and post construction topography. We are, however, sending Mr. Davidson a copy of the work drawings of the cross sections and cut and fill balances within this mailing. Actual projections of materials to be moved are included in the cost estimate, Section "D". We believe each of the other points raised by your three reviewers have been incorporated or answered in the text.

In the interest of keeping this project on schedule for work planned in September, we would urge you to grant this submittal a short turnaround. Upon approval, we still have to take bids, approve safety plans, award contracts, etc., all of which needs to be factored in the necessary timing to affect 1997 construction and seeding.

Thank you for your attention to this matter.

Sincerely,

Gary Raines

copy: Robert Davidson w / enclosures

file:tranltr1.sam

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for
Amendment to Reclamation Plan
Hidden Valley Mine Site
Emery County, Utah
Consolidation Coal Company
June 23, 1997
Revised August 12, 1997

OGM - C1 (Last Revised December 10, 1996)

File Fold

APPLICATION FOR PERMIT CHANGE

of Change: HIDDEN VALLEY MINE Amendment to Reclamation Plan	Permit Number: ACT/015/007 Mine: HIDDEN VALLEY MINE Permittee: CONSOLIDATION COAL CO.

Description, include reason for change and timing required to implement: Regrading "B" seam cover slope and adjacent alluvial slope, cover both areas with rocky material, reseed all disturbed areas. Purpose is to achieve vegetation success. To be implemented September, 1997.

Yes	☒ No	1. Change in the size of the Permit Area? ______ acres □ increase □ decrease.
□ Yes	☒ No	2. Change in the size of the Disturbed Area? ______ acres □ increase □ decrease.
Yes	☒ No	3. Will permit change include operations outside the Cumulative Hydrologic Impact Area?
□ Yes	☒ No	4. Will permit change include operations in hydrologic basins other than currently approved?
Yes	☒ No	5. Does permit change result from cancellation, reduction or increase of insurance or reclamation bond?
□ Yes	☒ No	6. Does the permit change require or include public notice publication?
Yes	☒ No	7. Does the permit change require or include ownership, control, right-of-entry, or compliance information?
□ Yes	☒ No	8. Permit change as a result of a Violation? Violation #
Yes	☒ No	9. Permit change as a result of Division Order? D.O. #
□ Yes	☒ No	10. Permit change as a result of other laws or regulations or policies? Explain:
s	☒ No	11. Does the permit change affect the surface landowner or change the post mining land use?
Yes	☒ No	12. Does permit change require or include underground design or mine sequence and timing? (Modification of R2P2
□ Yes	☒ No	13. Does permit change require or include collection and reporting of any baseline information?
Yes	☒ No	14. Could the permit change have any effect on wildlife or vegetation outside the current disturbed area?
☒ Yes	□ No	15. Does permit change require or include soil removal, storage or placement?
Yes	□ No	16. Does permit change require or include vegetation monitoring, removal or revegetation activities?
□ Yes	☒ No	17. Does permit change require or include construction, modification, or removal of surface facilities?
Yes	☒ No	18. Does permit change require or include water monitoring, sediment or drainage control measures?
☒ Yes	□ No	19. Does permit change require or include certified designs, maps, or calculations?
Yes	☒ No	20. Does permit change require or include subsidence control or monitoring?
☒ Yes	□ No	21. Have reclamation costs for bonding been provided for any change in the reclamation plan?
Yes	□ No	22. Is permit change within 100 feet of a public road or perennial stream or 500 feet of an occupied dwelling?
□ Yes	☒ No	23. Is this coal exploration activity?

Attach 3 complete copies of proposed permit change as it would be incorporated into the Mining and Reclamation Plan.

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.

[signature] - Mgr - Reclamation - 6/23/97

Signed - Name - Position - Date

Subscribed and sworn to before me this _____ day of ____________, 19 ____.

____
Notary Public

My Commission Expires: ____________, 19______

Attest: STATE OF ______________ } ss:
COUNTY OF ______________ }

Received by Oil, Gas & Mining

AUG 1 1997

ASSIGNED PERMIT CHANGE NUMBER

2nd

Amendment to Reclamation Plan
Hidden Valley Mine Site
Emery County, Utah
Permit No. ACT/015/007
Consolidation Coal Company

Submitted to the:

State of Utah
Department of Natural Resources
Division of Oil, Gas, and Mining
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

June 23, 1997
Revised August 12, 1997

Narrative Description of Proposed Work and Postmining Land Use
Amendment to Reclamation Plan
Hidden Valley Mine
Emery County, Utah
Consolidation Coal Company
June 23, 1997
Revised August 12, 1997

A. Introduction

The Hidden Valley property was acquired by Consolidation Coal Company from the Cal Mat Company in December, 1995. The property remains under Utah permit number ACT/015/007 originally issued to the Soldier Creek Coal Company, a subsidiary of CalMat, in 1980.

The purpose of the project described below is to achieve the vegetative cover as necessary for bond release. Consolidation Coal has, at the present time, no interest in access to the coal seams previously accessed by the Soldier Creek Company in Hidden Valley. The proposed work is to be done in late summer or early fall, 1997.

B. Present Configuration

Section C of this submittal, Reclamation Materials Assessment, indicates that the earlier reclamation at this site placed fine - grained material from alluvial areas on the steep slopes which were formed to cover the exploratory adits. These slope areas are also experiencing active erosion, which, combined with poor aspect and the arid conditions typical of the southwestern U.S., have made revegetation unsuccessful. Earlier attempts at reclamation would, probably, have been more successful if the effort had been directed at replacement of the rock debris that formed the slopes at the base of the rock canyon walls prior to disturbance.

With respect to topography, drawing 97-1 indicates the present topography of the site as determined by actual field survey. This drawing also indicates the expected topography to result after the proposed modification.

Slope stability: the present permit includes an analysis of slope stability for a final configuration of 2H:1V. Since this plan involves a reduction of the present "B" seam adit from the actual slope as constructed at approximately 2.8H:1V to a final slope of 2H:1V, this earlier analysis is considered valid for this project.

C. Purpose of Work Proposed

It has become apparent that the site, in its present configuration, will not support adequate vegetation to control erosion and achieve bond release. The work proposed for 1997 is expected to be phase 1 of a two part project. This year's work is to consist of a regrading of the "B" seam adit slope, with the resulting material removed from the slope to be used to flatten the area between the slope and Ivie Creek. After reconfiguration of the area, it is planned to remove rocky materials from the lower area of the access road and road slope to be used to apply a coarse fragment cover of approximate 12" thickness to the regraded "B" seam adit slope, and to create a series of depressions upon the slope through surface roughening. Selected material from the same source will be used to selectively apply a partial cover of coarse fragments to the flattened area between the slope and Ivie Creek. This area will also be surface roughened. Further, selected coarse materials will be used to effectively "riprap" the transition slope from the flattened area to existing grade (see drawing).

The expected result will be to restore the adit slope to more closely resemble the area prior to disturbance. The use of coarse, rocky material to cover the slope, in conjunction with surface roughening, will also serve to prevent erosion, and help in revegetation through water harvesting and the shading effect of the larger fragments. In regrading the area between the slope and the Creek, the result will be a flatter configuration that will serve to minimize erosion and to better harvest available moisture. Any possibility of this area flowing directly into Ivie Creek will be eliminated by construction of a deflection berm. The partial application of coarse fragments in combination with surface roughening over this general area is to provide the same benefits, i.e. the harvesting of moisture, shading, and the prevention of sediment production and transport.

Phase 2 of the two part project is to consist of the same treatment to the slope covering the "A" seam adit, with the exception that this slope will not require regrading, as it is presently at 2H:1V, which is about the steepest that can be safely traversed by construction equipment in application of coarse fragments. This phase of the project is expected to occur in two to three years, and will depend on the success evident with the first phase. Revegetation of disturbed sites in this part of the U.S. is, admittedly, difficult, and it is appropriate to evaluate the success of this first phase of the project prior to continuing.

D. Construction

The site will be accessed using the present roadway. Equipment will consist of a crawler bull dozer, an endloader, a hydraulic excavator, and necessary support such as fueling equipment and pickup trucks. The bulldozer will be used in the initial operations of pushing the present topsoil from the adit slope for redistribution on the surface in combination with the coarse material described below. The bulldozer will then regrade the adit slope, pushing the material from the slope to the area between the slope and Ivie Creek. Grading will be done so as to make certain that any dark material or material of suspect quality will not be exposed on the surface. Any dark lithochromic shale will be buried under the deepest layer of fill and soil cover. The endloader will then excavate, carry, and deposit the coarse material and surface soil on both the slope and the flattened area. The excavator will serve to place the coarse fragments on the area, as well as to roughen the surface . All machines will be used to configure and finish grade the roadway area so as to restore it to a condition such that future access is available.

E. Sediment Control

During the construction phase, sediment control will be through utilization of the existing silt fences. Although it will be necessary to remove sections of the fences for access, sufficient materials consisting of silt fencing or straw bales will be kept on hand in the event of precipitation such that the fences can be restored to their present function. Longer term, it is our opinion that the final configuration as proposed will reduce sediment production to levels such that control measures will not be required with regard to surface runoff from the reconstructed areas. The final graded surface will consist of coarse fragments (rock) and depressions created by surface roughening. This surface should function to mechanically eliminate sediment production and transport. For the remaining area slated for future construction, the silt fence will be retained. These measures should provide ample protection to Ivie Creek and its buffer zone.

Seeding of the areas graded to final configuration will be done by hand, using a broadcast type spreader. After application, the seed will be incorporated to the extent possible, using hand raking. The use of hay or straw mulch is not proposed for this project, as it is considered counter-productive to the establishment of vegetation in this case. The introduction of hay as a soil stabilizer is also not proposed, as the soil is both chemically and physically suitable for the intended purpose (see Section C, this submittal). The use of either hay or straw is considered problematic from the standpoint of introduction of unwanted seed source that could serve as unwanted competition with the desirable seed for the scarce moisture available. Also, our experience at the Burnham, New Mexico project indicates that hay or straw also tends to move and collect in depressions created by surface roughening, and serves to inhibit emergence of the planted seeds. Hay could further tend to attract the native elk to the site, encouraging premature grazing of the emerged seedlings.

Present topography, proposed topography, and other proposed work is presented in map form on drawing 97-1, section E of this submittal. This map also identifies the expected final configuration of the borrow area. It further provides information on the extension of the portion of the diversion ditch which originates above the southeast reclamation slope ("A" seam) and which will be affected by this phase of the project. Hydrology for this ditch was provided with the 1989 amendment to the original permit, with design detail provided for a 100 year, 24 hour event. The calculation for the flatter section of the ditch indicates only a 0.4 feet depth of flow from the design storm. The extension of the ditch will be constructed at a cross section as indicated as "retention berms" in the referenced submittal, i.e. 2' depth, 2H:1V side slopes.

E. Seed Mix

The following seed mix is proposed for use at the site, dependent on availability. If certain seeds are not available, the Regulatory Agency will be made aware of this, and an alternative mix will be formulated.

SEED MIX
HIDDEN VALLEY, 1997 WORK

COMMON NAME	SCIENTIFIC NAME	RATE, (# / ACRE)
GRASSES		
Squirrel Tail	Elemus elymoides (Sitanion hystrix)	4.0
Galleta "Viva"	Hilaria jamesii	2.0
Sand dropseed	Sporobolus cryptandrus	0.25
Alkali sacaton	Sporobolus airoides	0.5
Indian ricegrass	Oryzopsis hymenoides	4.0
Greatbasin wildrye "Trailhead"	Leymus cinereus	2.0
Bluebunch wheatgrass "Secar"	Pseudoroegneria (Elymus) spicata	3.0
Needle and thread	Stipa comata	2.0
Salina wildrye	Elymus salina	*
Purple three-awn	Aristida purpurea	1.0
FORBS		
Gooseberry leaf globemallow	Sphaeralcea grossulariaefolia	1.0
Palmer penstemon	Penstemon palmeri	0.5
Tarragon sagebrush	Artemisia dracunculus	*
Prairie sage	Artemisia ludoviciana	0.1
SHRUBS		
Fourwing saltbush	Atriplex canescens	4.0
Shadscale	Atriplex confertifolia	4.0
Mat saltbush	Atriplex corrugata	4.0
Castle Valley saltbush	Atriplex cuneata	4.0
Black sagebrush	Artemisia nova	0.25
Winterfat	Ceratoides lanata	4.0
Nevada Mormon tea	Ephedra nevadensis	2.0
Fremont's buckwheat	Eriogonum corymbosom	*
	TOTAL	42.6

* Seed to be collected on site, if possible.

F. Postmining Land Use

The discussion regarding postmining land use in the 1986 submittal by Soldier Creek Coal company addressed cattle grazing and wildlife habitat. The submittal goes on to say that "The disturbed area is mostly sandstone talus slopes that provide little livestock forage or wildlife habitat as is generally defined... This revegetation will not provide either wildlife or livestock forage of any significance but will stabilize the site."

Realistically, revegetation of the disturbed area will not contribute to stability of the site, nor will the revegetation be a major contributor to grazing. The usage evident of the site during the time it has been under Consolidation control has been by wildlife. Considering this, it is our plan to address the land use issue in a future submittal, in all likelihood proposing the reclassification of the site to wildlife forage or some other, more appropriate and more realistic category.

Reclamation Materials Assessment
CONSOL, Inc., Hidden Valley Mine
Emery County, Utah

23 June 1997

Prepared for: Mr. Gary Raines
Consolidation Coal Company
P.O. Box 566
Sesser, IL 62884

Prepared by: Lewis Munk, Ph.D., CPSS
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Reclamation Materials Assessment
CONSOL, Inc., Hidden Valley Mine
Emery County, Utah

23 June 1997

Lewis Munk, Ph.D., CPSS
Daniel B. Stephens & Associates, Inc.

1.0 Introduction

Mining at the Hidden Valley property involved the exploitation of small surface exposures or outcrops of coal. Coal extraction from this site was terminated in the early 1980's and the reclamation was initiated in 1986. The reclamation activities included regrading, cover-soil redistribution, seeding, and mulching. The reclamation efforts at the Hidden Valley mine are not considered successful by the Utah-DNR, because of the lack of vegetative cover in the regraded portal areas. The primary areas of concern are the higher gradient canyon slopes near the A and B portals that have not adequately revegetated and represent potential future sediment sources. Prior to mining, these slopes were probably originally talus composed of colluvial rock debris. After termination of mining, the areas near the portals were graded and soil materials from the adjacent alluvial terraces were placed on the slopes. The alluvial terrace soil materials are medium textured and subject to erosion if not protected by a permanent mulch or vegetation. The difficulties associated with vegetation establishment in the arid climatic regime of southern Utah are accentuated by the harsh exposures (south and west) of these slopes. The vegetative cover on the undisturbed slopes in the vicinity of the reclaimed area is probably insufficient to protect the reclaimed slopes from accelerated erosion, thus, even under the best revegetation scenario the medium textured soils on the reclaimed slopes would be susceptible to erosion.

The undisturbed slopes surrounding the reclaimed area are sparsely vegetated, but protected from accelerated erosion by surface rock fragments ranging in size from gravel to boulders. A conceptual design for the reclamation of this site was developed by CONSOL (Gary Raines, Steve Behling, and Lewis Munk) and the Utah-DNR (Bob Davidson and Susan White) during a site visit in March, 1997. The conceptual design incorporates the use of rock fragments to armor the steep south facing slopes. This design is meant to emulate the natural conditions in the surrounding undisturbed areas. The primary intent of the proposed treatments is to promote the long-term stability of the area and reduce on and off-site sedimentation. Rock cover, rather than vegetation cover, will provide the primary erosion protection on the reconstructed slopes. During the field discussions, it was recognized that the vegetation success criteria would be different for the rock covered slopes and the alluvial terraces, with a lower vegetative cover and productivity standard applied on the slopes. In general, the conceptual design for reclamation at Hidden Valley includes:

1) redistribution of the cover soils from the high gradient slopes to the alluvial terrace positions,
2) armoring the slopes with soils containing a high percentage of coarse fragments, and
3) seeding the reconstructed terraces and talus with adapted native vegetation.

The intent of this document is to evaluate the suitability of the soil materials at the site with respect to the proposed conceptual design for reclamation.

1.1 General Site characteristics

The Hidden Valley Mine is located at the base of an incised canyon characteristic of the Colorado Plateau region. The geomorphic components in the disturbed area include cliff and slope-forming canyon walls and high alluvial terraces. The disturbed areas are bounded on the south and west by the channel, low terrace, and floodplain of Ivie Creek. Berms and silt fences protect the stream from off-site sedimentation. The site occurs at an elevation of about 6000 feet and the surrounding vegetation is characterized by Utah juniper-Sagebrush-grass communities. Riparian vegetation is present in the stream corridor. The vegetation in the reclaimed area included four-wing saltbush (*Atriplex canescens*), Gardener saltbush (*Atriplex gardneri*), Big sagebrush (*Artemisia tridentata*), Mormom tea (*Ephedra* spp.), Galleta grass (*Hilaria jamesii*), Indian ricegrass (*Oryzposis hymenoides*), Salina wildrye (*Elymus salina*) and several unidentified forb and grass species. The undisturbed soils were not evaluated at the site, but probably included Orthents on the canyon walls, and deep, well-drained Fluvents or Cambids on the higher terrace positions.

2.0 Methods

A total of 10 samples were collected from the eight (8) locations in the reclaimed area (Figure 97-1). All the samples were analyzed for saturated paste pH (pH_s), extract electrical conductivity (EC_e), soluble Ca, Mg, and Na (Ca_s, Mg_s, and Na_s), AB-DTPA extractable Se, and particle size distribution. Selected samples were analyzed for acid base account (ABA), water soluble Ca, water soluble Se, and total acid (HNO_3-$HClO_4$-HF) digestable Se. The analytical methods used in this investigation conformed to the Utah-DNR guidelines or were approved as acceptable surrogates prior to testing (Table 1).

Table 1. Methods and instrumentation used in the analyses of the Hidden Valley soils samples.

Test	Method	Instrumentation
pH_s	Agron. 9, Method 10-3.2	electrode
EC_e	Agron. 9, method 10-3.3	electrode
Ca_s, Mg_s, Na_s	Agron. 9, method 10-3.4	ICP
AB-DTPA Se	Spackman et al., 1995	ICP-MS
Particle size distribution	Agron. 9, method 43-5	Hydrometer
Potential acidity (ABA)	Sobek et al., (1978)	Induction furnace
Neutralization potential (ABA)	Sobek et al., (1978)	HCl/NaOH titration
Water soluble Ca	Nelson, (1982)	ICP
Water soluble Se	Nelson, (1982) modified	ICP-MS
Total acid digestable Se	Spackman et al., 1995	HG-AAS

3.0 Results and Discussion

3.1 Materials Sampled

The intent of the soil sampling was to determine if any chemical or physical limitations are associated with the soil cover materials that were used on the reclaimed slopes. The majority of the samples collected at the Hidden Valley site represent the surface cover materials that will be placed back on the alluvial terraces (Table 2). The subsurface layers at sites HV1-2 and HV4-2 contained sandstone and lithochromic shale fragments and were sampled separately. Sample HV5-1 is a lithochromic shale exposed at the surface of the regraded slope near the A portal. Sample HV7-1 was collected at the based of a red shale exposure above the B portal slope. The sandstone cover material proposed for armoring of the A portal slope is represented by sample HV8-1.

Table 2. Color, effervescence, and type of materials sampled at the Hidden Valley Mine Site (3-18-97)†.

Site	Depth	Material type	Color	Eff.
HV1-1	0-18	Alluvial soil cover materials	10YR 4/3	es
HV1-2	18-24	Cover soil with shale and sandstone fragments	10YR 3/1	e
HV2-1	0-18	Alluvial soil cover materials	10YR 4/3	es
HV3-1	0-18	Alluvial soil cover materials	10YR 4/2	es
HV4-1	0-6	Alluvial soil cover materials	10YR 4/3	es
HV4-2	6-18	Cover soil with shale and sandstone fragments	10YR 3/2	es
HV5-1	0-6	Lithochromic shale fragments-substratum	5Y 5/2	eo
HV6-1	0-18	Alluvial soil cover materials	10YR 4/2	es
HV7-1	Surf	Red weathered shale/clay from surface exposure	5YR 3/3	eo
HV8-1	Grab	Sandstone borrow materials	ND	es

† Colors are of moist soil unless using the Munsell notation otherwise indicated. Eff. = reaction with 10% HCl, eo = none, e = weak, es= effervesces strongly.

3.2 Reclamation Materials Characteristics and Suitability

No chemical or physical limitations were identified in the soil cover materials in the reclaimed areas at the Hidden Valley Mine (Table 3). Thus, no limitations are predicted for the use of the cover materials that are currently on the regraded slopes. However, two samples of potential substratum materials had pH's near the Utah-DNR lower limit, and one of these samples had an extractable Se level that exceeded the Utah-DNR guideline. The implications and risks associated with acid forming materials and Se are discussed in the following sections.

Table 3. Selected chemical characteristics of the reclamation materials at the Hidden Valley Mine.

Sample	Depth	pH_s	EC_e	SAR	Ca_s	Mg_s	Na_s	Se	Sand	Silt	Clay	Class
	in.		dS/m		-----	meq/L	-----	mg/kg	------	%------		USDA
HV1-1	0-18	7.4	4.15	1.7	32.2	13.1	8.06	0.03	50	41	9	L
HV1-2	18-24	6.6	8.43	1.5	37.5	70.1	11.2	0.10	49	37	14	L
HV2-1	0-18	7.5	5.20	2.3	38.4	18.5	12.4	0.03	49	42	9	L
HV3-1	0-18	7.4	5.43	1.7	41.5	17.4	9.05	0.03	45	45	10	L
HV4-1	0-6	7.6	3.34	1.0	30.0	10.6	4.40	0.03	45	44	11	L
HV4-2	6-18	7.1	9.58	5.4	32.3	56.6	36.3	0.07	44	40	16	L
HV5-1	0-6	5.5	11.7	2.5	48.5	90.1	20.6	0.19	54	36	10	SL
HV6-1	0-18	7.6	4.39	2.4	32.6	14.3	11.5	0.05	48	42	10	L
HV7-1	Surf	5.8	7.42	5.9	24.9	46.1	35.2	0.05	19	49	32	SiCL
HV8-1	Grab	7.8	3.93	2.0	33.9	10.1	9.31	0.02	46	41	13	L

3.3 Acid Forming Materials Assessment

The alluvial soil-cover materials were weathered, calcareous, and lacked visual evidence of pyrite. These materials are not considered acid generating sources and probably have considerable neutralization capacity. However, the occurrence of low pH's in samples HV5-1 and HV7-1, and pyrite weathering products in the beds associated with sample HV7-1, raised concerns about the potential for acid forming materials at the site. Thus, the acid base account (ABA) of selected samples was evaluated (Table 3). A tiered testing approach was used in the ABA analysis. In the first phase of testing, total sulfur (TS) was used to calculate potential acidity (PA), and this value was subtracted from the neutralization potential (NP) to estimate the maximum acid base account (MABA). Acid base accounts calculated in this manner represent maximum values, since not all the S occurs as sulfide and sulfate minerals that have the potential to generate acidity. The MABA was calculated using the following formula: MABA = NP-TS, where NP and PA are in units of T $CaCO_3$ equivalents/KT. The PA was calculated using: PA = (TS)(31.25), where 31.25 is the conventional factor for converting percent S to tons of $CaCO_3$ equivalent.

Table 4. Acid base account data for selected samples from the Hidden Valley Mine, Emery County, Utah.

Sample Number	Total S	Extractable Sulfur Forms: H. Water	HCl	HNO_3	Residual	Neutralization Potential	Acid Base Account: Max.	Pyritic	Paste pH
	-----------------------	% Sulfur	-----------------------			-----Tons $CaCO_3$ Equiv./KT-----			
HV1-2	1.09	ND	ND	ND	ND	39	5	ND	6.6
HV5-1	1.21	0.85	<0.01	0.12	0.24	13	-24	9	5.5
HV7-1	1.02	0.66	<0.01	0.31	0.05	3	-28	-7	5.8
HV8-1	0.27	ND	ND	ND	ND	77	68	ND	7.8

Sulfur-forms analysis was conducted to better define the acid forming potential of the materials. The S-forms based PA evaluation uses pre- and post-extraction S contents to predict the acid generating potential of the materials. The water and acid extractions are meant to partition the non-acid generating S forms (e.g., sulfate and organic S) from the acid generating forms (pyritic S). The HNO_3-extractable sulfur was used to calculate the PA associated with pyrite and the pyritic acid base account (PABA).

The MABA data indicate that the acid forming potential of these materials is limited. Two of the four samples had positive MABA values, and the MABA values of the other two samples were in -25 T $CaCO_3$ / KT range (Table 3). The PABA's calculated from the HNO_3 extractable sulfur provide a more realistic representation of the potential for acid formation. The PABA for sample HV5-1 is positive indicating that this dark colored shale lacks the capacity to generate excess acidity in relation to its neutralization potential, and significant reductions in pH are not expected as this material weathers. The PABA for HV7-1 was negative suggesting that the materials in the outcrop may generate excess acidity in the long term. The red colored bed represented by sample HV7-1 is limited in extent and is not considerd representative of the materials on the site. Sample HV7-1 was collected primarily to document the tolerance of native species for acid soil conditions. The HV7-1 sample site supported a vigorous stand of Gardner saltbush. Thus, the pH of the majority of the materials at the Hidden Valley site are expected to be circum-neutral to slightly alkaline in reaction in the long-term, and acid soil conditions are expected to occur to a limited extent only in localized areas. Furthermore, alkalinity from the overlying cover materials is expected to moderate changes in pH over time as leaching occurs.

3.4 Selenium

The Utah-DNR guideline for extractable selenium of 0.1 mg/kg was exceeded in only one of the ten samples collected at the site (Table 3). Previous testing of the coal at Hidden Valley did not recognize Se as an element of concern (Pers. Comm. Mr. Robert Davidson, Utah-DNR, 8 March 1997). Thus, materials with elevated extractable Se are not likely to occur at the Hidden Valley site. Nonetheless, because sample HV5-1 represents a potential substratum component in the reclaimed area additional laboratory tests were conducted to evaluate the risks associated Se at Hidden Valley. The biogeochemistry and toxicity of Se are reviewed in the following sections along with the supplementary test results.

3.4.1 Selenium Requirements and Toxicity

Selenium is essential for human and animal nutrition (Levander, 1986). The essentiality of Se in plants has not been conclusively demonstrated, but it may be essential in primary Se accumulator species (Ganje, 1966; Emerick and DeMarco, 1991). Se deficiencies in livestock and poultry may result in a long list of ailments (Egan, 1966; Shapiro, 1973; Combs and Combs, 1986). Deficiencies in humans are rare, but have been recognized in isolated areas with extremely low soil-Se levels and in instances of extreme malnutrition (Chen et al., 1980; Majaj and Hopkins, 1966). Combs and Combs (1984) suggest that elevated levels of dietary Se may function to reduce the incidence of cancer and cardiovascular disease. Animal requirements are reported to range from 0.05 to 0.1 mg Se/kg diet (Mayland et al., 1989), with up to 0.3 mg/kg diet required as feed supplements for maximum productivity of poultry and livestock (CAST, 1994).

Toxicity symptoms in livestock may occur at dietary-Se levels ranging from 3.0-20.0 mg/kg for chronic exposure, and from 400-800 mg/kg for acute exposure (Mayland et al., 1989; James et al., 1991). Selenium toxicity levels in animals depend on a number of factors including, species, age, sex, dietary compliments, and health. Acute selenosis is rare, but may occur when livestock are forced to eat highly seleniferous plants, that are typically considered to be unpalatable. Selenium levels of 4-5 mg/kg body weight are required for manifestations of chronic toxicity symptoms (Mayland et al., 1989). Chronic selenosis (a.k.a., Alkali Staggers) occurs when animals ingest feeds containing 5-40 mg Se/kg for a period of weeks. Blind staggers is an another disease associated with the chronic ingestion of Se accumulator species, however, the symptoms cannot be induced by Se-salts, and the disease may be caused by factors other than Se toxicity (Levander, 1986; James et al, 1991). Selenium toxicity in humans is rare, but has been reported from a seleniferous area in China, where the inhabitants diet was restricted to eat foods produced solely on seleniferous soils (Levander, 1986). Additional instances of human toxicity were associated with the consumption of unregulated dietary Se supplements (Levander, 1986).

Selenosis in native vegetation is undocumented, but toxicities in selected crop plants are known to occur (Ganje, 1966; Carlson et al., 1989; Mayland et al., 1989). Selenium solution concentrations in the 2-30 mg/L range are required to induce yield reductions and mortality in susceptible plants (Carlson et al., 1989). In contrast, some plant species can adsorb large amounts of Se with no apparent detrimental affects. The plant species that tolerate high levels of Se are classified as either primary or secondary accumulator species. Primary Se accumulators are apparently restricted to seleniferous soils, whereas, the secondary Se accumulators occur on both seleniferous and non-seleniferous soils (Table 5) . Selenium concentrations in primary accumulators are commonly in the hundreds of mg/kg on a dry weight (DW) basis, and may range into the thousands of mg/kg. The secondary Se accumulators rarely concentrate more than 50-100 mg/kg, but may contain up to 1000 mg/kg DW. The tissue-Se levels of non-accumulator species growing on seleniferous soils rarely exceed 25-50 mg/kg DW and commonly contain < 5 mg/kg DW (Mayland et al., 1989; Emerick and DeMarco, 1991). Much attention has been directed toward Se accumulator species because of their value in geochemical exploration of uranium deposits and for locating seleniferous soils. However, it should be recognized that some plants apparently exclude Se when growing on seleniferous soils. Notable species from a mined land reclamation perspective include the grama grasses (*Bouteloua* sp.) and Buffalograss (*Buchloe dactyloides* (Nutt.) Engelm.) (Brown and Shrift, 1982; Mayland et al., 1989).

Table 5. Genera of recognized primary and secondary Se accumulator species in the western United States.

Primary Accumulators		Secondary Accumulators	
Genus	Common Name	Genus	Common Name
Aplopappus	Goldenweed	*Aster*	Aster
Astragalus	Locoweed	*Astragalus*	Locoweed
Happlopappus	Goldenweed	*Atriplex*	Saltbush
Machaeranthera	Aster	*Castilleja*	Paintbrush
Oonopsis	Goldenweed	*Comandra*	Toadflax
Stanleya	Primrose	*Grayia*	Hop Sage
Xylorrihiza	Aster	*Grindelia*	Gumweed
		Guterrezia	Snakeweed
		Haplopappus	Goldenweed
		Machaeranthera	Aster
		Mentzelia	Blazing star

3.4.2 Selenium Chemistry in Soils

Selenium occurs in soils and geologic materials as native selenium, metal selenides, weakly soluble oxyanions, adsorbed ions, and organo-selenium compounds. Selenium concentrations in uncontaminated soils generally range from 0.1 to 2.0 mg/kg and average about 0.5 mg/kg (McNeal and Balistrieri, 1989; Herring, 1991). The chemistry of Se in soils is complicated since it can concurrently exist in more than one oxidation state, including selenide (Se^{2-}), elemental selenium (Se^{0}), selenite (SeO_3^{2-} or Se(IV)), and selenate (SeO_4^{2-} or Se(VI)). Solution pH and redox potential are the primary determinants of the Se oxidation state.

The solubility of Se is determined by its oxidation state and mineral form, and its mobility is controlled by adsorption processes (Elrashidi et al., 1987; Brown, 1991). Selenides and elemental Se are predicted to occur at low redox potentials. Selenite is predicted under mildly oxidized conditions and selenate is the major species expected under high redox conditions. Metal selenides (e.g., PbSe, CuSe, SnSe, and $FeSe_2$) or elemental Se solid phases are very insoluble and control the solution concentrations when they are the stable forms. In well oxidized soils the solution concentration of selenite and selenate is typically controlled by adsorption processes, rather than dissolution-precipitation reactions (Elrashidi et al., 1987). Selenite and selenate adsorption are pH dependant with maximum adsorption occurring at low pH's (Neal et al., 1987; Neal and Sposito, 1989). Selenate is less strongly adsorbed than selenite and many of the other soil solution anions (Ryden et al., 1987). Thus, Se mobility and availability are expected to be highest in well-drained, alkaline soils, since the redox potential favors selenide mineral dissolution and the stability of the selenate species. Furthermore, selenite is not as strongly adsorbed under alkaline conditions.

3.4.3 Plant Uptake of Selenium

Plants are the primary pathway for Se exposure to grazing animals, although some uptake occurs through the direct ingestion of soils. Mikkelson et al., (1989) and Mayland et al., (1991) reviewed the factors affecting plant uptake of Se and indicated that plant uptake of Se increased as soil pH, redox potential, and clay content increased. Plants absorb selenate, selenite, and organo-selenium, but seem to preferentially absorb selenate and organo-selenium. Increasing boron, chloride, and sulfate concentrations and decreased phosphate concentrations usually depressed Se uptake. The effect of soil organic matter content on Se uptake is not clear, and it may either enhance or depress Se uptake by plants. The antagonistics effects of SO_4 on plant uptake of Se have been noted by a number of researchers (Epstein, 1955; Gissel-Nielsen, 1973; Smith and Watkinson, 1984; Wan et al., 1988). The reduction in Se uptake associated with SO_4 is probably the result of specific ion competition (Epstien, 1955). Gypsum soil amendments have been used to mitigate Se uptake in seleniferous soils (Wan et al., 1988). The uptake of selenate is affected to a greater degree than selenite by competing anions (Mayland et al., 1991).

3.4.4 Selenium at Hidden Valley

The Total Se concentrations of the materials tested at Hidden Valley are within the range found in uncontaminated soils (Fig 2) and are on the low end of the range found in Cretaceous marine sediments Kabata-Pendias and Pendias, 1992). For comparison, Total Se levels in seleniferous Cretaceous shales may range from 5-300 mg/kg (Mayland et al., 1989; Martens and Saurez, 1997). Selenium fractionation studies of Cretaceous coal bearing rocks conducted by CONSOL in New Mexico, revealed that the majority of the Se in these materials occurred in extremely recalcitrant forms (Munk, 1996). Similar results were reported from Se fractionation studies of Cretaceous formations in California, where more than 80 % of the Se was accounted for in sequential NaOH and HNO_3 extractions (Martens and Suarez, 1997). Although no Se fractionation data are available for coal-bearing formations in Utah, the majority of the Se in the rocks is expected to occur as recalcitrant selenides and organic compounds on the basis of genetic similarities with other Cretaceous marine sediments. Thus, the long-term risks associated with the Hidden Valley materials is predicted to be minimal since the dark shales do not contain high levels of Se, and the Se probably occurs in relatively stable mineral forms that will not readily weather to plant available forms.

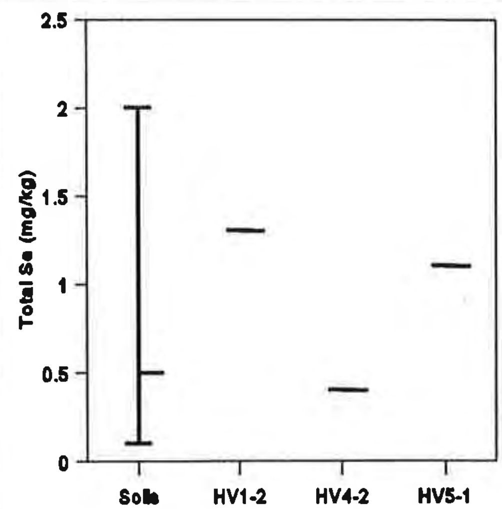

Figure 4. Range and mean- Total Se content of uncontaminated soils and total concentrations of Se in samples from the Hidden Valley Mine.

Table 6. Extractable Se and Ca concentrations of selected samples from the Hidden Valley Mine, Emery County, UT.

Sample	Extractable Se						Extractable Ca				
	1:1	1:2.5	1:5	1:10	AB-DPTA	Total	S.P.	1:1	1:2.5	1:5	1:10
	mg/kg										
HV1-2	0.09	0.08	0.10	0.13	0.10	1.3	313	586	1460	2900	5600
HV4-2	0.05	0.05	0.05	0.06	0.07	0.4	240	565	1420	2450	3520
HV5-1	0.15	0.16	0.18	0.22	0.19	1.1	440	646	1510	3000	5300

1:1, 1:2.5, 1:5, and 1:10 are soil:water dilution ratios; Total = strong acid digestable; S.P. = saturated paste extract.

The adsorption and plant uptake of Se is strongly influenced by Se speciation, with selenite being less readily absorbed by plants and more strongly adsorbed by anion exchange sites. Selenite is the predicted stable Se species in mildly oxidizing and acid conditions. Thus, selenite is expected to be the dominant species in the strongly-acid dark shales at Hidden Valley once they are buried under the sandstone cover materials. Burial of the dark shales by even a modest thickness of cover materials is expected to reduce the redox potential in the system and promote the stability of selenite.

The occurrence of gypsum in the soils at Hidden Valley affects the interpretation of risks associated with Se. Gypsum is important because of the antagonistic relationship between Se uptake and soluble SO_4 levels. In addition, limited evidence suggests that Se solution concentrations may be controlled by gypsum precipitation-dissolution reactions. Because of the limited solubility of gypsum, only about 20-30 meg/L of Ca or SO_4 will go into solution when gypsum is present. This relationship is the basis for recognitition of gypsum in the soils at Hidden Valley (Table 3). The increase in Ca content upon dilution method was used to confirm the presence of gypsum in selected samples (Salinity Laboratory Staff, 1954). The apparent increase in Ca concentration in the samples with increasing soil:water dilution indicates that the solution Ca levels are controlled by a solid phase dissolution process (Table 6; Fig.3). The divergence from linearity in the Ca plot for sample HV4-2 indicates that most of the gypsum in this sample was dissolved in the 1:5 and 1:10 dilutions. Alternatively, the linear increase in Ca with increased dilution for samples HV1-2 and HV5-1 indicates that the 1:10 dilution was insufficient to dissolve all the gypsum (Nelson, 1982). Thus, gypsum is inferred to be present in all three samples, but more abundant in samples HV1-2 and HV5-1.

The extractable soil Se concentrations in samples HV1-2, HV4-2, and HV5-1 increased with increasing dilution (Fig. 4). Although, the increase in Se concentration for sample HV4-2 was slight, and may represent analytical variability. The response of Se to increasing dilution in samples HV1-2 and HV5-1 is similar to that of Ca, suggesting that extractable Se is affected by a solid-phase dissolution process. Comparison of the solution Ca and Se data with thermodynamic equilibrium constants at 25° C for $CaSeO_3$-$2H_2O$ (Log K_{dis} = -5.44) and $CaSeO_4$-$2H_2O$ (Log K_{dis} = -3.09) indicate that the 1:1 solutions are undersaturated with respect to these solid phases. Thus, the Se solution concentrations are speculated to be controlled by solid phase gypsum that contains a minor selenite and/or selenate component (e.g., $CaSO_4$ (SeO_3-SeO_4)-$2H_2O$).

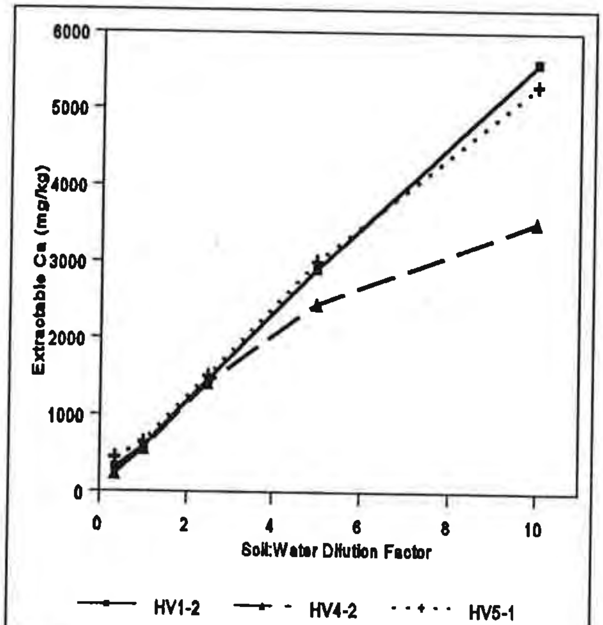

Figure 3. Extractable Ca concentration and soil:water dilution ratio for selected samples from the Hidden Valley Mine, Emery County.,Utah.

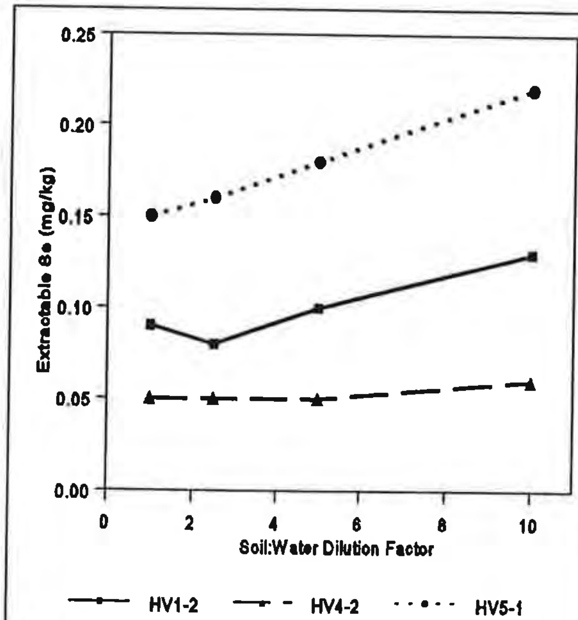

Figure 4. Extractable Se concentration and soil:water dilution ratio for selected samples from the Hidden Valley Mine, Emery County, Utah.

The apparent copreciptiation of Se with gypsum is considered to be important in determining the bioavailability of Se under field conditions. In soil environments where gypsum is a stable mineral phase, and Se is copreciptiated with the gypsum, the biovailability of Se is expected to be kinetically limited by the dissolution of gypsum. The kinetics of gypsum dissolution are a function of gypsum particle size, crystallinity, and antecedent soil water content. Gypsum is formed from the weathering products associated pyrite oxidation in Cretaceous marine sediments and mine spoils, and is a stable mineral phase in arid regions in the western United States, including Utah (Nettleton et al., 1982). The mineral ferroselite ($FeSe_2$) is a Se-pyrite analouge and probably occurs as a solid solution phase component with pyrite (Howard, 1977). Thus, the oxidation of the primary ferroselite and pyrite mineral phases are probably concurrent processes and the Se and S are expected to be similtaneously available for precipitation with gypsum under high Ca activity environments. The time transgressive weathering of pyrite and detrital feldspars should provide a continuous source of and Ca and S to the system, and gypsum is expected to increase in quantity with time. Furthermore, increases in the size and crystallinity of the gypsum precipitates is expected in the restricted leaching regime associated with the climate of the Hidden Valley site. Thus, gypsum is expected to be a stable long-term sink for Se in the soils.

3.5 Selenium Risks at Hidden Valley

The assessment of risks associated with Se in reclaimed environments is complicated. Fisher and Munshower (1991) indicated that the determination of suitable Se levels in the overburden should not be based on extractable Se levels alone. A sound assessment of risks associated with Se, should include total and extractable Se levels, post-mining land use, area of disturbance, plant species selection, and intensity of management. The selection of shallow rooted plant species with non-accumulator or Se-excluding tendencies further reduces the risks associated with soil Se. Thus, extractable Se levels greater than 0.1 mg/kg can probably be tolerated for small areas with watershed and/or wildlife habitat as the primary post-mining land. Fisher and Munshower (1991) concluded that AB-DTPA extractable Se levels of 0.25 mg/kg are reasonable when wildlife is the primary post-mining land use. In addition, an extensive five year study of soils and vegetation in natural and reclaimed areas in Wyoming concluded that AB-DTPA extractable Se levels of $<$ 0.3 mg/kg would not compromise forage resources (Spackman et al., 1996).

The risks associated with Se at Hidden Valley are considered to be mimimal since the majority of the materials do not contain elevated concentrations of Se, and the area of disturbance is small and will not be intensively managed for domestic livestock production. In addition, the physicochemical characteristics of the lithochromic shales are not conducive to the uptake of Se by plants, since they are acid and contain significant quantities of sulfate. Burial of these materials is likely to reduce the redox potential and promote the stability of selenite. The long-term fate of selenium is speculated to be controlled by coprecipitation with gypsum.

4.0 Recommendations for Reclamation

General recommendations for reclamation of the Hidden Valley site are listed below. It is expected that CONSOL will develop and submit more detailed engineering designs and plans that incorporate the concepts included in this section. The primary conceptual components of reclamation for the Hidden Valley site include:

1. Remove the alluvial-soil cover materials from the portal area slopes and redistribute to the terrace treads. The redistributed soil materials can be used to reduce the longitudinal slope gradients on the terrace treads.

2. Regrade the portal area slopes to more nearly match the slope gradients on the adjacent undisturbed areas (talus).

3. Cover the newly-regraded portal areas with the high coarse-fragment content sandstone borrow materials.

4. Broadcast seed the portal area slopes and regraded terrace treads with a locally adapted seed mix. Raking the seeded area is recommended to promote seed-soil contact.

5. No straw mulch is recommended for the newly-regraded slopes since the rock cover will function as a mulch.

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ESTIMATE OF COST
HIDDEN VALLEY MINE SITE
1997 WORK
JUNE 23, 1997
Revised AUGUST 12, 1997

ITEM	QUANTITY	EST. COST
1. Mob / demob	3 units	$3,750
2. R & R surface soil	475 cu. yd.	$1,306
3. Slope grading	3302 cu. yd.	$5,778
4. Coarse mat'ls. application	1400 cu. yd.	$3,850
5. Roadway grading	12 hr.	$1,080
6. Hand Labor	40 hr.	$1,400
7. Materials	Lump Sum	$2,000
TOTAL ESTIMATED COST		$19,164


76500 N
76250 N
76000 N
75750 N
64500 E
64750 E
65000 E
65250 E
65500 E
65750 E
66000 E
1" = 40'
"B" SEAM ADIT SLOPE
ACCESS ROAD
BORROW SOURCE
HV-1
HV-2
HV-3
HV-4
HV-5
HV-6
HV-7
HV-8
SURVEY BOUNDARY LOOP
"A" SEAM ADIT SLOPE
EXISTING TOPOGRAPHY
Topog Survey for
CONSOLIDATION COAL COMPANY
Hidden Valley Mine, Emery County UT
May 25, 1997 Scale: as noted
Surveyed by BTSW, Drawn by CW
BORROW SOURCE
- FINAL GRADE TO ENABLE VEHICLE PASSAGE
- FINAL CONFIGURATION MAY VARY TO FACILITATE COARSE MATERIAL SELECTION
BERM
2H:1V SLOPE
1 FT. CONTOUR INTERVAL
PROPOSED TOPOGRAPHY
LEGEND
CUT AREAS
- TO BE REDUCED TO 2H:1V SLOPE, COVERED W/12" MINIMUM THICKNESS OF COARSE MATERIAL
FILL AREAS
- TO BE PARTIALLY COVERED WITH COARSE MATERIAL
BORROW SOURCE
- FOR SELECT BORROW OF COARSE MATERIALS
2H:1V SLOPE AREA
- COVERED WITH 12" OF SELECTED LARGE MATERIAL FOR EROSION PROTECTION
SAMPLE SITE LOCATION
BOUNDARY MARK
CONSOLIDATION COAL COMPANY
WESTERN NON MINING OPERATIONS
P.O. BOX 566 SESSER, ILL 62884
HIDDEN VALLEY MINE
AMENDMENT TO RECLAMATION PLAN
1 8/97 G.W.R. DEFICIENCY RESPONSE
NO. SUB. DATE APPD. DATE BY DESCRIPTION
MINE HIDDEN VALLEY
DATE 6/97
CHKD. G.W.R.
SCALE AS NOTED
APPD.
DRAWING NO. 97-1
FILE HIDVAL.DGN
DRAWN B.D.B. SHEET OF

CONSOLIDATION COAL CO.
HIDDEN VALLEY MINE
"B" SEAM ADIT REGRADE
CROSS SECTIONS

CONSOLIDATION COAL CO.
HIDDEN VALLEY MINE
"B" SEAM ADIT REGRADE
CROSS SECTIONS

CONSOLIDATION COAL CO.
HIDDEN VALLEY MINE
"B" SEAM ADIT REGRADE
CROSS SECTIONS