

PacifiCorp

Energy West Mining Company

Cottonwood Mine

C/015/019

Cottonwood Fan Portal Phase I Bond Release

R645-301-300: Biology

Replace Entire Section

PACIFICORP

**PROPOSED COTTONWOOD FAN PORTAL AREA
COTTONWOOD CANYON**

300 BIOLOGY (R645-301-300)

TABLE OF CONTENTS

<u>REGULATION</u>		<u>Page</u>
R645-301-310	Introduction	1
R645-301-320	Environmental Description	2
R645-301-330	Operation Plan	3
R645-301-340	Reclamation Plan	4
R645-301-350	Performance Standards	5
R645-301-353.120	Revegetation	7

APPENDICES

Appendix A	Raptor Survey Results - 1996 (includes map Cottonwood Fan Portal Midterm Review Raptor Nest Location (KS1691C)
Appendix B	U.S.F.W.S. Letter (dated March 10, 1997)
Appendix C	Cottonwood Canyon Impact Zone Survey, Joseph M. Jarvis, 1981
Appendix D	Fish and Wildlife Resources Information (reference from MRP pages 2- 159 thru 2-174)
Appendix E	Vegetation Information for the Cottonwood Portal Area, Jerry R. Baker, 1982
Appendix F	Seed Mixture
Appendix G	Revegetation of the Soil Piles and Disturbed Slope Implemented in 1981
Appendix H	1994 and 1995 Proposed Cottonwood Fan Portal Vegetation Monitoring Reports
Appendix I	2002 Cottonwood Canyon Vegetation Monitoring Data: includes quantitative data for the 1998 reclamation [final]

310. INTRODUCTION

This section contains information provided from the Cottonwood MRP, revised maps, updated information for some areas, and answers to resolve the deficiencies found during the 1997 mid-term review.

The revegetation section has a revised seed mix that eliminates all introduced species and utilizes other species proven in field growth as determined from monitoring. (Trail Mountain Reference Area, mix suggested by the Division). Revised mapping, depicts as-built information of all 1998 final reclamation at the site.

The fish and wildlife resource information provides an improved updated map of nesting locations. A status sheet of nest locations is also included, as well as, a reference letter of endangered species.

320. ENVIRONMENTAL DESCRIPTION (R645-301-320)

This section contains information from Volume 1 and Volume 2 of the Cottonwood MRP, updated information on endangered and threatened species, and the 1996 raptor survey results.

To resolve the deficiencies found during the 1997 mid-term review of the fish and wildlife resource information section, the following has been completed. The map of raptor nesting locations near the Cottonwood Fan Portal Area has been updated. Drawing KS1691C will replace Plate 2-19A drawing CM-10587-WB. A status sheet for raptor nests has also been included (refer to Appendix A). A letter from the Fish and Wildlife Service has been included that lists endangered and threatened species that may occur in this area (refer to Appendix B).

The Cottonwood Portal Impact Zone Survey by J.M. Jarvis dated June 1981 has also been included (refer to Appendix C). This survey was required to locate any nesting efforts of bird species of high federal interest as well as protected raptors.

A reference copy of the wildlife resources information on pages 2-159 thru 2-174 from Volume 2 of the Cottonwood MRP has been included (refer to Appendix D). These pages contain information on wildlife habitat and vegetation for the Cottonwood Fan Portal Area.

The Vegetation Information for the Cottonwood Portal Area report by Jerry R. Baker dated July 1982 has been included in this section (refer to Appendix E). This report contains detailed information of vegetation in the disturbed area.

330. OPERATION PLAN (R645-301-330)

The Cottonwood fan portal area included 5 acres of disturbed habitat. Areas that could be reclaimed were seeded in 1981. This revegetation included approximately 2.5 acres or half of the original disturbed 5 acres. Reclamation of the remaining areas occurred in November, 1998. See drawing KS1710D Plate 5-5.

340. RECLAMATION PLAN (R645-301-340)

Reclamation of the Cottonwood Fan Portal is detailed in R645-301-500. Revised seeding and planting measures are included in this section under Performance Standards.

350. PERFORMANCE STANDARDS

Signs will be placed around the planted slopes for their protection. The area will be entered only to provide maintenance (as needed) and/or monitoring duties.

Weed control will not be undertaken unless it is determined necessary due to weed dominance and delayed rate of succession. All noxious weeds will be eradicated either chemically or physically if they become established on the site.

Rodent damage on revegetated areas will be assessed during monitoring periods. Species specific control measures will be implemented as necessary.

Annual monitoring will also include inspection for rills and gullies. Should these be present, they will be filled and the soil reseeded. Rill and gully repair will follow the regulations set forth in the Coal Rules R645-301-357.360 through R645-301-357.365. As repairs are recognized, the Division will be notified and the affected area will be reported in the annual vegetation report.

A new seed mix as suggested by the Division has been included (refer to Appendix F). In this new seed mix, all introduced species were eliminated. The mixture was also supplemented with other species proven in field growth monitoring at the Trail Mountain test plots. Revegetation techniques including issues such as slope, erosion control, and seed protection are outlined in R645-301-353.120. Revised mapping has also been provided. Drawing KS1700D Plate 5-1 has been updated to depict the past disturbance topography allowing improved details to determine quantities and area. Appendix G describes the first reclamation proceedings that occurred in 1981 (re-produced from the Cottonwood MRP - Volume 2).

Disturbed areas and soil piles of the proposed Cottonwood portal area total about five acres. Elevation is approximately 7,200 feet with a west and southwest exposure. On the steeper portion of the disturbed area, slope varies from 35-40°. The native plant community is dominated by Utah juniper and pinyon pine. However, both Douglas fir and White fir also occur. Common grasses are Salina Wildrye, Western Wheatgrass and Indian Ricegrass. Total aerial plant cover is about 40 percent. Soils are probably moderately alkaline and saline. Surface soil texture is a silt loam. Topsoil is shallow and rocky.

Revegetation of the proposed Cottonwood Fan Portal soil piles and disturbed slope was implemented in 1981 (refer to Appendix G). Quantitative and qualitative data were taken at the revegetated slopes as well as at the reference area. Based on the criteria outlined in the MRP, the slopes appear to be successful (refer to Appendix H). Cover and productivity sampling of the reclaimed slopes were conducted in accordance to R645-301-356 of DOGM's regulations. Dr. Patrick Collins, of Mt. Nebo Scientific Inc., used an 80% statistical confidence interval for establishing sample adequacy and group comparison tests. This is sufficient for base monitoring within the ten year responsibility period of the area. DOGM regulation R645-301-356.112 requires a statistical confidence interval of 90%. Based on the agreement between Dr. Collins and Ms. White of this discrepancy, the 1997 annual report of the reclaimed slope and reference area will reflect their decision. Dr. Collins 2002 vegetation survey is included in Appendix I.

Density sampling was established using point quarter distance method (refer to pg. 226 of the 1994 annual report and pg. 270 of the 1995 annual report). Table 9 in each of these reports show little to no significant difference of cover between revegetated slopes and reference areas; significantly more productivity between the revegetated slopes and reference areas; and significantly more woody species densities between the revegetated slopes and reference areas. Based on the findings of Dr. Collins, revegetation of the Cottonwood Fan Portal site has been successful. Therefore, the proposed species and methods are expected to be appropriate for final reclamation.

REVEGETATION (R645-301-353.120)

Seed Mixture: A revised seed mixture has been selected wherein all introduced species have been eliminated. Appendix F depicts the seed mix adopted for the proposed fan portal area. Shrub plantings, as outlined in Appendix F, were applied by seed spreading at the time of regular seeding process. The following revegetation techniques were used for final reclamation:

Revegetation Techniques

1. After soil placement was completed, the reclaimed areas (Terraces 1-4a on map KS1710D Plate 5-1) were covered with a straw mulch at a rate of 2000 lbs/acre. The straw was crimped, gouged, or plowed on the contour into the soil. This added organic content and structure to the soil.
2. The soil was then be deep gouged (pocked) throughout the reclaimed area to maximize moisture retention and erosion control.
3. Once pocking of each terrace was completed the approved seed mixture was broadcast with a "hurricane spreader" or hydroseeded.
3. The accessible ($\geq 2:1$ slopes) soil surfaces was then be turned lightly by hand-raking to cover seeds.
Note: Raking was not implemented with hydroseeding.
4. The revegetated areas were mulched with a wood fiber hydromulch and applied at a rate of 2000 lbs/acre and a tackifier applied at a rate of 150 lbs/acre. These applications were combined and applied in a one-step process. The seeding process was separate and prior to the mulching applications

Straw mulch with netting was utilized on the Johnson Mine Portal pad areas. All other areas were hydroseeded and hydromulched.

5. Fertilizer application was determined by the soil sample analysis and is as follows:

Ammonium nitrate	50 lbs/acre
Triple superphosphate	<u>75 lbs/acre</u>
Total Fertilizer Application	125 lbs/acre

The fertilizer was applied by using any of the two techniques; 1) by hand, after the application of the seed and before mulching, or 2) mixed with the mulching procedure previously described. The techniques used were at the discretion of the contractor and determined by the conditions encountered during revegetation.

Areas Previously seeded: Interim revegetation consists of the subsoil and topsoil piles, Old Johnson access road, basin areas, and recently the overland tube area. All interim areas totaled equal 1.65 acres. The final reclamation area previously seeded consists of the steep slope at the base of the proposed fan portal area and the upper diversion ditch terrace area totaling 2.32 acres. Refer to Plate 5-5 Drawing KS1710D.

Final reclamation Acres: Drawing KS1710D shows seeded locations for final reclamation. Areas depicted total 2.06 acres.

Maintenance, monitoring: revegetation success will be the same as detailed in the Wilberg Mine Revegetation section pages 4-20 thru 4-21.1.

COTTONWOOD CANYON AREA



ENERGY WEST MINING COMPANY
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
2002

SITE NAME: Soil Piles

AREA: Cottonwood Fan Portal Area

DATE: September 2-6, 2002

WORKERS: P. Collins, D. Collins

SLOPE: 35 deg.

EXPOSURE: Variable

ANIMAL USE/DISTURBANCE:

EROSION: Negligible

COVER: (Cover not sampled this year)

DOMINANT PLANT SPECIES OBSERVED:

Artemisia tridentata

Chrysothamnus nauseosus

Aster chilensis

Aster foliaceus

Penstemon palmeri

Elymus cinereus

Elymus lanceolatus

Elymus smithii

Elymus salinus

Elymus junceus

NOTES:

- 1) Recorded only qualitative data this year.
- 2) Sites looked excellent with good diversity.
- 3) Much of north pile has been removed. The remaining area has been reseeded (see photograph).

ENERGY WEST MINING COMPANY
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
2002

SITE NAME: Reclaimed Slope (old, '81)

AREA: Cottonwood Fan Portal Area

DATE: September 2-6, 2002

WORKERS: P. Collins, D. Collins

SLOPE: 35-41 deg.

EXPOSURE: W

ANIMAL USE/DISTURBANCE: Slight to moderate

EROSION: Minor erosion near roadside

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED:

Artemisia tridentata

Atriplex canescens

Atriplex confertifolia

Ceratoides lanata

Chrysothamnus nauseosus

Chrysothamnus viscidifolius

Ephedra viridis

Gutierrezia sarathrae

Aster foliaceus

Agropyron cristatum

Bromus carinatus

Elymus lanceolatus

Elymus salinus

Elymus smithii

Elymus junceus

Elymus cinereus

Poa pratensis

NOTES:

- 1) Slope is in excellent condition.
- 2) Qualitative sampling only this year.

ENERGY WEST MINING COMPANY
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
2002

SITE NAME: Reference Area

AREA: Cottonwood Fan Portal Area

DATE: September 2-6, 2002

WORKERS: P. Collins, D. Collins

SLOPE: 33 deg.

EXPOSURE: W

ANIMAL USE/DISTURBANCE: Slight to moderate

EROSION: Slight, natural patterns.

COVER:(see quantitative data)

DOMINANT PLANT SPECIES OBSERVED:

Amalanchier utahensis
Atriplex confertifolia
Chrysothamnus nauseosus
Eriogonum corymbosum
Ephedra viridis
Juniperus osteosperma
Pinus edulis

Stanleya pinnata
Machaeranthera canescens

Elymus salinus
Stipa hymenoides

NOTES:

- 1) This Reference Area still in good shape, but destructive results of a large storm event a few years ago.
- 2) Qualitative data only were taken this year.

ENERGY WEST MINING COMPANY
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
2002

SITE NAME: CFP Tube Convevor Area (1996 Seeding)

AREA: Trail Mtn. Mine/Cottonwood Fan Portal Area

DATE: September 2-6, 2002

WORKERS: P. Collins, D. Collins

SLOPE: 28 deg.

EXPOSURE: W, N, S.

ANIMAL USE/DISTURBANCE: None

EROSION: Negligible. Rocks in area seem to be greatly enhancing erosion control.

COVER: (no quantitative data taken this year)

DOMINANT PLANT SPECIES OBSERVED:

Atriplex canescens
Atriplex confertifolia
Artemisia tridentata
Chrysothamnus nauseosus

Aster foliaceus
Cirsium sp.
Linum lewisii
Penstemon palmeri

Elymus spicatus
Elymus lanceolatus
Elymus cinereus
Elymus smithii

- NOTES:
- 1) We sampled qualitative data this year.
 - 2) This year in this area we saw no yellow sweetclover.
 - 3) In 1997 the area was dominated by yellow sweetclover, whereas in 1998 we didn't see much of it. There was a lot again in 1999 and 2000. In 2001 there were many more desirable species and very little sweetclover. In 2002 we saw no yellow sweetclover and the fourwing saltbush looked much larger and mature. More shrubs were also present.
 - 4) Even though it was not seeded that long ago, the site was in excellent condition.

ENERGY WEST MINING COMPANY
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
2002

SITE NAME: Belt Portal ('96)

AREA: Cottonwood Fan Portal Area

DATE: September 2-6, 2002

WORKERS: P. Collins, D. Collins

SLOPE: Variable

EROSION: Negligible

EXPOSURE: SSW

ANIMAL USE/DISTURBANCE: Slight

COVER: (no quantitative data recorded)

DOMINANT PLANT SPECIES OBSERVED:

Artemisia tridentata

Chrysothamnus nauseosus

Rosa woodsii

Elymus cinereus

Elymus lanceolatus

Elymus salinus

- NOTES: 1) Qualitative sampling done in 2002.
- 2) Site looked very good.
- 3) Most of the area was dominated by Gt. Basin Wildrye.
- 4) Large boulders greatly enhanced erosion control.

ENERGY WEST MINING COMPANY
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
2002

SITE NAME: Portal Diesel ('96)

AREA: Cottonwood Fan Portal Area

DATE: September 2-6, 2002

WORKERS: P. Collins, D. Collins

SLOPE: 43 deg.

EXPOSURE: SW

ANIMAL USE/DISTURBANCE: Slight

EROSION: Negligible

COVER: (no quantitative data recorded this year)

DOMINANT PLANT SPECIES OBSERVED:

Chrysothamnus nauseosus

Astragalus cicer

Aster foliaceus

Elymus cinereus

Elymus smithii

Elymus lanceolatus

Elymus spicatus

Stipa hymenoides

NOTES:

- 1) In 2002, soil material from the topsoil pile was used to reclaim the 2 sediment ponds historical used at the CFP area. The area was then re-seeded in late summer or early fall 2002.
- 2) Cover seemed higher this year.
- 3) Site looked very good.
- 4) Site was dominated by grasses with some forbs and shrubs.

ENERGY WEST MINING COMPANY
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
2002

SITE NAME: Reclaimed Slope (Final) '98

AREA: Cottonwood Fan Portal Area

DATE: September 2-6, 2002

WORKERS: P. Collins, D. Collins

SLOPE: variable

EXPOSURE: SW

ANIMAL USE/DISTURBANCE: Slight

EROSION: Negligible

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED:

Aster chilensis

Aster glaucodes

Linum lewisii

Melilotus officinalis

Malcomia africana

Penstemon palmeri

Salsola pestifer

Agropyron cristatum

Elymus lanceolatus

Elymus junceus

Elymus cinereus

Elymus smithii

Elymus spicatus

- NOTES:
- 1) Generally, the site looked good.
 - 2) Road areas were rocky.
 - 3) There were patches where diversity was high; other areas diversity was low.
 - 5) We sampled quantitatively for cover (n=20) and woody species density (n=20).
 - 6) There were areas that had lots of small sagebrush seedlings.
 - 7) This was the 4th year of drought over the general area. This may have influenced the sampling results.

Woody Species Density	
RECLAIMED SLOPE '98	No/Ac
<i>Artemisia tridentata</i>	206.64
<i>Atriplex canescens</i>	533.83
<i>Chrysothamnus nauseosus</i>	602.71
<i>Gutierrezia sarothrae</i>	34.44
Total	1377.63

ENERGY WEST

Reclaimed Slope '98 (Final)

Cottonwood Fan Portal Area

Slope: Variable

Exposure: S W

Sample Date: 2 - 6 Sept 02

	1.00	2.00	3.00	4.00	5.00	6.00	7.00
SHRUBS							
<i>Artemisia tridentata</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Atriplex canescens</i>	0.00	0.00	0.00	0.00	5.00	0.00	10.00
<i>Chrysothamnus nauseosus</i>	0.00	2.00	10.00	0.00	0.00	0.00	0.00
FORBS							
<i>Artemisia drucunculus</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.00
<i>Aster chilensis</i>	0.00	0.00	2.00	5.00	5.00	0.00	5.00
<i>Linum lewisii</i>	0.00	0.00	0.00	0.00	5.00	0.00	0.00
<i>Melilotus officinalis</i>	0.00	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	10.00	5.00
GRASSES							
<i>Agropyron cristatum</i>	0.00	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	0.00
<i>Elymus cinereus</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.00
<i>Elymus junceus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Elymus lanceolatus</i>	0.00	0.00	0.00	0.00	5.00	0.00	0.00
<i>Elymus smithii</i>	0.00	0.00	0.00	0.00	5.00	0.00	0.00
<i>Elymus spicatus</i>	0.00	0.00	0.00	0.00	5.00	0.00	5.00
<i>Elymus trachycaulus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Stipa hymenoides</i>	25.00	3.00	3.00	5.00	0.00	10.00	0.00
COVER							
Total Living Cover	25.00	5.00	15.00	10.00	30.00	20.00	35.00
Litter	5.00	1.00	5.00	5.00	5.00	10.00	5.00
Bareground	20.00	70.00	10.00	55.00	40.00	50.00	35.00
Rock	50.00	24.00	70.00	30.00	25.00	20.00	25.00
% COMPOSITION							
Shrubs	0.00	40.00	66.67	0.00	16.67	0.00	28.57
Forbs	0.00	0.00	13.33	50.00	33.33	50.00	42.86
Grasses	100.00	60.00	20.00	50.00	50.00	50.00	28.57

	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
1.00	2.00	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	5.00	1.00	0.00	0.00
0.00	0.00	3.00	2.00	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	10.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	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
4.00	3.00	7.00	0.00	0.00	0.00	0.00	0.00	3.00	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

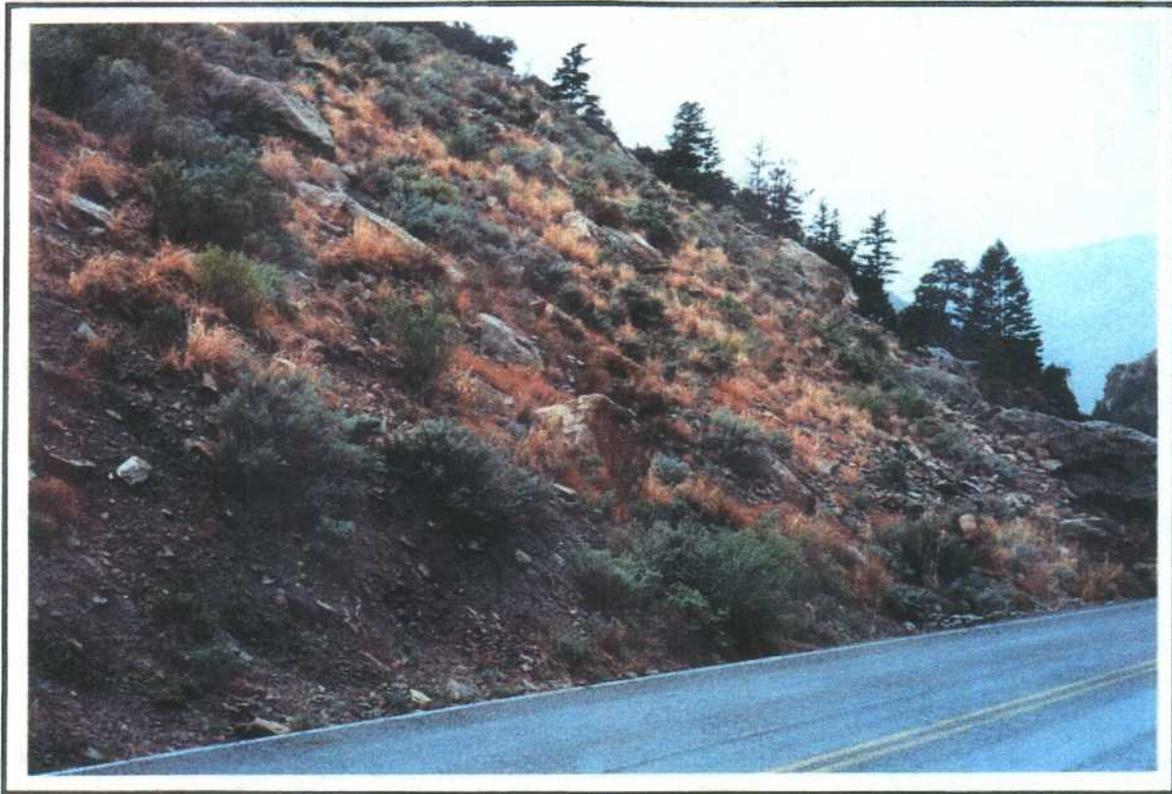
0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00
0.00	2.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	25.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	20.00	5.00	30.00	0.00	0.00
0.00	8.00	0.00	0.00	0.00	0.00	0.00	10.00	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	20.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

40.00	20.00	30.00	5.00	15.00	35.00	25.00	35.00	25.00	40.00
10.00	5.00	5.00	5.00	5.00	5.00	10.00	15.00	5.00	5.00
25.00	45.00	35.00	15.00	50.00	35.00	40.00	25.00	15.00	40.00
25.00	30.00	30.00	75.00	30.00	25.00	25.00	25.00	55.00	15.00

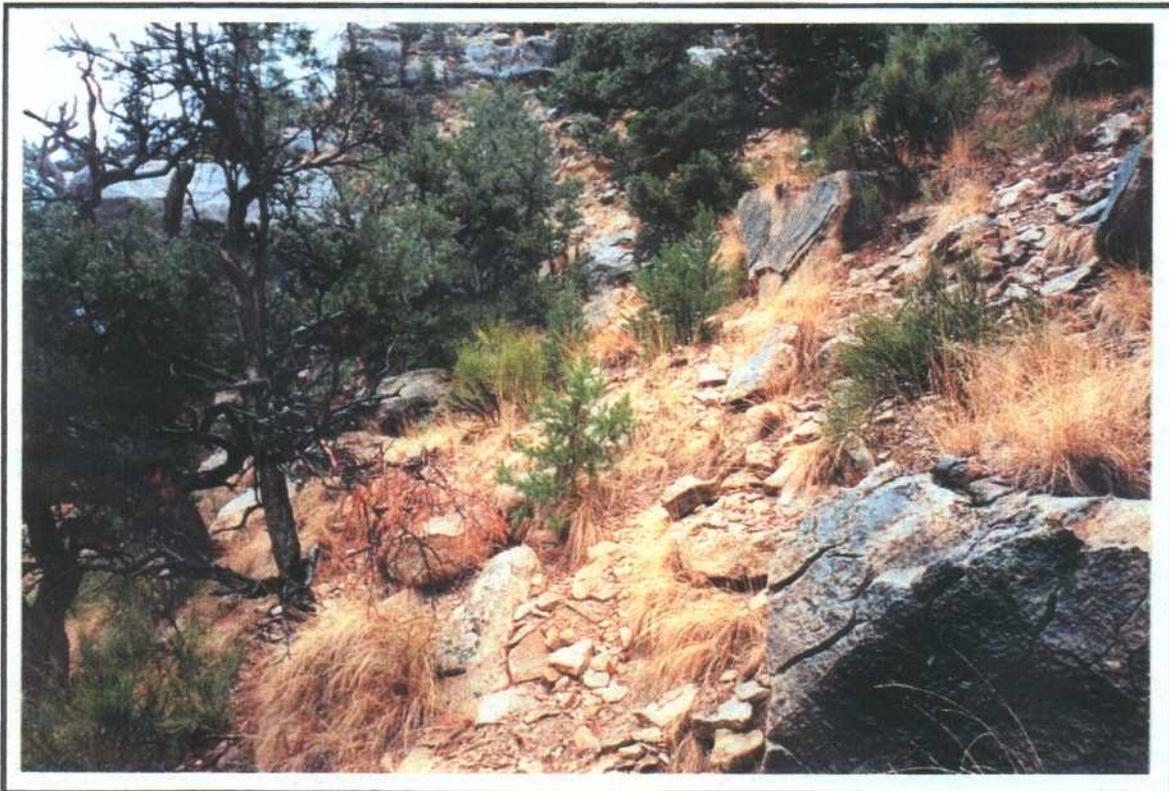
2.50	10.00	10.00	40.00	0.00	28.57	20.00	2.86	0.00	0.00
22.50	40.00	23.33	0.00	0.00	0.00	0.00	11.43	0.00	25.00
75.00	50.00	66.67	60.00	100.00	71.43	80.00	85.71	100.00	75.00

ENERGY WEST
 Reclaimed Slope '98 (Final)
 Cottonwood Fan Portal Area
 Slope: Variable
 Exposure: S W
 Sample Date: 2 - 6 Sept 02

18.00	19.00	20.00	Mean	SDev	Freq	
						SHRUBS
0.00	0.00	0.00	0.15	0.48	10.00	<i>Artemisia tridentata</i>
3.00	5.00	0.00	1.95	3.23	35.00	<i>Atriplex canescens</i>
0.00	0.00	2.00	0.95	2.27	25.00	<i>Chrysothamnus nauseosus</i>
						FORBS
0.00	0.00	0.00	0.25	1.09	5.00	<i>Artemisia drucunculus</i>
0.00	0.00	3.00	1.85	2.26	45.00	<i>Aster chilensis</i>
2.00	0.00	0.00	0.35	1.15	10.00	<i>Linum lewisii</i>
0.00	0.00	0.00	0.75	2.38	10.00	<i>Melilotus officinalis</i>
0.00	0.00	0.00	1.05	2.54	20.00	<i>Penstemon palmeri</i>
						GRASSES
0.00	0.00	0.00	0.75	3.27	5.00	<i>Agropyron cristatum</i>
0.00	0.00	0.00	0.75	3.27	5.00	<i>Bromus carinatus</i>
20.00	10.00	30.00	4.75	9.68	25.00	<i>Elymus cinereus</i>
0.00	0.00	0.00	1.60	5.49	15.00	<i>Elymus junceus</i>
0.00	0.00	0.00	1.00	2.55	15.00	<i>Elymus lanceolatus</i>
5.00	5.00	5.00	3.75	7.56	35.00	<i>Elymus smithii</i>
5.00	10.00	0.00	2.15	3.51	30.00	<i>Elymus spicatus</i>
0.00	0.00	0.00	0.25	1.09	5.00	<i>Elymus trachycaulus</i>
0.00	0.00	0.00	3.45	6.85	35.00	<i>Stipa hymenoides</i>
						COVER
35.00	30.00	40.00	25.75	10.99		Total Living Cover
10.00	10.00	10.00	6.80	3.17		Litter
25.00	20.00	25.00	33.75	14.99		Bareground
30.00	40.00	25.00	33.70	15.83		Rock
						% COMPOSITION
8.57	16.67	5.00	14.80	17.55		Shrubs
5.71	0.00	7.50	16.25	17.80		Forbs
85.71	83.33	87.50	68.95	22.18		Grasses



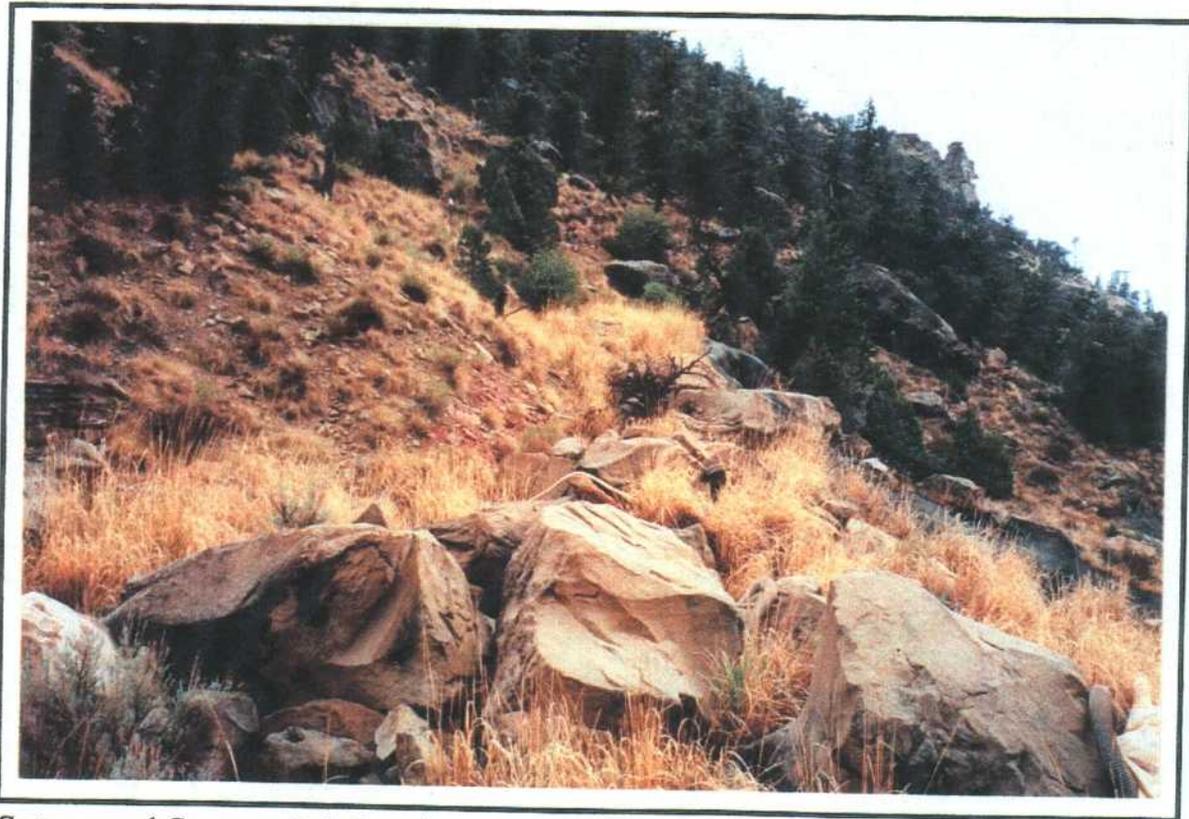
Cottonwood Canyon - Fan Portal Reclaimed Slope 1981



Cottonwood Canyon - Fan Portal Reference Area



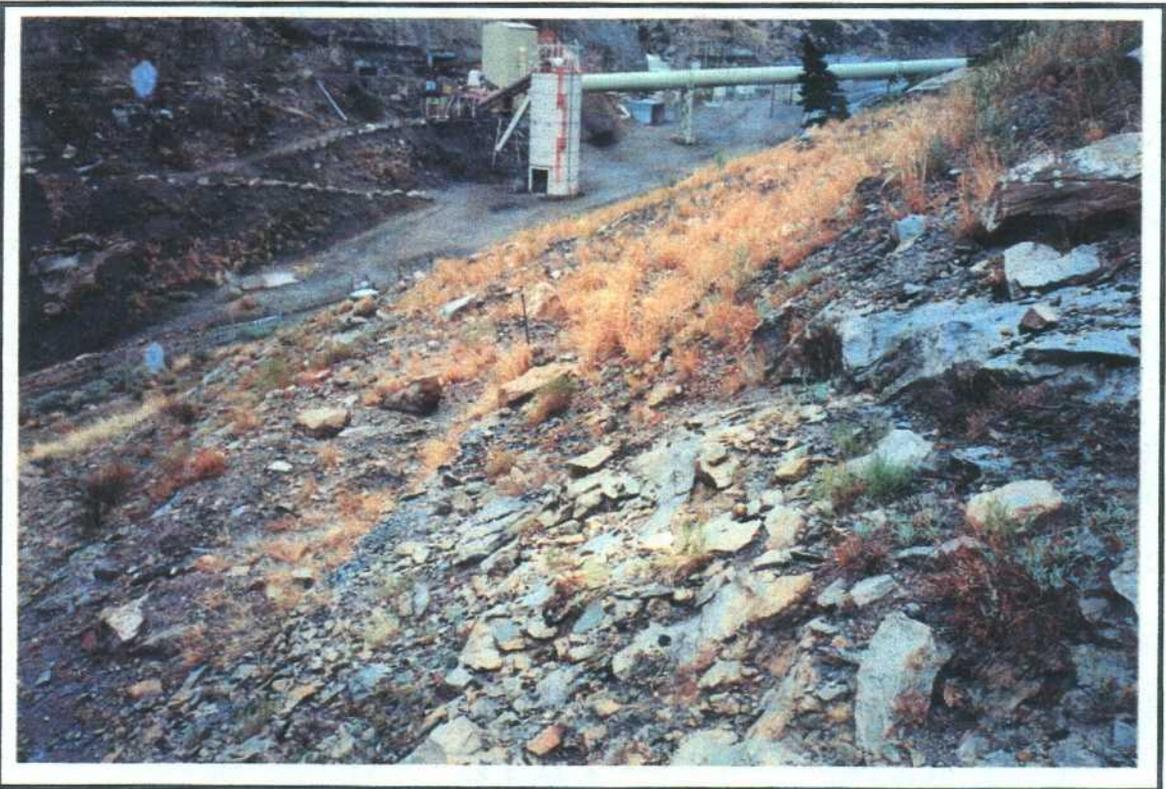
Cottonwood Canyon - Tube Conveyor



Cottonwood Canyon - Belt Portal 1996



Cottonwood Canyon - Portal (Diesel) 1996



Cottonwood Canyon - Reclaimed Slope 1998 (Final)

PacifiCorp
Energy West Mining Company
Cottonwood Mine

C/015/019

Cottonwood Fan Portal Phase I Bond Release

R645-301-500: Engineering

Replace Entire Section

PACIFICORP
COTTONWOOD FAN PORTAL
RECLAMATION PLAN
ACT/015/019

500 ENGINEERING (R645-301-500)

TABLE OF CONTENTS

<u>REGULATION</u>		<u>Page</u>
R645-301-510	Introduction	1
R645-301-550	Reclamation Design Criteria & Plans	2
R645-301-553.100	Backfilling, Grading	4
R645-301-553.110	Approximate original contour	5
R645-301-553.300:	Exposed Coal Seams, Acid Toxic Forming Materials	6

LIST OF APPENDICES

R645-301-500

Appendix A Computer Enhanced Photos of Cottonwood Canyon Fan

Portal:

- * Pre-Reclamation
- * Soil Placement Terrace #1
- * Soil Placement Terrace #2
- * Soil Placement Terrace #3
- * Soil Placement Terrace #4
- * Vegetation

510 INTRODUCTION

This section contains information to address the deficiencies found in the 1997 mid-term review, specifically backfill, grading, approximate original contour, and basin backfilling.

Refer to Pages 4-7 and 4-7.1 from MRP, Part 4, Volume 2. These pages reference the backfill safety factors, and grading along the contour.

550. RECLAMATION DESIGN CRITERIA & PLANS

This section responds to the deficiencies found in the mid-term review in regards to the regulations R645-301-553.100, backfilling and grading, and R645-301-110, approximate original contour restoration.

Existing Structures

Existing facilities, which include the access road to the Old Johnson Mine and two existing sedimentation basins. (Reclaimed November 1998 and July 2002, respectively)

The access road which originally served the Old Johnson Mine extended from the Cottonwood Canyon Road at a point across from the Trail Mountain Mine office road to the old portals at elevation 7,315 feet.

The existing sedimentation basins (reclaimed July 2002), located on the east side of Cottonwood Canyon road is retained and used to reduce suspended solids loading of storm runoff water from the disturbed portal area. The sedimentation basins were constructed during exploratory excavations. The North Basin is located south of the stockpile area and will collect the runoff from these two piles until revegetation has been established in this area (Drawing CM-10353-CP). The South Basin is located at the northwest corner of the disturbed portal area and will collect runoff from the portal site (Drawing CM-10351-CP).

In addition, an existing diversion ditch (refer to Map 3 [5-3-1] Cottonwood Fan Portal Hansen, Allen & Luce: Ditch UD-3), constructed above the exploratory excavation at the same time as the temporary sedimentation basins will be used to divert runoff around the proposed disturbed portal area. The diversion ditch runs in a north-south direction for a distance of 600 feet beginning at an elevation of 7,450 feet at its north end and declining to 7,375 feet at its southern extremity. Ditch UD-3 will be left to self reclaim. No maintenance will be conducted on this ditch.

NPDES Permit No. UT-0022896 has been issued for the Wilberg Mine and includes the sedimentation basins at the proposed Cottonwood Canyon Portal. By letter dated November 3, 1981, the Utah Department of Health, Division of Environmental Health has certified its compliance with State Water Quality Standards. Since July 2002 reclamation of the sedimentation ponds, the NPDES permit for discharge has been eliminated.

Water

No fresh water was required in the operation of the proposed Cottonwood Canyon Portal. No waste water was generated or discharged. Measures to protect the hydrologic balance will take the form of diversions, ditches and sedimentation basins.

Mine Water

There was no mine water discharged from the proposed Cottonwood Canyon fan portal.

Hydrological Design

The present disturbed area resulted as an action approved under a division exploratory license and subsequently included in the Cottonwood Mining Reclamation Permit . Drainage control for the area is accomplished using diversion ditches, culverts, sediment basins and rock gabion pooling ponds (refer to R645-301-700 Hydrology Section for a complete description of the hydrologic conveyence and sediment control structures).

553.100: BACKFILLING AND GRADING

Surveys conducted in early spring of 1997 have defined and determined backfill needs for each of the main terraces and secondary locations (refer to Plate 5-5 Drawing # KS1710D and photos in Appendix A). As mentioned in approximate original contour restoration section R645-301-553.110, some alterations were determined necessary in regards to restoring the site to as close to original contours as possible. PacifiCorp (Energy West) has provided within this volume drawings depicting quantities of material and sub/top soil placement (refer to Plate 5-5 Drawing # KS1710D and photos in Appendix A). It is Energy West's contention, as indicated in the already approved plan, that material at the base of the proposed site was not intended to be used as replacement backfill. But at the same time, Energy West intends to satisfy as best possible the reclamation needs in this area by using the stockpiled subsoil and topsoil (refer to 553.110: Approximate Original Contour Restoration). All stockpiled subsoil material was not used in the reclamation project due to the existing conditions of the site.

Again, the field observation by both Energy West and the Division personnel clearly determined that a different approach is necessary due to the existing conditions and limited constraints within this area. As observed during the onsite evaluation much of the lower portion above the existing reclaimed slope consists of a solid rock face. This creates a situation that limits good engineering practices related to backfilling or capabilities of maintaining fill material on such an area (refer to R645-301-230 of the Soils Section).

It was also determined that the upper section of the reclamation area for the proposed fan portal would not be feasible to reclaim. This was due to the height of the vertical cuts and limited horizontal shelf distance.

553.110: APPROXIMATE ORIGINAL CONTOUR RESTORATION

Recent surveys conducted during the spring of 1997 indicate that feasibility to reclaim all areas of the excavated proposed site are not feasible. Site evaluation was conducted by a disciplinary action team from the Division and PacifiCorp (Energy West) personnel during early 1997 and established that certain alterations are necessary in reclamation efforts on this particular site.

Energy West has surveyed all benches and delineated in the field slope locations and extent of fill as deemed necessary. PacifiCorp (Energy West) also commits to soil placement beyond the slope toes and to the natural downslope of designated bench or terrace areas. Rock placement and distribution are planned to assist in erosion control, fill sloughage, and aesthetics.

Subsoil and Topsoil Placement:

Top and Sub soil was excavated from the storage piles and hauled up the Old Johnson Mine access road and temporarily stockpiled at the flat area in front of the southern portal of the Old Johnson Mine. The material was hauled, from the temporary stockpile to the individual terraces. A total of four (4) terraces was reclaimed (refer to Plate 5-5 Drawing # KS1710D and photos in Appendix A). Backfilling of the four (4) terraces and the Old Johnson Mine access road allowed this area to resemble the surrounding environment and achieved approximate original contour and highwall elimination (refer to Plate 5-5 Drawing # KS1710D and photos in Appendix A).

Upper Diversion Bench and Diversion Ditch:

During the on site evaluation as mentioned above, the upper diversion terrace was discussed. It was considered at that time beneficial for the terrace to remain in place and not be restored to original contour. Some minor modifications would be necessary to provide the drainage along said terrace. These modifications include rerouting the drainage on the south end of

the diversion ditch and direct surface flow to the natural drainage channel approximately 100 feet south of existing angle change as indicated on drawing KS1700D, Plate 5-1 instead of turning downslope which at the present time has to be monitored and controlled for erosion.

Sediment Control Structure Removal:

Once the bonding period is complete and revegetation is satisfactory the sediment basins at the Proposed Cottonwood Canyon Fan Portal will be backfilled and graded as indicated on the x-section drawings CM-10351-CP, CM-10353-CP, Plate 3-10, refer to drawing KS-1742-D, Plate 5-5A for phase II reclamation. Basins were reclaimed in July, 2002.

R645-301-553.300: EXPOSED COAL SEAMS, ACID TOXIC FORMING MATERIALS

During the excavation process, the Hiawatha coal seam was exposed at the Cottonwood Fan Portal to determine seam characteristics and to gain engineering data for foundation analysis (referred to as Terrace 1). Backfill and grading during the reclamation process completely covered the exposed coal seam. Above the Hiawatha coal seam, several carbonaceous sequences were also exposed. These sequences occur naturally throughout the area. However, PacifiCorp conducted sampling to determine if the exposed carbonaceous layers were either acid or toxic forming materials. Results of the sampling (refer to the Soils Section, Appendix D) indicate that the two sites sampled, refer to Map 5-5 soils sites CFP0200 and CFP0400, are not consider acid or toxic forming based upon the criteria outlined by the Division (refer to R645-301-200 Soils: Appendix D). In addition, PacifiCorp analyzed the samples according ASTM standards to determine the combustible nature of the material. Results of the testing indicate (refer to results in Soils Section, Appendix D, sample analysis CFP0200 and CFP0400) that sample CFP0400 could not be defined as coal but had a BTU value of 3791. Sample CFP0200 could be defined as coal but only because of its high inherent moisture content. Coal is defines as a combustible rock containing more than 50% by weight of carbonaceous material including inherent moisture. The BTU value of sample

CFP0200 was 4911. The % ash in the two samples were 54.42% and 36.82%, respectively. It is highly unlikely that the exposed carbonaceous sequence would spontaneously combust given the normal meteorologic conditions found at the Cottonwood Fan Portal area and the small consolidated area.

PacifiCorp
Energy West Mining Company

Cottonwood Mine

C/015/019

Cottonwood Fan Portal Phase I Bond Release

R645-301-700: Hydrology

Replace Entire Section

PACIFICORP

COTTONWOOD FAN PORTAL
RECLAMATION PLAN

ACT/015/019

700 HYDROLOGY (R645-301-700)

TABLE OF CONTENTS

<u>REGULATION</u>		<u>Page</u>
R645-301-710	Introduction	1
R645-301-711	General Requirements	2
R645-301-712	Certification	3
R645-301-713	Inspection	4
R645-301-720	Environmental Description	5
R645-301-721	General Requirements (includes R645-301-722)	5
	A. Existing Groundwater Resources	5
	Groundwater Resources	5
	Post Mine Gravity Discharge	6
	B. Existing Surface Water Resources	6
	Surface Water Resources	6
	Surface Water Quality	7
R645-301-723	Sampling and Analysis	8
R645-301-724	Baseline Information	9
R645-301-724.100	Groundwater Information	9
R645-301-724.200	Surface Water Information	9

PACIFICORP

COTTONWOOD FAN PORTAL RECLAMATION PLAN ACT/015/019

700 HYDROLOGY (R645-301-700)

TABLE OF CONTENTS

<u>REGULATION</u>		<u>Page</u>
R645-301-724.300	Geologic Information	9
R645-301-724.400	Climatological Information	9
R645-301-724.600	Survey of Renewable Resources Lands	10
R645-301-725	Baseline Cumulative Impact Area Information	11
R645-301-728	Probable Hydrologic Consequences (PHC) Determination	12
	Description of the Mining Operation	12
	Geology	12
	Surface Water System	12
	Hydrologic Balance - Surface Water System	13
	Mitigation and Control Plans	13
	Surface Monitoring Plan	13
	Hydrologic Balance - Groundwater	14
	Mitigation	15
R645-301-729	Cumulative Hydrologic Impact Assessment (CHIA)	15
R645-301-730	Operation Plan	16
R645-301-731	General Requirements	16
R645-731-100	Hydrologic Balance Protection	16
	Groundwater Protection	16

PACIFICORP
COTTONWOOD FAN PORTAL
RECLAMATION PLAN
ACT/015/019

700 HYDROLOGY (R645-301-700)

TABLE OF CONTENTS

<u>REGULATION</u>	<u>Page</u>
Surface Water Protection	16
R645-731-200 Water Monitoring	16
Groundwater	16
Surface Water	17
R645-301-731.300 Acid and Toxic-Forming Materials	17
R645-301-731.500 Discharges	17
R645-301-731.600 Stream Buffer Zones	18
R645-301-731.800 Water Rights and Replacement	18
R645-301-732-764 Sediment Control	19
R645-301-750 Performance Standards	24
R645-301-751 Water Quality Standards and Effluent Limitations	24
R645-301-752 Sediment Control Measures	24
R645-301-760 Reclamation	25
R645-301-748, 755, 765 Casing and Sealing of Wells	27

710. INTRODUCTION (R645-301-710)

This application provides a detailed description of the hydrology, including groundwater and surface water of the Cottonwood Fan Portal area.

During 1980 exploration program was conducted consisting of removal of top/sub soil and native material to expose the Hiawatha seam for possible mine expansion along western permit boundary of the Cottonwood Mine. No underground mining occurred during the evaluation process and only a minor amount of coal was removal during the excavation.

During the evaluation of the Cottonwood Fan Portal approximately 5 acres were disturbed. Upon completion of the excavation, approximately 2.5 acres were reclaimed and seeded in 1981 (refer to Plate 5-5 Cottonwood Fan Portal Surface Facilities Map Phase I Reclamation: Revegetated Area).

711. GENERAL REQUIREMENTS (R645-301-711)

- 711.100 Existing hydrologic resources as given under R645-301-720
- 711.200 Proposed operations and potential impacts to the hydrologic balance as given under R645-301-730
- 711.300 The methods and calculations utilized to achieve compliance with hydrologic design criteria and plans given under R645-301-740
- 711.400 Applicable hydrologic performance standards as given under R645-301-750
- 711.500 Reclamation activities as given under R645-301-750

712. CERTIFICATION (R645-301-712)

All cross sections, maps, and plans required by R645-301-722 as appropriate and R645-301-731.700 will be prepared and certified according to R645-301-512.

713 INSPECTION (R645-301-713)

Two sedimentation basins were constructed in 1980 as part of the sediment control plan for the Cottonwood Fan Portal area. The design criteria and operational status is addressed in R645-301-732. Impoundments associated with the Cottonwood Fan Portal will be inspected as described under R645-301-514.300. Basins were reclaimed in July, 2002.

720. ENVIRONMENTAL DESCRIPTION (R645-301-720)

721. GENERAL REQUIREMENTS

The existing pre-mining hydrologic resource of the East Mountain property is detailed in Volume 9 - Hydrologic Section. The following section will discuss the hydrologic resources pertinent to the Cottonwood Fan Portal Reclamation Plan.

A. EXISTING GROUNDWATER RESOURCES

1. Groundwater Resources - Seeps
2. Post Mine Gravity Discharge

B. EXISTING SURFACE RESOURCES

1. Surface Water Resources
2. Surface Water Quality

A. EXISTING GROUNDWATER RESOURCES

1. GROUNDWATER RESOURCES - SEEPS

The characteristics and usefulness of a groundwater resource are dependent upon the geology of the water-bearing strata and on the geology and hydrology of the recharge area.

Groundwater movement and storage characteristics are dependent on the characteristics of the substratum. To facilitate an understanding of groundwater of the East Mountain property including the Cottonwood Fan Portal refer to Volume 9 - Hydrologic Section for a complete discussion of pertinent regional hydrologic and geologic features.

Groundwater resources of the Cottonwood Fan Portal are limited to a series of seeps located near the formational contact between the Blackhawk and Star Point Sandstone formations. Location of the seeps were identified during the slope cross section surveying project (refer to Plate 3-13 Cottonwood Fan Portal Hydrological Map, Drawing # CM-10501-CP). The source of the groundwater is from the winter snowpack which melts and infiltrates the lower Blackhawk Formation through vertical fractures. The groundwater flows down vertically until it intersects mudstone layers above

and below the Hiawatha seam. Groundwater flow continues horizontally downdip through the permeable sandstone channel located above the Hiawatha seam until it intersects the land surface in the form of seeps. Flow from the seeps is insufficient for quantity and quality determination. During reclamation, french drains will be installed to prevent slope failure due to saturation of the fill (refer to Plate 5-5 Cottonwood Fan Portal Surface Facilities Map Phase I Reclamation for a typical of a french drain). Construction of the french drain will consist of a layer of 2" drain rock to a depth of 6" to cover the affected area. A filter fabric will be placed over the drain rock to prevent contamination of the drain system. The size of the drain systems will be dependent upon topographic constraints along with size of the seep.

2. POST MINE GRAVITY DISCHARGE

No coal was removed except for a small quantity during the face procedure conducted in 1980. No direct connection exists from the mine workings of the Cottonwood Mine to the Fan Portal site. Gravity discharge from intercepted groundwater in the Cottonwood Mine will not occur at the Cottonwood Fan Portal area. As mentioned early, several small seeps occur along the formational boundary between the Blackhawk and Star Point formations. Flow from the seeps is insufficient for sample collection.

B. EXISTING SURFACE WATER RESOURCES

1. SURFACE WATER RESOURCES

The PacifiCorp permit area including the Cottonwood Fan Portal area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Cottonwood Fan Portal area is confined exclusively to the Cottonwood Canyon Creek drainage system (refer to Vol. 9 - Hydrologic Section: Map HM-1). For a complete discussion of the surface water systems of the East Mountain property including the Cottonwood Fan Portal refer to Volume 9 - Hydrologic Section.

The Cottonwood Fan Portal area consists of approximately 5 acres located on a west facing slope in the Cottonwood Canyon Creek drainage. Surface flow prior to the excavation in

1980 consisted of sheet flow downslope until intersecting the road drainage system of County Road 506. As part of the Cottonwood Fan Portal evaluation, three drainage ditches were constructed to divert the undisturbed runoff from the disturbed area (refer to Plate 3-13 Cottonwood Fan Portal Hydrological Map, Drawing # CM-10501-CP). Undisturbed drainage ditch UD-1 is located at the northern boundary of the Cottonwood Fan Portal site and reports to a 24" drop inlet which in turn reports to a 36" culvert directly tied to Cottonwood Canyon Creek bypass culvert. Undisturbed drainage ditch UD-2 is located adjacent to undisturbed area UD-1 and conveys undisturbed runoff along the old Johnson Mine access road and reports to a 36" culvert directly tied to Cottonwood Canyon Creek bypass culvert. Undisturbed drainage ditch UD-3 is located along the slope above the main disturbed area. Drainage from the ditch UD-3 flows from the north to the south and enters a natural drainage located along the southern boundary of the Cottonwood Fan Portal area. Two sediment basins (reclaimed July, 2002) were developed to collect and treat surface runoff from the disturbed area (refer to R645-301-732 for design criteria for the sediment basins). Outfall from the sediment basins discharges to the ditch located along the eastern boundary of the county road. Flow along the ditch is diverted to Cottonwood Canyon Creek through a 24" culvert located below the lower sediment basin.

2. SURFACE WATER QUALITY

Water from the disturbed area is diverted through a sediment basin prior to discharging to the receiving stream. In 1980 the sediment basins were incorporated into the Wilberg/Cottonwood UPDES permit: UT-0022896, as outfall location 002. Discharge water quality from the sediment basins is monitored according to UPDES permit stipulations. Discharge has not occurred from the sediment basin since 1982. Water quality and quantity of the receiving stream - Cottonwood Canyon Creek, is monitored above and below the Cottonwood Fan Portal area as specified in Appendix A of Volume 9 - Hydrologic Section . Results of the monitoring including hydrographs and water quality statistics are reported in the Annual Hydrologic Report. Since July 2002 reclamation of the sedimentation ponds, the NPDES permit for discharge has been eliminated.

723. SAMPLING AND ANALYSIS (R645-301-723)

Water quality sampling and analysis of samples collected by PacifiCorp will be done according to the "Standard Methods for the Examination of Water and Wastewater." Refer to Appendix A for sample documentation and analytical methods and detection limits (refer to Vol. 9 - Hydrologic Section).

724. BASELINE INFORMATION (R645-301-724)

PacifiCorp maintains an extensive groundwater and surface monitoring program to characterize pre-mining and any mining-related impacts both to quality and quantity (refer to Volume 9 - Hydrologic Section for baseline information collected in and adjacent to the East Mountain property). As an integral part of the permit application, an annual Hydrologic Monitoring Report is prepared by PacifiCorp and submitted to appropriate government agencies.

R645-301-724.100 GROUNDWATER INFORMATION

Groundwater resources of the Cottonwood Fan Portal are limited to a series of seeps which occur along the formational contact between Blackhawk Formation and the Star Point Sandstone. Flow from the seeps is insufficient for quality and quantity determinations.

R645-301-724.200 SURFACE WATER INFORMATION

A detailed description of all surface water bodies, i.e., streams and lakes, including quality, quantity, and usage is given in section R645-301-711 of Volume 9 - Hydrologic Section.

R645-301-724.300 GEOLOGIC INFORMATION

Applicable geologic information can be referenced in the Geologic section of this volume.

R645-301-724.400 CLIMATOLOGICAL INFORMATION

PacifiCorp operates a network of weather stations, including two at low elevations (Hunter and Huntington power plants) and two at high elevations (Electric Lake and East Mountain). Refer to Volume 9 - Hydrologic Section and the Annual Hydrologic Reports for a complete climatological description of the East Mountain permit area.

No mining occurred within the Cottonwood Fan Portal area.

725. BASELINE CUMULATIVE IMPACT AREA INFORMATION (R645-301-725)

Hydrologic and geologic data required to assess the probable cumulative impacts of the coal mining and reclamation activities are presented in the Hydrologic (including the Annual Hydrologic reports), Operational, and Reclamation sections of the permit applications.

728. PROBABLE HYDROLOGIC CONSEQUENCES (PHC) DETERMINATION (R645-301-728)

Probable hydrologic consequence determinations are based on extensive investigations conducted to determine existing groundwater and surface water resources along with ongoing hydrologic research and comprehensive monitoring programs including hydrologic and subsidence. Data utilized to arrive at the conclusions presented in this section were discussed earlier (see Section R645-301-711), and specific information pertaining to impacts to the hydrologic balance will be discussed under the appropriate section.

Description of the Mining Operation

No mining occurred at the Cottonwood Fan Portal. The site was initially developed in 1980 to determine the feasibility of expanding mining operations to the western boundary of the Cottonwood mine permit area. Subsequent changes in the mine plan eliminated this area from future considerations and this site was recommended for final reclamation in 1996.

Geology

A detailed description of the geology (structure and stratigraphy) has been presented in a previous section and will not be duplicated here. (Refer to R645-301-711).

Surface Water System

A detailed description of the regional and permit area surface water resources has been presented in previous sections and will not be duplicated here. (Refer to R645-301-722). In general, the surface drainage system of the Cottonwood Canyon Fan Portal area is within the Cottonwood Canyon Creek drainage. The data collected from the monitoring sites established along Cottonwood Canyon Creek is included in each annual Hydrologic Monitoring Report.

Impacts to surface water due to the reclamation of the Cottonwood Fan Portal area will be minor, both in terms of quality and quantity. A detailed analysis of the associated impacts is described in the Hydrologic Balance section below.

Hydrologic Balance - Surface Water System

As mentioned previously in this report, the drainage conveying runoff away from the Cottonwood Fan Portal area is Cottonwood Canyon Creek which is a tributary to Cottonwood Creek. Protection of the hydrologic balance from additional contribution of sediment solids will be addressed in the Mitigation and Control Plan discussed below.

Mitigation and Control Plans

All of the disturbed runoff will be treated to minimize additional contributions of sediment solids to the receiving stream. Sediment control devices utilized to control additional contribution of sediment solids include, two sediment basins (reclaimed July, 2002) designed for a 10 year/24 hour storm event, silt fence structures placed along the disturbed and undisturbed ditch lines and rock gabions placed along the disturbed ditch parallel to County Road 506 (refer to Plate 3-13 Cottonwood Fan Portal Hydrological Map, Drawing # CM-10501-CP). The two sediment basins were constructed in 1980 to treat disturbed area runoff (refer to Plate 3-13 Cottonwood Fan Portal Hydrological Map, Drawing # CM-10501-CP). In addition to the sediment basins, three undisturbed diversion ditches were constructed to divert runoff from the disturbed site. No maintenance will be conducted on these diversions. They will be allowed to reclaim naturally.

Surface Monitoring Plan

A hydrologic surface monitoring program, initiated in 1979 has been underway at each of the surface monitoring stations shown on Map HM-1 (refer to Vol. 9 - Hydrologic Section). Stations were established to monitor water quality and quantity above and below the mine permit areas including the Cottonwood Fan Portal. The parameters for laboratory analyses

are those established by DOGM in "Guidelines for Surface Water Quality" (refer to Vol. 9 - Hydrologic Section: Appendix A). Once baseline data have been collected (two-year period), the surface sites described in the hydrologic monitoring schedule in Appendix A will continue to be monitored quarterly (when accessible) throughout the operational and reclamation phase of the mine. The quarterly monitoring during the mine operational and reclamation phase will include flow and quality to delineate seasonal variation and assess changes in water quality. In addition to the surface water monitoring program, drainage from the Cottonwood Fan Portal area will be monitored at the sediment basin (reclaimed July, 2002) outfall (UPDES permit UT-0022896-002) according to specifications in the UPDES permit (this discharge site has been eliminated).

Future data may show that modifications of the monitoring schedule are justified. Any changes to the monitoring schedule (frequency or parameters) will be made only with the approval of DOGM. Results of all water quality data will be submitted to that agency quarterly, with an annual summary.

Reclamation monitoring of surface water will continue at representative stations determined with the aid and approval of DOGM. Representative surface water stations will be monitored biannually during high and low flow conditions. Monitoring will continue until the release of the reclamation bond or until an earlier date to be determined after appropriate consultation with local, state, and federal agencies.

Hydrologic Balance - Groundwater

As discussed in previous sections, groundwater of the Cottonwood Fan Portal area is limited to a series of seeps located at the formational contact between the Blackhawk Formation and the Star Point Sandstone. These seeps will be protected through the installation of french drains as discussed in R645-301-721.

Mitigation

Due to the limited groundwater resources a mitigation plan is not necessary for the Cottonwood Fan Portal.

729. CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT (CHIA) (R645-301-729)

The Division will provide an assessment of the probable cumulative hydrologic impacts of the proposed coal mining and reclamation operation and all anticipated coal mining and reclamation operations upon surface and groundwater systems in the cumulative impact area.

730 OPERATION PLAN (R645-301-730)

Water Monitoring Location Map: refer to Vol. 9 - Hydrologic Section: Map HM-1 and Plate 3-13 Cottonwood Fan Portal Hydrological Map, Drawing # CM-10501-CP .

731 GENERAL REQUIREMENTS (R645-301-731)

PacifiCorp has submitted a plan to minimize disturbance to the hydrologic balance, to prevent material damage, and to support approved post-mining land use (see Operational and Reclamation plans).

R645-731-100 HYDROLOGIC BALANCE PROTECTION

Groundwater Protection

Although the analysis of the overburden samples tested has shown that no toxic or hazardous materials are present, groundwater quality will be protected by handling earth materials and runoff in a manner that minimizes infiltration to the groundwater system.

Surface Water Protection

Surface water quality will be protected by handling earth materials, groundwater discharges, and runoff in a manner that minimizes the potential for pollution.

R645-731-200 WATER MONITORING

Groundwater

Due to the limited groundwater resources no groundwater plan is necessary for the Cottonwood Fan Portal area.

Surface Water

PacifiCorp has conducted baseline monitoring of surface waters within and adjacent to the Cottonwood Fan Portal area (refer to Annual Hydrologic Monitoring Reports). Long-term monitoring sites in Cottonwood Canyon Creek have been monitored quarterly since 1979. Monitoring equipment, structures used in conjunction with monitoring the quality and quantity of surface water on-site and off-site will be properly installed, maintained, operated, and will be removed by PacifiCorp when approved by the Division. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the "DOGM Guidelines for Surface Water Quality." Locations of all surface monitoring sites and sampling schedules can be found in Appendix A (refer to Vol. 9 - Hydrologic Section).

Surface water will be monitored and data will be submitted at least every three months for each monitoring location. Monitoring submittals will include analytical results from each sample taken during the quarter. When the analysis of any surface water sample indicates noncompliance with the permit conditions, PacifiCorp will promptly notify the Division and immediately take actions provided for in R645-300-145 and R645-301-731. For point source discharges, monitoring will be conducted in accordance with 40 CRF Parts 122 and 123, R645-301-751 and as required by the Utah Division of Environmental Health for National Pollutant Discharge Elimination System permit.

R645-301-731.300 ACID AND TOXIC-FORMING MATERIALS

Analysis of the overburden samples tested has shown that no toxic or hazardous materials are present (refer to R645-301-200 Soils Section for sample location and analytical results).

R645-301-731.500 DISCHARGES

Refer to UPDES information in Appendix B in Vol. 9 - Hydrologic Section of the Cottonwood Mine MRP.

R645-301-731.600 STREAM BUFFER ZONES

The Cottonwood Fan Portal area is within 100 feet of the original stream channel of Cottonwood Canyon Creek. Based on data collected by PacifiCorp, Cottonwood Canyon Creek is a intermittent stream from Section 24, Township 16 South, Range 6 East to the confluence with Cottonwood Creek. With the development of the Trail Mountain Mine adjacent the Fan Portal site, Cottonwood Canyon Creek was diverted through a 66" culvert throughout entire reach of the area proposed for reclamation. Buffer zones will not be required to protect Cottonwood Canyon Creek.

R645-301-731.800 WATER RIGHTS AND REPLACEMENT

No water rights will be affected by the reclamation activities conducted at the Cottonwood Fan Portal area.

732 - 764 SEDIMENT CONTROL (R645-301-732 thru R645-301-764)

The following section will outline the undisturbed and disturbed area runoff control facilities. The undisturbed runoff control facilities consist of ditches (labeled UD - for undisturbed ditch) and culvert C-1. Ditches UD-1 and UD-2 convey runoff to culvert C-1. Ditch UD-3 intercepts runoff above the Fan Portal Site and conveys runoff to the existing drainage to the south which is a tributary to the existing 48" County Road 506 culvert. This ditch will be allowed to self reclaim.

The disturbed area runoff control facilities consist of ditches which convey runoff from all disturbed areas (except DA-4) to the sediment basins (reclaimed July, 2002). Treatment for the runoff from sub-basin DA-4 is provided with vegetation and rock cover.

SUB-BASIN HYDROLOGIC CHARACTERISTICS

Sub-basin hydrologic characteristics are summarized in the following table.

COTTONWOOD MINE COTTONWOOD FAN PORTAL SUB-BASIN CHARACTERISTICS			
SUB-BASIN	AREA (acres)	VOLUME WEIGHTED CURVE NUMBER	TLAG (hrs)
UA-1	16.9	76	.111
UA-2	74.7	74	.183
UA-3	16.3	75	.110
TOTAL	107.9		
DA-1	1.2	81.8	.067
DA-2	2.3	80.3	.080
DA-3	1.5	85.5	.086
DA-4	1.8	69.5	.066
TOTAL	6.8		

Volume weighted curve number for each sub-basin was derived using curve numbers based on soil type and cover density for areas of different cover within the sub-basin (refer to

appendix for sub-basin specific details). The following different types of cover were identified in the sub-basins associated with the Cottonwood Fan Portal Site.

Juniper-Pine Grass Complex: The slopes above the Fan Portal Site are estimated to have an effective cover of 51% with a Curve Number of 72 (see Figure 9.6 in the appendix taken from SCS, 1972).

Sage-Grass Complex: The sage-grass areas are estimated to have an effective cover of 54% with a Curve Number of 62 (see Figure 9.6 in the appendix taken from SCS, 1972).

Temporarily Reclaimed: Areas which have been temporarily reclaimed are estimated to have an effective cover of 50% of herbs with a Curve Number of 80 (see Figure 9.6 in the appendix taken from SCS, 1972).

Disturbed Areas: Areas which have been disturbed during the construction activities are assumed to have a Curve Number of 90.

RUNOFF CONTROL CULVERTS AND DITCHES

The runoff control culverts and ditches are classified as temporary structures and are to have capacity for a 10 year 6-hour storm event. The storm runoff peak for the 10 year 6-hour event was found using HEC-1 (see input and output in appendix) with a precipitation depth of 1.55 inches (Miller et. al., 1973). The 10 year 6-hour peak runoff at each of the selected culverts is summarized in the following table along with the required minimum pipe slope to convey the design flow. The required inlet depth to pass the design flow was found using "Hydraulic Charts for the Selection of Highway Culverts" HEC 5 (US DOT, 1965). The required minimum pipe slope for inlet flow conditions was found using the Mannings Equation (see calculations in appendix).

COTTONWOOD FAN PORTAL CULVERT DESIGN CRITERIA				
CULVERT	DESIGN FLOW (cfs)	PIPE DIAMETER (IN)	REQUIRED HEAD WATER DEPTH (ft)	REQUIRED MINIMUM SLOPE (ft/ft)
C-1	14.0	36	2	.002
C-2	1.7	24	1	.001
C-3	.6	24	1	.001
C-4	.6	18	1	.001

The following table presents the design criteria for the runoff control ditches at the Fan Portal Site. The channel depth shown on the following table includes 0.5 feet of freeboard. Ditch hydraulics were analyzed with the Mannings flow equation. A Mannings n of 0.03 was assumed for unlined ditches. Riprap was sized with a minimum safety factor of 1.5 in accordance with the methods presented in the Barfield et. al. (1981). Riprap is assumed to be needed where velocities exceed 5 feet per second. Ditch UD-2 and the south end of ditch UD-3 require riprap lining.

COTTONWOOD FAN PORTAL DITCH DESIGN CRITERIA					
CHANNEL	DESIGN FLOW (cfs)	MAXIMUM SLOPE (ft/ft)	BOTTOM WIDTH (ft)	SIDE SLOPE (H/V)	CHANNEL DEPTH (ft)
UD-1	3.1	0.13	4	2.0	1.0
UD-2	11.0	0.09	3	2.5	1.0
UD-3	2.8	0.20	3	2.5	1.0
DD-1	0.4	0.10	1	2.0	1.0
DD-2	0.6	0.18	1	2.0	1.0
DD-3	0.6	0.10	1	2.0	1.0
DD-4	0.7	0.12	1	2.0	1.0
DD-5	0.8	0.11	1	2.0	1.0

10-YEAR 24-HOUR STORM RUNOFF VOLUMES AND MEAN ANNUAL SEDIMENT YIELD TO SEDIMENT BASINS (Reclaimed July, 2002)

Storm runoff from Sub-basin DA-1 is treated by the north sediment basin and runoff from Sub-basin DA-2 and DA-3 is treated by the south sediment basin. The following table presents a summary of the tributary drainage to the north and south sediment basins. The existing sediment basins have the capacity for the runoff from the 10-year 24 hour rainfall event and the mean annual sediment yield.

COTTONWOOD FAN PORTAL				
SEDIMENT BASIN CAPACITY (Reclaimed July, 2002)				
10-YEAR 24 HOUR RUNOFF VOLUMES & MEAN ANNUAL SEDIMENT YIELD				
SEDIMENT BASIN	TRIBUTARY AREA (acres)	10 YR 24 HR RUNOFF (acre-feet)	MEAN ANNUAL SEDIMENT YIELD (acre feet)	BASIN CAPACITY (acre-feet)
NORTH	1.2	0.09	0.01	0.11 0.15*
SOUTH	3.8	0.30	0.16	0.52 0.50*

* Volumes re-calculated based upon 1997 cross sections.

SEDIMENT CONTROL MEASURES

Upon completion of the site exploration in 1980, sediment control measures were implemented to minimize additional contributions of sediment solids to the receiving stream. Sediment control devices utilized to control additional contribution of sediment solids include, two sediment basins (reclaimed July, 2002) designed for a 10 year/24 hour storm event, silt fence structures placed along the disturbed and undisturbed ditch lines and rock gabions placed along the disturbed ditch parallel to County Road 506 (refer to Plate 3-13 Cottonwood Fan Portal Hydrological Map, Drawing # CM-10501-CP). The two sediment basins were constructed in 1980 to treat disturbed area runoff (refer to Plate 3-13 Cottonwood Fan Portal Hydrological Map, Drawing # CM-10501-CP). In addition to the sediment basins,

three undisturbed diversion ditches were constructed to divert runoff from the disturbed site. All diversion ditches will be allowed to reclaim naturally. No maintenance will be conducted. In areas where adequate soil was present or stored, an approved seed mixture was applied at a application rate specified by the Division (refer to Plate 5-5 Cottonwood Fan Portal Surface Facilities Map Phase I Reclamation: Revegetated Area). Areas of final reclamation have been monitored according to the approved schedule for vegetation success rates (refer to R645-301-300).

750. PERFORMANCE STANDARDS

**751. WATER QUALITY STANDARDS AND EFFLUENT LIMITATIONS
(R645-301-751)**

Discharges of water from areas disturbed by coal mining and reclamation operations will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the EPA set forth in 40CFR Part 434 (refer to Vol. 9 - Hydrologic Section : Appendix B for UPDES permit information).

752. SEDIMENT CONTROL MEASURES

Sediment control measures will be located and maintained according to plans and designs given under R645-301-732.

760. RECLAMATION

761. GENERAL REQUIREMENTS

Before abandoning the Cottonwood Fan Portal area or seeking bond release, PacifiCorp will ensure that all temporary structures are removed and reclaimed. Temporary structures utilized at the Fan Portal site include two sediment basins (reclaimed July, 2002), silt fence structures, gabions and undisturbed diversion ditches excluding #UD-3 and #DD-4 which will be retained. The use of a sediment modeling program (RUSLE ver. 1.06) was used to justify the removal of the two sediment basins. This information is detailed in Appendix B of this chapter.

762. ROADS

The "Old Johnson Road" will be utilized to access reclamation activities associated with the Cottonwood Fan Portal. Reclamation of the road will commence immediately after it is no longer needed for reclamation operations (refer to R645-301-400 for details concerning reclamation of the access road). Silt fencing will be placed according to need along the road outslope, base of backfill, to insure sediment control.

762.100

Cut and fill slopes will be reshaped to be compatible with the postmining land use and to complement the drainage pattern of the surrounding area. Ditches DD-4 and UD-3 will be retained in their current configurations to prevent undisturbed/disturbed runoff from affecting the steep slope reclamation project. These ditches will be allowed to reclaim naturally. No maintenance will be conducted.

763. SILTATION STRUCTURES

During the reclamation process and until vegetation success is achieved, all temporary structures will be retained and maintained. In addition to the operational siltation structures (refer to Plate 5-5 - Surface Facilities Map Phase I Reclamation [sediment basins, ditches, silt fence structures]) silt fence structures will be installed during reclamation above the upper sediment basin (reclaimed July, 2002) and along the base of the major slope area which is on the main fill embankment terrace. This terrace provides drainage (Ditch DD-4) to the existing south sediment basin. In no case will the structures be removed sooner than two years after the last augmented seeding. When the siltation structures are removed, the land on which the siltation structure is located will be regraded and revegetated in accordance with the reclamation plan. Refer to Plate 5-5A Drawing # KS1742D Cottonwood Fan Portal Surface Facilities Map Phase II Reclamation for the final basin site configurations including filling of the sediment basins.

After the sediment basins have been filled, silt fence will be used to control sediment until vegetation is well established.

SEDIMENT CONTROL

Sediment control measures (silt fences) will be installed during Phase II reclamation after removal of the basins. Silt fence will be installed at the lowest point of disturbance at each of the basins.

TOPSOIL AND SUBSOIL PILE SEDIMENT CONTROL

After removal of the topsoil pile and subsoil pile to the extent required, contouring and reseeded will be completed according to the MRP, reclamation plan. Silt fence will be installed at the base of each pile to control sediment until vegetation can be established, when vegetation meets standards as required by the Division the silt fencing will be removed.

748., 755., 765. CASING AND SEALING OF WELLS

(R645-301-748-755, R645-301-748, R645-301-765)

No wells exist within or adjacent to the Cottonwood Fan Portal.

PacifiCorp
Energy West Mining Company
Cottonwood Mine

C/015/019

Cottonwood Fan Portal Phase I Bond Release

R645-301-700: Hydrology, Appendix B

Replace Entire Appendix Section

**PacifiCorp
Cottonwood Fan Portal**

Justification to Remove Sediment Basins

Appendix B

Sediment Loss Modeling for Justification to Remove Sediment Basins

Sediment loss was calculated, using the Revised Universal Soil Loss Equation (RUSLE) ver. 1.06, to determine if reclamation practices would cause or contribute to the degradation of downstream water quality. RUSLE is a set of mathematical equations that estimates soil loss and sediment yield resulting from rill and interrill erosion. This empirically derived value was used to compare modeled sediment loss from a disturbed area to a typical undisturbed area with similar aspect, elevation, and slope. The equation uses the factors as follows:

$$A=RKLSCP$$

Where:

- A = Average annual soil loss in tons per acre per year
- R = Rainfall/runoff erosivity
- K = Soil erodibility
- LS = Hillslope length and steepness
- C = Cover management
- P = Support practice

Sediment loss for the Cottonwood Fan Portal Area was determined by calculating the sediment loss from a detailed area of the proposed mine site reclamation. Drawing KS-1881D shows this area and where each calculation was made. Slope profiles were placed on runoff plains within the reclaimed area. The areas were divided according to the direction of runoff. Each profile was identified by cross-section. For instance, cross-section 52+00 passes through the area where the slope profile was calculated, therefore, the slope profile was named 52+00.

Data for the undisturbed area was collected from a previously modeled undisturbed area of the Des Bee Dove Mine. The slope profile calculations are similar in aspect, slope, elevation, vegetative and rock cover, soil characteristics and temperature. Refer to the Des Bee Dove permit, Appendix XIV, Phase I Reclamation Plan for slope profiles. Input data for this area is included on the disk provided.

The area selected to calculate sediment loss is considered representative for the entire disturbed drainage area. In other words, the average loss is determined from the reclaimed areas and then multiplied by an acreage factor. The RUSLE program is found in this appendix on the 3.5" floppy disk labeled RUSLE, Cottonwood Fan Portal Area, Input Parameters for Soil Loss Calculations. A review of the files will present all values used to determine sediment loss on the disturbed areas. The RUSLE equation factors mentioned above are discussed below. Table 1 summarizes sediment loss calculations used in RUSLE.

The R-factor is the expression of the erosivity of rainfall and runoff. Rainfall data can be found in the City database within RUSLE. Editing of the City database was conducted in order to gain historical meteorological data similar to the conditions found at the Des Bee Dove mine site (i.e.

temperature, precipitation, elevation, exposure, etc.). Sixteen (1976-1992) years of precipitation and temperature data from the town of Hiawatha, Utah was added to the data base in order to conduct this modeling exercise. The estimated R-value for this area calculated to be 10 for both disturbed and undisturbed areas.

The K-factor is an expression of the inherent erodibility of the soil or surface material at the Cottonwood Fan Portal Area. Redistributed soil material used for reclamation was originally derived from native sandstone and shale parent materials. Chemical analysis of these materials were conducted in 1997 to estimate the chemical characteristics of the facility benches. The data (average of % sand, silt, clay, and rock cover of all sampling conducted on the benches) from these samples was used to calculate the K-factor for the disturbed areas of the mine (refer to **R645-301-200: Soils** to review this data). The K-factor estimated for the reclaimed disturbed areas of the Cottonwood Fan Portal Area is 0.307. The K-factor result for the undisturbed area is 0.21.

Topography was taken into account when calculating the LS-factor. This factor takes the hillslope length (L) and gradient (S) as contributing to erosion. If either one of these factors increase, total soil loss per unit area will also increase. Various lengths and gradients were used in each profile and are shown on Drawing KS-1881D in this appendix.

The cover-factor (C) was determined for the soil in a reclaimed state. This site was reclaimed in 1998 and some vegetation has established. Vegetation data from the 2002 vegetation survey (refer to R645-301-300: Biology, Appendix I) conducted by Mt. Nebo Scientific was used to determine this factor. The maximum roughness, however, was used in this calculation since deep pocking was utilized over the entire reclamation site. Other ground cover entries were also used such as rock fragments and vegetative residue (i.e. straw or wood fiber mulch). These entries were conservatively used since no data has been established.

The support practice (P) factor is important when calculating for the disturbed area. It allows credit for creating closed outlet terraces or sediment basins (i.e. pocking) spaced evenly along the hillslope profile.

Listed below in Table 1 are the values used to calculate sediment loss from the reclaimed portions of the Cottonwood Fan Portal Area.

The table indicates sediment contributions from the disturbed areas of the Cottonwood Fan Portal Area. Table 1 shows that the average sediment loss from the reclaimed area is estimated at 0.20 tons/acre/year or based on approximately 5 acres of disturbance, 1.0 tons/year. It is assumed the remainder of the reclaimed disturbed area will be similar to the study area.

Table 1: Soil loss calculations of the Cottonwood Fan Portal Area reclaimed area utilizing RUSLE.

Location*	50+00	52+00	54+00
R	10	10	10
K	0.322	0.326	0.289
LS	19.48	21.36	23.52
C	0.0404	0.0393	0.0385
P	0.077	0.077	0.077
SDR	0.008	0.008	0.008
A	0.1951	0.2107	0.2015
SY	0.0203	0.0219	0.0209

* Refer to Drawing KS-1881D in this Appendix for the location of each hillslope profile.

It can be seen in Table 1 that the support practices greatly reduce sediment loss (sediment yield) from the site. Credits were allowed for pocking mulching, and tackifying the reclaimed surface to reduce runoff and loss of sediment. Although straw bales and sediment fences were installed as part of the sediment pond removal, their effect is ignored in the calculations using the RUSLE.

Table 2 shows the modeling results of the undisturbed area at the Des Bee Dove Mine. Sediment loss (A) is notable less than that of the disturbed, however, the sediment yield is similar.

Table 2: Soil loss calculations of the Des Bee Dove Mine undisturbed area utilizing RUSLE.

Location**	DBD A1-1U	DBD A1-2U	DBD A1-3U	DBD A2-1U	DBD A2-2U	DBD A2-3U
R	10	10	10	10	10	10
K	0.2	0.2	0.2	0.2	0.2	0.2
LS	14.5	16.2	14.3	13.3	7.71	16.3
C	0.0017	0.0017	0.0017.0	0.0017	0.0017	0.0017
P	1.0	1.0	1.0	1.0	1.0	1.0
SDR	1.0	1.0	1.0	1.0	1.0	1.0
A	0.0493	0.0551	0.0486	0.0452	0.0262	0.0554
SY	0.0493	0.0551	0.0486	0.0452	0.0262	0.0554

** Refer to Drawing CS-1854D in Appendix XIV in Des Bee Dove MRP for the location of each hillslope profile.

The results illustrated in Table 2 show similar annual sediment yields per acre in the disturbed area as compared to the undisturbed. This is due directly to the deep gouging and mulching techniques that were used during final reclamation. As shown by the values in the "P" (support practices) and "SDR" (sediment delivery ratio), much of the sediment that is detached as a result of rill and interrill erosion processes is trapped within the pocks or stabilized by mulching practices. The sediment yield from the disturbed area is near zero (0). Sediment contributions from the disturbed areas is expected to be negligible