PacifiCorp

Energy West Mining Company

Deer Creek Coal Mine

North Rilda Canyon

Portal Facilities

Amendment to Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah Task ID #3613

Volume 11

File in:
❑ Confidential
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Date Folder 11042010 C/0150018
See Incoming For additional information

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

Five (5) Clean Copies – Volume 11, Deer Creek Mine, North Rilda Canyon Portal Facilities, Introduction Tab

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Text Section - Entire Section including Figures

C/015/018 Incoming
#3613
a

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

P.O. Box 310
15 North Main Street
Huntington, Utah 84528

COPY

November 3, 2010

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

Subj: **Clean Copy Submittal for the Amendment to Update the Deer Creek Mining and Reclamation Permit, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613.**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West"), as mine operator, hereby submits the clean copies to the above stated amendment that was conditionally approved on October 5, 2010.

Energy West originally submitted this amendment on June 30, 2010. After the Division's technical analysis of the amendment submittal, the Division found three (3) deficiencies and returned the entire submittal back to the permittee, Energy West.

Energy West corrected the permit submittal to address the Division's concerns and re-submitted for review. On October 5, 2010, the Division conditionally approved this amendment application on the condition that the permittee submit clean copies for incorporation into the Deer Creek MRP.

This clean copy submittal includes six (6) clean copies of the amended information in Volume 11, Volume 11a, and Volume 11b. Also included is the C2 form for aid in incorporating the approved information into the MRP.

As keeping with our original plan, Energy West has completed the first of three parts of this amendment process for the Rilda Facilties. The three parts are as follows:

Part 1 (Current Submittal to Complete) – Update Volume 11, Volume 11 Appendix Volume A, Volume 11 Appendix Volume B – text, maps, and data,

Part 2 – Update bonding calculations for the Rilda facilities (to include Chapter 800 Bonding),

Part 3 - Reduce the permit area for the Deer Creek Mine to include only those areas that are currently bonded.

Energy West will now proceed with Part 2 by recalculating the reclamation bond for the Rilda Facilities. If you have any questions or concerns regarding this submittal, please contact Dennis Oakley at (435) 687-4825.

Sincerely,

for Kenneth Fleck
Geology and Environmental Affairs Manager

File in:
☐ Confidential
☒ Shelf
☐ Expandable
Date Folder 11042010 C/0150018
See: Incoming For additional information

Enclosures C2 Form
Volume 11
Volume 11 Appendix Volume A
Volume 11 Appendix Volume B

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

COPY

Permittee: PacifiCorp
Mine: Deer Creek **Permit Number:** C/015/0018
Title: Clean Copy Submittal to Update Volume 11, Rilda Canyon Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah, Task ID #3613.

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐ Add	☒ Replace	☐ Remove	Volume 11, Introduction Tab, Text Section, Add Red-line text and remove Strikeout text
☐ Add	☒ Replace	☐ Remove	Volume 11, Introduction Tab, Replace Figures A, B, and C
☐ Add	☐ Replace	☒ Remove	Volume 11, General Tab, Remove Tab, and entire contents
☐ Add	☒ Replace	☐ Remove	Volume 11, Soils Tab, Text Section, Add Red-line text and remove Strikeout text
☐ Add	☒ Replace	☐ Remove	Volume 11, Biology Tab, Text Section, Add Red-line text and remove Strikeout text
☐ Add	☒ Replace	☐ Remove	Volume11, R645-301-300 Biology Maps Tab, Replace Maps Table of Contents cover sheet
☐ Add	☒ Replace	☐ Remove	Volume 11, R645-301-300 Biology Maps Tab, Replace Maps 300-1, 300-2, 300-3, 300-4, 300-5 and 300-6
☐ Add	☒ Replace	☐ Remove	Volume 11, Land Use and Air Quality Tab, Text Section, Add Red-line text and remove Strikeout text
☐ Add	☒ Replace	☐ Remove	Volume 11, Land Use and Air Quality Tab, R645-301-400 Maps Tab, Replace Maps Table of Contents coversheet
☐ Add	☒ Replace	☐ Remove	Volume 11, R645-301-400 Land Use and Air Quality Maps Tab, Replace Map 400-1
☐ Add	☒ Replace	☐ Remove	Volume 11, Engineering Tab, Text Section, Add Red-line text and remove Strikeout text
☐ Add	☐ Replace	☒ Remove	Volume 11, Engineering Tab, Remove Appendix A
☐ Add	☒ Replace	☐ Remove	Volume 11, R645-301-500 Engineering Figures Tab, Replace FigureR645-301-500c
☐ Add	☒ Replace	☐ Remove	Volume 11, R645-301-500 Engineering Figures Tab, Replace FigureR645-301-500d
☐ Add	☒ Replace	☐ Remove	Volume 11, R645-301-500 Engineering Maps Tab, Replace Replace Maps Table of Contents cover sheet
☐ Add	☒ Replace	☐ Remove	Volume 11, R645-301-500 Engineering Maps Tab, Replace maps, 500-1 (1of 3 thru 3 of 3), 500-3, 500-4 (1 of 4 thru 4 of 4), 500-5,
☐ Add	☐ Replace	☒ Remove	Volume 11, R645-301-500 Engineering Maps Tab, Remove maps 500-4 (5 of 5)
☒ Add	☐ Replace	☐ Remove	Volume 11, R645-301-500 Engineering Maps Tab, Add Rilda Facility Plans Package
☐ Add	☒ Replace	☐ Remove	Volume 11, Geology Tab, Text Section, Add Red-line text and remove Strikeout text
☐ Add	☒ Replace	☐ Remove	Volume 11, Geology Tab, Geology Maps Tab, Replace Maps Table of Contents cover sheet
☒ Add	☐ Replace	☐ Remove	Volume 11, Hydrology Tab, Add Red-line text and remove Strikeout text
☐ Add	☒ Replace	☐ Remove	Volume 11, Appendix Volume A, Soils, Appendix C, Replace Maps 200-1 and 200-2
☒ Add	☐ Replace	☐ Remove	Volume 11, Appendix Volume A, Biology, Appendix D, Add Macroinvertebrate Comprehensive Report (2004 - 2008)
☒ Add	☐ Replace	☐ Remove	Volume 11, Appendix Volume A, Biology, Appendix D, Add Macroinvertebrate Reports 2009
☐ Add	☒ Replace	☐ Remove	Volume 11, Appendix Volume B, Hydrology, Appendix B, Text Section, replace entire section.
☐ Add	☒ Replace	☐ Remove	Volume 11, Appendix Volume B, Hydrology, Appendix B, Figures Section, replace entire section.
☐ Add	☒ Replace	☐ Remove	Volume 11, Appendix Volume B, Hydrology, Appendix B, Tables Section, replace entire section.
☒ Add	☐ Replace	☐ Remove	Volume 11, Appendix Volume B, Hydrology, Appendix B, Appendicies Section, Add

			Appendicies 1-6.
☐ Add	☐ Replace	☒ Remove	Volume 11, Appendix Volume B, Hydrology, Appendix B, Remove Appendix 1, Computer Backup.
☐ Add	☒ Replace	☐ Remove	Volume 11, Appendix Volume B, Hydrology, Appendix B, Replace Maps 700-1, 700-2, 700-3, 700-4.
☐ Add	☐ Replace	☒ Remove	Volume 11, Appendix Volume B, Hydrology, Appendix B, Remove Maps 700-5 and 700-6.

Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	**Received by Oil, Gas & Mining**
	RECEIVED NOV 0 4 2010 DIV. OF OIL, GAS & MINING

Form DOGM - C2 (Revised March 12, 2002)

COPY

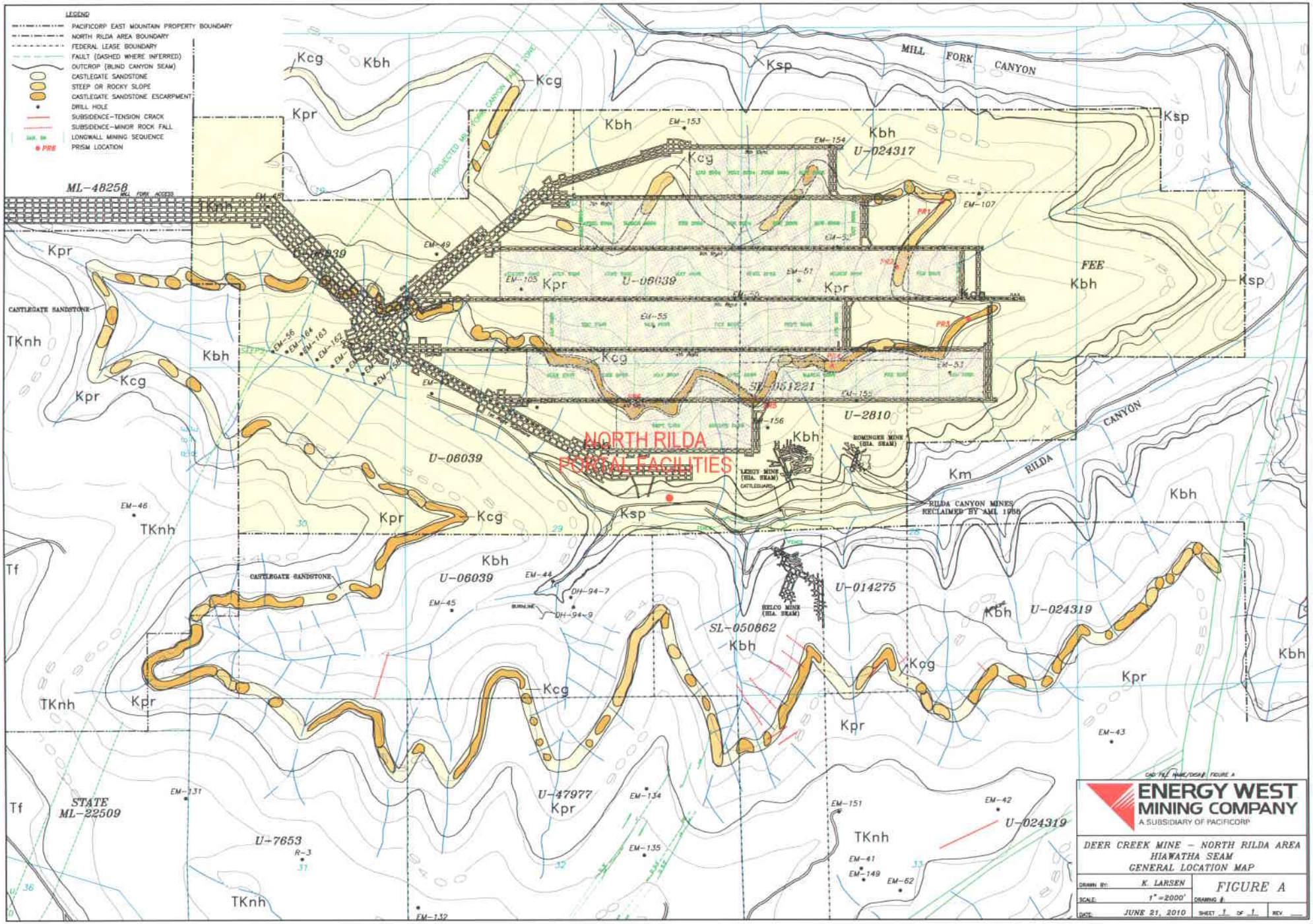
INTRODUCTION

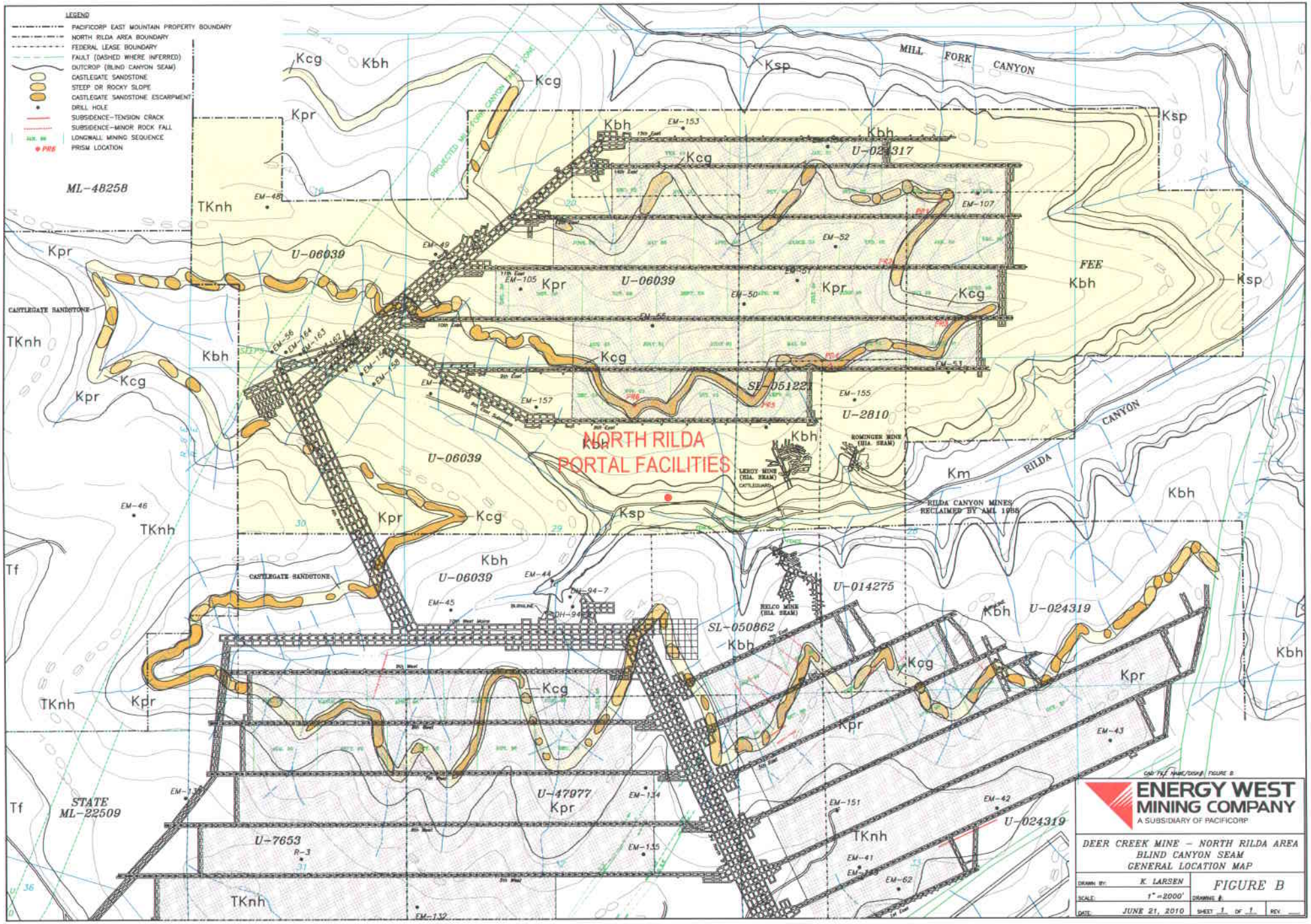
In 1997, PacifiCorp received approval to expand its mining operations in Rilda Canyon (Refer to Figures A: Hiawatha Seam and Figure B:Blind Canyon Seam). This expansion involved increasing the size of the Deer Creek permit area by 1,960 acres. An additional 50 acres was added in 1998 upon completion of a lease modification to Federal Lease U-06039 (modification Number 2). In 2001, PacifiCorp applied and received approval to modify Federal Lease U-06039 for third time for an additional 65.7 acres (modification Number 3). Refer to Supplemental Volume, Legal and Financial Information for right-of-entry and permit boundary information.

Because of its northern location relative to the existing permit area and Rilda Canyon, the area of expansion is simply called the "North Rilda Area".

Mining expansion into the North Rilda Area was anticipated early in the permitting process. Because of this, the North Rilda Area was included in many of the baseline studies and on many of the mine permit maps i.e. geology, hydrology, soils, vegetation, land use, surface and subsurface ownership, and permit area maps.

Mining in the North Rilda Area was completed in August 2004 for all 2nd mining activities and November 2005 for all 1st mining activities. First mining activities included development of the 1st Right workings for the development of the Rilda Canyon portals.


LEGEND
PACIFICORP EAST MOUNTAIN PROPERTY BOUNDARY
NORTH RILDA AREA BOUNDARY
FEDERAL LEASE BOUNDARY
FAULT (DASHED WHERE INFERRED)
OUTCROP (BLIND CANYON SEAM)
CASTLEGATE SANDSTONE
STEEP OR RUGGY SLOPE
CASTLEGATE SANDSTONE ESCARPMENT
DRILL HOLE
SUBSIDENCE-TENSION CRACK
SUBSIDENCE-MINOR ROCK FALL
LONGWALL MINING SEQUENCE
PRISM LOCATION
NORTH RILDA PORTAL FACILITIES
MILL FORK CANYON
RILDA CANYON
ML-48258
U-06039
U-024317
U-2810
U-014275
U-024319
U-47977
U-7653
SL-051221
SL-050862
FEE
STATE ML-22509
CASTLEGATE SANDSTONE
RILDA CANYON MINES RECLAIMED BY AML 1998
ROMINGER MINE (HIAWATHA SEAM)
LEROY MINE (HIAWATHA SEAM)
SELCO MINE (HIAWATHA SEAM)
Kcg
Kbh
Kpr
Ksp
Km
TKnh
Tf
EM-153
EM-154
EM-107
EM-49
EM-51
EM-55
EM-53
EM-156
EM-46
EM-44
EM-45
EM-131
EM-134
EM-135
EM-132
EM-151
EM-42
EM-43
EM-41
EM-149
EM-62
DH-94-7
DH-94-9
ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP
DEER CREEK MINE – NORTH RILDA AREA
HIAWATHA SEAM
GENERAL LOCATION MAP
DRAWN BY: K. LARSEN
SCALE: 1"=2000'
DATE: JUNE 21, 2010
FIGURE A
SHEET 1 OF 1


LEGEND
PACIFICORP EAST MOUNTAIN PROPERTY BOUNDARY
NORTH RILDA AREA BOUNDARY
FEDERAL LEASE BOUNDARY
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U-024317
U-06039
FEE
SL-051227
U-2810
U-014275
U-024319
SL-050862
U-47977
U-7653
STATE ML-22509
ROMINGER MINE (HIA SEAM)
LEROY MINE (HIA SEAM)
RILDA CANYON MINES RECLAIMED BY AML 1988
BELCO MINE (HIA SEAM)
CASTLEGATE SANDSTONE
Kcg
Kbh
Ksp
Kpr
TKnh
Km
Tf
EM-153
EM-107
EM-52
EM-105
EM-50
EM-55
EM-51
EM-155
EM-157
EM-56
EM-164
EM-163
EM-46
EM-44
EM-94-7
EM-45
EM-43
EM-42
EM-151
EM-41
EM-62
EM-135
EM-134
EM-132
ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP
DEER CREEK MINE – NORTH RILDA AREA
BLIND CANYON SEAM
GENERAL LOCATION MAP
DRAWN BY: K. LARSEN
SCALE: 1" = 2000'
DATE: JUNE 21, 2010
FIGURE B

PacifiCorp acquired the Mill Fork Lease and entered into a COAL MINING LEASE AND AGREEMENT with the State of Utah on April 1, 1999. The coal tract as described in the lease contains approximately 5,562.82 acres, more or less. With the leasing of the Mill Fork Tract in 1999, PacifiCorp controls through ownership and leasing certain fee coal lands together with assigned federal coal leases nearly 30,000 acres of contiguous minable property located in Emery County, Utah. PacifiCorp submitted an application to include the Mill Fork Lease within the Deer Creek Mine permit in November 2001. The application was approved on March 5, 2003. This expansion involved increasing the acreage of the Deer Creek permit by 5,562.82 acres. Because of the geographic location, the proposed new area of expansion is referred to as the "Mill Fork Permit Area", refer to Volume 12.

After the acquisition of the Mill Fork Lease, PacifiCorp investigated multiple alternatives to access the coal reserves located to the northwest of the North Rilda Area. The process has included:

- Application for lease modification to physically connect the Mill Fork tract (State Lease) to the existing federal leases controlled by PacifiCorp (submitted November 2001 [originally submitted as a right-of-way application in November 2000]). Federal Coal Lease U-06039 was modified to include an additional 65.7 acres to allow the boundaries of the federal lease to become contiguous with State Lease ML-48258 (approved December 14, 2001)
- Submission of Incidental Boundary Change application to amend the Deer Creek permit to include the lease modification area (approved January 2001).
- Surface coal exploration programs have been conducted to evaluate the coal reserve characteristics (2000-2004).
- Mine plans have been developed based on results of the coal exploration programs. As outlined in Volume 12, access to the Mill Fork lease is accomplished through a set of main entries developed in the Hiawatha seam driven in a westerly direction along the southern most lease boundary.
- PacifiCorp evaluated long term options to improve overall underground transportation and economic considerations.
- Options investigated included:
    - Acquisition of Crandall Canyon Mine
    - New portal facilities in Mill Fork Canyon
    - New portal facilities in Rilda Canyon
        - In-seam horizontal drilling was conducted to evaluate potential location of portal facilities.
- As a result of extensive investigation, PacifiCorp selected Rilda Canyon as the best option based on the following:
- Environmental Considerations
    - Facilities are located in an area previously disturbed by mining

- Surface facilities are designed to accommodate ~~men and~~ materials only. Coal mined from the Hiawatha (lower) and Blind Canyon (upper) seams will continue to be shipped through the existing Deer Creek mine workings to the portal in Deer Creek Canyon. From this point, the coal will be transported to the Huntington Power Plant coal storage area via the existing overland beltline. Only surplus production beyond the Huntington Plant needs will be trucked on the highway from the plant.

- Engineering Considerations
  - Facilities designed and built to minimize surface disturbance; Sequencial construction includes construction of a fan/portal pad with material storage, sediment basin, pond, and topsoil and rock storage areas (covering 7.3 acres).
  - Utilization of existing infrastructures (roads, powerline)
  - Business Considerations
  - PacifiCorp and Andalex Resources were unable to arrive at a workable agreement utilizing the Crandall Canyon Mine due to Andalex's continuation of mining with the South Crandall Lease.

Initially, the facilities were proposed in an area disturbed by previous mining operations. However, due to concerns related to culverting some 1,500 feet of perennial stream that were expressed by the Army Corp of Engineers, environmental groups, etc., PacifiCorp chose to move the proposed facility site up canyon approximately ½ mile. The facilities disturbed area was initially proposed to cover approximately 9.0 acres with and additional 4.1 acres for soil storage. Facilities were to include a bathhouse, warehouse, shop, parking, water treatment and sewage system. However because of dwindling minable coal reserves, full facility construction was not economical. The Rilda Portal facility was reduced to only serve as a fan pad and material accessway.

PERMIT ORGANIZATION

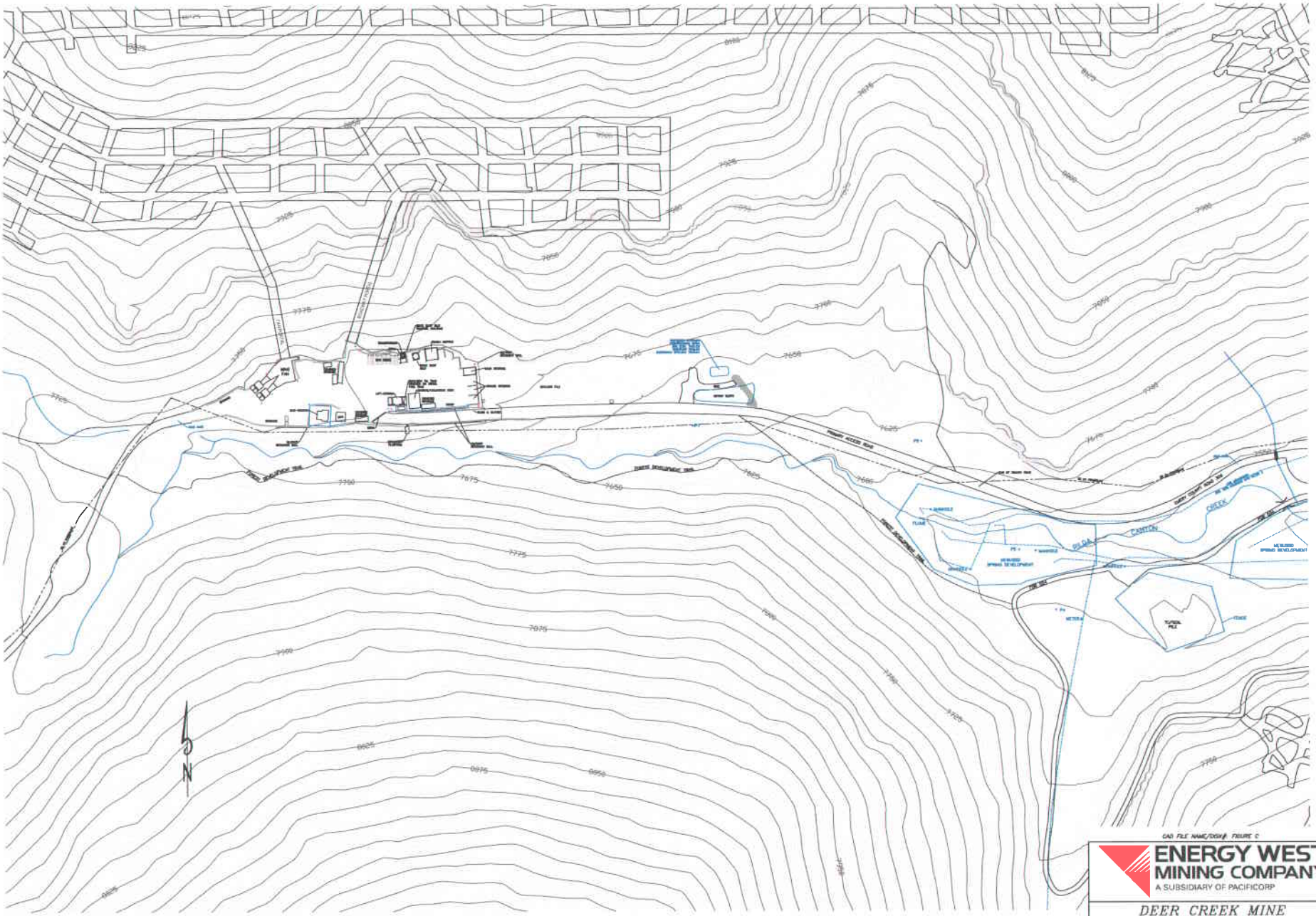
The following sections of this mining application pertain to all applicable coal mine permit application requirements of the Utah R645-Coal Mining Rules (revised May 1, 1998). Applicable sections herein include:

Volume 11

Introduction
R645-301-100. General Information
R645-301-200. Soils
R645-301-300. Biology
R645-301-400. Land Use and Air Quality
R645-301-500. Engineering
R645-301-600. Geology
R645-301-700. Hydrology
R645-301-800. Bonding

Volume 11 Appendix Volume

Table of Contents
Soils
Biology
Land Use
Engineering
Geology
Hydrology



CAD FILE NAME/DISK# FIGURE C

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

DEER CREEK MINE
NORTH RILDA
PORTAL FACILITIES

DRAWN BY:	K. LARSEN	FIGURE C	
SCALE:	1" =300'	DRAWING #	
DATE:	JUNE 21, 2010	SHEET 1 OF 1	REV.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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Remove All Contents including Tab

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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Text Section – Entire Section

R645-301-200 SOILS SECTION

TABLE OF CONTENTS

LIST OF APPENDICES

(Refer to Volume 11: Appendix Volume)

Appendix A*	Report: Soil Inventory and Assessment, Rilda Canyon Portal and Facilities Site, Deer Creek Mine, EIS Environmental and Engineering Consulting, May 2004.
Appendix B*	Report: Soil Survey Report of the New North Rilda Canyon Portal Facilities Area, Mt. Nebo Scientific, July 2004. Soil Storage Addendum March 2005.
Appendix C	Prime Farmland Determination: NRCS, October 2004.

LIST OF MAPS

200-1	Soils Classification Map*
200-2	Soils Stripping and Storage Location Map*

* Note: Soil Inventory and Assessment Reports, Soil Survey Reports, and Soil Maps (reported by 3rd party consultants) report additional areas within the project area that have been evaluated. These areas include the once proposed subsoil stockpile area, and potential miscellaneous storage and reference areas in the lower parts of Rilda Canyon. These areas were evaluated during the initial planning stages for the project. However, because the project scope was significantly revised which decreased the footprint of the disturbed area, those additional areas are not included within the as-built boundaries of the Rilda Portal Facilities.

R645-301-210 INTRODUCTION

Mining in the Rilda Canyon area has been conducted since the 1940's. Four historic mines (Helco Mine, Leroy Mine, Jeppson Mine, and Rominger Mine) are located in Rilda Canyon that were reclaimed by Abandoned Mined Lands in 1988. In 1995, PacifiCorp expanded its Deer Creek Mining operations into the North Rilda area. Approximately 23 million tons of minable coal was anticipated to be mined from this area during life-of-mine production. Surface ventilation facilities were constructed in the Left Fork of Rilda Canyon to provide for ventilation to the North Fork area. Because of the need to expand the mining operations farther to the northwest (Mill Fork State Lease #48258), surface facilities are required in Rilda Canyon. Initially, a full mining complex was proposed and plans were submitted and approved by the Utah Division of Oil, Gas, and Mining (UDOGM). This proposal included all support facilities for underground mining operations excluding coal transportation. The actual and final construction of the North Rilda Canyon Portal facilities (completed 11/2008) includes two portals, facility pad, fan, electrical facilities, storage facilities, soil storage, and drainage control facilities. Actual total disturbance totals approximately 7.3 acres.

Five soil surveys or investigations have been conducted in the Rilda Canyon area: Gainer, 1983, Furst 10/90, Furst, 12/91, EIS Environmental and Engineering Consulting, 5/04, and Nyenhuis, 7/04. The soils investigation provided by Furst can be found in Volume 1, Part 2 (Environmental Resources), pages 2-181.1 through 2-181.39. These reports discuss soil resources of the Left Fork of Rilda Canyon. The EIS report discusses soil resources in the area of the historic Leroy, Jeppson, and Rominger mines, refer to Volume 11 Appendix Volume - Soils: Appendix A. This area was initially proposed for surface facilities. However, because of concerns of culverting approximately 1500 feet of the Rilda Creek, the site location was moved approximately ½ mile up canyon. The Nyenhuis report discusses soil resources of the Rilda Canyon Portal Facilities; refer to Volume 11 Appendix Volume - Soils: Appendix B.

Soil segregation locations have been established in the Left Fork Rilda Canyon Fan Facilities area (refer Volume 4 Map 2-17A) and the Rilda Canyon Portal Facilities area (refer to Map 200-1, Soils Stripping and Storage Location Map). These areas store segregated topsoil from each of the disturbed areas.

The following sections detail investigations of the soil environment in Rilda Canyon. Through these investigations, detailed procedures are designed for the removal and storage, sampling, analysis, and replacement of soil during reclamation of the disturbed sites.

R645-301-220 ENVIRONMENTAL DESCRIPTION

The Rilda Canyon Portal Facilities are located on the north side of Rilda Canyon, a tributary of Huntington Creek. The surface facilities are located in an east-west trending canyon below the intersection of the right and left forks of Rilda Canyon. The elevation differences in the area of the mine site range from approximately 7,500 feet above mean sea level near the soil storage area to 7,725 feet near the forks of Rilda Canyon.

R645-301-221 Prime Farmland Investigation

As stated in the regulations, all permit applications, whether or not Prime Farmland is present, will include the results of a reconnaissance inspection of the proposed permit area to indicate whether Prime Farmland exists as given under R645-302-313.

PacifiCorp has consulted with the National Resources Conservation Service (formally the Soil Conservation Service) on three separate occasions for Prime Farmland Determination related to the Deer Creek Mine permit boundary;

- November 10, 1983 (refer to Volume 1, pages 2-215 through 2-2118)
- March 27, 1991 (refer to Volume 1, pages 2-218.1 through 2-218.2)
- October 14, 2004 (refer to Volume 11 Appendix Volume Soils: Appendix C)

Based on the NRCS investigations of all of the lands within the Deer Creek Mine area (including the Rilda Canyon Portal Facilities) these lands do not qualify as "Prime Farmland" for the following reasons:

- Soils contain more than 10% percent surface rock fragments, or
- Percent slope multiplied by K (erodibility factor) exceeds 2
- Area is above all existing irrigation systems

R645-301-222 Soil Survey

Previous Studies

The soils in the area have been included in previous baseline studies of the general permit area. Furthermore, the soils of the area have been mapped previously by the operator in anticipation to include the area for future mining (see Volume 4, Map 2-16, "Future Permit Area"). A field survey of the soils of the permit area was conducted by T.H. Furst in 1990. Field work and laboratory analyses of Soil Pedon 3 in the study described and classified the soils mapped in the North Rilda Area. The soils have been classified as mixed Typic Cryoborolls, loamy-skeletal, 25-40% slopes. The pedon contained >0.6% organic carbon throughout the soil solum, and the percent base saturation was most likely >50% throughout the soil solum (inferred from the pH). Soil textures ranged from sandy loam in the A and Bw1 horizons to loam in the Bw2 horizon. Electrical conductivity ranged from 0.4-0.5 mmhos/cm and the sodium adsorption ratio for all

horizons was less than 3.4. Soil reaction (pH) ranged from 8.0 to 8.1. SAR values were also low enough to be rated as "good" by DOGM guidelines. Alkalinity (HCO_3) was less than 4 meq/L, whereas, the saturation percentages of all horizons ranged from 44.6% to 52.6%. Available water capacity ranged from 0.10 to 0.15 inches of water per inch (depth) of soil. Calculations of the total available water revealed that about 3.6 inches of water would be available on a whole pedon basis when the displacement of soil material by coarse fragments was taken into account.

The soils were generally described "as a dark grayish brown loamy surface layer about 40 cm thick, underlain by a pale brown clay subsoil 40 cm thick, over a light gray calcareous substratum with up to 50% sandstone fragments". A general soil map for the permit area which includes the North Rilda Area has been provided as Volume 4, Map 2-16 in the Deer Creek MRP. For additional information about the soils in the area refer to Volume 1, Part 2 of the MRP.

2003-2004 Studies

PacifiCorp retained Environmental Industrial Services (Soil Scientist: Dan Larsen) to conduct a soil inventory to aid in the development and reclamation associated with the proposed expansion of the Deer Creek Mine in Rilda Canyon. The EIS report discusses the inventory and assessment of soil resources of the historic mining areas of the Leroy and Rominger mines. This report is included since an area below the Leroy Mine portal area is proposed for disturbance. PacifiCorp has constructed a sedimentation pond within this area. The EIS report lists this area as soil map unit D "disturbed". This soil consists of mixed soil materials and waste coal. The area below the Leroy Mine had been previously reclaimed. Two soil pits revealed a layer of about one to two feet of cobbly sandy loam soil over waste coal materials in most areas. Waste coal deposits are up to eight feet in depth.

As stated earlier, PacifiCorp's original proposal was to construct the facilities in the area of the historic Leroy, Jeppson, and Rominger mines. However, because of concerns of culverting approximately 1500 feet of the Rilda Creek, the site location was moved approximately ½ mile up canyon. As a result, PacifiCorp retained Mr. Jim Nyenhuis, Certified Professional Soil Scientist/Soil Classifier (ARCPACS 2753), to map the revised location at the Order 1 level of intensity for the proposed area, refer to Volume 11 Appendix Volume - Soils: Appendix B. The study area was approximately 16 acres in size and was composed of the proposed surface facility area, intersection of the right and left forks, and the alluvial bottom to the south of the facilities. Field work including soil sampling was completed in July 2004. Pacificorp contracted Mr. Jim Nyenhuis to supplement the initial study of the proposed facilities near the intersection of the right and left forks to include an in-depth analysis of the topsoil and subsoil storage areas. Topsoil/subsoil material was proposed to be stockpiled at separate locations approximately 0.5 miles down canyon from the mine site. The topsoil site is located away from any drainage's in a fairly flat previously disturbed area directly below the reclaimed Helco Mine portal site. The subsoil/construction fill site (not used for soil storage) was planned for locating in Rominger Canyon. The canyon was previously disturbed to access the Rominger and Jeppson coal mines. Appendix B has been amended in to include soil descriptions and sampling analysis of the proposed soil storage locations.

R645-301-222.100 Map Delineating Soils

A site specific, Order 1 soils survey for the proposed mine site area was performed by Mr. Jim Nyenhuis and Dan Larsen during 2003 and 2004. Detailed reports of the on-site field work and laboratory analyses along with soil maps are presented in Volume 11 Appendix Volume - Soils: Appendix A & B.

R645-301-222.200-300 Soil Identification and Descriptions

Soil types of the proposed disturbed area are identified on maps located in Volume 11 Appendix Volume - Soils: Appendix A 2003-4 EIS report: Sediment Pond Area and Appendix B, 2004 Mt. Nebo Report: Mine Facility and Soil Storage areas. During 2003 and 2004, Mr. Dan Larsen, Soil Scientist from EIS and Mr. Jim Nyenhuis from MT. NEBO conducted field mapping of the proposed mine facility, sediment pond and soil storage areas. Soil profiles were exposed either by hand tools or a backhoe to examine the full soil sequence at various locations around the proposed disturbed area. Soil sampling and subsequent analyses were used to determine suitability for reclamation purposes. Soils data from previous investigations conducted in the 1990's, as well as aerial photography, and detailed site investigations were used to define the boundaries of each map unit. This information was then used to prepare a detailed map unit description for each of the mapping units delineated during the Order 1 Survey at the mine site sediment pond and soil storage areas (refer to Map 200-1).

Five map units were within the study area:

- Map Unit A Alluvium Bottomland Soils
- Map Unit B Steep Rocky Slopes, Haplustepts, Ustorthents
- Map Unit E Colluvial Toeslopes, Bench (referred to Map Unit C by EIS: Appendix A)
- Map Unit F Steep Facing Slopes; Cryoborolls
- Map Unit D D: Disturbed Land, Soil, Coal, Stones, Fill Material
  DR: Disturbed Land (Old Mine Access Road)
  DF: Disturbed Fan Site (Leroy Portal Area)
  RD: Rilda Canyon Road (Emery County #306)

Pedon Descriptions

Map Unit A: Alluvial Bottom Land Soils

Alluvial bottomland (Map Unit A) is located along Rilda Creek and in the confluence area of the Left and Right Forks of Rilda Creek. Alluvial bottomland is south of the Rilda Canyon Road and will not be disturbed by mining activities. An area within the bottomland along the Right Fork of the Rilda Creek, near the confluence with the Left Fork of Rilda Creek, includes the study area for the proposed relocation of the Spring Collection system for the North Emery Water Users Special Services District. Slope range of the map unit is 0 to 15 percent. Vegetation within the alluvial bottomland is a mixture of Douglas fir, aspen, and spruce with an understory of grasses and grape holly. Elevation ranges from about 7,600 to 7,750' MSL. The map unit is considered to be in a "frigid" soil temperature regime.

Soils within Map Unit A are very deep (>60" to bedrock), well to somewhat poorly drained, and are developing primarily in streamlain alluvium with some slopewash colluvial material. Soil textures are primarily sandy loam or sandy clay loam. Coarse fragment content is generally less than 15% in the surface layer, and increases to about 20% or more in the subsoil and substratum. Stones and boulders are scattered on the soil surface. Brycan bouldery very fine sandy loam is the dominant soil within the alluvial bottomland, and is described below. Schupert gravelly very fine sandy loam occupies the narrow channel bottom of Rilda Creek within the study area, and was described in the previous survey for the fan installation project (Furst, 1991).

Schupert is a very deep, well drained, slowly permeable soil forming in streamlain alluvium. It is classified as a "Fine-loamy, mixed, superactive, calcareous, frigid Typic Ustifluvent." The most recent official NRCS soil series description for Schupert, dated March 2003, is on file.

Soils within the Alluvial Bottomland have been described and/or sampled at four locations (S1, S4, S7, and RC2). Evaluation of the field and laboratory data indicates the soil most closely correlates to the Brycan soil series.

Brycan bouldery very fine sandy loam is a very deep, well drained, moderately permeable soil with slow runoff forming primarily in streamlain alluvium. It is moderately to strongly calcareous. The surface layer meets criteria for a mollic epipedon. Brycan is classified as a "Fine-loamy, mixed, superactive, frigid Cumulic Haplustoll". The most recent official NRCS soil series description for Brycan, dated June 2000, is on file.

Sample site RC2 was located in the Proposed Spring Collection Study Area in the west extension of the study area. At typical sample site RC2, Brycan has a very dark

grayish brown (10YR 3/2, dry) sandy loam surface layer about 6 inches thick. The subsoil is a brown (10YR 4/3, dry) sandy clay loam about 12 inches thick. The underlying "BC" transition layer is a brown (10YR 5/3, dry) sandy loam to a depth of about 30 inches. The "C" horizon substratum is a brown (10YR 5/3, dry) sandy loam to a sampled depth of 66 inches. Coarse fragment content ranges from about 10 to 20 percent throughout the soil profile. Scattered stones and boulders are on the soil surface. The Spring Collection Study Area was not developed as originally proposed.

Map Unit B: Steep Rocky Slopes; Haplustepts, Ustorthents

Map Unit B was mapped in the northwest corner of the west extension of the facility area and the canyon side slopes of the subsoil/construction storage area. The area west of the facilities will not be disturbed by mining. PacifiCorp had originally proposed storing and protecting topsoil in-place in the subsoil/construction fill storage area in Rominger Canyon. Soils within Unit B have been described and/or sampled at three locations (S5, S6, and RC6). Map Unit B consists of steep to very steep, well drained, rocky slopes. Stones and boulders are commonly scattered on the surface. Sandstone rock outcrop is nearby. Vegetation is dominantly pinyon and juniper. Soil depth ranges from shallow to very deep in stony colluvium. Soils have little profile development, and are high in carbonates. The surface layer is less than 5 inches thick, and can be dark colored in certain areas. The subsoil and substratum layers are often very cobbly to very stony sandy loam to loam with 20 to 35% carbonates. This area is no longer proposed for disturbance.

Map Unit E: Colluvial Toeslopes; Bench

Map Unit E (Colluvial Toeslopes; Bench) is the dominant map unit on the current study area. It is the site for all of the ~~proposed~~ mining and related facilities. Map Unit E occupies a gently sloping alluvial fan toeslope-bench situated between the Star Point Sandstone outcrop located near the base of the steep mountain sideslope and the alluvial bottomland of Rilda Creek to the south. As such, it is a south-facing slope with mixed, diverse vegetation including Ponderosa pine, Juniper, Douglas fir, some spruce, mountain mahogany, sagebrush, and mixed grasses. Elevation ranges from about 7,600 to 7,730' MSL. The map unit is considered to be in a "frigid" soil temperature regime, and an "ustic" soil moisture regime.

Three representative sites were fully described and sampled within Map Unit E (RC1, RC3, and RC4). All three sites were located midway across the unit, and indicated very deep, well drained soils. Results from seismic testing across this bench indicate an approximate depth of unconsolidated materials (soil above unweathered materials) of 5' on the north end nearby to the Star Point Sandstone outcrop, increasing to a total depth of 50 to 75' on the south end of the bench which ends just north of Rilda Creek alluvial bottomland. Three seismic lines were run across the bench, and the methods and results are contained in a separate report (AMEC Consultants, 2004).

Evaluation of the field and laboratory data for Map Unit E indicates that the soil most closely correlates to the Osote soil series. Osote is an established soil series of small extent mapped in south-central Utah. The most recent official NRCS soil series description for Osote, dated February 1999, is on file. Osote is a very deep, well drained, slowly permeable soil forming in colluvium and slopewash alluvium from sandstone and shale materials. Osote is slightly to strongly calcareous. The surface layer meets criteria for a mollic epipedon. Osote is classified as a "Fine-loamy, mixed, superactive, frigid Typic Calciustoll".

Based on a review of all three sample pedons (RC1, RC3, and RC4), Osote typically has a brown (10YR 4/3, dry) sandy loam to loam surface layer about 9 to 16 inches thick. The lower part of this layer is a "Bw" cambic horizon. The subsoil "Bk" calcic horizon is a brown to light yellowish brown (10YR 5/3 to 10YR 6/4, dry) strongly calcareous sandy loam, sandy clay loam, or loam to a depth of about 20 to 38 inches. The underlying "C" horizon substratum is a yellowish brown to light yellowish brown (10YR 5/4 to 10YR 6/4, dry) sandy loam, sandy clay loam, or loam to a depth of 60 inches (5') on the north side of Map Unit E, and exceeding 84 inches (7') on the south side of the map unit. Slightly weathered, unconsolidated colluvial material extends to a depth of 50 to 75' on the south side of the unit (AMEC Consultants, 2004). For a full description of the map units, laboratory results, evaluation of soil suitablility and topsoil volume refer to Volume 11 Appendix Volume - Soils: Appendix B.

Map Unit F: Steep North Facing Slopes; Cryoborolls

One delineation of Map Unit F (Steep North Facing Slopes; Cryoborolls) was mapped on a north-facing slope above the south side of the Right Fork of Rilda Creek in the western extension area. This area will not be disturbed by mining activities. It was not sampled for laboratory analysis. Soils on this steep, north-facing slope are best classified as "loamy or loamy-skeletal, mixed, Typic Cryoborolls" with typical slopes of 25 to 60% or more. This map unit dominantly has Douglas Fir and spruce vegetation, with some aspen.

In a typical profile, Typic Cryoborolls have a stony to bouldery sandy loam to loam, dark-colored, surface layer ranging from 10 to 18 inches thick. The surface layer meets criteria for a mollic epipedon. The subsoil is a brown stony to very stony sandy loam or loam. Typic Cryoborolls are well drained.

Map Unit D: Disturbed Land Including Subcategories

Disturbed Land - The soils in this map unit have been disturbed by previously mining activities and road construction. They consist of mixed soil materials and waste coal. In the area that had been reclaimed below the Leroy Mine, three soils pits (S2, S3 and RC8) along with four geotechnical trenches (pits 7, 8, 10 and 11) revealed a layer of about one to two feet of cobby sandy loam soil over coal waste

materials. The coal deposits are up to eight feet in depth (refer to Geotechnical Pit Photos in Volume 11 Appendix Volume: Soils - Appendix A). In addition to the area below the Leroy Mine, geotechnical trenches were excavated in the disturbed lands along Emery County Road #306 (pits 4, 6, and 9) and in the Rominger Mine area (pits 13 and 14).

Disturbed Land - DR: Old Mine Access Road - This unit designates the narrow access road leading to reclaimed Leroy Mine. This single track road cuts through Soil Unit B on a steep, rocky, south facing slope. The surface of the old road consists of gravely to stony soil materials derived mostly from sloughing and erosion of the cut slope and subsoil in the road base. Soil textures are mostly sandy loam with intrusions of loam. The materials in the upper 8 to 24 inches show good rooting potential. Underlying materials are very stony. Soils within this unit have been described and/or sampled at one location (S6). Geotechnical trenches were excavated along the access road; refer to Volume 11 Appendix Volume: Soils - Appendix A.

Disturbed Land - DF: Leroy Mine Site - This is a bench and cut slope at the location of the Leroy Mine portals. It includes a relatively flat area which has very little soil material over sandstone bedrock and a cut slope having poor quality soil materials. Soil sample, RIL1303, site S-5 was collected from the cutslope to characterize the soil materials at this location. A single geotechnical trench was excavated across the portal area (pit 1), refer to Volume 11 Appendix Volume: Soils - Appendix A.

Disturbed Land - RD: Emery County Road #306 - Map Unit RD consists of the present road corridor in Rilda Canyon. It was not evaluated as a soil map unit although there are suitable soil materials beneath the road.

In addition to the survey conducted related to the portal facility area, PacifiCorp consulted with Mr. Jim Nyenhuis in preparing a soil classification map for the proposed soil storage sites located near the portal facilities area (refer to Volume 11 Appendix Volume - Soils: Appendix B). The topsoil storage site is located on a gentle alluvial/colluvial fan slope directly below the reclaimed Helco Mine portals on what was the coal storage area for the mine. This site was reclaimed in the late 70's by the lease holder and again by AML in 1988. The primary plant community in this area is disturbed Sagebrush/Grass community (refer to Volume 11 Appendix Volume - Biology: Appendix A for a complete description of the area). Approximately 60% of the area is mapped as Unit D (Disturbed Land; soil, coal, stones, fill material), with remaining area mapped as Unit A.

The subsoil/construction fill storage site (no longer proposed for disturbance) is located in a narrow canyon used as access/coal storage for the reclaimed Rominger and Jeppson mines. Access to the canyon is directly from Emery County Road #306. The primary plant communities in this area is native, Douglas Fir/White Fir, Pinyon-Juniper/Curl Leaf Mountain

Mahogany/Ponderosa Pine, Pinyon-Juniper/Curl Leaf Mountain Mahogany and Previously Disturbed AML (refer to Volume 11 Appendix Volume - Biology: Appendix A for a complete description of the area). Soil units mapped include; Disturbed - valley area and access road on the west side of the canyon, Colluvial toeslopes - collouvial fan (Unit E) located of the west side of the canyon and steep rocky slopes; haplustepts, ustorthents (Unit B) - steep slopes located on the east and west side of the canyon reclamation project (refer to Volume 11 Appendix Volume - Soils: Appendix A and B for soil descriptions of the site).

The following table list the acerage of each soil unit within the extent of the Rilda Portal Facility disturbance:

SOIL MAP UNIT	ACREAGE WITHIN STUDY AREA (acres)
Map Unit A: Alluvium Bottomland Soils	0.41
Map Unit B: Steep Rocky Slopes, Haplustepts, Ustorthents	1.29
Map Unit D: Previously Disturbed Area, Reclaimed by AML	3.53
Map Unit E: Colluvial Toeslopes, Bench	6.96
Map Unit RD: Rilda Canyon Road	0.91
	Total 13.1

R645-301-222.400 Potential Productivity of Soils

Present and potential productivity of the existing soils was conducted by the Natural Resources Conservation Service and is presented in Volume 11 Appendix Volume - Biology: Appendix B.

R645-301-223 Soil Characterization

The results of the Order 1 Soil Surveys are presented in Volume 11 Appendix Volume - Soils: Appendix A & B. Each distinct soil is presented as a soil map unit with accompanying description, laboratory analyses, and spatial extent clearly defined. Excavation test pits used to conduct the detailed examination, description and sampling of each mapping unit are also displayed on Map 200-1.

R645-301-230 OPERATION PLAN

The following sections describe the methods for the removal and storage of topsoil and subsoil/construction fill from the Rilda Canyon portal facilities. The construction sequence covers approximately 6.8 acres that required the removal of topsoil. Subsoil within this area was utilized in the construction of the facilities pad and therefore, no subsoil was stored. The location of the topsoil storage area is found on 200-1 and 200-2 in Volume 11 Appendix Volume- Soils: Appendix C.

R645-301-231 General Requirements

R645-301-231.100 Methods for Removing and Storing Topsoil, Subsoil

All areas disturbed at any time during the construction of the mine and its surface facilities had all available topsoil (i.e. plant growth medium) separately removed and segregated from other colluvial material. The topsoil was stockpiled in the topsoil storage area for use during reclamation (refer to Map 200-1, 200-2 and Engineering Section Maps 500-3 and 500-4 sheet 3 of 4). Based on the survey conducted by Mr. Jim Nyenhuis (refer to Volume 11 Appendix Volume - Soils: Appendix B) both the A and portions of the B horizon were suitable for removal. Approximately twenty-four inches of topsoil materials was salvaged from all areas. One exception includes the sediment pond area which was previously disturbed by historic coal mining and later reclaimed by AML. Soil removal activities from the AML area during the pond construction sequence found that the material contained a high quantity of coal. Most of the material was hauled to the Deer Creek waste rock site for disposal. Quality coal was transported to the Huntington Power Plant. Material not containing coal (approximately 2,137 yards^3) was field checked for pH, EC, color and texture. This material was segregated and stored as recommended by the Division's soil scientist monitoring the soil removal process. The material was separated from the existing topsoil material by a colorful fabric and stored as a substitute topsoil.

Soil and geophysical surveys conducted at the mine facility and sediment pond areas revealed that the colluvial soil material extends to a depth greater than projected cuts to develop the post construction topography. Based on this analysis, cut material in excess of the upper twenty-four inches of the topsoil was utilized as fill within the constructed mine pad for the Rilda Portal Facility.

All soils were removed with one or more of the following types of equipment: bulldozer, scraper, front-end loader, and/or track-hoe. A qualified soil scientist provided on-site consultation during the topsoil removal process to maximize removal of quality topsoil and minimize inclusion and dilution.

Topsoil and substitute topsoil materials were stockpiled at a separate location approximately 0.5 miles down canyon from the mine site. This location will allow the soil materials to be properly managed and minimize the potential for impacts from the active mining operation.

The topsoil storage site is located away from the main Rilda Canyon drainage in a fairly flat, previously disturbed area. Topsoil is stored within the area outlined on Maps 200-1 and 200-1 and contains approximately 4,285 cubic yards of topsoil excavated as part of the facility

pad construction activities; and 2,137 cubic yards of substitute topsoil excavated and salvaged from the sediment pond area. As mentioned above, the soil materials are separated by a colored marker fabric to distinguish between the two types of topsoils.

Location of the topsoil storage pile minimizes disturbance by utilizing previously disturbed areas associated with the Helco Mine. During the operations of the Helco Mine, this area was used as coal storage and handling area. Water monitoring well (P4, refer to map 500-3 in the Engineering Section) installed near the pile indicates that the depth of the saturated alluvium is approximately twenty feet below the existing ground surface. As discussed above, this area was used as a coal storage and handling site. All topsoil or substitute topsoil salvaged from the construction sequences has been stored at this location.

To prevent additional compaction of the existing soils, the pile was constructed over a broad area with track mounted equipment. End dump trucks hauled the soil from facility area to the soil storage site. Trucks did not travel on the storage site, but dumped loads adjacent to Forest Development Road 024. Track mounted equipment distributed the soil across the site Topsoil storage slopes, as constructed; do not exceed 2:1. The pile was graded, pocked, seeded and hydromulched to establish a vegetative growth for sediment and erosion control.

Temporary sediment control has been installed around the perimeter of the piles to divert runoff around the pile and reduce erosion due to runoff from the surrounding area. The temporary sediment control will also serve to prevent the loss of soil from the site. The roughened surface of the stockpiles will prevent rapid runoff and help to control erosion until vegetation becomes reestablished.

The stockpile seeding was conducted during the fall period with the sagebrush/grass seed mix outlined R645-300 Biology Section Table 300-8. Vegetative cover will protect the soil from wind and water erosion. If supplemental seeding is needed, it will be completed as necessary. Sideslopes will be monitored for erosion as well and will be repaired if erosion appears to be excessive. A fence has been constructed around the perimeter of the pile to protect it from grazing impacts.

A boulder storage area is located east the facilities. This area was needed to store large boulders encountered during facility pad construction activities. Stored boulders will be used during final reclamation for development of riprap or placed on the final reclaimed slopes to blend in with surrounding terrain.

R645-301-231.200 Demonstration of Suitability

Analyses from the soil samples taken in the disturbed area are listed in Volume 11 Appendix Volume - Soils: Appendix A and B. The suitability of this material for reclamation is discussed in Appendix A and B. Material proposed as a supplement to topsoil has also been tested and mapped. The suitability of this material for vegetative growth has been demonstrated through past reclamation activities in Rilda Canyon (AML reclaimed mines: Helco, Leroy and Rominger/Jeppson). Approximately 10.7 acres has been disturbed during

past mining activities, refer to Engineering Section Map 500-1. Approximately 1.79 acres of the Rilda Canyon Portal Facilites (including soil storage areas) has been previously disturbed by coal mining activities. Vegetation has re-established successfully on the previously disturbed areas even in areas without the benefit of topsoil replacement, reseeding or supplemental irrigation.

During past coal mining activities, cuts and fills were made on both north and south facing sides of the canyon. Areas were leveled for staging areas, coal seam exposures, coal handling and drilling pads. The cuts were left in place. In several areas, no reclamation was conducted on the disturbed lands. Natural vegetation has moved in and become established on the previously disturbed areas even without the replacement of topsoil materials and seeding.

R645-301-231.300 Test Plan for Evaluating the Results of Topsoil Handling and Reclamation Procedures

At the time of final reclamation and after the subsoil material has been regraded, the soil material will be sampled on 500 foot intervals to a depth of 48 inches. A soil auger will be used to collect samples by 1.0 foot increments. A field instrument will be used to sample the regraded material for pH and EC parameters. Field sampling will allow immediate identification of salinity, acidity or sodicity problems. Should problem areas be located, sampling will be intensified to a 100 foot square grid described below. Four augered holes will be randomly placed in the regraded area of the mine facility. The randomly selected sites will be sampled along the survey baseline established for the mine facility area. The subsoil material will be sampled at 1.0 foot intervals. Samples will be sent to a certified laboratory to be analyzed for the parameters outlined in Table 6 of the Utah *"Guidelines for Topsoil and Overburden Handling"*. If any potential problems are identified, additional sampling will be conducted in the vicinity of the suspect sample to better define the extent of the area affected. Should a problem be identified, the area would be resampled on a grid of 100 foot centers to define the nature and extent of the problem. The problem area would then be evaluated in consultation with the Division with the most appropriate remedial action implemented.

If testing finds the field parameters are within an acceptable range, redistribution of the topsoil will then be initiated. Topsoil will be sampled as it is hauled from the storage pile for comparison to the baseline data. Amendments would be added to the regraded areas at rates based on their comparison to the baseline soil data. Fertilizer would be added as needed by using a spreader then mixing the fertilizer into the soil, along the contour.

R645-301-231.400 Construction and Maintenance of Topsoil Handling and Storage

Construction of the topsoil storage site began by removing all large, existing vegetation and installing sediment control structures to channel natural undisturbed drainage away from the stockpile location. Existing soil from the storage area was not removed. A colored marker fabric, 1.0 foot in width, was installed on 10.0 foot centers to identify the predisturbed surface. Topsoil was hauled from the mine facility and sediment pond areas with end dump

trucks to develop the storage pile. The topsoil will remain in place until final reclamation occurs. A field fence was constructed surrounding the topsoil pile to protect it from grazing impacts. Maintenance of the topsoil pile throughout the life of the mining operation will consist of; 1) seeding new material added to the stockpile, 2) reseeding where erosion or other elements have caused a loss of vegetation, and 3) maintenance of the sediment control structures.

R645-301-232 Topsoil and Subsoil Removal

Prior to the removal of the topsoil, all trees and brush were cleared and removed from the site. Soil was stripped to various depths up to 2.0 feet depending on soil type and/or topsoil depth. Where thick deposits of topsoil or material from reclaimed AML sites were found, soil material was removed as much as possible. The coal waste was removed from the area and disposed of at the existing Deer Creek waste rock site or utilized in the generation of electrical power. The topsoil storage area is illustrated on Maps 200-1, 200-2, Engineering Section 500-3 and 500-4 sheets 3 of 5 and 4 of 5.

Prior to any surface disturbance of the portal area soil test pits were dug. Soil test pits/trenches were established in the proposed disturbed areas (refer to refer to Volume 11 Appendix Volume - Soils: Appendix A and B). These areas included the pinon/juniper habitat areas, riparian habitat areas, sage/brush grass, mountain brush habitat areas, and AML reclaimed sites. Refer to Map 200-1 for test pit/trench site locations. Samples were taken at various depth intervals and analyzed according to the *Guidelines for Management of Topsoil and Overburded for Underground and Surface Coal Mining* (Leatherwood and Duce, 1988). Analyses of these pre-construction samples are found in Volume 11 Appendix Volume - Soils: Appendix A and B.

As documented during the soil survey (refer to Volume 11 Appendix Volume - Soils: Appendix A) and geotechnical investigation (refer to Volume 11 Appendix Volume - Engineering: Appendix F - 2004 AMEC/LGS Geophysics) an area of buried coal was encountered covering approximately 0.7 acres with an average thickness of 4.0 feet. The buried coal is located directly below the reclaimed Leroy Mine portals. During development of the drainage control and sediment pond, the buried coal was removed and transported either to the Deer Creek Waste Rock Storage Site or utilized for power generation if coal quality allowed (refer to Volume 11 Appendix Volume - Soils: Appendix A for analysis of the coal waste material). A portion of the buried coal ~~is~~ was located outside the proposed disturbed area as shown of Map 200-2. Energy West cooperated with AML enhanced this area during site development.

Within the disturbed areas of the Rilda Portal Facility and sediment pond approximately 6,422 cubic yards of suitable topsoil material was recovered and stockpiled during construction activities. The upper 24 inches of recommended topsoil salvage included portions of the A and B horizons (refer to Volume 11 Appendix Volume – Soils: Appendix A & B).

TOPSOIL SALVAGE VOLUME				
SOIL SALVAGE AREA	*Acres*	*Salvage Depth* (inches)*	*Estimated Volume (cubic yards*	*Actual Volume (cubic yards)*
Mine Facility: North of Emery County Road #306	2.7	24 (1)	8,712	2,875
Mine Facility: South of Emery County Road #306	1.3	24 (1)	4,195	1,410
SUBSTITUTE TOPSOIL SALVAGE VOLUME				
Sediment Pond Area	1.3	Depth not applicable. Soil mixed from previous reclamation. Only clean and tested soil was salvaged.	N/A	2,137(2)

(1) Based on recommendations from the Order 1 survey conducted by Mr. Jim Nyenhuis (refer to Volume 11 Appendix Volume - Soils: Appendix B)
(2) Sediment Pond Area: Soil salvaged from this area was used to enhance the previously AML reclaimed area, excess soil material was segregated and stored as recommended by the qualified soil scientist monitoring the soil removal process. Disturbed soil with coal in the profile will not be salvaged. Coal waste encountered during soil salvaging and construction of the sediment pond was segregated separately and transported to the Deer Creek Waste Rock Site for disposal or utilized for power generation if coal quality allows.
*Actual volumes of recovered topsoil were only approximately 33% of the estimated volumes. This was mainly due to the many large boulders encountered during the stripping sequence. Other factors affecting volume included depth to bedrock, color, and texture.

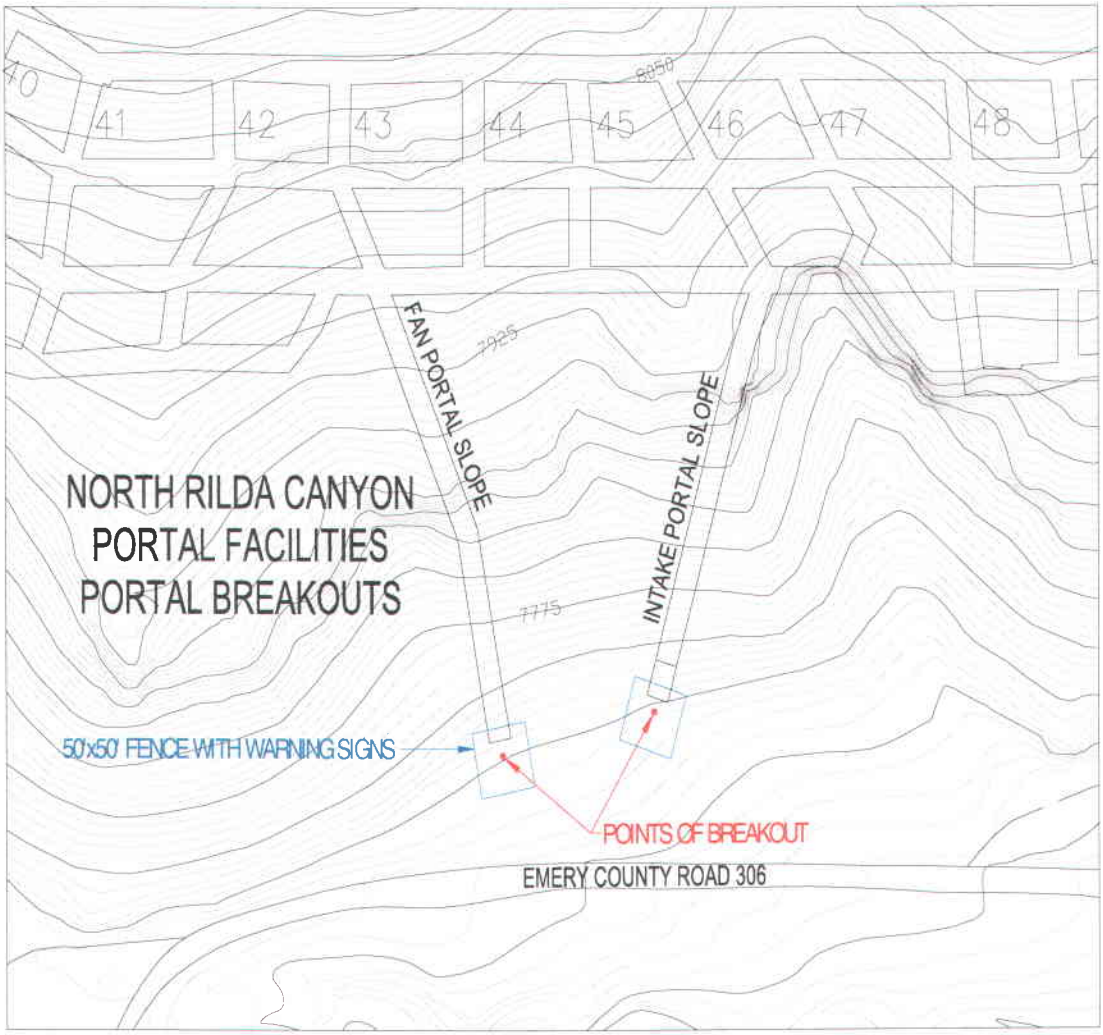
R645-301-232.500 Subsoil Segregation

As mentioned above, no subsoils were segregated or stored. After topsoils were removed, subsoils were utilized as fill material for the construction of the facility pad.

R645-301-232.600 Timing

To alleviate ventilation concerns at the Deer Creek Mine, the Bureau of Land Management (BLM) during a telephone conference on August 23rd /October 27th, 2005, recommended that Energy West submit an R_2P_2 request to allow the continuation of the Rilda Canyon fan portal/intake entry rock slope development to intercept the outcrop in Rilda Canyon. Approving the development of the portals from within the mine to the surface is consistent with the stipulations outlined in the Federal Lease U-06039 (Special Stipulation #14). In an email received by the BLM (August, 2005), the Manti LaSal Forest Supervisor agreed to allow Energy West to develop the fan portal breakout as long as no equipment was used on the surface and the public is protected from potential harm. No permanent structures were constructed until Energy West received approval from the Assistant Secretary of Land and Minerals at the Department of Interior. During the August, 2005 phone conference, OSM personnel indicated the proposed action is not considered mine plan modification.

On October 27th, 2005, Energy West participated a phone conference with BLS, USFS, OSM, and DOGM to discuss the potential of developing an intake entry immediately east of the fan portal. This additional entry was needed for additional ventilation to the Mill Fork Lease (ML48258) mine workings. All in attendance agreed that the intake entry portal should be developed identically to the fan portal development (i.e. no equipment was used on the surface and the public is protected from potential harm, no permanent structures constructed until Energy West receives approval from the Assistant Secretary of Land and Minerals at the Department of Interior). In an email received by the BLM (October, 2005), the Manti LaSal Forest Supervisor agreed to allow Energy West to develop the intake entry portal breakout.



R645-301-200 Figure 1: North Rilda Canyon Portal Facilities - Points of Breakout

The area affected by the portal developments, two areas approximately 30x40 feet (0.056 acres, refer to R645-301-200: Figure 1). As outlined in the BLM R_2P_2 request, Energy West followed the outlined steps:

1. All rock slope development will be from within the mine to the outcrop of the Star Point Sandstone.
2. Colluvial material encountered at the outcrop interface will be stored within the mine.
3. During the final breakout process, mine personnel will be stationed at the outcrop to warn/prevent unwarranted access and to monitor the area for any unsafe condition(s).
4. If any rocks are dislodged as a result of the portal development which impact public safety, Energy West will immediately rectify the situation.
5. Warning signs will be installed along Emery County Road #306 warn the public of the portal development process.
6. A temporary fence will be erected around the breakout area to prevent unwarranted access. Fencing materials used will be non-shiny material and/or of dark color.
7. Silt fence will be erected downslope of the portal breakouts to prevent additional contribution of suspended solids to the receiving stream.
8. Warning signs will be installed along the exterior of the fence, including; NO SMOKING, NO UNAUTHORIZED PERSONNEL BEYOND THIS POINT, DANGER.
9. No equipment will be used on the surface except for hand tools to remove material to prevent unsafe conditions.
10. All slopes, ribs or faces of the opening or unstable areas in the surrounding area will be scaled, secured and supported before completion.
11. The exiting brow of the mine openings will be secured and the exit of the mine openings will be posted off with timber and fencing upon completion of the mine development.
12. No permanent structures will be constructed until Energy West receives approval from the Assistant Secretary of Land and Minerals at the Department of Interior.

Development of the fan/intake entry portals from within the mine is consistent with the engineering plans outlined in the permit. Exception to the plan is soil stripping prior to development of the portals. As discussed earlier, development of the fan/intake entry portals from within the mine will involved two areas approximately 30 x 40 feet, or 0.056 acres. During development of the fan/intake entry portals, all materials extracted were stored within the mine. The exact location of the Star Point Sandstone and colluvial interface was unknown; thereby estimating the subsoil quantity was not possible. Energy West took all precautions necessary to minimize disruption to the surface topography. The amount of topsoil stored within the mine, assuming a two foot salvage depth, is approximately178 yards^3. At the start of construction Energy West removed the extracted soil material temporarily stored in the mine and utilized it in construction of the facility pad.

R645-301-233 Topsoil Substitutes and Supplements

Inspections of the disturbed areas of Rilda Canyon related to the historic coal mining activities have shown that the regraded colluvial materials have provided a suitable growth medium for sustaining native vegetation on previously disturbed surfaces. Even without replacement of the topsoil material, existing revegetation at the sites indicate that excavated, regraded materials are capable of successfully supporting vegetation that existed prior to disturbance with minimal surface preparation. The revegetation has occurred without the addition of mulch, seed, nutrients or supplements and without the installation of erosion protection. Based on the soil surveys conducted for the Rilda Canyon Portal Facilities, substitute topsoil will not be required for final reclamation of the mine site.

Note: During excavation of the sediment pond as part of the facilities pad construction activities, some soil materials (approximately 2,137 yards^3) were salvaged and stored in the topsoil storage area. Field sampling of the material for pH and EC revealed that the material is suitable for use in the growth medium. This soil material has been separated from the existing native topsoil using a colored fabric marker to distinguish between the two stored piles.

R645-301-234 Topsoil Storage

As required under R645-301-234, permanent stockpiles of topsoil for use during final reclamation was placed on a stable surface within the permit area where it will not be subject to significant disturbance, wind erosion, or compaction during life of mine. The stockpile location is considered an ASCA area where BTCA techniques have been used for the treatment of runoff water from the area. Refer to R645-301-700 for details concerning ASCA areas. The stockpile location is presented on Maps 200-1, 200-2; Engineering Section Maps 500-3, 500-4 sheets 3 of 4. The topsoil storage pile site occupies approximately 0.51 acres. Stockpile slopes have been built not to exceed 2:1 Slopes are irregular, pocked, mulched, and seeded to help retain precipitation. Temporary sediment control devices are utilized to minimize runoff and retain soil and moisture on the site.

Revegetation of the topsoil storage pile was with an effective cover of sagebrush/grass (refer to R645-301-300: Biology Table 300-8 for seed mix). The stockpile will not be disturbed prior to final topsoil redistribution without prior approval by the Division. According to Neinhaus, 2004, the quality of the subsoil (below 2 feet depth) varies little from the top 2 feet of material.

R645-301-240 RECLAMATION PLAN

As mining activities at the Deer Creek Mine ceases and the utilization of the surface facilities is no longer needed, land reclamation processes will commence. Reclamation of all disturbed areas will follow the requirements of R645-301. The Soils Reclamation plan for the Rilda Canyon Portal Facilities is detailed below.

R645-301-242 Soil Redistribution

At the time of reclamation of the Rilda Canyon Portal Facilities, PacifiCorp will reduce the footprint of the Portal Facility Area disturbed area by redistributing soil material to be consistent with the postmining land use of the area. This will be accomplished by cutting and/or filling the areas disturbed by mining activities. Prior to initiating regrading process at the facility area, the entire area will be ripped with a dozer to a depth of approximately two feet to reduce soil compaction.

Existing soils used to construct the facility pad will be distributed to form the land to the proposed post-mining grade. Topsoil materials that were previously stockpiled will be redistributed in a uniform thickness on the scarified, postmining regraded subsoil surface. Track-mounted equipment will be used to recontour the disturbed area. Refer to R645-301-500: Engineering, where a detailed plan for recontouring the area is presented. Travel over redistributed soil material will be minimized to the extent possible. This will be accomplished by reclaiming the mine in specific sequences, utilizing existing roads and travelways to live haul soil material. It is important to understand that while reclamation will be specifically sequenced, various stages will be occurring simultaneously throughout the site. The regraded surface will be staked to indicate the depth of topsoil to be applied. After the topsoil has been spread and leveled, it will be pocked/scarified along contour, unless prohibited by slope configuration or grade. At this time other additives would be incorporated into the soil if deemed necessary by soil sampling. Seeding and mulching will be completed soon after redistribution of the topsoil to minimize wind and water erosion.

The sediment pond area, approximately 1.3 acres, will be regraded and covered with available soil salvaged from this area. As discussed in above, there is approximately 2,137 cubic yards of excess soil material for reclamation. If additional soil is available, it will be used to create mounds, extrusions, etc. to provide a natural aesthetic appearance to the reclaimed slopes.

The topsoil storage sites will be reclaimed by first removing the colored indicator fabric. The area will then be slightly roughened being careful not to expose buried coal from past mining activities. Boulders will be randomly placed on the surface similar to pre-existing conditions, estimated at approximately five percent coverage. Revegetation of the topsoil storage piles will be with an effective vegetative cover (refer to R645-301-300: Biology Tables 300-7 and 300-8 for seed mixtures). A hydromulch/tackfier will be sprayed on all disturbed areas of the site.

R645-301-243 Soil Nutrients and Amendments

Nutrients and soil amendments will be applied to the redistributed material when deemed necessary by assessment of the laboratory analyses. Laboratory analyses for the redistributed topsoil will be compared to soil samples collected from the baseline studies. Nutrients and amendments will be added, to make the redistributed soil similar to the undisturbed soils and aid in establishment of the vegetative cover. The nutrients can be added hydraulically, by broadcasting, or by drilling. If the nutrients and amendments are broadcast to the ground surface they will be intermixed with the soil during placement.

The topsoil will be sampled as it is being put in place as described in R645-301-231.300. Random grab samples will be collected from the regraded surface during redistribution of the topsoil. Three composite samples will be collected for each of the areas to be topsoiled: mine facility and sediment pond areas. Soil nutrients and amendments will be added as dictated by the results of the tests in comparison with baseline sampling results.

R645-301-244 Soil Stabilization

Various sized rocks and boulders (litter) will be randomly placed on slopes of reclaimed areas to control slope slippage, promote microhabitats, and provide a natural aesthetic appearance. Where it is deemed necessary, especially on slopes greater than 20%, a soil tackifier (refer to R645-301-300: Biology, Seeding Techniques) will be incorporated into the reclamation process to stabilize soil material.

Rills and gullies, which develop in areas that have been regraded and topsoiled and which either; 1) disrupts the approved postmining land use or the reestablishment of the vegetative cover, or 2) causes or contributes to the violation of water quality standards for receiving streams will be filled, regraded, or otherwise stabilized.

R645-301-250 PERFORMANCE STANDARDS

All topsoil and subsoil will be removed, maintained and redistributed according to the plan given under R645-301-230 and R645-301-240.

All stockpiled topsoil and subsoil will be located, maintained and redistributed according to plans given under R645-301-230 and R645-301-240.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

Five (5) Clean Copies – Volume 11, Deer Creek Mine, North Rilda Canyon Portal Facilities, Biology Tab

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R645-301-310 INTRODUCTION

A portion of the following vegetative, fish, and wildlife resource information has been taken from the Data Adequacy document (Data Adequacy L.B.A No. 11, December 1996) and the Environmental Assessment (Mill Fork Federal Coal Lease Tract UTU-71307, Environmental Assessement document, Lease By Application, No. 11) reported by the Manti LaSal National Forest in June, 1997.

R645-301-320 ENVIRONMENTAL DESCRIPTIONS

The following sections of this application contain descriptions, information, and plans to protect the biological, aquatic, and wildlife resources within and in the vicinity of Rilda Canyon.

R645-301-321 Vegetation Information

The North Rilda area is located within an east-west trending canyon that is very steep and narrow with rounded narrow ridge tops. Contour elevations range from approximately 7,400 feet to over 9,600 feet. Vegetative cover and species composition within this elevation range is very diversified. Ecosystems within this portion of East Mountain contain various habitats that are mostly influenced by the steep and broken slopes and their orientations. Distinguishable plant communities within the area are: Pinyon/Juniper, Mountain Brush, Mixed Conifer (upper elevations), Sagebrush/Grass and Riparian. A very narrow band of Riparian community is considered to follow along the stream to the Rilda Canyon Springs. Refer to Map 300-1 of this section for the diverse vegetative communities. Note that Map 300-1 is a vast area map. For more vegetative community details related to the Rilda Canyon Portal Facilities refer to Volume 11 Appendix Volume - Biology: Appendix A.

Vegetation studies have been conducted within the Deer Creek Mine permit area. The vegetation mapping that was previously conducted for the mine area includes the North Rilda Area, (formerly called the "Future Permit Area" [Volume 4, Map 2-14]). Vegetation studies were conducted for the North Rilda permit area by Mt. Nebo Scientific, 2003 and 2004 (refer to Volume 11 Appendix Volume - Biology: Appendix A), and J.R. Barker in 1982 (refer to Volume 3, Appendix II of the MRP). Quantitative and qualitative data of the major plant communities provided in the 1982 study are also relevant to the North Rilda Area.

Mr. Rick Collins, Mt. Nebo Scientific, identified different vegetation communities in the Rilda Canyon Portal Facilities area and designated reference areas for each community. Of the identified reference areas, only the Sagebrush/Grass (undisturbed), Pinyon Juniper/Mountain Brush (undisturbed), and White Fir/Aspen reference areas have been established. A reference area for the pre-disturbed area (AMR/AML) was identified by Mt. Nebo Scientific; this area is used for topsoil storage to minimize the footprint and to keep all disturbances within the permit boundary. The pre-disturbed areas (AMR/AML) will be seeded with Pinyon-Juniper/Mountain

Brush seedmix at final reclamation and be held to the undisturbed reference area standards for reclamation. Map 300-2 of this section, depicts the location of each reference area.

The most dominant plant community in the facilities area is the Pinyon /Juniper/Mountain Brush Transition. The prominent species identified in this area are: Utah Juniper (*Juniperus osteosperma*), Rocky Mountain Juniper (*Juniperus scopulorum*), Pinyon Pine (*Pinus edulis*), Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*), Ponderosa Pine (*Pinus ponderosa*), Big Sage (*Artemisia tridentata*), Salina Wildrye (*Elymus salina*), Indian Rice Grass (*Oryzopsis hymenoides*), Cutler ephedra (*Ephedra cutleri*), corymbed eriogonum (*Eriogonum corymbosum*), and bluebunch wheatgrass (*Elymus spicatus*).

The Mixed Conifer community, identified in Collin's report (refer to Volme 11 Appendix Volume - Biology: Appendix A) as Douglas Fir/White Fir and White Fir/Aspen communities, are found in the upper elevations of the canyon. The most common plant species of the Mixed Conifer community are: White Fir (Abies concolor), Quaking Aspen (Populus tremuloides, Douglas fir (*Pseudotsuga menziesii*), Saskatoon serviceberry (*Amalanchier alnifolia*), corymbed eriogonum (*Eriogonum corymbosum*) and bluebunch wheatgrass (*Elymus spicatus*).

Plant communities that were impacted the construction of the portal facilities in North Rilda Canyon were quantitatively sampled. Additionally, similar communities chosen outside the disturbed areas were also sampled to determine appropriate reference areas for the disturbed communities (refer to Volume 11 Appendix Volume - Biology: Appendix B). The Similarity Index (SI) of the disturbed vegetation compared to the reference areas was determined using the Motyka's version of the Sorensen's index (Chambers, Jeanne C., Brown, Ray W., Methods for Vegetation Sampling and Analysis on Revegetated Mined Lands, Report INT-151, United States Department of Agriculture, Forest Service, October 1983):

$$SI = \frac{2\,MW}{MA + MB}$$

Where:

MW = Sum of the smaller importance values of the species or life-forms common to both areas.
MA = The sum of the importance values of all species or life-forms in one area.
MB = The sum of the importance values of all species or life-forms in the other area.

The SI results for the three plant communities are:

White fir/Aspen:	93.5
Pinyon-Juniper/Mountain Brush:	70.3
Sagebrush/Grass:	83.9

UDOGM recommends an SI of at least 70 to show an acceptable comparison between the proposed disturbed and reference area vegetation.

Threatened, Endangered and Sensitive Plant Species

Threatened, endangered, and sensitive plant species of interest in Emery County (2004 review) include *Astragalus monti* (Heliotrope milkvetch), *Hedysarum occidentale var. canone* (Western sweetvetch), *Silene petersonii* (Plateau catchfly), and *Aquilegia flavescens* (Yellow columbine). Populations of these species have been found to inhabit the upper areas near the Rilda Canyon Portal Facilities area. Other listed species of concern include *Cycladenia humilis var. jonesii* (Jones Cycladenia), *Erigeron maguirei* (Maguire Daisy), *Townsendia aprica* Last Chance Townsendia), *Schoenocrambe barnebyi* (Barneby Reed-mustard), *Pediocactus dispainii* (San Rafael Cactus), *Pediocactus winkleri* Winkler Pincushion Cactus), *and Sclerocactus wrightiae* (Wright Fishhook Cactus).

Mr. Rick Collins (Mt. Nebo Scientific) conducted an in-depth vegetation analysis of the area related to the Rilda Canyon Facilities, As stated in his report, "There was a potential of the following plants to be present in the study areas: canyon sweetvetch (*Hedysarum occidentale* var. *canone*) and Link Canyon Trail columbine (*Aquilegia flavescens* var. *rubicunda*). These plants have been listed as "sensitive" in the Manti-La Sal National Forest by the USDA Forest Service. These plants, nor their ideal habitats, were not found during the plant surveys". In the 2003 study Collins states, "No threatened, endangered, rare or otherwise sensitive plants were observed within the study areas during the course of the field sampling and surveys" (refer to Volume 11 Appendix Volume - Biology: Appendix A.).

Vegetation productivity analysis was conducted by M. Dean Stacy and Jim Brown of the Natural Resources Conservation Service (NRCS) in October 2004 (refer to Volume 11 Appendix Volume - Biology: Appendix B). The NRCS condition rating is 3 levels (Good, Fair, Poor), with sub-ratings of high and low. Though precipitation totals for the year were slightly below normal (85% of normal, based on East Mountain Weather Station data), the conditions of the reference areas were in the mid range (fair) condition. Productivity values for the communities to be impacted by the facilities are in the report.

R645-301-322 Fish and Wildlife Information

The Rilda Canyon Portal Facilities are all inclusive within the Rilda Canyon drainage, a tributary to Huntington Creek. Water resources within Rilda Canyon provide habitat for a variety of big and small game animals, non-game animals and birds. A complete listing of all theatened and endangered wildlife species that have the potential to be present near and/or within the North Rilda Canyon can be found in the County lists of Utah's Federally Listed Species (UDWR, 8/14/02, at http://www.dwrcdc.nr.utah.gov/ucdc/). Refer to Volume 11 Appendix Volume - Biology: Appendix C for the 5/21/2004 list, by county. A complete listing of all wildlife species that have the potential to be present near and/or within the Rilda Canyon can be found at this same internet address.

The following wildlife information tables includes Threatened and Endangered Species, Sensitive Species, Management Indicator Species, and Priority Migratory Bird Species, listed in Emery County, Utah, and may be present in the Rilda Canyon facilities area. Most data from these tables came from "Wildlife Resources Report for the SITLA - Access on East Mountain Project", Re-revised July 2004, by the Ferron/Price Ranger District, Manti La-Sal National Forest.

Table 300-1: Emery County, Utah Threatened and Endangered Species (Wildlife and Fish) (2004 List)

Species	Species Status	Species Habitat Association	Rilda Habitat Information
Bald Eagle *Haliacetus*	Threatened	Habitat not considered in this area.	May occur incidentally but no nesting is known in the area.
Mexican Spotted Owl *Strix ocidentalis lucida*	Threatened	In Utah, the Mexican spotted owl nests in steep-walled, complex rock canyons at relatively low elevations with mixed conifer stands. Canyons are generally at least 2 kilometers long and less than 2 kilometers wide.	This habitat is in Rilda Canyon, but the elevation is marginal and the canyon does not meet the 2 X 2 rule. The steep-walled outcrops are south facing with conifer habitat generally on the north facing slopes.

Table 300-1: Emery County, Utah Threatened and Endangered Species (Cont.)			
Species	**Species**	**Species**	**Species**
Black-footed Ferret *Mustela negripes*	Endangered	Depends of prairie dog colonies for food. Grass vegetation is normally associated with this habitat.	Prairie dog colonies have not been observed in the facilities area. Sagebrush/Grass vegetation communities are minimal and mostly at lower elevations.
Canada Lynx *Lynx canadensis*	Threatened	Coniferous forests that have cold, snowy winters. Generally not sufficient large tracts of suitable habit	This habitat does exist in Rilda Canyon, but the large suitable habitat is generally not sufficient.
Southwestern Willow Flycatcher *Empidonax trailii extimus*	Endangered	Riparian habitat, nesting in area with high shrub densities interspersed with openings or meadows.	Riparian habitat is present in the canyon, but this vegetation community is down canyon of the facilities and very narrow.
Bonytail *Gila elagans*	Endangered	Warm water reaches of larger rivers in the Colorado River Basin.	Prime habitat not found. The Rilda Canyon stream is feed by cold springs that originate near the joining of the Left and Right Forks. The stream has great differences in flow during the Spring and Fall flows.
Humpbacked Chub *Gila cypha*	Endangered	Deep, swift mainstream and large tributaries in relatively inaccessible canyons of the Colorado River Basin.	Prime habitat not found. The stream in the Rilda Canyon is not considered a large tributary, is not deep or swift.
Razerback Sucker *Xyrauchen texanus*	Endangered	Mainly along the mainstreams of the Colorado, Greenand San Juan Rivers.	Prime habitat not found. The nearest known population occurs approximately 50 miles from the project area, in the lower San Rafael River and green River.
Colorado Pikeminnow *Ptychocheilus lucius*	Endangered	Species exists only in the upper Colorado River system. Adults prefer medium to large rivers. Young prefer slow moving backwaters. Food source is usually other fish.	Prime habitat not found. Rilda Canyon's stream is small and adult feed is limited.
Whooping Crane *Grus Americana*	Endangered	Primarily found in wetlands, but pastures and cultivated fields are also habitats.	Prime habitat not found. Some riparian vegetation is found down stream of the mine site, but it is not the wet, open area preferred.

Table 300-2: Sensitive Species (Utah Conservation Data Center and Manti-LaSal Forest) (2004 List)		
Species	**Species Habitat Association**	**Rilda Habitat Information**
Spotted Bat *Euderma maculatum*	Habitat consists of a variety of vegetation types in elevations ranging from 2,500 to 9,500', including riparian, desert shrub, spruce/fir, ponderosa pine, montane forests and meadows.	Habitat in Rilda. Small areas of several of the vegetation communities are present. A bat survey in Rilda Canyon was conducted in October 2004. (Refer to Appendix G)
Townsend's Big-eared Bat *Plecotus townsendii pallescens*	Hibernates in caves and mines. The mixed conifer vegetation communities in the canyon provides suitable habitat for foraging.	Habitat in Rilda. Caves are not found in the area in the area, but the south facing escarpments could be considered habitat. A bat survey in Rilda Canyon was conducted in 2004. (Refer to Appendix G)
Northern Goshawk *Accipiter gentilis*	Mixed Conifer vegetation stands in this elevation.	Habitat in Rilda. Mixed Conifer communities are present in Rilda Canyon, but the stands are on the north facing slopes and away from the facilities' activities.
Three-toed Woodpecker *Picoides tridactylus*	Forests containing spruce, fir, ponderosa pine, tamarack, and lodgepole pine.	Habitat in Rilda. Small, mixed stands of spruce/fir communities are on the north facing slopes. A few ponderosa pines are on the south facing PJ/Mountain Brush communities.
Colorado Cutthroat Trout *Oncorhynchus clarki pleuriticus*	Require cool, clear water in streams with well vegetated banks, which provides cover and bank stability. Deep pools and structures such as boulders and logs provide instream cover.	Habitat in Rilda Canyon. Two fish and invertebrate surveys were conducted during 2004. Flows vary in the stream during the spring and fall. Turbidity increases during spring runoff and summer storm events. (Refer to Appendix D)
Bonneville Cutthroat *Oncorhynchus clarki utah*	Requires a functional stream riparian zone, which provides structure, cover, shade, and bank stability. Found in this habitat ranging from high elevation mountain streams and lakes to low elevation grassland streams.	Habitat in Rilda Canyon. Two fish and invertebrate surveys were conducted during 2004. Species was not identified. (Refer to Appendix D)

Table 300-2: Sensitive Species (Cont.)		
Species	**Species Habitat Association**	**Rilda Habitat Information**
Spotted Frog *Rana luteiventris*	Habitat preference is isolated springs and seeps that have a permanent waster source. Isolated populations exist in the West Desert and along the Wasatch Front.	Habitat in Rilda Canyon
Greater Sage-grouse *Centrocercus urphasianus*	Also known as the Sage-hen and the Sage-chicken. Habitat is sagebrush plains, foothills and mountain valleys. Sagebrush is the predominant plant of quality habitat.	Small sagebrush communities are in Rilda Canyon.
Peregrine Falcon *Falco peregrinus*	The species is distributed very widely, breeding in a variety of habitats.	Rilda Canyon cliffs could be habitat for Peregrine falcon nesting. Annual raptor surveys are conducted in Rilda Canyon.
Flammulated Owl *Otus flammeolus*	Prime habitat is Montane forests, especially ponderosa pine forests. Species is considered widespread in Utah, but breeding occurs primarily in the southwestern and north-central parts of the state.	Habitat in Rilda Canyon. The north facing slopes is mixed conifer community. Some individual Ponderosa pines are present in the bottom of the canyon.

Table 300-3: Other Wildlife Species of Consideration (2004 List)		
Species	**Species Habitat Association**	**Rilda Habitat Information**
Mule Deer *Odocoilus hemionus*	Mixed conifer forest, Pinyon/Juniper/Mountain Brush and sagebrush communities are suitable habitat.	High value winter and critical summer habitat are in Rilda Canyon. Mule Deer are found in the canyon.
Rocky Mountain Elk *Cervus canadensis*	Tend to occupy higher elevation aspen and mixed conifer communities in spring through fall, and move to lower Pinyon/Juniper and sagebrush communities during the winter months.	High value winter, critical summer, and critical winter habitat are in Rilda Canyon. Elk are known to use the area in late spring, summer and fall.
Moose *Alces alces*	Marshy, riparian type communities.	High value winter and critical smmer habitat are in Rilda Canyon. Moose transplants have been seen in canyons near the Rilda Canyon.
Mountain Lion or Cougar *Felis concolor*	Species is fairly common throughout Utah's mountainous areas. Diet is composed of deer, rabbits, rodents and other animals.	Habitat in Rilda Canyon.
Black Bear *Ursus americanus*	Species is common is Utah's large forested areas. Diet is composed of fruits, insects, grubs, some small vertebrates, and carrion.	Habitat in Rilda Canyon.
Wolverine *Gulo gulo*	Prefer alpine tundra and mountain forest habitats. Eats a variety of food, including eggs, roots, carrion and many types of animals.	Habitat in Rilda Canyon.
Golden Eagle *Aquila chrysaetos*	High cliffs are used for nesting. Search for prey in high mountain brush, perennial forb, and high elevations perennial grassland habitat.	One golden eagle nest is known in the canyon. Annual raptor surveys are conducted in the canyon and other areas of East Mountain.
Macroinvertebrates (Aquatic Species)	Stream and riparian habitat	This habitat exists in Rilda Canyon. Two fish and invertebrate studies were conducted in 2004.

Table 300-4: Migratory Birds (2004 List)		
Species	**Species Habitat Association**	**Rilda Habitat Information**
Virginia's Warbler *Vermivora virginae*	Preferred breeding habitat includes chaparral and open stands of pinyon/juniper, ponderosa pine and scrub oak, mountain mahogany thickets on dry mountainsides.	The preferred scrub hillsides, scrub oak, is not present in Rilda Canyon, but small stands of pinyon/juniper and mountain mahogany occur. There have been no known confirmed nesting sites found on the Manti-La Sal National Forest.
Black Rosy-Finch *Leucosticte atrata*	Breeding populations occur as high as 11,000' in Utah. Habitat is crevices or holes in inaccessible vertical cliffs.	High cliff habitats are present in the area. Generally, could only be considered in the area during slight shifts southward, moving south out of Montana and northen Wyoming.
Broad-tailed Hummingbird *Selasphorus platycercus*	Primary breeding habitat is lowland riparian communities, but have also been recorded in aspen, mountain riparian, ponderosa pine, Engelmann spruce, subalpine fir, and Douglas fir. Nesting typically occurs at elevations ranging from 6,000 to 8,000'.	Primary habitat not present in Rilda Canyon. Upper nesting elevation is at the facilities elevation.
Black-throated Gray Warbler *Dendroica nigrescens*	Preferred breeding habitat includes dry oak slopes, pinyon/Juniper, open mixed woods and dry coniferous and mixed conifer habitats, with grassy understories. Elevation is up to 5,400'.	Habitat found in Rilda Canyon, but the canyon elevation is above the upper elevation limit
Gray Vireo *Vireo vicinior*	Species breeds on arid slopes dominated by mature pinyon-juiper and juniper woodlands in southwestern Utah, north to Sevier County.	Habitat found in Rilda Canyon.

Table 300-4: Migratory Birds (Cont.)		
Species	**Species**	**Species**
Brewer's Sparrow *Spizella breweri*	Primary habitat is Utah is the shrub steppe habitat. However, Brewer's sparrows may also be found in high desert scrub (greasewood) habitats. They may also breed in large sagebrush openings in pinyon-juniper or coniferous forest habitats.	Habitat found in Rilda Canyon.
Sage Sparrow *Amphispiza belli*	Species occurs throughout Utah during the spring and summer months, but primarily in the southwestern portion of the state during the winter. Prefers shrubland, grassland and desert habitats.	Habitat exists in small stands of sagebrush/grass communities in the canyon.

Aquatics within the Rilda Canyon Creek corridor were protected during construction and operation activities by placing silt fence or other acceptable best management practice (BMP) along the southern edge of the disturbance. The silt fence or other acceptable BMP will be removed when the UDOGM determines that vegetation is sufficiently established. The surface yard was constructed to slope towards the north. In addition, the topsoil pile will have silt fence or other acceptable BMP installed around the slopes that can drain treated runoff to the stream. Wildlife was protected by conducting construction during months that minimized impacts to breeding and birthing activities.

A rat midden site is located near the facilities area. There was no actual disturbance in this area. It is protected by placing a 6 foot chainlink fence around the base.

I. Aquatic Species

The Utah Division of Wildlife Resources (UDWR) has conducted aquatic surveys of the perennial and intermittent streams in the area. The following information summarizes the representative game species in the Right Fork Rilda Creek.

Benthic Invertebrates - The USGS in cooperation with the UDWR and Utah Division of Oil, Gas, and Mining (UDOGM) conducted a comprehensive hydrologic study (from July 1977 through September 1980) of the upper drainages of the Huntington and Cottonwood Creeks ("Hydrology of the Coal-Resource Areas in the Upper Drainages of Huntington and Cottonwood Creeks"). Data on benthic invertebrates were collected from 16 sites in October 1977, July and October 1978, and October 1979. This data is cited and used as a reference source in comparison baseline

evaluation conducted during 2004 and 2005 for the North Rilda Canyon area. (Refer to United States Geological Survey, Water-Resource Investigations, Open-File Report 81-539, Salt Lake City, Utah, 1981)

As written from the report, "...data indicate that there were significant seasonal differences in the benthic invertebrate population at a given site in addition to areal differences...These organisms appeared in their maximum numbers in the July samples collected at sites in the higher altitudes of the study area, but they were not present in any of the October samples. The large numbers found in July, reflected a seasonal cycle rather than an unnatural condition that allowed one species to dominate." The average diversity (Shannon-Weiner diversity index) found between 1977 and 1979 in Rilda Canyon was 2.84.

In addition to the previous studies of Rilda Creek drainage, UDWR conducted biological organism and habitat studies of Rilda Creek in the spring of 2004(refer to Volume 11 Appendix Volume - Biology: Appendix D). As stated in the report entitlied "*Preliminary Report on Surveys Conducted to Determine Potential Impacts of Rilda Surface Facility Development in Rilda Canyon During 2004*", representatives of the UDWR, Southeastern Region were asked by the UDOGM to participate in an on-site meeting, discuss the impacts of this project on the biota within Rilda Canyon, and aid in the development of a comprehensive EA. During this and subsequent meetings it was decided that UDWR would conduct pre and post-disturbance evaluations of macroinvertebrate populations and identify resident fish populations in Rilda Creek. This preliminary report, plus the reports that will be generated from the spring and fall 2005 surveys, marks the completion of the pre-disturbance baseline data sampling effort. Details on the methodology employed during macroinvertebrate and fish sampling and a limited results section are included in this report. Refer to Volume 11 Appendix Volume - Biology: Appendix D for a copy of the preliminary report. A copy of the final report will be included upon completion by UDWR. The Preliminary Report, indicates the presents of fish in the Rilda Canyon stream. Brown trout *(Salmo trutta)*, and cutthroat trout *(Oncorhynchus clarki)*, two salmonid species were found. No fish were found above the stream crossing. As suggested, the stream along the disturbed facilities area will be protected to minimize the impacts of sedimentation and reduction of water quality below the side drainage undisturbed bypass culvert installations. Disturbed runoff will be treated as outlined in the Hydrology Section.

An additional study of the area was conducted by Cirrus Ecological Solutions in the fall of 2004. Spring and fall surveys will be conducted in 2005. The results in this Preliminary Report are similar to previous (Walker) survey. Brown trout and cutthroat trout were observed. Refer to Volume 11 Appendix Volume - Biology: Appendix D, for this report. The 2004 -2005 surveys will serve as baseline aquatic data for Rilda Creek.

II. Terrestrial Species

Wildlife studies have been conducted within the Deer Creek Mine permit areas and those areas adjacent to it. The wildlife habitats of the North Rilda Area include Mixed Conifer, Pinyon-Juniper/Mountain Brush, and Sagebrush/Grass communities. Descriptions of these and other habitats that exist within the permit and adjacent boundaries have been given in previous wildlife sections of the MRP. "Species of Special Significance", threatened, endangered, and "Special Status Species" have been described previously. Table 1 of Volume 1, Part 2 of the MRP lists Vertebrate Species of the Wasatch Plateau of which the Deer Creek Mine permit and adjacent area and the North Rilda Area are part. The tables include the species status (common, rare, threatened, etc.), the habitats in which they occur, and the likelihood of their occurrence within the boundaries of the lease area.

Mule Deer, Elk, and Moose habitats have been mapped for the permit and adjacent areas. Refer to Maps 300-3, 300-4, and 300-5 of this section to view the areas. "Critical Summer Range", "Critical Winter Range", and "High Value Winter Range" are shown on the maps. The Utah Division of Wildlife Resources indicate that the entire Rilda Canyon area is habitat for Mountain Lion and Black Bear. UDWR also have records of occurrence for wolverine eight miles northwest and thirteen miles southwest of Rilda Canyon. Habitat for the Canadian Lynx is also found in the Rilda Canyon area. The wolverine and lynx habitat maps, found on the UDWR web site (http://dwrcdc.nr.utah.gov/ucdc/default.asp) are shown as "predicted habitat" and not "known habitat" maps.

Raptor nesting studies and nest mapping have been conducted in the North Rilda Area. Much of the area is raptor nesting habitat. Specific nests have been numbered and mapped in the area (this report has been submitted to the Division of Oil, Gas and Mining only and is found in PacifiCorp's Confidential Files, located at the UDOGM office) The status of the two nests in Rilda Canyon have also been submitted and are part of the Confidential Files. Nest information and locations are based on results from the 2004 annual raptor survey conducted by Energy West Mining Co., in conjunction with the Utah Department of Wildlife Resources. Energy West Mining Co. conducts annual raptor surveys in the area. The results of those surveys are available upon request.

A Ventilation Fan Sound Survey was conducted in November 2004; see Volume 11 Appendix Volume - Biology: Appendix E. Results indicate that the sound frequency and volume of the fans in Rilda Canyon will be near background levels at the perennial stream origination point.

R645-301-322.210 Threatened and Endangered Species

The Environmental Assessment (Mill Fork Federal Coal Lease Tract UTU-71307, Environmental Assessment, LBA Application #11. June, 1997), MRP Volume 12 reports "No threatened or endangered wildlife species are known to inhabit the proposed lease area. A Bald Eagle (*Haliaeetus leucocephalus)* nest near the Hunter Power Plant is approximately 26 miles southeast of the coal lease. The coal lease area is outside of the foraging area for the Bald Eagles. No roost sites have been found in the lease area ..."

Other TES information applicable to the North Rilda Canyon Portal Facilities:

Mexican Spotted Owls (MSO) have recently become a species of interest since the U.S. Fish and Wildlife Service (USFWS) designated (in January, 2001) 4.6 million acres on federal lands in Arizona, Colorado, New Mexico, and Utah as critical habitat. The designation includes 3.2 million acres in Utah. More specifically, the designation includes areas west of the Colorado River within the West Tavaputs Plateau in Carbon County and the northeast corner of Emery County east of US Highway 6. Other areas in Utah have been designated as critical habitat, however, these areas exist in the southern portion of the state. Typical MSO, habitat according to the 2001 Environment Assessment (Environmental Assessment, Designation of Critical Habitat for the Mexican Sotted Owl, January 2001, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico), consists of "a diverse array of biotic communities. Nesting habitat is typically in areas with a complex forest structure or rocky canyons, and contains uneven-aged, multi-storied mature or old growth stands that have high canopy closure (Ganey and Balda 1989, USDI 1991). In the northern portion of the range (southern Utah and Colorado), most nests are in caves or on cliff ledges in steep-walled canyons....typically characterized by the cooler conditions...frequently contain small clumps or stringers of ponderosa pine, Douglas fir, white fir, and/or pinyon-juniper".

Dr. Dave Willey from Montana State University, known Mexican Spotted Owl expert, modeled representative habitat using the 2000 Willey-Spotskey Mexican Spotted Owl Habitat Model. The model included the Manti-LaSal area. Figure 300-1 includes the North Rilda Canyon area, with the Mill Fork Lease area outlined. Areas identified in black, are areas of potential nesting habitat. The green's are identified as potential foraging areas of steep sloped mixed conifers. However, it is reported in the UDWR's *Inventory of Sensitive Species and Ecosystems in Utah, 1997* that foraging, nesting and roosting habitats are "dominated by Douglas-fir and/or white fir...In the northern portion of the range (southern Utah and Colorado), most nests are in caves or on cliff ledges in steep-walled canyons." Potential steep sloped, mixed conifer foraging habitats of this type are found on the extreme northeastern border, extreme western border, and a small area in the southwest corner of the Mill Fork lease area as illustrated in Figure 300-1. Large ponderosa pines are typically found in lower elevations in the rocky canyons. The Rilda Canyon drainage is depicted in the lower

right corner of Figure 300-1. The Rilda Canyon supports both aspen and Douglas fir stands, and has cliff ledges or steep walled canyons recognized as typical foraging habitats.

On October 5, 2004, a habitat suitability determination study was conducted by EIS Environmental & Engineering Consulting. Refer to Volume 11 Appendix Volume - Biology: Appendix F for the report. The summary of this report states that MSO habitat constituents are in Rilda Canyon.

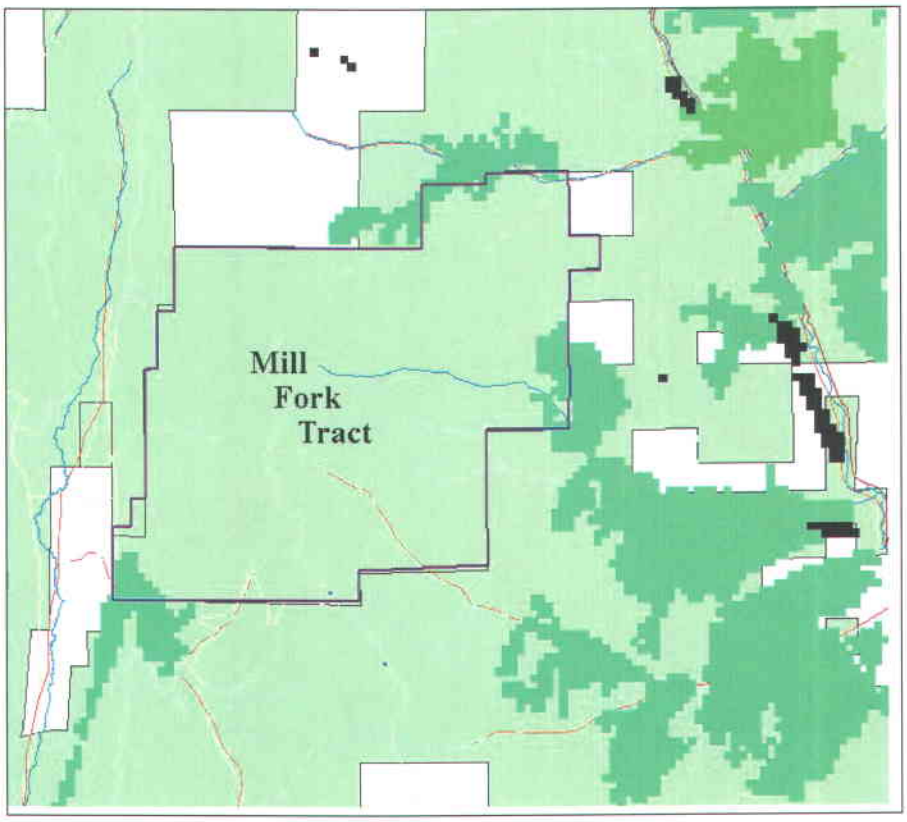

Figure 300 - 1: Mexican Spotted Owl nesting and foraging areas (Dr. Dave Willey, Montana State University, 2000).

The Spotted bat *(Euderma maculatum)* depends on cliffs for roost/hibernation areas. These areas exist in isolated locations in the south facing slopes of Rilda Canyon. Energy West Mining Company and Genwal Resources in 1997, contracted Richard Sherwin, Dr. Duke Rogers, and Carl Johansson to conduct a bat survey in the areas of Huntington Canyon, Straight Canyon, and Cottonwood Canyon. The purpose of this survey was to assess the distribution, abundance, and habitat requirements of the Townsand big-eared and Spotted bats. These parameters were investigated for the following: 1) areas under consideration as potential lease sites for mining (North Rilda Area, Cottonwood Canyon LBA and the Mill Fork lease); 2) sites where subsurface coal mining is onging, and 3) sites (both on and off the Manti-La Sal National Forest) that serve as controls (no mining activties). The results of this surveys (Refer to Volume 12 Appendix A: *Assessment of Spotted Bat (Euderma maculatum) and Towsend's Big-eared Bat (Corynorhinus townsendii) in the Proposed Cottonwood Canyon, North Rilda Area and Mill Fork Lease areas, Manti La Sal National Forest, Emery County, Utah.)* are as follows:

Use assessment for Townsend's big-eared bats in specified areas
No Townsend's big bats were located within the survey areas during the project.

Use assessment for Spotted bats in specified areas
No Spotted bats were mist netted during these studies; refer to Volume 12 Appendix A Table 1 for a summary of results. There is some indication that water source(s) may not be as critical for the Spotted bat as for other species of bats with which it co-occurs. In a study of urine concentrating ability among selected species of bats, the spotted bat could concentrate its urine more effectively than any species of bats evaluated, with the exception of two typically "desert species", the pallid bat (Antrozous pallidus) and the Western pipistrelle (Pipistrellus hesperus - Geluso, 1978). It is likely that the Spotted bats were using water sites specifically to forage rather than drink, making netting extremely difficult.

Spotted bats were observed throughout the eastern (lower elevation) portions of the study areas. The highest concentrations of calls were recorded in Rilda and Huntington Canyons. These canyons seem to best represent "classic" Spotted bat habitat with an abundance of fractured sandstone cliffs, and large areas of suitable foraging habitat.

From three studies, it appears that Spotted bats are using the cliffs as roosting areas and the canyons as flyways to reach the lower elevation foraging areas. The principal Spotted bat foraging areas are located over the lower elevation riparian habitat located near the mouth of Huntington Canyon. Spotted bats concentrated foraging efforts above the upper canopy of intact riparian vegetation, particularly cottonwood trees (Populus ssp.).

Spotted bats were not restricted to the study areas, but rather are widely distributed in low densities throughout the entire area. In fact, Spotted bats were detected in suitable habitat throughout the area (including utilizing the parking lots of the Village Inn Motels in Huntington and Castledale).

There also is evidence that the Spotted bats tolerate at least moderate human disturbance while foraging. Surveys were conducted at several sites near roads with light to moderate vehicular traffic (Crandall Canyon, Huntington Canyon), including tandem trucks used for hauling coal from the Genwal Mine portal located in Crandall Canyon. Spotted bats were observed foraging at low elevations sites off the lease areas, sometimes within 30 meters of the right of way.

Spotted bats are common throughout the Huntington Canyon area. They were identified utilizing the lease areas (North Rilda and Mill Fork), the active mine permit areas and the control sites (refer to Volume 12 Appendix A, Table 2). Based on the number of individuals observed and their habitat use patterns, it does not appear that current mining practices represent a long term threat to the viability of this population. The bat communities in all areas sampled consist of the same suit of species among all areas of similar habitat and complexity (this includes sites in actively mined areas, control sites, and proposed lease areas (North Rilda and Mill Fork).

The fact that Spotted bats are relatively common in active and previously mined areas implies that past cliff failures have not dramatically impacted resident populations. As a cliff roosting species, it is likely that they have adapted to tolerate natural rock falls and subsidence. Mine related cliff failures do not generally result in a net loss of habitat (ie. cliffs), but rather provide replacement habitat which may later be colonized by members of the local population. The results of the study indicate that Spotted bats are "common" enough throughout the area that the localized failure of cliffs (as a result of coal mining within the proposed lease areas [North Rilda Area and Mill Fork]) does not pose a serious threat to the population as a whole.

An additional bat habitat study was conducted in October 2004 by Joel and Gabrielle Diamond, Refer to Volume 11 Appendix Volume - Biology: Appendix G. This study was specific to the Rilda Canyon area. Findings in the 2004 study were similar to the 1997 study.

R645-301-323 Maps and Aerial Photographs

The map for vegetation diversity is located in the Maps Section of R645-301-300: Biology of this volume (Map 300-1). Deer, elk, and moose habitat are located on Maps 300-3, 300-4 and 300-5. The Raptor nest map has been transmitted to the Division of Oil, Gas and Mining, and is part of PacifiCorp's confidential files, located in the UDOGM office. In addition to biologic base maps provided in this section, PacifiCorp conducts annual reconnaissance surveys, including subsidence monitoring (annual aerial photogrammetric surveys), infrared photography (5 year intervals), and hydrologic monitoring.

R645-301-330 OPERATION PLAN

Protection and Enhancement:
Methods, devices, and procedures to protect fish, wildlife and stream degradation during construction, operation and reclamation activities are:

1. Reduced disturbed footprint.
   As depicted in Volume 11 - Engineering, Maps Section, Map 500-1, the Rilda Canyon Portal Facilities are located in an area disturbed by historical coal mining. This disturbed land is part of the historic coal developments known as the Helco, Leroy, Rominger, and Jeppson mines. All of the mines were reclaimed by AML in 1988. The historic mine sites disturbed a total of 10.67 acres. Of the 7.28 total disturbed acres, 1.79 acres are on land pre-disturbed by the historical mine sites. The pre-disturbed land is 24.6% of the total disturbed at the Rilda Canyon Portal Facilities. PacifiCorp commits to enhancing the previously disturbed area to revegetation standards relative to the non-disturbed reference areas. In addition to the designing the facilities utilizing the previously disturbed area, PacifiCorp negotiated with Andalex Resources to acquire a right-of-way within the existing Genwal Mine disturbed area for a future breakout associated the Deer Creek Mine. Originally, PacifiCorp included a potential breakout for the Deer Creek Mine within the Mill Fork Lease ML-48258 located in Crandall Canyon upstream from the existing Genwal Mine. The ventilation breakout in Crandall Canyon would have required access road and pad disturbing approximately 1.0 acre near Crandall Creek. As a result of the right-of-way acquisition, overall the disturbance associated with the Deer Creek Mine will be reduced.
2. The surface yard has been constructed such that all surface runoff flows to the north, away from the stream, to a disturbed culvert system. (Refer to Engineering and Hydrology Sections for plan to treat disturbed runoff).
3. A Barrier has been installed along the surface yard's southern disturbed boundary (closest disturbance near the stream).
4. Interim vegetation on slopes and topsoil piles.

5. Buffer Zones markers placed along the south disturbed border to make construction workers aware of the location of the stream.
6. Reduced speed limit on the mine access road (Emery County Road #306).
7. Compliance with a Spill, Prevention, Control and Countermeasures (SPCC) Plan for the mine facility. The SPCC Plan is required under 40 CFR 112. It's primary use is prevention, reporting and clean-up of spills.
8. Compliance with and Air Quality Approval Order for the mine facility.
9. Annual raptor survey
10. To limit the impact on wildlife, the facility disturbance is located below the stream crossing at the forks of Rilda Canyon. Wildlife can continue to use the area for access from one fork to the other.
11. Material haulage to the existing Rilda Canyon fan in the Left Fork has been discontinued after the Rilda Canyon facilities became functional. Materials are hauled underground via the facility's portal.
12. Raptor safe power poles have been installed in the facilities following PacifiCorp's "Guidelines For Managing Birds on Powerlines", refer to Volume 11 Appendix Volume - Biology: Appendix H.
13. Startup construction (commenced April 15, 2006) and startup of reclamation activities will not take place between December 1st and April 15th, an exclusionary time for wintering and calving periods. All access prior to April 15, 2006 to the Rilda Canyon Facilities was approved by the Division on a case-by-case basis.

In addition to the protection and enhancement methods, devices and procedures listed above, PacifiCorp in cooperation with the regulatory agencies has developed a series of mitigation commitments to enhance and mitigate potential impacts associated with the Rilda Canyon development related to big game species, raptors, riparian habitat (aquatic species, bats and migratory birds) and noxious weed control. The list details the mitigation commitments:

Wildlife Mitigation Commitments:

Table 300-5: Rilda Canyon Wildlife Mitigation

Wildlife	Project	Project Summary	Overseeing Agency(s)	General Objective	Date of Implementation	Required Reporting
Big Game Species	Leroy Mine Area; Buried Coal Removal and Landscape Enhancement	Leroy Coal Mine operated during the 1940's through the 1950's. Development included a narrow access road, two portals and coal storage and haulage area. Soil/geotechnical surveys delineated an area containing approximately 4,000 tons of buried coal. In addition, these surveys also documented that the depth of soil was limited in this area and ultimately affected the success and diversity of the revegatation. PacifiCorp proposes as part of the development of Rilda Canyon to remove the buried coal within the proposed disturbed area. During final reclamation, PacifiCorp commits to reclaiming this area to the same standards as areas previously not disturbed, including committing the revegetation standards to non-disturbed reference areas.	DOGM	To achieve reclamation of the Leroy Mine buried coal area with vegetation success similar to the non-disturbed reference area.	Project will be initiated and be completed during the development of the facilities, approximately two years.	Certified as-built drawings after the construction of the Rilda Canyon facilities. This project was completed August 2006, Refer to Map 300-6 in the Maps Section

Table 300-5: Rilda Canyon Wildlife Mitigation

Wildlife	Project	Project Summary	Overseeing Agency(s)	General Objective	Date of Implementation	Required Reporting
Big Game Species	Abandoned Mine Areas Outside of the Proposed Disturbance	Cooperate with Abandon Mine Lands (AML), United States Forest Service (USFS) to reclaim and enhance the Leroy Mine access road and portal site, including access road, buried coal, historic coal spills and portal highwalls.	DOGM, USFS	To achieve reclamation success of the Leroy Mine disturbed area outside the proposed Rilda Canyon facilities boundaries with vegetation success similar to the non-disturbed reference area. PacifiCorp will utilize available soil resources to backfill the portal bench and access road. The entire area will be recontoured to approximate original contour to the extent possible. After completion of the backfill and grading process, the entire area will be pocked and seeded as outlined in the Biology and Engineering Sections for areas within the proposed disturbed area.	Project will be initiated and completed during the development of the facilities, approximately two years.	Upon completion of the project, PacifiCorp will develop a report documenting the restoration project. This project was completed August 2006, Refer to Map 300-6 in the Maps Section

Table 300-5: Rilda Canyon Wildlife Mitigation						
Wildlife	**Project**	**Project Summary**	**Overseeing Agency(s)**	**General Objective**	**Date of Implementation**	**Required Reporting**
Big Game Species Small Game Species Migratory Birds	Habitat Protection on East Mountain Private Land	"PacifiCorp owns and controls approximately 4,440 acres of private lands on East Mountain within the Manti-LaSal National Forest boundary in Emery County, Utah. These private fee lands are located amongst federal lands and have unrestricted open range access to the southern and eastern portions of East Mountain together with open range on 440 acres of fee lands in the northern area in Rilda Canyon. PacifiCorp manages these private lands for multiple use and has no plans for development which would impair wildlife habitat, seasonal livestock grazing or recreation."	NA	Maintain ownership and control of East Mountain properties throughout the life of the Rilda Canyon facilities. These lands will be managed for multiple use. Use which would impair wildlife habitat, such as seasonal livestock grazing or recreation will be limited.	NA	NA

Table 300-5: Rilda Canyon Wildlife Mitigation

Wildlife	Project	Project Summary	Overseeing Agency(s)	General Objective	Date of Implementation	Required Reporting
Raptor Species	Company News Letter	Periodically include in the company newsletter awareness of highway deer kill and the impacts to raptors.	NA	Increase awareness of the potential impacts associated with traffic and raptors. PacifiCorp will periodically make available to employees special newsletters outlining the potential impacts of raptor mortality and corrective measures to reduce these impacts. Coordinate with Emery County Road Department to install warning signs along Emery County road #306.	Upon issuance of the Rilda Canyon permit, PacifiCorp will initiate the educational newsletters to mine employees and contact Emery County Road Department.	NA

Table 300-5: Rilda Canyon Wildlife Mitigation

Wildlife	Project	Project Summary	Overseeing Agency(s)	General Objective	Date of Implementation	Required Reporting
Riparian Habitat Big/Small Game Species Migratory Birds Aquatic Habitat	Rilda Creek Sediment Loading Reduction Project	Rehabilitate through sediment and erosion control activities the perennial portion of Rilda Creek, from Rilda Canyon Springs to the mouth of the canyon. Coordinate with government agencies to facilitate the project. Project would involve approximately two miles of stream corridor.	DWR, USFS, DOGM	Install best management practices (BMP's) to control erosion and reduce sediment loading throughout the perennial reach (approximately two miles) of the Rilda Creek. Sediment and erosion control will involve a systematic approach: identify the problems and opportunities, develop project goals and objectives, select and design BMP alternatives, implement selected designs, monitor results and modify designs if necessary.	Upon issuance of the Rilda Canyon permit, PacifiCorp will coordinate initial meeting with governmental agencies necessary funding to complete all work within one year after the completion of the reconstruction of EC#306.	N/A This project was completed November 2008
General	Noxious weed	PacifiCorp will monitor Rilda and Mill	DOGM and	Control noxious weeds in Rilda and		NA

Table 300-5: Rilda Canyon Wildlife Mitigation						
Wildlife	**Project**	**Project Summary**	**Overseeing Agency(s)**	**General Objective**	**Date of Implementation**	**Required Reporting**
	program	Fork Canyons annually for noxious weeds. Manually/chemically treating methods will be used to control noxious weeds.	USFS	Mill Fork canyons. PacifiCorp will use manual methods and if necssary institute chemical treatment program to eradicate noxious weeds. If chemical treatment is necessary, PacifiCorp will follow a DOGM/USFS approved application plan and apply for necessary permits and approvals from the USFS.		

A brief summary of the facilities that have been constructed are: side drainage, undisturbed by-pass ditches, and culverts, disturbed ditches and culverts, fueling area, trash bunker, rock dust silo, non-coal waste storage, sediment pond, fan, generator, and some designated storage areas. Steep slopes (retaining walls), created during construction of the facilities were supported using geotechnical design criteria.

Buffer zones along the stream have been established and marked with "Buffer Zone" signs to minimize potential impacts to the stream.

To protect the vegetative growth media, the topsoil was removed prior to construction of the facilities (Refer to the Soils Section of this permit). The top soil storage area is designated on Map 200-1 in R645-301-200: Soils. Erosion protection includes deep pocking, interim vegetation and silt fence or other acceptable BMP until the vegetation is established. A "Topsoil" signs has been placed at the foot of the pile for location awareness.

Erosion control is discussed in the Engineering and Hydrology sections of this volume.

Baseline data for aquatic species include two spring and fall surveys prior to facilities construction. Post construction surveys were conducted in the spring and fall of 2008. A spring survey will be conducted once every 3 years, using the same protocol and sampling sites as the 2004 surveys. This operational survey will commence in the spring of 2011.

Second mining (ie. longwall extraction) of the North Rilda area was limited to the ridge separating Rilda and Mill Fork canyons. Second-mining full extraction did not occur beneath the stream channels of these canyons. First mining (i.e. mainline development) occurred below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence" design of the 4th North Mains development within the Right Fork of Rilda and the long-term stability analysis refer to the Volume 11, Appendix Volume - Engineering: Appendix A.

To protect the alluvial/colluvial system of the Right Fork of Rilda Canyon a stream buffer zone was established based on the extent of the stream corridor and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The stream corridor within the Right Fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at PacifiCorp's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

R645-301-340 RECLAMATION PLAN

The following sections contain plans for final reclamation and revegetation of the Rilda Canyon Facilities. All disturbed lands will be reclaimed as part of the post mining land use stipulations for grazing, wildlife and recreation. The plan complies with the biological protection performance standards of the State Program. The reclamation plan for the Left Fork facilities is found in Volume 2, Part 4, of the Deer Creek Mine permit.

R645-301-341 Revegetation

Table 300-6 discloses the timetable in which reclamation will be conducted on the North Rilda Canyon portal facilities. Much of the operations will be conducted simultaneously. The main emphasis of reclamation will work from the top of the canyon to the bottom.

Table 300-7 establishes a monitoring program that extends through the responsibility period of the bond.

Table 300-6: Rilda Canyon Portal Facilities Reclamation Schedule: Initial Reclamation for mine facilities

#	Project	Estimated Scheduling *											
	Months	1	2	3	4	5	6	7	8	9	10	11	12
1	Soil Sampling	Sampling conducted.											
2	Structure Removal												
3	Closures – Portals & Ventilation												
4	Hauling, Backfilling, Compaction & Grading												
5	Seed Bed Preparation												
6	Fertilization & Mulching												
7	Seeding & Planting												
8	Sediment Control Structure Removal *												

* The sediment pond will be removed at the completion of all other reclamation activities above the pond.

Notice in the table above that backfill and grading activities and seeding activities are occurring simultaneously. This will occur as work progresses down canyon. Seeding is planned for the fall season. Seeding will occur contemporaneously with backfilling and grading. Mulching, hydromulching, and tackifing will occur as successive processes. Access with mulching equipment will be achieved by the use of the reconstructed Emery County road #306.

Table 300-7: Rilda Canyon Portal Facilities Reclamation Schedule: 1st thru 10th Year											
#	10 Year Revegetation & Monitoring	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year
1	Plant Monitoring Disease & Pest Control *		★	★	★	★	★	★	★	★	★
2	Soil Stabilization Rills & Gullies		★	★	★	★	★	★	★	★	★
3	Contingent Seeding		★		★						
4	Revegetation Inventory for Bond Release				★				★	★	★

* Monitoring is conducted twice per year during the spring and fall.

Description of Revegetation Operations

Tables 300-8 through 300-10 are the vegetation seedmixes to be used during interim and final reclamation. Supplemental tublings or bare root plants, as indicated in seedmix, will not be planted as part of the interim seeding. Pinyon Juniper/Mountain brush habitats are those areas that have a high exposure to sunlight. These areas are typically drier and need grass growth early on for moisture retention and soil stabilization.

Table 300-8: Seed Mixture (Pinyon-Juniper/Mountain Brush)		
Common Name	**Scientific Name**	**Lbs/Acre Equivalent PLS***
Grasses		
Bluebunch Wheatgrass	Agropyron spicatum	2.0
Sandberg Bluegrass	Poa secunda	1.0
Great Basin Wild Rye	Leymus cinereus	2.0
Indian Ricegrass	Oryzopsis hymenoides var. Paloma	1.0
Western Wheatgrass	Agropyron smithii var. Rosanna	3.0
Forbes		
Blueleaf Aster	Aster glaucodes	0.25
Blue Flax	Linum lewisii	0.25
Louisiana Sage	Artemisia ludoviciana	0.2
Northern Sweetvetch	Hedysarum boreale	1.0
Palmer Penstemon	Penstemon palmeri	0.5
Shrubs		
Snowberry	Symphoricarpus oreophilus	0.5
Curleaf Mahogany	Cercocarpus ledifolius	1.0
Fourwing Saltbush	Atriplex canescens	2.0
Saskatoon Serviceberry	Amelanchier alnifolia	1.0
True Mountain Mahogany	Cercocarpus montanus	1.0

* Pure Live Seed

Table 300-9: Seed Mixture (Sagebrush/Grass)		
Common Name	**Scientific Name**	**Lbs/Acre Equivalent PLS***
Grasses		
Salina Wildrye	Elymus salinus	2.0
Needle and Thread Grass	Stipa comata	3.0
Sandberg Bluegrass	Poa secunda	2.0
Indian Ricegrass	Oryzopsis hymenoides var. Paloma	3.0
Western Wheatgrass	Agropyron smithii var. Rosanna	2.0
Forbes		
Blueleaf Aster	Aster glaucodes	0.5
Blue Flax	Linum lewisii	1.0
Louisiana Sage	Artemisia ludoviciana	0.2
Northern Sweetvetch	Hedysarum boreale	1.0
Palmer Penstemon	Penstemon palmeri	0.5
Shrubs		
Bitterbrush	Purshia tridentate	1.0
Fourwing Saltbush	Atriplex canescens	2.0
Snowberry	Symphoricarpos oreophilus	1.2

* Pure Live Seed

Table 300-10: Seed Mixture (White Fir/Aspen)		
Common Name	**Scientific Name**	**Lbs/Acre Equivalent PLS***
Grasses		
Bluebunch Wheatgrass	Agropyron spicatum	1.0
Indian Ricegrass	Oryzopisi hymenoides var. Paloma	2.0
Western Wheatgrass	Agropyron smithii var. Rosanna	3.0
Kentucky Bluegrass	Poa pretenses	1.0
Mountain Brome	Bromus marginatus	2.0
Slender Wheatgrass	Elymus trachycaulus ssp. trachycaulus	2.0
Forbs		
Louisiana Sage	Artemisia ludoviciana	0.2
Northern Sweetvetch	Hedysarum boreale	1.0
Pacific Aster	Aster chilensis	0.2
Rocky Mountain Penstemon	Penstemon strictus	1.0
Silky Lupine	Lupinus sericeus	1.0
Shrubs		
Snowberry	Symphoricarpos oreophilus	1.0
Saskatoon Serviceberry	Amelanchier alnifolia	0.5
Skunkbush Sumac	Rhus trilobata	0.5
Trees		
White Fir	Abies concolor	200/acre
Quaking Aspen	Populus tremuloides	200/acre
Blue Spruce	Picea pungens	200/acre

* Pure Live Seed

Though several reference areas were designated and sampled, (see Volume 11 Appendix Volume - Biology: Appendix A), the disturbed area will only impact four vegetation communities. As indicated in the vegetation map, of this appendix, the sagebrush/grass seed mix will be used in the upper part of the disturbance. The topsoil storage area will be seeded with the White Fir/Aspen seedmix (Table 300-10) for interim and final vegetation. Disturbances to the White Fir/Aspen Community, near the Rilda Canyon stream, will be seeded with the White Fir/Aspen seedmix. All other areas will be seeded with the Pinyon-Juniper/Mountain Brush seedmix. Within the disturbed area is a small community of Douglas Fir/White Fir, approximately 0.25 acres. Because of the small size, this area will be seeded with the Pinyon-Juniper/Mountain Brush seedmix. This seedmix will be used for both the previously undisturbed (AMR/AML) and previously disturbed Pinyon Juniper (AML) areas.

No Riparian vegetation areas will be disturbed.

Seeding Techniques

Seeding will take place as contemporaneously as practical following soil placement and contouring/pocking of the area being reclaimed. Certified noxious weed free alfalfa hay will be incorporated into the soil following contouring at a rate of 2000 lbs/acre. The mulch will be applied using a tub grinder or similar blower. Pocking techniques will mix the alfalfa hay into the upper portion of the soil.

The seed mixture will be broadcast using a "hurricane spreader" or applied using a hydroseeder. If the seed mixture is hydroseeded, a small amount of wood fiber mulch will be added to mark the area of coverage during application.

After the seed is applied, the entire area will be hydromulched with a wood fiber or other acceptable mulch and applied at a rate of at least 1500 lbs./acre for cover and protection. A tackifier (plantago or other similar tackifier) will be added to the mulch and applied at a rate recommended by the manufacturer. Tackifier may only be used on slopes greater than 2:1. Mulch and tackifier will be applied simultaneously.

As indicated in Table 300-10, supplemental tublings or bare root plants will be planted after final reclamation. Tublings or bare root plants will be planted at the stated numbers per acre.

Measures to determine success of revegetation are those included in R645-301-350 of the Utah Coal Rules and as detailed later in this section.

R645-301-342 Fish and Wildlife

To minimize impact of the stream area and to make the operator aware of the presents of the stream, "Buffer Zone" signs will be placed along the stream side of the disturbed area.

To limit the impact on wildlife, the facility disturbance is located below the stream crossing at the forks of Rilda Canyon. Wildlife can continue to use the area for access from one fork to the other. In addition, material haulage to the existing Rilda Canyon fan in the Left Fork will be discontinued. Materials will be hauled underground via the facility's portal.

Measures taken during reclamation and liability period to reduce impact to environment and wildlife:

1. Rock piles will be formed to create habitat for small mammals.
2. Supplemental container planting to enhance the reseeded areas.
3. Supplemental container planting will be arranged in groupings or clusters to promote wildlife cover.

4. Weekly water monitoring of the stream, during construction and reclamation, if there are flows, will be taken upstream and downstream of the site. Field parameters measured include pH, turbidity, and conductivity.
5. Vegetation pocking to create micro-niches for vegetation to control and limit erosion.
6. Mulch and tackifier will be used to promote vegetation and control and limit erosion.
7. Reclamation activities will not take place between December 1st and April 15th, an exclusionary time for wintering and calving periods.

R645-301-350 PERFORMANCE STANDARDS

Construction/reclamation activities will not take place between December 1st and April 15th.

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

Standards for successful revegetation includes weed species not more than 10% and no noxious weeds. 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. Chemical applications will be approved by UDOGM in consultation with the Forest Service.

Rodent damage on revegetated areas will be assessed during monitoring periods. Species specific control measures will be implemented as necessary. Control measures must be approved by the Division in consultation with the Utah Division of Wildlife Resources prior to application.

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.

All vegetation sampling will be undertaken in the late summer for maximum plant growth. The line intercept or ocular estimation methods will be used to measure cover and species composition. The point-center quarter method will be used to measure shrub and tree density.

Productivity measurements will be a double sampling procedure of clipped plots and ocular estimates. Rectangular plots (6.27 in. x 100 in.) will be randomly located in reference areas and revegetation sites. Sampling will be at the 90% confidence level.
The reference area will be checked to detect any change from natural or man-induced activities and to verify they are in fair or better condition. Sampling of the reference sites at the time of bond

release will be conducted concurrently with final reclamation sampling, using the same methodology used to sample the reclaimed areas.

The standards for success to be applied for ground cover and production of living plants on the reclaimed areas at the Rilda Canyon Portal Facilities will be at least equal to 90% (with a 90% confidence level) to that of the corresponding reference area at the time of bond release. Cover in the reclaimed areas will not be less than that required to achieve the approved post-mining land use outlined in R645-301-400: Land Use and Air Quality.

At the time of bond release or after the 10 year responsibility period has passed, similarity between the reclaimed area and corresponding reference area will compare life forms and/or species present in each community by the use of similarity indices. Indices of similarity provide the means of mathematically comparing the plant communities in the two areas. One of, or a combination of the three indices found in the Vegetation Guidelines, February 1992, will be used to determine the similarity between the reclaimed and reference area. If another index (or combination thereof) is used, Division approval will be required. Similarity will be considered successful when the index value is at least 70% of the reference area.

All vegetation monitoring data will be reported annually. This report will contain a narrative of the actual monitoring methods used, results, and a discussion of the overall success or failure of each area. Raw data sheets will also be included in the annual reports. Standards attained at the time of bond release will be approved by the Utah Division of Oil, Gas and Mining (UDOGM).

REFERENCES:

North Rilda Canyon Portal Facilities Area Vegetation Survey, 2004, Mt. Nebo Scientific, Inc.

Chambers, Jeanne C., Brown, Ray W., Methods for Vegetation Sampling and Analysis on Revegetated Mined Lands, Report INT-151, United States Department of Agriculture, Forest Service, October 1983.

Danielson, T.W.; Remillard, M.D.; Fuller, R.H., Hydrology of the Coal- Resource areas in the Upper Drainages of Huntington and Cottonwood Creeks, Central Utah; U.S. Geological Survey-Water Resource Investigations, Open-File Report 81-539.

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, in Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

Walker, Craig A., Preliminary Report on Surveys Conducted to Determine Potential Impacts of Rilda Surface Facility Development in Rilda Canyon During 2004; Utah Department of Natural Resources, Division of Wildlife Resources, 1594 West North Temple, Suite 2110, Salt Lake City, Utah 84114.

Environmental Assessment, Designation of Critical Habitat for the Mexican Spotted Owl, January 2001, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico.

Wildlife Resources Report for the State of Utah School and Institutional Trust Lands Administration (SITLA) Access Route on East Mountain Project; USDA Forest Service, Intermountain Region,, Ferron/Price Ranger District, Manti-La Sal National Forest, Emery County, Utah, Re-re-revised July 2004.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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Biology Maps Section – Replace TOC Cover Sheet

Deer Creek Coal Mine
Rilda Canyon
Portal Facilities

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Biology Maps Section

Permit No. C/015/018
December 2004
Amended June 2010

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Maps Section – Replace Maps 300-1, 300-2, 300-3, 300-4, 300-5, and 300-6.

ENERGY WEST MINING COMPANY
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DEER CREEK MINE – MILL FORK LEASE
STATE LEASE ML-48258/UTU-84285
DEER HABITAT MAP

DRAWN BY:	K. LARSEN	DRAWING #:	300-3
SCALE:	1" =2000'		
DATE:	JUNE 18, 2009	SHEET 1 OF 1	REV. 3

DEER HABITAT LEGEND
- CRITICAL SUMMER RANGE
- HIGH VALUE WINTER RANGE

LEGEND
- MILL FORK LEASE PROPERTY BOUNDARY
- COAL LEASE BOUNDARY
- DEER CREEK MINE PERMIT BOUNDARY
- FAULT (DASHED WHERE INFERRED)

AS-BUILT MINE FACILITY
DISTURBED AREA = 6.77 ACRES

LEFT FORK FACILITIES

EXISTING TOPSOIL
DISTURBED AREA = 0.51 ACRES

U-78953
U-024317
U-024319
U-06039
U-7653
U-47977
SL-051221
SL-050862
U-2810
U-014275
STATE ML-48258
STATE ML-22509
UTU-84285

ENERGY WEST MINING COMPANY

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DEER CREEK MINE – MILL FORK LEASE
STATE LEASE ML-48258/UTU-84285
ELK HABITAT MAP

DRAWN BY:	K. LARSEN	DRAWING #:	300-4
SCALE:	1"=2000'		
DATE:	JUNE 18, 2009	SHEET 1 OF 1	REV. 3

ELK HABITAT LEGEND
- CRITICAL SUMMER RANGE
- CRITICAL WINTER RANGE
- HIGH VALUE WINTER RANGE

LEGEND
- MILL FORK LEASE PROPERTY BOUNDARY
- COAL LEASE BOUNDARY
- DEER CREEK MINE PERMIT BOUNDARY
- FAULT (DASHED WHERE INFERRED)

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U-7653

U-47977

U-024319

SL-051221

SL-050862

U-2810

U-014275

U.P.&L. CO. FEE

NATIONAL FOREST

WASATCH MOUNTAIN

Indian Creek Campground

Mill Fork

Little Fork

Left Fork

Mine

Drill Hole

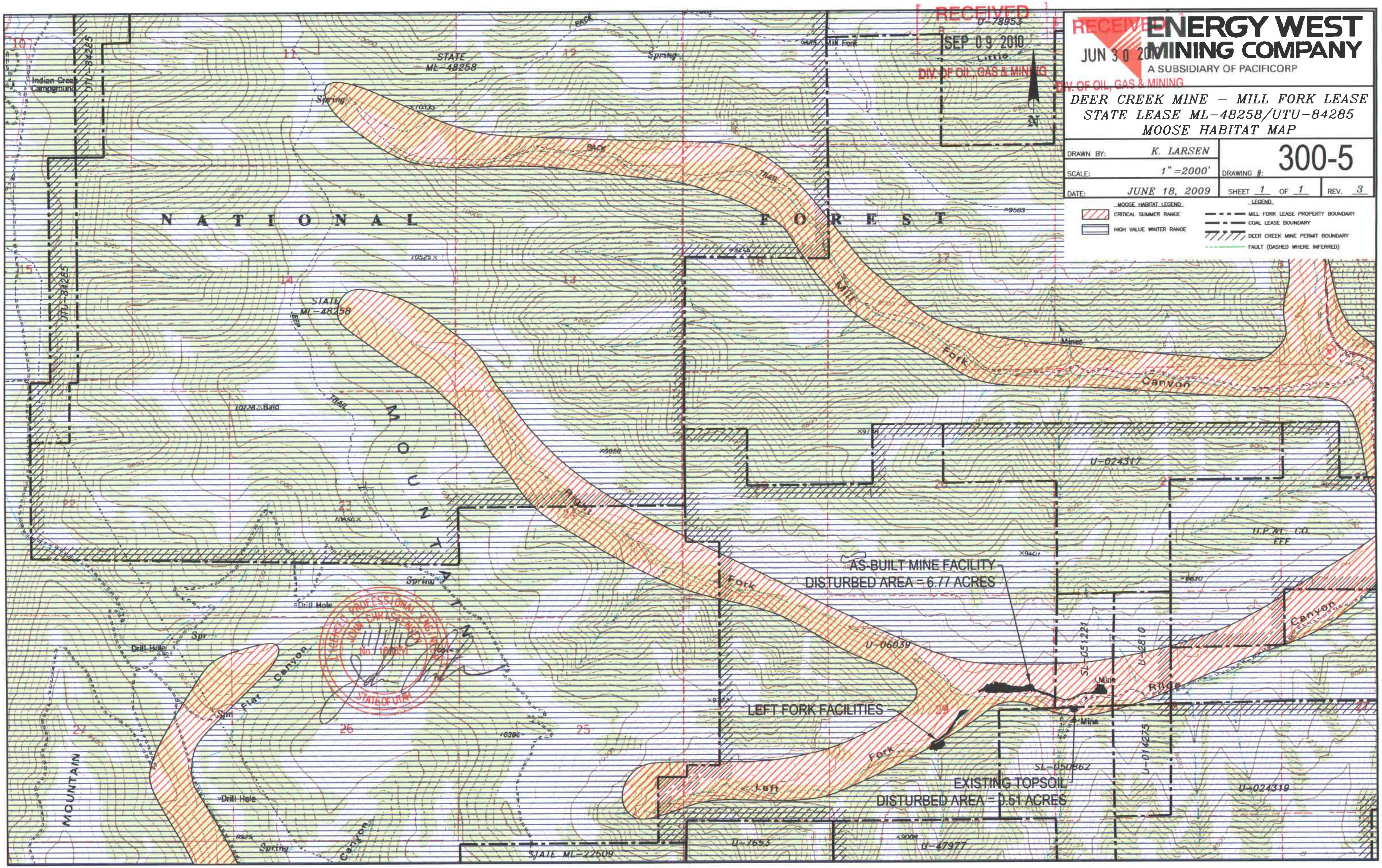
Spring

Flat Canyon

Canyon

Ridge

UTU-84285



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ENERGY WEST MINING COMPANY
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DEER CREEK MINE – MILL FORK LEASE
STATE LEASE ML-48258/UTU-84285
MOOSE HABITAT MAP
DRAWN BY: K. LARSEN
SCALE: 1" =2000'
DATE: JUNE 18, 2009
DRAWING #: 300-5
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MOOSE HABITAT LEGEND
CRITICAL SUMMER RANGE
HIGH VALUE WINTER RANGE
LEGEND
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COAL LEASE BOUNDARY
DEER CREEK MINE PERMIT BOUNDARY
FAULT (DASHED WHERE INFERRED)
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MOUNTAIN
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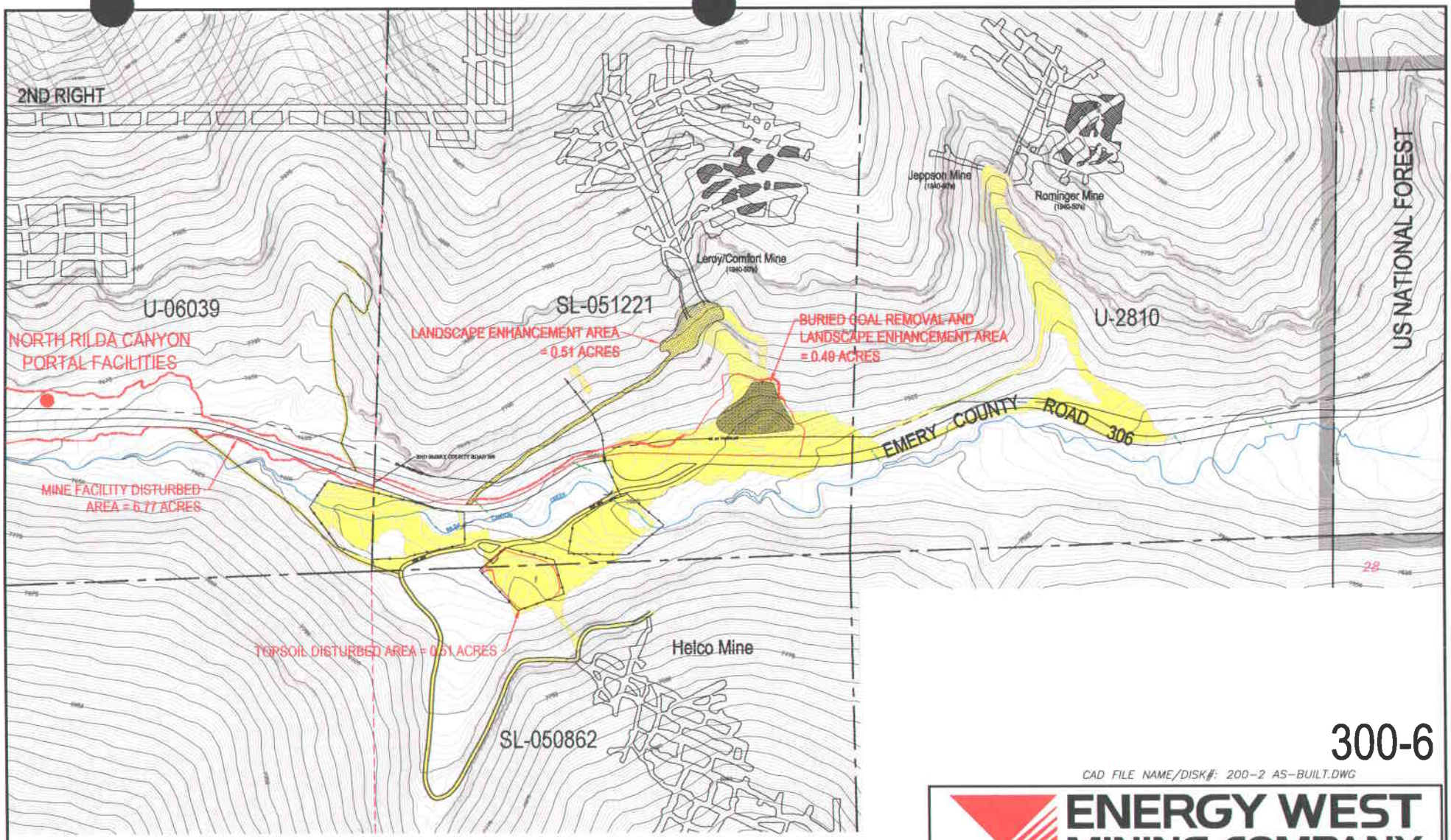
LEFT FORK FACILITIES
EXISTING TOPSOIL
DISTURBED AREA = 0.51 ACRES
Mine
Drill Hole
Spring
Flat Canyon
STATE OF UTAH



LEGEND

- FEDERAL COAL LEASE
- DEER CREEK MINE PERMIT BOUNDARY
- PRE-DISTURBED AREA (AML RECLAIMED 1988)
- BURIED COAL REMOVAL AND LANDSCAPE ENHANCEMENT AREA
- DISTURBED BOUNDARY

LICENSED PROFESSIONAL ENGINEER
JOHN CHRISTENSEN
11/140
No. 165651
STATE OF UTAH

300-6

CAD FILE NAME/DISK#: 200-2 AS-BUILT.DWG

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

RILDA CANYON FACILITIES BURIED COAL REMOVAL AND LANDSCAPE ENHANCEMENT

DRAWN BY:	K. LARSEN	300-6	
SCALE:	1" =400'	DRAWING #:	
DATE:	JUNE 18, 2009	SHEET 1 OF 1	REV.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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R645-301-400 LAND USE & AIR QUALITY SECTION

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R645-301-410 LAND USE

This document will include the general requirements to meet the State of Utah's regulatory requirements to mine coal in the North Rilda Area and operate surface facilities in Rilda Canyon as part of the Deer Creek Mine. This application includes descriptions of the premining and proposed postmining land uses. As reflected by its format, much of the current Deer Creek MRP was written prior to the State's R645- Rules. This amendment to the plan attempts to follow the Rules general format, yet allow it to also be consistent with the existing MRP.

R645-301-411 Environmental Description

The North Rilda Area is geographically part of East Mountain, a plateau within the Wasatch Plateau. The area lies primarily between two major tributaries of Huntington Canyon -- Mill Fork Canyon and Rilda Canyon. Three vegetation types dominate the North Rilda Area. They are the mixed coniferous forests that occupy the north and northeast facing slopes (upper elevations), and the pinyon-juniper and mountain brush communities found on the drier south and southwest facing slopes. Elevations of the area range from 7,500 to 9,400 ft above sea level. For a map showing the North Rilda Area and its geographical surroundings as well as plant communities, see R645-301-300, Map 3-1.

Premining land use of the area was primarily livestock grazing, wildlife habitat and occasional timber cutting.

The USDA Forest Service has identified the following uses for the general area, including the North Rilda Area: big game winter range (Elk-critical, deer-high value), mining and mineral development, and general rangeland including timber and forage. Additional information about land use of the permit and adjacent area as a whole can be found in Vol. 1, Part 2 of the MRP.

At present, the area is used as wildlife habitat with some grazing permits issued by the USDA Forest Service. Deer and elk use the upper elevations of East Mountain for summer range, and the lower slopes and drainages for winter range.

Productivity of the pinyon-juniper communities of the area have been previously estimated at 100-325 lbs. per acre. Mixed conifer communities of the area have been estimated at 167-290 lbs. per acre (Refer to Volume 1, Part 2).

The Land Use Plan for the Wasatch Plateau designates no recreational development or timber sales on East Mountain but does specify improvements to big game range and the protection of watersheds. Private timber sales have taken place south of the North Rilda area.

An economic evaluation of timber resources was conducted by the USFS prior to any earthwork operations at the Rilda Canyon Portal Facility. PacifiCorp compensated the USFS for all saleable timber resources removed from this area as part of the facility construction.

R645-301-411.110 Maps

Maps showing the present permit area, adjacent area, and the North Rilda Area with respect to environmental description and land use are included in the MRP. Vol. 4, Map 1-2 shows the surface ownership information. Map 3-1 shows the vegetation communities of the area. Vol. 4, Map 2-16 is a general soils map that also shows the North Rilda Area. Vol. 4, Map 2-18A is a land use drawing. Vol. 4, Map 2-19 shows mule deer and elk habitat of the area.

R645-301-411.140 Cultural and Historic Resources Information

Archeological surveys have been conducted in the permit and adjacent areas within and contiguous to the North Rilda Area. The most recent survey was conducted in September of 2003, by John A. Senulis (SENCO-PHENIX). This survey report has been placed in the Division's Confidential File. Mr. Senulis summarizes his survey with this statement, "Neither the site nor any of the isolates are recommended for nomination to the National Register of Historic Places. No other cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended".

R645-301-411.200 Previous Mining Activity

The general area has a long history of coal mining. Small mining operations were located in several canyons within the Deer Creek permit area including: Deer Creek, Meetinghouse, Rilda, and Mill Fork canyons. A majority of the operations commenced in the early 1940's and terminated in the mid 1950's. Four abandoned mines are located in Section 28, Township 16 South, Range 7 East of the North Rilda Area, the Leroy (aka Comfort Mine), Jeppson, Rominger (aka Ferrell Mine), and Helco mines (refer to Map 4-1 for extent of historical workings). All of the mines are located in the Hiawatha seam and were reclaimed by AML in 1988. The Johnson Mine (Section 29, Township 16S, Range 7E) is located up canyon from the Rilda Canyon Portal Facilities but had no associated workings as documented in H.H. Doeling, 1972.

Current mining operations are being conducted at the Deer Creek Mine. Trail and Cottonwood/Wilberg mine are in temporary cessation as of mid-2001. The Des Bee Dove mining complex was completely reclaimed in 2003. Mining operation plans and geologic information for these mines have been described in Vol. 2, Part 3 and Vol. 8.

R645-301-412 Reclamation Plan

In areas where surface disturbances result from coal mining and reclamation operations, regrading and revegetation will be conducted to restore the areas to their premining conditions which they were capable of supporting prior to mining. Because such a small surface disturbance is planned for the North Rilda Area, little or no effect to the past or future land use is

anticipated. The land will be reclaimed to the original land use practices of grazing and wildlife habitats.

A detailed reclamation plan has been developed for the ~~North~~ Rilda Canyon Portal Facilities area and included in Section R645-301-200 thru R645-301-700 of this volume. The reclamation plan for the Left Fork Fan Facilities is found in Volume 2, Chapter R645-301-500: Engineering, Appendix R645-301-500-B.

R645-301-412.300 Suitability and Compatibility

The reclamation soil sampling will identify any soil that is not suitable. All unsuitable soils will be placed at least 4 feet below the final grade surface. This will ensure suitable growth material for vegetation. All fills will be graded at slopes compatible with the surrounding areas.

R645-301-413 Performance Standards

All disturbed areas will be restored in a timely manner to conditions they were capable of supporting before mining. Liability will be for the duration of the coal mining and reclamation operations and for the period of extended responsibility for achieving successful revegetation. All post mining land use criteria will be satisfied before the bond is fully released.

R645-301-413.100 Postmining Land Use

Reclamation of the small area of disturbance at the Rilda Canyon Portal Facility to comply with the postmining land use will take place soon after closure of the facilities. Because of the small area needing to be reclaimed, the process can take place in one construction season. Vegetation performance standards will be met by comparison to undisturbed vegetation reference areas.

R645-301-420 AIR QUALITY

Air pollution control measures are described in the "Approval Order DAQE-AN0239003-02" issued by the Division of Air Quality. This order has conditions that the operator must comply with to reduce emissions that may affect the air quality. Because processing or coal transport will not be conducted at the Rilda Canyon Portal Facilities, the controlled emissions will only include fugitive dust emissions. Those emissions will be controlled by typical dust suppressant measures. The Division of Air Quality requires that the Approval Order be in place and complied with by the operator for the life of the facilities operation. Periodic inspections, by the Division of Air Quality, are conducted at the site to verify compliance. This air quality Approval Order is filed at the Energy West Mining offices in Huntington, Utah.

Some of the dust suppressant measures typically taken are: asphalt surfaces, wetting or sweeping of

surfaces, restricted speeds for vehicular traffic, limitations for travel on service roads.

All areas adjacent to roads or travelways have been planted for revegetation. Reseeding is repeated until vegetation is adequately established. Revegetation has been applied on all disturbed surfaces and regraded areas.

R645-301-421 Clean Air Act

Coal mining and reclamation operations will be conducted in compliance with the requirements of the Clean Air Act (42 U.S.C. Sec. 7401 et seq.) and any other applicable Utah or federal statutes and regulations containing air quality standards.

R645-301-422 Utah Division of Air Quality

The operator has coordinated compliance efforts with the State of Utah, Division of Air Quality. The current Approval Order (AO) issued to the operator is DAQE-AN0239003-02 and is dated June 14, 2002. Refer to R645-301-420.

REFERENCES:

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, in Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

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Maps Section – Replace TOC Cover Sheet

Deer Creek Coal Mine
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Land Use & Air Quality Maps Section

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Maps Section – Replace Map 400-1

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Archeological surveys have been conducted in the permit and adjacent areas within and contiguous to the North Rilda Area. The most recent survey was conducted in September of 2003, by John A. Senulis (SENCO-PHENIX). This survey report has been placed in the Division's Confidential File. Mr. Senulis summarizes his survey with this statement, "Neither the site nor any of the isolates are recommended for nomination to the National Register of Historic Places. No other cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended".

R645-301-411.200 Previous Mining Activity

The general area has a long history of coal mining. Small mining operations were located in several canyons within the Deer Creek permit area including: Deer Creek, Meetinghouse, Rilda, and Mill Fork canyons. A majority of the operations commenced in the early 1940's and terminated in the mid 1950's. Four abandoned mines are located in Section 28, Township 16 South, Range 7 East of the North Rilda Area, the Leroy (aka Comfort Mine), Jeppson, Rominger (aka Ferrell Mine), and Helco mines (refer to Map 4-1 for extent of historical workings). All of the mines are located in the Hiawatha seam and were reclaimed by AML in 1988. The Johnson Mine (Section 29, Township 16S, Range 7E) is located up canyon from the Rilda Canyon Portal Facilities but had no associated workings as documented in H.H. Doeling, 1972.

Current mining operations are being conducted at the Deer Creek Mine. Trail and Cottonwood/Wilberg mine are in temporary cessation as of mid-2001. The Des Bee Dove mining complex was completely reclaimed in 2003. Mining operation plans and geologic information for these mines have been described in Vol. 2, Part 3 and Vol. 8.

R645-301-412 Reclamation Plan

In areas where surface disturbances result from coal mining and reclamation operations, regrading and revegetation will be conducted to restore the areas to their premining conditions which they were capable of supporting prior to mining. Because such a small surface disturbance is planned for the North Rilda Area, little or no effect to the past or future land use is

anticipated. The land will be reclaimed to the original land use practices of grazing and wildlife habitats.

A detailed reclamation plan has been developed for the ~~North~~ Rilda Canyon Portal Facilities area and included in Section R645-301-200 thru R645-301-700 of this volume. The reclamation plan for the Left Fork Fan Facilities is found in Volume 2, Chapter R645-301-500: Engineering, Appendix R645-301-500-B.

R645-301-412.300 Suitability and Compatibility

The reclamation soil sampling will identify any soil that is not suitable. All unsuitable soils will be placed at least 4 feet below the final grade surface. This will ensure suitable growth material for vegetation. All fills will be graded at slopes compatible with the surrounding areas.

R645-301-413 Performance Standards

All disturbed areas will be restored in a timely manner to conditions they were capable of supporting before mining. Liability will be for the duration of the coal mining and reclamation operations and for the period of extended responsibility for achieving successful revegetation. All post mining land use criteria will be satisfied before the bond is fully released.

R645-301-413.100 Postmining Land Use

Reclamation of the small area of disturbance at the Rilda Canyon Portal Facility to comply with the postmining land use will take place soon after closure of the facilities. Because of the small area needing to be reclaimed, the process can take place in one construction season. Vegetation performance standards will be met by comparison to undisturbed vegetation reference areas.

R645-301-420 AIR QUALITY

Air pollution control measures are described in the "Approval Order DAQE-AN0239003-02" issued by the Division of Air Quality. This order has conditions that the operator must comply with to reduce emissions that may affect the air quality. Because processing or coal transport will not be conducted at the Rilda Canyon Portal Facilities, the controlled emissions will only include fugitive dust emissions. Those emissions will be controlled by typical dust suppressant measures. The Division of Air Quality requires that the Approval Order be in place and complied with by the operator for the life of the facilities operation. Periodic inspections, by the Division of Air Quality, are conducted at the site to verify compliance. This air quality Approval Order is filed at the Energy West Mining offices in Huntington, Utah.

Some of the dust suppressant measures typically taken are: asphalt surfaces, wetting or sweeping of

surfaces, restricted speeds for vehicular traffic, limitations for travel on service roads.

All areas adjacent to roads or travelways have been planted for revegetation. Reseeding is repeated until vegetation is adequately established. Revegetation has been applied on all disturbed surfaces and regraded areas.

R645-301-421 Clean Air Act

Coal mining and reclamation operations will be conducted in compliance with the requirements of the Clean Air Act (42 U.S.C. Sec. 7401 et seq.) and any other applicable Utah or federal statutes and regulations containing air quality standards.

R645-301-422 Utah Division of Air Quality

The operator has coordinated compliance efforts with the State of Utah, Division of Air Quality. The current Approval Order (AO) issued to the operator is DAQE-AN0239003-02 and is dated June 14, 2002. Refer to R645-301-420.

REFERENCES:

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, in Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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Maps Section – Replace TOC Cover Sheet

Deer Creek Coal Mine
Rilda Canyon
Portal Facilities

Land Use & Air Quality Maps Section

Permit No. C/015/018
December 2004
Amended June 2010

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Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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Maps Section – Replace Map 400-1

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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R645-301-500 ENGINEERING SECTION

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R645-301-510 INTRODUCTION

The Engineering Section provided within this permit application contains general descriptions, information, and design criteria for both operation and reclamation of the facilities associated with the North Rilda Area and Mill Fork Area mining operations. Most plans, maps and designs for the North Rilda Area operations (Left Fork Fan Facilities) can be found in Volume 2 of the Deer Creek Mining and Reclamation Plan (MRP). A portion of these facilities are detailed below. All plans, maps and designs associated with the Mill Fork Area operations (Rilda Canyon Portal Facilities) are detailed in the following sections. In general, the Left Fork Fan Facilities will be discussed first follow by the Rilda Canyon Portal Facilities.

Coal mining has occurred since 1946 in Deer Creek Canyon, a tributary of Huntington Canyon in Emery County, Utah. Utah Power & Light Company (now PacifiCorp) purchased the operations and coal leases from Peabody Coal Company in 1977. The Deer Creek Mine portal, mine personnel, and its coal handling facilities are located in Deer Creek Canyon.

Mining in the North Rilda Area produced coal from both the Blind Canyon and Hiawatha coal seams. Approximately 23 million tons of minable coal was mined from the North Rilda Area during the past few years. A portion of the North Rilda Area will be used to provide access from the Rilda portals to the Mill Fork Lease area. Refer to Volume 5, Plates 3-6, Life of Mine Plan / 5 Year Increments - Blind Canyon Seam, and 3-7, Life of Mine Plan / 5 Year Increments - Hiawatha Seam.

Because of the need to expand the mining operations to the northwest (Mill Fork State Lease #48258), surface facilities are required in Rilda Canyon. This includes construction of the mine entries, facilities pad, fan, ancillary facilities, sediment control structures, and soil storage piles. No coal processing or coal transportation facilities will be utilized at these facilities. All mined coal from the extended Deer Creek Mine will continue to be transported through the Deer Creek Canyon portals and processed at these facilities. The processed coal is then transported via beltline to the Huntington Power Plant. The Huntington Power Plant is owned and operated by PacifiCorp.

A variety of engineering principles and techniques are applied in the Deer Creek Mine operation. Principles of engineering employed are those associated with standard prudent mine engineering practices. More detail about the methodologies used to plan the coal mining activities for long-range goals at the Deer Creek Mine and the use of computer assisted models can be found in Volume 2, Part 3 of the MRP.

R645-301-511 General Requirements

This document includes the general requirements to meet the State of Utah's regulatory requirements to mine coal in the North Rilda Area and operate surface facilities in Rilda Canyon as part of the Deer Creek Mine. The surface facility operation plan includes information or references the existing mine plan when appropriate. The potential impact to the environment is also addressed. As reflected by its format, much of the current Deer Creek MRP was written prior to the State's R645- Rules. This plan attempts to follow the Rules general format, yet allow it to also be consistent with the existing MRP.

Rilda Canyon Portal Facilities and Operations: Early mining operations, prior to PacifiCorp's presence in the canyon, occurred near the surface facilities (see Map 400-1). These operations include the Rominger (Ferrell) Mine, Jeppson Mine, Leroy (Comfort) Mine, and Helco Mine (refer to site photos A through C in Volume 11 Appendix Volume - Engineering: Appendix G). These mines were active during the 1940's and early 1950's. Abandoned Mine Lands (AML) reclaimed these mines in 1988. Much of the the disturbed surface area of the Rilda Canyon facilities occurs west of the Leroy, Rominger, and Jeppson mines disturbed area. However, a portion of the disturbance, namely the sediment pond (Leroy mine site) and topsoil storage (Helco mine site) occurs in these previously disturbed areas.

Surface facilities in Rilda Canyon include the existing mine fan, substation and water supply in the Left Fork of the canyon, and surface related facilities associated with the Rilda Canyon Portal Facilities. These facilities include (but not limited to) access and mine fan portals, exhaust fan, facilities pad, fuel dock, rock dust tank, sediment pond, sediment basin, waste and waste rock storage bins, substation, MCC building, drainage systems, and covered storage buildings. Refer to Section R645-301-521 for a detailed description of all surface facilities of the Rilda Canyon Portal Facilities. Also refer to Volume 12 of the Deer Creek MRP for detailed information of the mining plan, mining production, and mining methods that will be utilized within the Mill Fork Lease.

R645-301-512 Certification

Applicable cross sections and maps have been included or referenced within this document. They have been prepared by, or under the direction of, and certified by a qualified, registered, professional engineer, geologist, or land surveyor, with assistance from experts in related fields such as hydrology, geology, and biology.

R645-301-513 Compliance with MSHA Regulations and MSHA Approvals

All structures that are constructed to allow mining in the North Rilda Area and the Mill Fork Lease will comply with all regulations, whether at the local, State, or Federal level.

There are no impoundments or sedimentation ponds that meet size or other qualifying criteria of MSHA, 30 CFR Part 77. All impoundments or sedimentation ponds utilized by operations in Rilda Canyon meet the requirements outlined in the Utah Coal Regulations.

Underground development waste, coal processing waste and excess spoil will continue to be disposed of in accordance with plans approved by DOGM and MSHA. There are no plans to return coal processing wastes to the underground workings at Deer Creek Mine. All coal is shipped via beltline through the Deer Creek Canyon portals.

There are no plans to construct refuse piles within the facilities area in Rilda Canyon. All refuse that is transported through the Rilda Canyon portals is temporarily stored in a refuse bunker. As the bunker fills to capacity, the refuse is transported by truck to the Deer Creek waste rock site in Huntington Canyon for permanent storage.

Each shaft, drift, adit, tunnel, exploratory hole, entryway or other opening to the surface from underground will be capped, sealed, backfilled or otherwise properly managed consistent with MSHA, 30 CFR 75.1771. Refer to Section R645-301-550 Reclamation Design Criteria and Plans below.

PacifiCorp proposes to collect or divert storm water runoff from the mine facilities area (refer to R645-301-521-180 Support Facilities for details). Collected runoff is diverted through a series of ditches and pipes to the sediment basin. As this basin fills to capacity, runoff will over flow and divert to the sediment pond located in the Leroy Mine area. Undisturbed runoff is diverted around or under the facilities through ditches and pipes into the Rilda Creek.

R645-301-514 Inspections

All appropriate engineering inspections and reports will be conducted by a qualified registered professional engineer or other qualified professional specialist under the direction of the professional engineer during the construction, operation, and reclamation activities of mining.

R645-301-515 Reporting and Emergency Procedures

In the event any potential hazard exists, develops, or occurs in association with slides and/or impoundment structures which may have an adverse effect on the health and safety of the public, property, or the environment, DOGM will be promptly notified. The operator commits to comply with any remedial measures required to protect and ensure the health and safety of the public.

The Deer Creek Mine facility conducts routine inspections on a weekly basis. Should a hazard exist or occur, personnel have been instructed to notify the Mine Manager, who will coordinate and implement any emergency procedures and remedial measures to be taken.

Where temporary cessation of operations is necessary for a period beyond 30 days, the applicant will submit the proper notification and information required of R645-301-515.300 to DOGM.

R645-301-520 OPERATION PLAN

R645-301-521 Introduction

The plan for the mining in the North Rilda Area includes or references maps, cross sections, narratives, descriptions, and calculations indicating how the relevant requirements are met. The plan describes and identifies the lands subject to coal mining and reclamation activities over the estimated life of the operations and describes the size, sequence, and timing of the sub-areas for which it is anticipated that individual permits for mining will be sought. For review of the mining plan of the Mill Fork Lease area, refer to Volume 12, Mill Fork Lease, ML-48258.

R645-301-521.110 Previously Mined Areas

Areas previously mined in the Rilda Area are presented on Map 500-1, Pre-Disturbance Topography, in the Maps Section. These areas include the Leroy Mine, Rominger Mine, Jeppson Mine, and Helco Mine. Mining occurred in these mines in the 1940's and 1950's. Abandoned Mine Lands reclaimed these sites in 1988. Extents of mine workings of the said mines are included on Map 500-1. Photos of all previously mined areas in Rilda Canyon area illustrated in Volume 11 Appendix Volume - Engineering: Appendix G. All openings have been backfilled by AML during reclamation activities.

R645-301-521.122 Man Made Features

Rocky Mountain Power owns and operates a 25 KV electrical power transmission line that supplies electrical power to the Left Fork fan facilities. This line (refer to Map 500-3), prior to construction, was located on the north side of EC#306. This transmission line required relocation to south side of the then proposed Rilda Canyon Portal Facilities. Energy West coordinated with Rocky Mountain Power to establish a new right of way for the transmission line and completed this relocation activity in May 2005.

Water wells exist in Rilda Canyon near the disturbed area boundary. These wells were developed in 1989 to evaluate the hydrologic characteristics of the alluvium for the North Emery Water Users Special Service District's spring collection system (also adjacent to the disturbed area boundary). The wells were drilled through the alluvium to bedrock. Monthly monitoring (level only) is conducted on the wells. Refer to Map 500-3 for location. Refer to Volume 9 for complete discussion. Refer to photo's D through F in Volume 11 Appendix Volume - Engineering: Appendix G.

R645-301-521.123 Public Road

Emery County Road #306 runs approximately 3.0 miles from the Huntington Canyon road, Highway 31, to the turn around area in the Left Fork of Rilda Canyon. A portion of this road is located within the disturbed area boundary of the Rilda Canyon Portal Facilities (refer to maps 500-1, 500-3, and Figure R645-301-500c). Energy West has worked with Emery County Special Services District #1 (ECSSD#1) and the Emery County Commission to develop an agreement to suspend public use of that portion of EC#306 that runs through the facilities area. This agreement is located in Volume 11 Appendix Volume - Engineering: Appendix B. Refer to Volume 11 Appendix Volume - Engineering: Appendix G for photos of the suspended portion of the road.

R645-301-521.124 Location of Existing Coal Waste

As mentioned above, previous mining occurred in Rilda Canyon at the Leroy Mine, Rominger Mine, Jeppson Mine, and Helco Mine. Map 500-1 shows predisturbed areas associated with these mines. At reclamation of these mines, coal waste material was buried on-site. It is not known to what extent or volume waste coal is buried throughout the area.

R645-301-521.130 Landowners and Right of Entry and Public Interest Maps

Refer to Supplemental Volume (Legal and Financial Information) for description of lands containing surface and subsurface ownership. Refer to Volume 4 Maps 1-1 and 1-2 for locations of ownership.

R645-301-521.140 Mine Maps and Permit Area Maps

The boundaries of the North Rilda Area to be affected for the life of coal mining and reclamation activities are found on Map DU1688 in Volume 11 Appendix Volume - Engineering: Appendix A. Refer to Volume 12, Mill Fork Lease ML-48258 to review all proposed affected areas and discussion of subsidence in the Mill Fork Lease. Subsidence for the North Rilda Area is discussed below in R645-301-525.

R645-301-521.150 Land Surface Configuration Maps

Map 500-1 illustrates the topography prior to construction of the Rilda Canyon Portal Facilities. Contours extend at least 100 feet beyond the area of each disturbance.

R645-301-521.160 Maps and Cross Sections for the Constructed Features

Typical construction sequencing is presented on Map 500-2 in the Maps Section. This map shows the construction sequences that have been used to construct the facilities. Plan views

of the existing land surface configuration for the coal mining and reclamation operations in the North Rilda Area are found on maps 500-3. Map 500-3 shows a plan view of the existing disturbance for the 6.77 acre mine facility site as well as the location of the topsoil storage areas. The as-built design for the topsoil pile shows a fenced area of approximately 0.51 acres. The total volume of the pile is approximately 7,862 cubic yards (5,725 cubic yard topsoil and 2,137 cubic yard of substitute topsoil. Refer to the table in ***R645-301-232 Topsoil and Subsoil Removal*** for soil pile capacity.

The facilities pad was developed by cutting and/or filling the surface to create an earthen structure that supports the buildings and storage areas. The facilities pad was cut to the bedrock on the north side of the pad. This bedrock stretches the entire length of the disturbed area boundary and is nearly vertical. The mass balance Table 500-1 below illustrates the cuts and fills required for constructing the facility pad and sedimentation pond. Maps 500-4, 1 of 4 and 2 of 4 show the cross-sections through the facilities area. Map 500-4, 3 of 4 shows the cross-sections through the topsoil pile. Map 500-4, 4 of 4 shows the cross-sections through the sediment pond. Cross-sections are spaced on 50 foot centers and are identified by interval and distance from the starting point (i.e. 15+00, 15+50, etc.). Carlson Software was utilized to calculate the total volumes of cuts and fills. However, as indicated in Table 500-1, there are instances (i.e. coal material removed from the site, void in boulder fills, etc.) that cause inaccuracies of the cut and fill volumes. As shown in the table, those inaccuracies are accounted for and volumes have been adjusted accordingly.

Table 500-1: As-Built Mass Balance for Rilda Portal Facilities

		Area (sf)	Volume (cy)
Faclilities/Pond Area			
1	Total Cut		41,284
2	Total Fill**		29,522
Topsoil Pile			
3	Total Cut		-
4	Total Fill***		7,862
Concrete Volume** (removed at reclamation)**			
5	Concrete Pad (Avg. 9" thick)	69,650	1,935
6	Fan Pad (Avg. 5' thick)	6,000	1,111
7	MCC Building (4' crawl space under building)	400	59
8	Total Volume to be Reduced from Item 2		3,105
Hard Armor Areas***			
9	Hilfiker Wall	8,400	249
10	Boulder Pile	20,350	603
11	Sediment Basin Outslope	4,020	119
12	Sediment Pond Outslope	4,375	130
13	Total Volume to be Reduced from Item 2		1,101
Coal/Coal Waste Removed from Area			
14	Coal		290
15	Coal Waste		2,000
16	Total Volume to be Reduced from Item 2		2,290
Culverted Areas (Voids caused by buried culverts)			
17	UC-1: Area = 1.77 ft^2, Length = 72 ft.	1.77	127
18	UC-2: Area = 1.77 ft^2, Length = 148 ft	1.77	262
19	DC-1: Area = 1.77 ft^2, Length = 391 ft.	1.77	692
20	DC-2: Area = 1.77 ft^2, Length = 198 ft.	1.77	350
21	Portion DC-3: Area = 1.77 ft^2, Length = 142 ft.	1.77	251
22	Total Volume to be Reduced from Item 2		1,683
Mass Balance Calculations			
	Total Cut Items(1-(4+8+13+16+22)		25,396
	Total Fill (Item 2)		26,373
	Difference		(977)
	% Difference		-4%

NOTES:

* As-built volumes calculated utilizing aerial survey data and Carlson Software.

** Includes approximately 18,100 cy of imported rock material for construction of Hilfiker wall.

*** Includes both topsoil quantities (approx. 5,725 cy) and substitute topsoil quantities (approx. 2,137 cy) that is segregated and stored at the topsoil pile storage location (Map 500-3). These volumes were hand surveyed in the field. Item 4 was calculated using Carlson Software.

**** Carlson Software calculates volumes according to surface elevations. Concrete is, therefore, part of the cut/fill volumes and must be subtracted from total cut (Item 1).

***** Boulders excavated during construction were utilized as a hard armor BMP or stored. When calculating the cut/fill volumes, voids in the boulders are not considered. For estimation purposes, a 40% void volume is subtracted from the total cut volume for a depth of 2 feet.

****** This difference is probably the result of the importation of fill specified for construction.

Cross-sections associated with the stations on Map 500-3 are shown on Map 500-4. These cross-sections illustrate pre-existing contours, post-construction contours, and reclamation contours. The Carlson Software data is shown on Map 500-3. Reclamation of the facilities is discussed later in this chapter.

Constructed buildings and facilities are shown on Map 500-3. These constructed facilities have been included in the performance bond calculations. Refer to R645-301-800: Bonding, for detailed information.

R645-301-521.170 Transportation Facilities
Primary and secondary roads are described in detail in Section R645-301-527.

R645-301-521.180 Support Facilities
As-built drawings of the Rilda Canyon Portal Facilities are found in Volume 11, Appendix Volume 11A - Engineering, Appendix H. Surface facilities in Rilda Canyon are located at two locations; 1) Left Fork of Rilda Canyon and 2) at the forks of Rilda Canyon.

Left Fork of Rilda Canyon: This facility includes an access road and a pad area which supports two portals, a substation, power line, fan, water storage tank, and pumphouse. Topsoil removed prior to construction of the site is also stored within the permit area of the Left Fork Rilda Canyon fan facilities. Additional information about this facility is provided in Volume 2, Part 3 and Volume 5, Map 3-9A and Map 3-9B.

Rilda Canyon Portal Facilities: This facility is located at the forks of Rilda Canyon and includes the following: Access and Mine Fan Portals, Mine Fan, Facilities Pad, Fuel Dock, Rock Dust Tank, Waste, Rock and Waste Rock Storage Bins, Covered Storage Buildings, Substation, Lift Station, Sediment Basin, Sediment Pond, and Drainage Systems (see Map 500-3 in this chapter). A short discussion of each facility is presented below:

Access and Mine Fan Portals - During the development of the Rilda Canyon Portal Facilities two separate surface breakouts were constructed; 1) Mine (Intake) Access, and 2) Blowing Mine Fan opening. Both portals were developed [from underground] as rocks slopes through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point in the Hiawatha Coal Seam. Methods used to construct this portal and tunneled slope utilized conventional drill and shoot methods. The dimensions of the portal are approximately 20' x 9' rectangular opening. The fan is constructed at the west portal. Mine equipment and men will use the east portal to access the northwestern part of the Deer Creek Mine.

Mine Ventilation Fan - The fan installation at the Rilda Canyon portal facility is a dual, parallel fan arrangement. The fans are located side-by-side on concrete foundation. The fans are installed in a blowing configuration, taking in outside air and forcing it into the mine. Only one fan will operate at a time. Each fan is driven by an electrical motor. Back-up power is supplied by a diesel generator north of the fan. The motors are housed in steel frame buildings.

Facilities Pad – The facilities pad is constructed utilizing Hilfiker MSE (mechanically stabilized embankment) wall system on the south side of the pad. The fill material with the pad consists of existing subsoil material and imported granular fill (approximately 18,100 cy). The pad is lined with a welded impermeable geofabric membrane and topped with 9" concrete. All precipitation that intercepts the pad is collected through a single drop inlet and piped to the sediment basin. Refer to Map 500-3 and 700-2 for this drainage control location.

Fuel Dock – The fuel dock facility is located near the roadway access on the south side of the pad. This covered and self contained facility contains two steel storage tanks; 2,500 gallon diesel tank and a 2,500 gallon emulsion tank.

Rock Dust Tank – A 140 ton capacity steel rock dust silo is located on the north side of pad. The silo is mounted on a concrete foundation. Rock dust is pumped into specially equipped rock dust trailers or trucks.

Lift Station - The lift station is a device that allows longwall equipment to be loaded and unloaded from flat-bed trailers. The lift station is located on the south side of the pad next to the fuel dock.

Sediment Basin – The sediment basin is located east of the rock storage area. This structure collects runoff from the facilities pad and road access areas. The basin is equipped with an open riser extending vertically. The riser allows any silt laden runoff to impound behind its embankment. Excess runoff will be conveyed via a 20 inch High Density Polyethelene pipeline to the sediment pond.

Sediment Pond - The Rilda Canyon Facilities include construction of a single sedimentation pond located at the eastern extent of the disturbed area. Analysis utilized to determine the size and hydraulics related to the construction and operation of the sedimentation pond and all supporting drainage structures are included in the Drainage and Sediment Control Plan (refer to Volume 11 Appendix Volume - Hydrology: Appendix B). Note that prior to any construction, temporary sediment control was established to protect the Rilda Canyon creek from additional contributions of sediment. These plans are outlined in the above referenced material.

Waste, Rock, and Waste Rock Storage Bins – The storage bins are located on the east end of the facility pad and are used for bulk storage of rock used in the mine, as well as, a temporary storage for garbage and waste rock material produced from mining operations. The bins are constructed of rebar reinforced concrete. The waste bin encloses a portable steel dumpster that is covered by netting which keeps litter from blowing away in windy conditions.

The waste rock bin temporarily stores waste rock that is hauled out of the mine. When the bin is full, the waste rock is loaded and hauled to the Deer Creek waste rock site where it is permanently stored.

Covered Storage Bins – There are six covered storage bins throughout the facilities pad area. These bins are utilized to store materials and supplies which will be used as part of the mining operations. The bins are constructed of 6" box beam steel and covered on three sides. Refer to Map 500-3 for the location of these structures.

Substation – Power is supplied to the Rilda Canyon facilities via a 25KV utility service line which parallels the south side of the facility pad. The substation splits the power service into various supply lines and powers the surface operations on the pad. This facility occupies approximately 2,150ft^2 and is completely enclosed by a 7' chain link fence.

A reclosure switch platform is constructed within the existing powerline corridor that allows personnel to trouble shoot power failures before reapplying power back to the Rilda Left and Right Fork Sub-stations. The reclosure switch protects the substations and other electrical installations from automatic re-closing of incoming power from the Power Company. The platform is constructed of steel and extends from the edge of the facilities pad to an area near the power pole where the reclosure switch is installed. All design and construction processes comply with OSHA and NEC safety standards for platform and electrical installations.

Drainage Systems – Two separate drainage systems are utilized at the Rilda Canyon Portal Facility site and classified as either "undisturbed" or "disturbed". The "undisturbed" system collects water above the facility pad and from side slopes adjacent to the site and conveys it past the disturbed area into the natural channel of Rilda Canyon Creek.

The "disturbed" collection system collects runoff from facilities pad and storage areas and conveys it to the sedimentation basin. This system consists of concrete catch basins, CMP culverts and opened ditches designed to adequately collect and pass the peak flow from a 10yr/6hr precipitation event. Refer to Volume 11 Appendix Volume - Hydrology: Appendix B for detailed design and Maps 500-3

and 700-2 for locations.

R645-301-521.200 Signs and Markers Specifications

Permit area identification signs are placed and maintained at each point of access from public roads. Signs identify the business name, address, telephone number, and DOGM identification number of the Deer Creek Mine.

Perimeter markers are placed around all disturbed areas of the Rilda Canyon portal facilities and Left Fork Rilda Canyon fan facilities. Perimeter signs are placed at a reasonable sight distance from one another.

Areas along the Rilda Canyon perennial stream (within 100 feet of the disturbed area of the Rilda Canyon Portal Facilities) are considered a buffer zone and are appropriately posted as such.

The topsoil area is appropriately posted to identify this location. A silt fence, ditch or other appropriate control structure is used to prevent topsoil erosion from the site. Refer to Volume 11 Appendix Volume - Hydrology: Appendix B for a complete description of the Alternative Sediment Control Areas (ASCA's).

R645-301-522 Coal Recovery

This section includes a description of the mine plan and measures used to maximize the use and conservation of the coal resource. The description attempts to show that coal mining and reclamation operations are conducted to maximize the utilization and conservation of the coal, while utilizing the best technology currently available to maintain environmental integrity. This decreases the likelihood of re-affecting the land in the future through coal mining and reclamation operations. Coal Recovery in the Mill Fork area is included in Volume 12, Mill Fork Lease, ML-48258 of the Deer Creek MRP.

Mine Plan: Access to the to North Rilda reserves was achieved with the use of 5-entry set of mains referred to as 4th North Mains. The 4th North Mains are developed northwest (approximately 4000 feet) from the 4th North / 10th West Mains intersection. Mainline development, designated as 5th North, then changed course to a northeast bearing, with development proceeding under the Right Fork area of Rilda Canyon. Selection of the Right Fork stream crossing area was based on the results of an extensive surface exploration program conducted in the Right Fork of Rilda Canyon (refer to Volume 9 maps HM-9, HM-10 and HM-12). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the bedrock interface. Based upon the results of the surface exploration program, mining below the Right Fork of Rilda Canyon was re-located approximately 800 feet to the west

of the original projection. Re-location of the mains to the west increased the overburden from approximately 120 to 200 feet.

Based on the information gained from the surface exploration program, a detailed plan was developed to position the 4th North/5th North intersection to optimize the "no-subsidence" design of the 5th North / Rilda Canyon Right Fork crossing route and rock slope access into the lower Hiawatha Seam as well as maximizing overall reserve recovery within the area.

From the 4th North/5th North intersection, mainline development proceeded to the northern boundary of Federal Coal Lease U-024317. Longwall gateroad development sections were driven due east from the 5th North Mains to the extent of mineable reserves. Six longwall panels were completed in the Blind Canyon Seam, and six longwall panels were completed in the Hiawatha Seam. Sequences of longwall panels extracted in the Blind Canyon Seam were as follows:

Blind Canyon Seam:

Longwall Panel	Coal Lease
11th East	Federal Leases U-06039
	U-024317
	PacifiCorp patent fee claims
12th East	Federal Leases U-06039
	U-024317
	PacifiCorp patent fee claims
14th East	Federal Leases U-06039
	U-024317
	PacifiCorp patent fee claims
15th East	Federal Leases U-024317
9th East	Federal Leases U-06039
	U-024317
	SL-051221
	U-2810
	PacifiCorp patent fee claims
8th East	Federal Leases U-06039
	SL-051221

Hiawatha Seam Access: Access to the to North Rilda Hiawatha seam reserves was achieved with development of rock slopes and vertical raises from the Blind Canyon seam to the Hiawatha seam. From the bottom of the slopes, a 5-entry set of mains referred to as 6th North Mains were developed to the northeast for access to gateroad development in the Hiawatha seam. Main line development was reduced to three entries above 6th Right. The sequences of longwall extracted in the Hiawatha Seam were as follows:

Hiawatha Seam:

Longwall Panel	Coal Lease
5th Right	Federal Leases U-06039
	U-024317
	PacifiCorp patent fee claims
4th Right	Federal Leases U-06039
	U-024317
	PacifiCorp patent fee claims
3rd Right	Federal Leases U-06039
	U-024317
	SL-051221
	U-2810
	PacifiCorp patent fee claims
2nd Right	Federal Leases U-06039
	SL-051221
7th Right	Federal Leases U-06039
	U-024317
8th Right	Federal Leases U-06039
	U-024317

Longwall mining on North Rilda Ridge was completed during August 2004. As indicated above, a total of six panels were extracted in each seam.

Mill Fork State Lease ML-48258 Access: Based on data acquired through surface coal exploration programs, Energy West developed a mine plan to access the Mill Fork State Lease with a set of 6-entry mains driven on a northwest bearing from the 6th North Mains. Mining within the Mill Fork Access corridor was restricted to mainline development. To ensure long term stability, pillars will not be removed (refer to Volume 5 Map 3-7).

Rilda Canyon Portal Facility Access: Based on data acquired through in-mine directional drilling program, Energy West developed a mine plan to access the Rilda Canyon Portal Facility area by extending the 1st Right submains with a set of four entry submains driven southeast toward the Hiawatha coal outcrop near the fork of the Rilda Canyon. Near the Hiawatha outcrop, however, the in-mine directional drilling located a burn area that affects approximately 250 feet of outcrop coal. The intake and travelway breakouts were accomplished by driving a pair of rock slopes to the outside below the burned coal area of the seam. The slope was constructed at the elevation of the mine facilities pad and sloped upward at approximately 8% for approximately 500 feet to intersect the Hiawatha coal seam. The dimensions of the portals are approximately 20' x 9' rectangular opening. Mine equipment currently utilizes the access portal for material supply of underground mining operations. Mine equipment will be transported through the portal to access the northwestern (Mill Fork) reserves of the Deer Creek Mine.

Two northern and two southern panels of each seam extended below the Castlegate Sandstone escarpment. As specified in the lease stipulations, "except at specifically approved locations, the Castlegate escarpment must be protected from mining induced failure". Due to the limited surface exposure of the Castlegate Escarpment, no special monitoring of environmental assessment was deemed necessary for the northern panels. An environmental analysis for full extraction longwall mining beneath the Castlegate Sandstone escarpment has been completed for the two southern panels with an accompanying Decision Notice/FONSI signed (Volume 11 Appendix Volume - Engineering: Appendix C and D). The environmental analysis assessed the following:

a. How much escarpment could fail based on analytical methods, observation of similar areas, geologic/topographic conditions, and panel orientation.

b. What resources would be affected by escarpment failure and description of the nature and magnitude of these effects, ie: vegetation; wildlife and habitat; threatened/endangered and sensitive species; cultural and paleontological resources; hazards; visual quality; etc.

The Castlegate Sandstone escarpment within the North Rilda Permit Application area has been defined in the permit application in two (2) distinct portions:

- *NORTH CASTLEGATE ESCARPMENT - NORTH RILDA AREA*
- *SOUTH CASTLEGATE ESCARPMENT - NORTH RILDA AREA*

North Castlegate Escarpment: The Castlegate Sandstone escarpment within the northern portion of the North Rilda Area (north face of the ridge) has very limited surface exposure due to the presence of talus slopes and forest vegetation which cover most of the escarpment in this area. Due to the limited surface exposure of the Castlegate escarpment, no special monitoring or mine layout protection is planned for the escarpment in this area, i.e.; the four (4) northernmost longwall panels in the Blind Canyon and Hiawatha Seams - North Rilda Area, refer to Volume 11 Appendix Volume - Engineering: Appendix A for complete description and comparison of the North Castlegate Escarpment to previously mined areas.

South Castlegate Escarpment: The Castlegate Sandstone escarpment within the southern portion of the North Rilda Area (south face of ridge) has a prominent surface exposure. Based on an on-going geotechnical study evaluating the potential effects of longwall (full-extraction) mining on the stability of the Castlegate escarpment, i.e.; Cottonwood Newberry Canyon/Corncob Wash and Trail Mountain 5th East/Cottonwood Canyon Test Areas, on going development of a predictive escarpment/mining model is in progress. The current model developed from these studies was used to forecast anticipated effects of proposed mining under the escarpment within the southern portion of the North Rilda Area, ie: The two (2) most southern longwall panels proposed in the Blind Canyon and Hiawatha Seams - North Rilda Area, refer to R645-301-500: Appendix A for complete description of the Geotechnical Study.

Coal Recovery: The maximum amount of economically recoverable coal will be extracted from the North Rilda Area of the Deer Creek Mine with the exception of protective coal barriers which must be left in place to ensure the integrity of the mine entries associated with the active underground workings and to protect environmentally sensitive surface resources within the Rilda Canyon Fork Area (See R_2P_2 Mine Plan Map [Volume 5, Map 3-6 & 3-7]). These protective coal barriers can be broken into five (5) separate categories:

(1) **Property Boundary Barriers:** All external property boundary lines are protected by a 50 foot (minimum) solid coal "buffer" barrier.

(2) **Protective Main Entry Barriers:** Protective main entry barriers are designed to protect long term mine entries from excessive abutment pressures of the retreating longwall. Design of these barriers are based on (I) intended duration of use, (ii) depth of cover in the area, (iii) geologic conditions present, and (iv) historical performance of similar sized barriers in similar conditions.

(3) **Bleeder Entry Barriers:** Bleeder entry barriers are designed to insure the long term stability of the longwall panel bleeder system. Design of these barriers is based on (I) intended duration of use, (ii) depth of cover in the area, (iii) geologic conditions present, and (iv) historical performance of similar sized barriers in similar conditions. Evaluation of localized conditions at the time of development, in conjunction with the preceding design parameters, will be on-going to determine final barrier sizing so that bleeder entry stability and coal recovery may be optimized.

(4) **Surface and Sub-Surface Resource Protective Barriers:**
(a) In-place coal will be left within the Rilda Canyon fork area to insure the long-term stability and integrity of environmentally sensitive surface and sub-surface resources.
(b) In-place coal will be left within the Mill Fork Access area to ensure the long-term stability and integrity.

(5) **Mining Below the Right Fork of Rilda Canyon**: A portion of the right fork of Rilda Canyon lies within the proposed North Rilda Area Permit Application of the Deer Creek Mine. Due to the environmental sensitivity of the Right Fork area (specifically the sub-surface hydrologic alluvial system and associated surface riparian vegetation zone), a complete analysis of a proposed "no-subsidence" design of the 5th North Mains development within the area of the right fork of Rilda Canyon has been prepared addressing the long term ground stability and subsidence protection of the area with regards to proposed mining. All pre-mining and post-mining conditions have been evaluated based on the best geologic and engineering

information currently available (refer to R645-301-500 Engineering Section: Appendix A).

The 4th North Mains consist of a 5-entry development section, bearing northwest from the Deer Creek 10th West Mains. Initial location of the 10th West/4th North intersection was based on the following:

(a) Existing Blind Canyon seam conditions encountered in 10th West Mains development.
(b) Proximity to the projection of the Mill Fork Fault Graben.
(c) Most practical access route to the North Rilda - Blind Canyon and Hiawatha coal reserves, across the North Rilda Canyon Forks area.

A complete analysis of the location and long term ground stability of the 4th North / 10th West Mains and the Left Fork of Rilda Canyon was prepared and submitted by PacifiCorp to the BLM on November 15, 1996. Approval to proceed with relocation and development of the 4th North Mains was given by the BLM (per letter) February 13, 1997.

With regard to PacifiCorp's North Rilda Area Permit Application, the 4th North Mains were originally projected to be developed northwest (approximately 3000 feet), from the 4th North / 10th West Mains intersection. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location of the 4/5th intersection to maximize the overburden in the Right Fork stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. Based on the information gained from the surface exploration program, a detailed plan was developed to position the 4th North/5th North intersection to optimize the "no-subsidence" design of long term entry stability for the 5th North / Rilda Canyon Right Fork crossing route and rock slope access into the lower Hiawatha Seam as well as maximizing overall reserve recovery within the area.

It is expected that recovery rates of 85% can be obtained within the proposed longwall panel areas. The overall minable reserve recovery for the North Rilda Canyon area of the Deer Creek Mine is estimated at approximately 65%. In addition to the protective barriers listed above, Energy West has no plans on recovering coal pillars for remaining gateroad and mainline development entries.

The Deer Creek mining plan is based on the geologic information of the area obtained from outcrops, drilling, and previous mining by the operator. For geologic information of this area, refer to R645-301-600 and Volume 8 of the MRP.

R645-301-523 Mining Methods

The following is a description of the mining operation proposed to be conducted during the life of the mine within the North Rilda Canyon Area, including the methods of coal mining, engineering techniques, and anticipated annual and total production of coal.

Continuous Mining Units (Main Entry and Longwall Section Gateroad Development):
The principal purpose of the continuous mining units within the North Rilda Area of the Deer Creek Mine is underground mine development (i.e. section development of mainline entries, longwall section and gate road development, and longwall section setup/bleeder entry development; along with development of mine water holding sumps, rock storage rooms, etc.).

Figure R645-301-500a (Figure Tab) illustrates the basic configuration of a typical five-entry main, consisting of (nominal) 20 feet wide entries and crosscuts driven on standard 80 feet x 100 feet entry centers. The pillars created measure a (nominal) 60 feet wide x 80 feet long; a size which has been developed for sufficient support of the main entries and overlying strata.

A variation to this typical configuration was utilized for the development of main entries underlying the crossing of the Rilda Canyon Right Fork Area. These five-entry mains consist of (nominal) 20 feet wide entries and crosscuts driven on 80 feet x 130 feet entry centers. To eliminate multiple intersections in the stream crossing area, crosscut locations were staggered. The pillars created measure a (nominal) 60 feet wide x 110 feet long; a size which improves long term main entry stability and overlying strata stability through an area of hydrologic and surface resource concern.

Figure R645-301-500a also illustrates the basic configuration of a typical two-entry longwall panel development, consisting of (nominal) 20 feet wide entries and crosscuts driven on (nominal) 50 feet x 100 feet entry centers. With the retreating longwall mining system, all panel development work is accomplished by continuous mining units prior to longwall installation.

Longwall Mining System: The predominant mining method to be used in the North Rilda Area of the Deer Creek Mine is *Longwall Retreat Mining*. This method, as practiced by PacifiCorp, presents the safest and most efficient underground resource recovery mining method available.

As referenced above, the two-entry gateroad system is developed with (nominal) 20 feet wide entries and crosscuts driven on (nominal) 50 feet x 100 feet entry centers. This type of "yield pillar" configuration is designed so that the gateroad pillar will

gradually yield as longwall retreat proceeds from panel to panel. The purpose of this design is to prevent the buildup of unrelieved stresses within the pillar.

Figure R645-301-500b (Figure Tab) illustrates the basic configuration of a retreating longwall system. After gateroad entries are driven to the extent of the longwall panel length, on both sides of the longwall panel, setup and bleeder entries are driven to connect the gateroads. A solid coal barrier is left between the setup and bleeder entries, size based on; (1) intended duration of use, (2) depth of cover in the area, (3) geologic conditions present and (4) historical performance of similar sized barriers in similar conditions.

Longwall face width, depending on the geologic parameters of the coal deposit, varies from 500 feet to 1000 feet wide. Standard face width is 750 feet center to center (from center-line of head-gate belt entry to center-line of tailgate entry), or 730 feet coal block width. Once installed in the setup entry, the longwall begins retreat mining (from the setup entry "outby" toward the main line entries). A protective barrier is left between the mined out longwall panel (extraction face) and the main line entries that is sized to insure long term main line entry stability.

Panels are designed within the mining area, bounded by natural and imposed limits, with varying degrees of confidence as to final location and extent. Faults may vary somewhat from currently assumed locations. Geologic limitations such as seam splits, channel scours, spars, stratigraphic thinning, burned coal areas, etc. may affect resource recovery by varying the mining limits by hundreds of feet as information becomes available and as mining recovery economics and practicality are further refined. Regulatory mining restrictions, such as escarpment protection barriers and perennial stream buffer zones further confine mining extent.

The anticipated production will be obtained by utilizing two to three continuous mining units and one longwall mining system. The Deer Creek Mine normally operates two continuous mining units and one longwall mining system.

The North Rilda Area of the Deer Creek Mine was developed with mains and sub-mains which supported a series of longwall mining panels. This system is very effective in extracting and maximizing coal recovery. Approximately 75% of the Deer Creek minable coal reserve will be extracted by longwall mining systems, 25% will be extracted by continuous miner development.

The extracted coal is transported by underground conveyor belt to the Deer Creek portals, sized in the Deer Creek coal handling facility and conveyed to the PacifiCorp - Huntington Power Plant, approximately two miles away. A portion of the coal was also transferred to the Cottonwood Mine loading facilities via underground conveyor

belts and transfer shaft. The loading facility and underground conveyor system is no longer in operation.

The interburden in the minable area where the two seams overlap averages about 80 feet. Multi-seam mining will be evaluated where in interburden thickness of less than 30 feet exist between the two seams.

The mine layout of the Deer Creek mine is illustrated in Volume 5, Maps 3-6 and 3-7. The drawings show an arrangement of longwall panels and development sections interconnected by systems of main and sub-main entries. This arrangement is predicated on geographical dedication of reserves, regulatory mining restrictions, available coal quality, and geologic information.

The planned mine development sequence accommodates longwall panels as the primary means of efficiently extracting the reserves. This will ensure the best possible means of maximizing reserve recovery while maintaining consistent coal quality and ground control. Volume 5, Map 3-6 and Map 3-7 shows the North Rilda Area. Table 3 (Volume 2, Part 3) provides the approximate number of acres affected by mining in five-year increments for the Deer Creek Mine.

Mine Production: Average Production rates for the North Rilda Area were approximately 1,150 tons/machine shift for continuous miners and 9,000 tons/machine shift for the longwall. Table 4 (Volume 2, Part 3) of the MRP lists the anticipated annual and total production of coal at the Deer Creek Mine.

All in-mine coal haulage is by belt conveyor. Of the total entries in the main entry system, at least one entry is dedicated specifically to the belt conveyor. All mine personnel and materials are transported underground by diesel equipment. Table 5 (Volume 2, Part 3) lists the major ancillary equipment used in Deer Creek Mine.

R645-301-524 Blasting and Explosives

The Deer Creek Mine is a developed and producing underground mine and there is no anticipated need for any surface blasting activities incident to the underground mining activities. However, if circumstances develop that require surface blasting activities, a plan will be initiated in accordance with DOGM regulations in R645-301-524.

R645-301-524.100 Blaster Certification

All surface blasting incident to underground mining operations will be conducted under the direction of a certified blaster. Blaster certifications will be kept at the blasting site during blasting activities.

A certified blaster and at least one other person will be present at the firing of a blast. The blaster will be familiar with the blasting plan and site specific performance standards (refer to Volume 3 Appendix VI for the approved plan)

R645-301-524.200 Blast Design
Submittal of blast designs for shots will be made to the Division for approval prior to conducting surface blasting at the mine site. A schedule will be presented to the Division prior to conducting blasting activities. The blast design will be prepared and signed by a certified blaster.

R645-301-524.300 Blast Survey
A pre-blasting survey will be conducted as needed.

R645-301-524.400 Blast Schedule
If conducted, the blaster will use audible signals to notify those in the vicinity immediately before the blast. No residents live within one-half mile of the proposed blasting site. All blasting will be conducted between sunrise and sunset.

R645-301-525 Subsidence Control Plan

This section describes in detail the operator's plan to ensure minimal environmental impacts from mine-induced subsidence. The Operation Plan (Volume 2, Part 3) plus the Geology Section (Volume 8) present the detailed data on which the analytical approach for the subsidence control plan is based. The following subsections describe the principal factors involved in controlling subsidence impacts resulting from the proposed mining operations.

For subsidence control and monitoring information specific to the Mill Fork Lease, please refer to Volume 12, Mill Fork Lease, ML-48258 in the Deer Creek MRP.

R645-301-525.100 Subsidence Damage Probability Survey
A survey has been conducted on that portion of East Mountain surface which could possibly be affected by the mining of coal from the North Rilda and Mill Fork areas. It has been determined that there are renewable resources present in the area in the forms of springs, water seeps, grazing land, timber, and wildlife. There are no springs and seeps located above the projected mining activities in the North Rilda Area. The occurrence of the springs is discussed in the hydrology section of this document (Section 700). Only two springs are located within the North Rilda permit area, 80-50 located in Section 29 and the Rilda Canyon Springs located in Section 28 (refer to Volume 9 HM-9 for the location of the springs and Volume 9 - Hydrologic Section of the Deer Creek MRP: Appendix A for sampling sites and monitoring schedule). Most of the streams within the permit area are ephemeral and/or intermittent. Only the lower portion of Rilda Canyon Creek below the Rilda Springs is considered perennial. The streams are fed by springs that emanate primarily in the North Horn Formation west of the permit boundary. Second mining (i.e. longwall extraction, room

& pillar, of the North Rilda area) will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining (i.e. mainline, gateroad development) did occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 5th North Mains development within the Right Fork of Rilda Canyon and the long-term stability analysis refer to the Engineering Section R645-301-500 A. To protect the alluvial/colluvial system of the Right Fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the Right Fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

The angle of draw of subsidence produced by full-extraction mining can be influenced by many factors. These include the size of the area mined; number of seams mined, fractures or faults in the overburden, adjacent mine workings, and adjacent areas of burned coal and clinker. If mine workings extend to an area of burned coal, experience has shown that the overburden stresses above the mined area can be transferred to the adjacent burned coal and clinkers which can cause the clinkered areas to fail. In this case, the angle of draw may appear to be very shallow, when the crushing of the clinkered areas is the source of subsidence outside the normal area of influence.

Faults can also influence the angle of draw. If mining occurs adjacent to an existing fault, the area of subsidence will follow the natural plane of weakness formed by the fault. In this case, the angle of draw will be the same as the dip of the fault.

Based on data collected by the U.S. Bureau of Mines and eighteen years of subsidence data collection on East and Trail mountains, the angle of draw is found to be between 0 and 15 degrees from vertical. In some limited areas, the angle of draw is greater than 15 degrees, but in every case, the angle is greater due to the influence of one of the other factors mentioned above.

For planning purposes, any barrier of protection left in the mine to protect surface features should use a 15 degree angle of draw unless one of the factors mentioned above is known to exist in the immediate area.

No structures such as cabins, fencing, water troughs, and stock ponds currently exist within the boundaries of the North Rilda Area. A single gas well (Merit Energy Federal 32-23) is located adjacent to the mine workings in Section 23, T16S, R6E, SLB&M. A cooperative agreement between Merit Energy and PacifiCorp ensured that mine workings were confined in such a way that the well and associated pipeline were not impacted by mining or subsidence.

R645-301-525.200 Protected Areas

The operator will conduct the underground mining operations so as to prevent subsidence from causing material damage to the surface and to maintain the value and reasonable foreseeable use of that surface in accordance with the preceding subsidence control plan.

As mentioned in the PROBABLE HYDROLOGIC CONSEQUENCES DETERMINATION section, (728: Hydrologic Balance - Surface Water System), the drainages conveying runoff away from the permit areas are streams in Rilda, and Mill Fork canyons. Second mining, i.e. longwall extraction, room & pillar, of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining, i.e. mainline, gateroad development, will occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 4/5th North Mains development within the Right Fork of Rilda and long-term stability analysis, refer to Volume 11 Appendix Volume - Engineering: Appendix A. To protect the alluvial/colluvial system of the Right Fork of Right Fork of Rilda Canyon, a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the Right Fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

R645-301-525.300 Subsidence Control

The operator intends to minimize surface effects of subsidence by adopting, wherever practical, the longwall mining method and mining the coal deposits as completely as possible. The areas within the mine limits not mined by the longwall method will be mined by continuous miner in development for the longwall system. Approximately seventy-five percent (75%) of the recoverable coal reserve will be mined by the longwall method, the remaining area will be mined by continuous miner units.

The longwall mining method allows almost total extraction of the mineral and induces caving of the immediate and upper roof strata. As the coal seam is extracted, the overlying stratum caves rapidly. The caving process has been shown to propagate to within 100 feet of the surface in less than two weeks after mining. This was determined by a cooperative study conducted by the U.S. Bureau of Mines using Time Domain Reflectometry (TDR). In this study, a coaxial cable was cemented within a drill hole positioned near the center of the 14th West longwall panel in the Cottonwood Mine. As the caving of the strata occurred, the cable would shear or be stretched. The depth of the shears or stretches could be identified with instruments on the surface. The data collected from this study is contained in Volume 3, Appendix IV of the MRP. Surface subsidence has been observed within two months of the coal extraction. In most areas, the subsidence will stabilize within 2 years of mining.

It is the operator's intent to mine areas as wide and long as present mining technology or equipment allows in order to minimize the area which would be on the sloping edge of the subsidence trough. The pillars of support for the longwall gate roads have been designed on the yielding pillar principle so that they will yield to destruction. This has been proven in practice in the mines and therefore will not affect the subsidence trough.

The size of the support coal pillars used in mine planning for both the Blind Canyon and Hiawatha seams to ensure long term stability has been determined by basic calculation for the deepest expected cover (from prior mining practice in the area) and USBM study. Experience has also shown that, in multi-seam mining circumstance, columnizing main entry development pillars in both seams is essential for long term main entry stability.

Full extraction areas, by definition, are planned and can control subsidence in areas. It is anticipated that the planned subsidence will minimize impacts and result in a generally uniform lowering of the surface lands in broad areas, thereby limiting the extent of material damage to those lands and causing no appreciable change to present land uses and renewable resources. Subsidence prediction work has shown that the expected maximum planned and controlled subsidence will vary from zero to fifteen (0-15) feet, assuming that the total cumulative extraction from the two minable seams will not exceed twenty (20) feet.

First Mining, "No Subsidence Restricted" Areas

1) Right Fork of Rilda Canyon
   First mining, (i.e. mainline development), has occurred below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 5th North Mains development within the Right Fork of Rilda Canyon and the long-term stability analysis refer to the Engineering Section R645-301-500 Appendix A.

2) Mill Fork State Lease ML-48258 Access (Hiawatha Seam)

Access to the to North Rilda Hiawatha seam reserves was achieved with the development of rock slopes and vertical raises from the Blind Canyon seam to the lower seam. From the bottom of the slopes, a 5-entry set of mains (referred to as 6th North Mains) were developed to the northeast for access to gateroad development in the Hiawatha seam. Main line development was reduced to three entries above 6th Right.

Based on data acquired through surface coal exploration programs, Energy West developed a mine plan to access the Mill Fork State Lease with a set of 6-entry mains driven on a northwest bearing from the 6th North Mains. Mining within the Mill Fork Access corridor will be restricted to mainline development. To ensure long term stability, pillars will not be removed (refer to Volume 5 Map 3-7).

R645-301-525.400 Subsidence Monitoring Plan

The operator initially adopted a twofold approach to subsidence monitoring:

1) Aerial photogrammetry,
2) On-the-ground monumentation.

After seven years of comparing the two types of surveys it was determined that both methods effectively document the amount of subsidence which has occurred; however, the aerial photogrammetry method has the advantage of showing more detail because more data points can be monitored with less effort. Therefore in 1987, with the concurrence of the State of Utah, Division of Oil, Gas & Mining (DOGM), the operator discontinued on-the-ground monumentation and now collects subsidence data solely by aerial photogrammetry.

The subsidence monitoring program, conducted since 1980, has produced data which not only document the amount of subsidence that has occurred but also allows the operator to predict the amount of subsidence that is likely to occur when mining in new areas. The detail of the data collected in years past is not included herein. If the reader desires to investigate past data, it can be found in the annual subsidence reports on file at DOGM.

Aerial Photogrammetry: PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. A baseline photogrammetric survey was conducted in 1980 which includes over 12,000 elevations measured on a 200-foot spacing grid. These elevations are then compared to elevations measured from the photographs taken annually in August. This method has proven to be the best way to collect subsidence data on East Mountain. In flat areas, with limited vegetation, the elevations can be read from the photographs with a precision of one-half foot. In steeper areas, where cliffs are present, the resolution becomes less reliable, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data. The applicant will maintain survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinates on photos within ±1 foot. Following this procedure the operator shall conduct annually an aerial photo survey of all areas which have

been undermined. The operator shall continue monitoring all areas undermined until it is mutually agreed by the operator and DOGM that the subsidence in a given area has become stable and no further monitoring is necessary. The findings of the survey shall be reported to DOGM annually in a summary report.

Special Monitoring - Castlegate Cliff Escarpment

North Castlegate Escarpment - North Rilda Area

The Castlegate Sandstone escarpment within the northern portion of the North Rilda Area has very limited surface exposure due to presence of talus slopes and vegetation that cover the formation in this area. Due to the limited surface exposure of the Castlegate escarpment, no special monitoring or mine layout protection measures was planned for the escarpment in this area (refer to Volume 11 Appendix Volume - Engineering: Appendix A for a comparison of the North Castlegate Escarpment to previously mined areas).

South Castlegate Escarpment - North Rilda Area

The Castlegate escarpment, within the southern portion of the North Rilda Area, has well established surface exposure. Based on a geotechnical study evaluating the potential effects of longwall (full-extraction) mining on the stability of the Castlegate Sandstone escarpment, i.e. Cottonwood Newberry Canyon/Corncob Wash and Trail Mountain 5th East Cottonwood Canyon Test Areas, development of a predictive escarpment/mining model was developed and presented to DOGM, USFS and BLM. The model developed from these studies was used to forecast anticipated effects of proposed mining under the escarpment within the southern portion of the North Rilda Canyon Area, i.e. two (2) southern-most longwall panels proposed in the Blind Canyon and Hiawatha Seams - North Rilda Area (See R_2P_2 Mine Plan Maps Volume 5, Maps 3-6 & 3-7). Based on the predictive escarpment/mining model, areas of potential cliff escarpment failure were monitored with photogrammetric methods, augmented by conventional survey data.

To comply with the special monitoring stipulation referenced in the environmental assessment, "Deer Creek Mine will also monitor subsidence through their mine plan requirements and as proposed, provide higher resolution monitoring data for the North slope of Rilda Canyon by installing prisms for accurate surveying on the top of the escarpment", PacifiCorp installed a series of prisms in 1999 to document subsidence features of Castlegate escarpment (Refer to Map DU1688E in Volume 11 Appendix Volume - Engineering: Appendix A).

Prisms PR-1, PR-2, and PR-3 were installed in February 1999 prior to full extraction mining. Prisms PR-4, PR-5, and PR-6 were installed in June 1999.

All prisms were monitored prior to mining to establish baseline values and percent error variations. During the mining process, prisms were monitored daily until the movement stabilized. Data from the prism monitoring has been reported in each Annual Subsidence report.

In addition to the prism monitoring, PacifiCorp installed warning signs in Rilda Canyon prior to undermining the two southern panels.

After undermining the prisms, each were found to have moved within a few days or weeks after mining was completed. Movement continued throughout 2002 and 2003. Since 2003, the prisms movements have essentially stabilized. Energy West considers the subsidence to be complete and monitoring has discontinued. Prism data has been reported in the annual subsidence report each year from 2000 to 2007.

PacifiCorp did cooperate with the surface land management agency (U.S.D.A. Forest Service) in an environmental analysis of the potential impacts. Final mining approval of the referenced southern longwall panels was granted based on the objective evaluation of the predictive model and assessment of potential surface impact from full-extraction mining within the affected area. The environmental analysis is complete with the associated Decision Notice/FONSI signed on 11/1/99 (see Volume 11 Appendix Volume - Engineering: Appendix C and D in this section) and DOGM consent dated November 10, 1999 (Volume 11 Appendix Volume - Engineering: Appendix E).

R645-301-525.500 Repair of Damage

Should significant subsidence impacts occur, the applicant will restore, to the extent technologically and economically feasible, those surface lands that were reduced in reasonably foreseeable use as a result of such subsidence to a condition capable of supporting pre-subsidence reasonably foreseeable uses.

In order to restore any land affected by operations to a condition capable of supporting the current and post-mining land uses stated herein, the operator will replace water determined to have been lost or adversely affected as a result of operator's mining operations if such loss or adverse impact occurs prior to final bond release. The water will be replaced from an alternate source in sufficient quantity and quality to maintain the current and post-mining land uses as stated herein.

During the course of regular monitoring activities required by the permit, or as the operator otherwise acquires knowledge, the operator will advise DOGM and the surface land management agency of the loss or adverse occurrence discussed above, within ten working days of having determined that it has occurred. Within ten working days after DOGM notifies operator in writing that it has determined that the water loss is the result of the

operator's mining operation, the operator will meet with DOGM to determine if a plan for replacement is necessary and, if so, establish a schedule for submittal of a plan to replace the affected water. Upon acceptance of the plan by DOGM, the plan shall be implemented. The operator reserves the right to appeal DOGM's water loss determinations as well as the proposed plan and schedule for water replacement as provided by Utah Code Ann. 40-10-22(3)(a).

As outlined earlier, there are no springs or seeps located above the projected mining activities in the North Rilda Area. Most of the streams within the permit and affected areas are ephemeral and/or intermittent. Only the lower portion of Rilda Canyon Creek below the forks is considered perennial. The streams are fed by springs that emanate primarily in the North Horn Formation west of the permit boundary. Second mining, i.e. longwall extraction, room & pillar, of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining (i.e. mainline) gate road development will occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 5th North Mains development within the Right Fork of Rilda Canyon and long-term stability analysis refer to the Engineering Section Volume 11 Appendix Volume - Engineering: Appendix A. To protect the alluvial/colluvial system of the Right Fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the Right Fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

R645-301-525.700 Public Notice

The operator will not mine in any areas that would allow potential subsidence effects (as indicated by the angle of draw) to affect any area outside of the lease and affected area boundary until this constraint on coal recovery is resolved by OSM and BLM or permission is granted by the adjacent surface agencies. A mining schedule; which details the area in which mining is to take place and the planned date of the mining activity, has been submitted to the affected surface owners.

R645-301-526 Mine Facilities

Support facilities exist and have been constructed in Rilda Canyon, a tributary of Huntington Canyon; Left Fork Fan Facilities, and Rilda Canyon Portal Facilities. The Left Fork Fan Facilities pad and access road of this area occupy approximately 2.01 acres of Manti-La Sal National Forest land in the NW1/4, NW1/4, SE1/4 of Section 29, T16S, R7E, SLM. These facilities include an access road and a pad area which supports two portals, a substation, power line, fan, water storage tank, and pumphouse. Topsoil removed prior to construction of the site is stored within the disturbed area of the Left Fork Rilda Canyon facilities.

Vehicular access has been limited to the public turn-around area below the portal facilities. However, the Left Fork road continues to serve as a Forest Development Trail, allowing access by horseback and foot travel up the Left Fork of Rilda Canyon and beyond the fan facility area. Access to the facility pad is controlled with fencing and a locked gate at the point where the road enters the pad. The existing trail continues beyond this point.

Vehicular use of the road within the Left Fork Fan Facilities will only occur in emergency situations, for environmental maintenance, and for maintenance to the substation. Environmental maintenance will include transportation of men, materials, and equipment required to maintain, install, or remove structures that are necessary to comply with environmental laws and regulations. Surface environmental compliance inspections will be conducted on foot from the turn-around area. Maintenance to the substation is usually conducted by an independent contractor. Surface access will need to be maintained for these purposes.

In 1997, vehicular use of the road within Rilda Canyon was revised through proper permitting action via USFS, UDWR, and UDOGM approvals to allow the permittee to transport a limited number of truckloads (tractor/trailer combinations utilizing forty foot trailers or ten wheel end dump trucks) per day of solid, bulk materials for usage in the North Rilda area of the mine. Special travel stipulations were imposed to limit this access. As material storage is no longer needed at the Left Fork facility, access will only be used for the three situations mentioned above.

One exception to the three situations above is that during the winter months, snow fall depths on the access road can hamper and greatly delay access during emergency situations. Therefore, to maintain emergency preparedness, if and when snow depth along the access road becomes greater than 12 inches, snow removal activities will be practiced.

Snow removal activities will be accomplished by push, pickup, load and haul techniques. Snow volumes will be hauled to the Deer Creek Mine active waste rock site via ten wheel dump trucks and placed for proper treatment of the snow melt runoff. Side casting of snow into the Left Fork Rilda Creek drainage or the adjacent road ditch will not be practiced.

Specific locations and other information regarding the access road and facility pad in Left Fork Rilda Canyon are shown in Volume 4, Maps 2-15A and 2-17A; Volume 5, Maps 3-9A and 3-9B; and Volume 6, Maps 4-1A and 4-4A (Sheets 1, 2 and 3). More specific information about each of the structures and facilities is provided in the MRP. [Volume 2, Part 3 entitled "MINE FACILITIES (Rilda Canyon)"].

Rilda Canyon Portal Facility is located on a 7.28 (including soil storage area) acre site approximately 2.0 miles from the mouth of Rilda Canyon. Of the 7.28 acres of actual disturbance, approximately 1.79 acres were previously disturbed by earlier mining which leaves only 5.49 acres of additional disturbance needed for the surface facilities. The site is characterized by moderate vegetation and rugged, steep terrain. Surface facilities as described in R645-301-521.180, include the following: Access and Mine Fan Portals, Mine Fan, Facilities Pad, Fuel Dock, Rock Dust Tank, Waste, Rock and Waste Rock Storage Bins, Covered Storage Buildings, Substation, Lift Station, Sediment Basin, Sediment Pond, and Drainage Systems. A pre-disturbance topography map is constructed to show the contour of the canyon prior to any construction activities. This map is found in the Maps Section as Map 500-1. As-built construction cross-sections are found on Map 500-4. All construction cut slopes and fills conform to the recommendations outlined in the Geotechnical Study found in Volume 11, Appendix Volume - Engineering: Appendix F.

R645-301-526.110 Mine Structures and Facilities

As illustrated on Map 500-1, three abandoned mines exist on the north side of Rilda Canyon: Leroy, Rominger, and Jeppson mines (also refer to photos A through C in Volume 11 Appendix Volume - Engineering: Appendix G, Previously Disturbed Areas). These areas were reclaimed by AML in 1988. No structure presently exists in connection with these mines except for their respective reclaimed footprints. The lower portion of the Leroy Mine is utilized for the location of the sediment pond. Approximately 1.5 acres of predisturbance exists at this site where coal was buried during reclamation activities conducted by AML. The soil covering this coal was stripped off and stored during construction activities. The coal was hauled off to the existing Deer Creek waste rock site or utilized if the quality proved acceptable. Substitute topsoil stripped from the facilities area and was stored at the topsoil storage area which is located next to the NEWUSSD spring collection facility. Both topsoil and substitute topsoil (approximately 7,862 cubic yards) are stored at this location until reclamation activities commence.

The North Emery Water Users Special Service District (NEWUSSD) spring system (refer to photos D through F in Volume 11 Appendix Volume - Engineering: Appendix G (Previously Disturbed Areas) consists of a series of collection lines extending westward up Rilda Canyon and southward up a small side drainage as shown on Map HM-8 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). The NEWUSSD spring system is metered at four locations. Meter 1 (Side Canyon Spring) is located at the downstream end of a collection line which enters Rilda Canyon from the South. Meter 2 (Side Canyon Spring plus South Spring) is located near the bottom of the main east-west trending collection line

which lies to the south of Rilda Canyon Creek at a point just upstream (west) of the main spring collection box. Meter 3 (North Spring) records flows for the east-west central collection line which was constructed through the central portions of the valley near Rilda Canyon Creek. Meter 4 (North Spring) collects data from the north collection line located on the north side of Rilda Canyon Creek. Meter 3 and Meter 4 were combined in 1995 during the Rilda Canyon road improvement project.

In addition to the main spring collection lines, there are two flumes in the vicinity which monitor flow rates within Rilda Canyon Creek. The upper flume, RCF-2, is located adjacent to the extreme west end of the spring collection system monitored by Meter 4. Flume RCF-3 is located in Rilda Canyon Creek adjacent to spring collection Meter 2.

Initially five shallow wells were located in the area surrounding the spring collection system to monitor groundwater level fluctuations through time. The locations of the wells are shown on Volume 9 Map HM-9. Wells 1 through 5 are relatively shallow wells which were constructed prior to 1989 by West Appa Coal Company. In 1990, two additional large diameter wells were developed, (Wells 6 and 7) adjacent to wells P-2 and P-3, respectively, in order to obtain more complete groundwater data through aquifer testing. Wells P-2 and P-3 were abandoned and sealed in 1995.

R645-301-526.116.1 Mining Within 100 Feet of Public Road

PacifiCorp intends to conduct coal mining and reclamation activities within 100 feet of Emery County Road #306. However, in 2005, PacifiCorp ~~has~~ entered into two separate agreements with Emery County Special Services District No. 1 to encroach upon their right of way in Rilda Canyon. Agreement #1 is made to reconstruct, realign, widen, and surface County Road #306 to allow for increase speed and increased traffic. Agreement #2 is made to allow a portion of this road to be temporarily restricted from public use. The restricted use area starts approximately 1/4 mile west of the cattle guard and extend approximately 2,300 feet to the mine gate in the left fork of Rilda Canyon (refer to Figure R645-301-500c). A copy of Agreements #1 and #2 are found in Volume 11 Appendix Volume - Engineering: Appendix B. Access will be given to Emery County Road Department officials and North Emery Water Users Special Services District for periodic inspection and maintenance of their facilities and also to regulatory and other governmental agencies so they may access their jurisdictional areas. Photos of the suspended portion of the road are found in Volume 11 Appendix Volume - Engineering: Appendix G (Existing Road).

R645-301-526.116.2 Relocating a Public Road

Emery County Road #306 exists in the location of the North Rilda Canyon portal facilities. This road runs approximately 3.0 miles from the Huntington Canyon road, Highway 31, to the turn around area in the Left Fork of Rilda Canyon. It is owned and maintained by Emery County Special Service District No. 1. As mentioned above, an agreement has been constructed between PacifiCorp and Emery County to suspend the public use of a portion of EC #306. Approximately 2,300 feet of the road has been temporarily eliminated through the

facilities throughout the life of the mine. At time of reclamation, the suspended portion of the road will be reconstructed in its original location and to its original design. The design and construction plans are the property of Emery County Road District and are better known as Rilda Canyon Road Change Order #1. PacifiCorp has retained a copy of these plans and formatted them onto a CD. These plans can be reviewed in Volume 11 Appendix Volume - Engineering: Appendix G. Reclamation and replacement of the road will be completed to the standards found in these original road designs. Figure R645-301-500c in the Figures Section shows the location of the road and typical road section.

As this restricted use area eliminates public access to the former Forest Service trail system in the canyon, PacifiCorp's Agreement #1 with ECSSD#1 includes the construction of a new trailhead and parking area on the east end of the mine facilities and the reconstruction of the county road (see detailed design in Figure R645-301-500c in the Figures Section and discussion in the Reclamation Plan below). PacifiCorp has established a trail (in cooperation with the USFS) on the south side of Rilda Creek that by-passes the mining facilities. The trail crosses the Rilda Canyon creek and travels parallel to the creek to a point where it reconnects to the existing trail as shown in Figure R645-301-500c. The trail has been constructed to comply with USFS design parameters. Upon reclamation, the trail will be eradicated and the road will be relocated to its original location.

R645-301-526.200 Utility Installation and Support Facilities

As described above, North Emery Water Users Special Services District (NEWUSSD) possesses a spring collection system in Rilda Canyon near the mine facilities location (refer to Map 500-1). Water transmission lines associated with the spring collection system have been located to protect against damage from mining operations in the areas in which they pass through the disturbed area.

As Emery County Road #306 was reconstructed (2007), PacifiCorp cooperated with NEWUSSD to insure protection of water transmission lines. Location and design of EC#306 is within the jurisdiction of the Emery County Road Department. Plans for the road can be reviewed in Volume 11 Appendix Volume - Engineering: Appendix G. Support facilities were previously discussed in R645-301-521.180. Construction and operation of these facilities were in accordance to applicable Emery County Building Codes. Drawings and specifications were submitted to the Emery County building inspector for their review.

R645-301-527 Transportation Facilities

The Rilda Canyon operations utilize roads in association with the facilities described in the above sections. The Left Fork Rilda Canyon Fan Facilities are described in Volume 2, Part 3. A description of the transportation facilities is detailed below.

Roads

The Deer Creek Mine Rilda Canyon operations utilize two roads as follows:

(a) Left Fork Rilda Canyon Access Road
(b) Emery County Road #306 (Rilda Canyon Portal Facility)

Left Fork Rilda Canyon Access Road: The Left Fork Rilda Canyon Facility Access Road is approximately 1150 feet in length (see Map 3-9A and 3-9B in Volume 5). It follows the north side of the Left Fork of Rilda Canyon from the end of the county road (suspended from public access in 2005) to the facility pad. The existing road/trail was upgraded to a gravel surfaced road in 1995 with an average width of 11 feet and an average grade of approximately 8%. The road was designed in accordance with recommendations from the surface management agency (Manit-LaSal National Forest). See R645-301-534 below and Volume 2, Part 3 for additional information.

Emery County Road #306 (Rilda Canyon Portal Facility): PacifiCorp has entered into an agreement with Emery County Special Services District #1 to reconstruct/realign county road #306 (Agreement #1 in Volume 11 Appendix Volume - Engineering: Appendix B). This road is utilized by traffic related to the mine as well for recreational and grazing purposes. The road has been completely asphalted (completed 2007) with a trailhead and parking area constructed of the Rilda Canyon Portal Facility.

This portion of the road is owned and operated by ECSSD #1. However, during winter months snow removal will be required along the entire length of this road. As this is the responsibility of the Emery County Road Department, PacifiCorp may find the need to assist the road department by clearing snow from EC#306 by contracting this work to a private contractor. PacifiCorp will require the contractor to use a deicing product as specified by Emery County on the county portion of the road to make the road safe for mine personnel and other local traffic. The deicing product will not be stored on-site but can be acquired at the Deer Creek portal facilities. No salt will be used within the disturbed areas of the Rilda Canyon Portal Facilities.

R645-301-527.100 Road Classification

Only one primary road exists within the disturbed area of the Rilda Canyon portal facility area. This road begins at the mine gate (the end of public access from EC #306and terminates at the facilities pad. This road is utilized daily by mine personnel and supply truck deliveries. The length of the primary is approximately 1,326 feet and coated with asphalt. The foundation of the road is identical to the reconstructed road EC#306. The main components of the foundation are the sub-grade, sub-base, base course, and surface cover. There are no embankments associated with this road.

The subgrade is the native underlying soil that serves as the primary foundation for the road and facilities pad. Placement of the subgrade was completed in specific lifts and did not exceed 8 inches. Compaction was over the full depth of the fill to at least 95% of the maximum dry density as determined by the AASTHO T-180 test procedures. Refer to the Geotechnical Study provided by AMEC Earth and Environmental Inc. in Volume 11, Appendix Volume - Engineering: Appendix F.

The subbase is a compacted granular material between the subgrade and the base course. Typically, the subbase thickness is between 12 inches and 18 inches for the loads that are expected at the mine site. Aggregate and gradation specifications are less stringent than the specifications for the base course.

The base course is the surface layer directly beneath the surface cover. The material has strict specifications for strength, stability, hardness, aggregate type and gradation. Typical thickness of the base course is 6 inches which should provide a stable base for the surface covering material.

The surface covering material consists of bituminous material and mineral aggregates that are well graded. The cover is typically 4 inches thick. As with all foundation layers for the primary road construction, the specifications for the material and construction are detailed by the design. A typical illustration for road base design and location of primary is found on Map 500-3 in the Maps Section. Original designs for this portion of the road are found in Volume 11 - Appendix Volume 11A – Engineering: Appendix G. These designs will be accessed and utilized to replace the road back to its original condition and location at time of reclamation of the site.

R645-301-528 Handling and Disposal of Coal, Overburden, Excess Spoil and Coal Mine Waste

As discussed earlier, approximately 1.79 acres of the facility was disturbed as a result of previous coal mining and other activities. Geotechnical investigations conducted during April 2004 delineated an area of approximately 0.7 acres of buried coal directly below the Leroy Mine. It was estimated that at least 3,600 tons was buried based on the following: 1) average depth of 4.0 feet, 2) in-place weight of 60 lbs/ft^3, 3) area: 30,302 ft^2. Coal waste encountered during soil salvaging and construction of the sediment pond was segregated separately and transported to the Deer Creek Waste Rock Site for disposal or utilized if the coal quality allowed. Quality data is found in Volume 11 Appendix Volume - Soils: Appendix A, EIS Report, Appendix 6.2, Soil Testing Data, Sample ID RIL1003.

In 2006, coal and coal waste were excavated and removed from the sediment pond area by track-hoe and truck. The quantity of coal removed was 744 tons (accounted for by weigh scales) or 249 cubic yards. This coal was shipped by truck to the Huntington Power Plant and utilized for

power generation. Coal waste removed from the site was approximately 2000 cubic yards. This material was transported by truck to the Deer Creek Waste Rock Site for permanent disposal.

During operations in Rilda Canyon, very limited amounts of coal mine waste (waste rock) may be transported through the Rilda Canyon portals. Most waste rock will be removed through the Deer Creek portals. The Deer Creek MRP includes a narrative explaining the construction, modification, use, maintenance, and removal of coal, overburden, excess spoil, and coal mine waste through the Deer Creek portals. Up to approximately 125 cubic yards of waste rock may be temporarily stored in a controlled manner in the designated area as shown on Map 500-3. The waste rock will be transported to the Deer Creek waste rock site when the temporary storage area becomes full (Refer to the surface facilities Map 500-3 and facility description in R645-301-521.180).

R645-301-528.330 Non-Coal Waste

All non-coal wastes generated during mining activities and removed from the mine through the Rilda Canyon portals will be placed and stored in a controlled manner in a designated portion of the disturbed area as shown on Map 500-3. The materials will be removed from the site and disposed of in an approved disposal facility.

R645-301-529 Management of Mine Openings

Two (2) portals are located in the Left Fork of Rilda Canyon which support intake and return ventilation entries for the operation of the mine. Underground access to the Rilda Canyon Portal Facilities is achieved by the continuation of a set of three entry 1st Right Submains and development of two rock slopes to the portal facility area near the intersection of the Right and Left Forks. All of the development has occurred in the Hiawatha coal seam and Starpoint Sandstone immediately beneath the coal seam. During the development of the Rilda Canyon Portal Facilities two separate surface breakouts were constructed; 1) Mine Fan, and 2) Intake Access. Both portals were developed [from underground] as rocks slopes through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point in the Hiawatha Coal Seam. Methods used to construct this portal and tunneled slope utilized conventional drill and shoot methods as well as conventional mining methods. The dimensions of the portals are approximately 20' x 9' rectangular opening. The fan is constructed at the west portal. Mine equipment and materials will utilize the east portal to access the northwestern part of the Deer Creek Mine.

Sealing of the portals in the Left Fork Rilda Canyon is detailed in Volume 2, Part 4, Reclamation Plan. Sealing of the portals in the Rilda Canyon portal facility is detailed in the reclamation plan in Section R645-301-540.

R645-301-530 OPERATIONAL DESIGN CRITERIA AND PLANS

R645-301-531 General

This section includes a general plan for precipitation runoff management, sediment control, impoundment design, road design, and coal mine waste handling plans. Actual construction drawings for the Rilda facilities were developed by Jones and DeMille Engineers and can be found in Volume 11, Appendix Volume 11A – Engineering, Appendix H.

R645-301-532 Sediment Control

The Rilda Canyon portal facilities (not including soil storage area) cover approximately 6.77 acres of disturbed area. All water within this area will be conveyed to drop drains, ditches, and/or culvert systems. Sediment control allows for undisturbed runoff to bypass the facilities via a diversion ditch and culvert system into the Rilda Creek. Disturbed runoff from the facilities pad area reports to a single drop drain and diverted to the sediment basin via buried culvert system. Over flow from the disturbed system is diverted through a buried culvert to the sediment pond located below NEWUSSD spring collection area. Refer to Volume 11, Appendix Volume 11B – Hydrology: Appendix B for the specific design of this system.

R645-301-532.200 Stabilization

Sediment control on cut and fill slopes and soil piles will be accomplished primarily by revegetation. Prior to the establishment of vegetation, the slopes will be protected by the application of a surface tackifier, rock mulch, erosion control fabric, and/or other means approved by the Division. An undisturbed drainage ditch has been constructed at the toe of the cut slopes along the north side of the facility pad to divert all undisturbed drainage away from the disturbed area. Diversion ditches are protected using protective barriers to physically separate the disturbed from the undisturbed areas.

Other sediment control measures are discussed in detail in the Hydrology Section.

R645-301-533 Impoundments

As described previously, a sediment pond is utilized to collect storm water runoff from the disturbed area of the surface facility area. The design of the pond is found in Volume 11 Appendix Volume - Hydrology: Appendix B. Pond design encompasses approximately 1.0 acre of disturbed land.

R645-301-533.200 Foundations

The pond is designed as an incised structure. Foundations for embankments and impounding structures are constructed as outlined in the Geotechnical Study conducted by AMEC (refer to Volume 11 Appendix Volume - Engineering: Appendix F). A construction summary is given below.

Foundations were constructed by first stripping the area of vegetation and topsoil. Large boulders were removed to a depth of at least two feet below the base of the impounding structure. The natural exposed subgrade was compacted utilizing the excavation equipment used at the pond area. At least three passes were made over the natural soils with this equipment.

Embankment fills were placed in horizontal lifts not exceeding 12 inches in loose thickness. Moderate to large sized boulders were removed prior to placement. Fill was compacted throughout by the double passing of construction, spreading, or hauling equipment over the embankment surface. Side slopes are constructed to not exceed 2 horizontal and 1 vertical.

R645-301-533.300 Side Slope Protection

To protect against infiltration, the pond was over-excavated two (2) feet, compacted, and lined with clay on the bottom and sides. Areas where embankment fills were necessary (south and east sides), vegetation was planted or the slopes were armored with rock riprap to protect against erosion. Refer to R645-301-300: Biology for seed mix.

R645-301-533.700 Plans

A complete plan and design for the pond is found in Volume 11 Appendix Volume - Hydrology: Appendix B. Total as-built volume of the sediment pond is 1.71 ac. ft.. Sediment volume contribution from the disturbed area is negligible (0.0716 ac. ft./yr.) especially when the sediment basin is accounted for. The pond will be cleaned of sediment when the depth of sediment reaches 40% of the total volume of the pond or 7.4 feet in depth.

There are no underground operations below this pond that could potentially impact the structure. The pond will be utilized during the life of the mining operations and will be removed at reclamation.

R645-301-534 Roads

Left Fork Rilda Canyon: The Left Fork Rilda Canyon Fan Access Road is approximately 1,150 feet in length. It follows the north side of the Left Fork of Rilda Canyon from the turnaround above the Rilda Canyon Portal Facilities to the Left Fork facility pad. The existing road/trail was upgraded to a gravel surfaced road with an average travel width of 11 feet an average grade of approximately 8%. The road was designed in accordance with recommendations from the surface management agency (Manti-LaSal National Forest).

Drainage control is provided by a ditch along the north side of the road. The ditch is armored with type L, D50 = 9" riprap at stations 3+36 to 6+55, 7+69 to 9+89 and 11+82 to 13+96 to comply with DOGM and Forest Service Stipulations (refer to Map 3-9B in Volume 5). Additionally, Map 3-9B, illustrates the typical rip rapped ditch installation. Flows in the ditch are controlled by rip rap. An 18" diameter CMP culvert carries the flow beneath the road and

into the natural drainage system. Further information regarding drainage controls along the access road is found in Volume 3: Appendix VII, Surface Runoff Control Plan, prepared by Hansen, Allen & Luce.

The road and culverts will be removed during final reclamation from the site and the Forest Development Trail will be re-established. Refer to the Reclamation Plan for the Left Fork Rilda Canyon fan facilities in Volume 2, Part 4.

Rilda Canyon Portal Facilities: Prior to the construction of the facilities pad, a portion of the Emery County Road #306 existed within the proposed boundaries of the Rilda Canyon Portal Facilities. This road runs approximately 3.0 miles from the Huntington Canyon road, Highway 31, to the turn around area in the Left Fork of Rilda Canyon. It is owned and maintained by Emery County Special Service District No. 1. A portion of this road has been temporarily restricted for public use in order to allow PacifiCorp to conduct mining and reclamation operations. The restricted use area starts approximately 1/4 mile west of the cattle guard and extends approximately 2,300 feet to the mine gate in the left fork of Rilda Canyon (refer to Figure R645-301-500c).

As this restricted use area cuts off public access to the Forest Service trail system in the canyon, PacifiCorp has entered into an agreement with Emery County (Agreement #1) to construct a new trailhead and parking area east of the mine facilities. PacifiCorp established a trail that by-passes the mining facilities and connects into the existing Forest Service trail system. Upon reclamation, the trail will be left in place and the road will be relocated to its original location. (Refer to original design of road in Volume 11 Appendix Volume - Engineering: Appendix G

All roads associated with the Rilda Canyon Portal Facilities have been designed to ensure environmental protection and safety appropriate for their planned duration and use, including consideration of the type and size of equipment used. The design and construction of the roads incorporate appropriate limits for surface drainage control, culvert placement, culvert size, and all design criteria established by the Division and Forest Service. Actual construction drawings, including plans for primary road construction, for the Rilda facilities were developed by Jones and DeMille Engineers and can be found in Volume 11, Appendix Volume 11A – Engineering, Appendix H. Safety factors that apply to the Hilfiker Retaining Wall are outlined in this appendix.

R645-301-535 Spoil

For a discussion on spoil of the Deer Creek Mine, refer to Vol. 2, Part 3 of the MRP.

R645-301-536 Coal Mine Waste

Underground development waste, coal processing waste, and excess spoil will continue to be disposed of in accordance with plans approved by DOGM and MSHA. There are no plans to return coal processing wastes to the underground workings at the Deer Creek Mine. All coal mine wastes (waste rock) will be removed from the mine through either the Deer Creek portals or the Rilda Canyon portals and disposed of at the Deer Creek waste rock site in Huntington Canyon. Refer to Volume 10 of the Deer Creek MRP for a full discussion of the design, construction, and maintenance of the waste rock site.

A temporary waste rock storage facility is located on the surface at the Rilda Canyon portal facility in Rilda Canyon and noted on Map 500-3 as "Waste Rock". The capacity of the waste rock bunker is approximately 125 cu. yds. The waste rock will be hauled to the Deer Creek Waste Rock Site as the bunker reaches its capacity. Refer to construction drawings in Volume 11, Appendix Volume 11A – Engineering, Appendix H.

R645-301-537 Regraded Slopes

There will be no spoil or underground development waste used to regrade slopes to achieve approximate original contour. Slopes for the Rilda Canyon Portal facilities will be constructed using the rock, subsoil and topsoil material.

R645-301-540 RECLAMATION PLANS

Reclamation of the Left Fork Fan Facility is detailed in Volume 2, Part 4 of the Deer Creek MRP. The reclamation of the Rilda Canyon Portal Facilities is detailed in the following sections.

R645-301-541 General

As required by R645-301-540, the applicant intends to conduct final reclamation as follows:

1. Remove existing structures.
2. Remove buried diversion systems, where necessary, and provide 100yr/6hr storm event channels.
3. Re-contour the disturbed area to blend in with the existing surroundings.
4. Stabilize all fill structures.
5. Reconstruct Emery County Road #306
6. Reduce sediment loading to receiving streams by incorporating Best Management Practices (BMP's).
7. Vegetate all disturbed areas to meet minimum requirements of plant cover, diversity and production as compared to the reference areas.
8. Meet the stated post-mining land use.
9. Achieve bond release.

R645-301-541.300 Structure Removal

Following the completion of mining, work will begin on the demolition of surface facilities. All structural steel, metal siding and other building materials except concrete will be dismantled and disposed of off the permit area. These structures include, but are not limited to:

- Fan and fan housing
- Fuel storage tank
- Substations
- Oil storage tank
- Fences
- Covered Storage Bins
- Rock dust silo
- Coal and Non-Coal Waste Bins
- Facilities Pad and MSE Wall

All foundations and structures built of concrete will be broken up and buried on-site, permanently stored underground, or taken to the waste rock site for disposal. There is approximately 3,046 cy of in-place concrete at the Rilda Canyon Portal Facility. It is estimated that the density for in-place concrete is approximately 150 lbs/ft^3. For crushed concrete, the estimated density is approximately 110 lbs/ft^3. The volume of crushed concrete increases the volume of in-place concrete about 27%. Using these density estimates, the volume of concrete to dispose at the Rilda Canyon Portal Facility will be approximately 3,868 cy. Any excess demolition material will be used to backfill the portals or taken to the waste rock site for disposal. All asphalt material from the disturbed area will be excavated and taken to a permitted class IV landfill. For cut and fill quantities, refer to Table 500-1 above and R645-301-553 and Map 500-4 for cross-sections.

R645-301-542 Narratives, Maps, and Plans

A detailed timetable for the completion of each major step in reclamation is outlined in R645-301-300: Biology, Table 300-5. Pre-reclamation surface configurations for the Rilda Canyon Portal Facility are located on Maps 500-3 and 500-4. These drawings show the location and extent of surface disturbances due to coal mining and reclamation activities at the portal facility. A detailed plan for backfilling, soil stabilization, compacting and grading is outlined below in R645-301-553, Backfilling and Grading. Certified contour maps, cross-sections, and soil placement maps can be found in the map sections of this volume.

R645-301-542.600 Roads

Emery County road #306 will be reconstructed as part of the post mining land use. The road will be replaced in the approximate original location that it existed prior to the construction of the facilities area. The road will be reconstructed as per the designs of Emery County Special Service District #1, Change Order No. 1, November 1994. These designs are the property of Emery County. A copy can be reviewed in Volume 11 Appendix Volume - Engineering: Appendix G. All drainage structures will be replaced. Sediment control will be that control stated in R645-301-552, Permanent Features and R645-301-553.100, Disturbed Areas.

R645-301-550 RECLAMATION DESIGN CRITERIA AND PLANS

Reclamation activities at the Rilda Canyon Portal Facility will include plans and designs for 1) Casing and sealing of portals, 2) Permanent features, and 3) Backfilling and grading. These plans and designs are outlined below.

R645-301-551 Casing and Sealing Underground Openings

The Rilda Canyon Portal Facility has a total of two (2) portals of which one (1) is a blowing fan installation. These portals are located on the surface facility map, Map 500-3. The plan for sealing these portals consists of a permanent MSHA-approved, plug-type seal with at least 25 feet of non-combustible material compacted, to the extent possible, to form an earthen plug (see Figure R645-301-500d in the Figures Section). The earthen plug will extend out the portal and graded to match the topography that existed prior to mining and reclamation activities in this area. Since the portals have been developed post-SMCRA, the associated highwalls will be completely eliminated by the reclamation activities. All concrete materials that are crushed and removed from the pad areas, storage bunkers, etc. will be permanently disposed of within the two portals facility portals. Compliance to MSHA requirements for ventilation will be followed during this backfilling activity. Backfilling and grading of the portals and mine site is detailed below.

R645-301-552 Permanent Features

Small depressions (pocks) will be constructed to retain moisture, minimize erosion, create and enhance wildlife habitat, and assist revegetation. The pocks will be constructed with a track-hoe or similar machinery and placed in random order. The pocks will measure approximately 1.5 feet deep by 3.0 feet in diameter. Pocking techniques and sediment loss is explained in detail in the Soil and Hydrology sections.

R645-301-553 Backfilling and Grading

Once the structures have been removed and the portals sealed as outlined in Figure R645-301-500d, backfilling and grading will commence. Reclamation will be accomplished by systematically reclaiming the Rilda Canyon Portal Facility starting at the uppermost part of the disturbed area, working down. Prior to initiating backfilling and grading process at the facility area, the entire area will ripped with a dozer to a depth of approximately two feet to reduce soil compaction. Various stages of the reclamation process may be occurring simultaneously in different parts of the site. Working from top to bottom will minimize handling and compaction of the material in the reclaimed areas and allow the sedimentation structures below the reclamation work to remain in place. Backfilling and grading the disturbed area of the mine site will be conducted to achieve approximate original contour (AOC) of the entire site. At

completion of backfilling and grading, the sediment pond will be removed. The clay liner will be disposed of on-site by burying at least four (4) feet below the final surface configuration. Recontouring will be completed as detailed on Map 500-4. Cut/fill quantities are balanced as outlined in Table 500-2 below. Map 500-5 shows final reclamation topography of the entire mine site.

Table 500-2: Mass Balance of Cut/Fill Volume for Reclamation.

	Faclilities*/Pond Area	Area (sf)	Volume (cy)
1	Total Cut		25,553
2	Total Fill		6,762
	Hard Armor Areas* **		
3	Hilfiker Wall	8,400	249
4	Boulder Pile	20,350	603
5	Sediment Basin Outslope	4,020	119
6	Sediment Pond Outslope	4,375	130
7	Total Volume to be Reduced from Cut		1,101
	Topsoil Pile** **		
8	Total		7,000
	Mass Balance Calculations		
	Total Cut (Items 1-7+8)		31,452
	Total Fill (Item 2)		26,762
	Difference		4,690
	% Difference*****		15%

NOTES:

* As-built volumes calculated utilizing aerial survey data and Carlson Software.

** Includes approximately 18,100 cy of imported rock material used during the construction of the Hilfiker wall. Imported material will be placed at bottom of all fill areas.

*** Boulders in these areas consist of a 40% void. Therefore, a 40% volume in this area (item 4) is subtracted from the total cut (item 1). Depth of the areas average 2ft.

**** Approximately 10 inches of topsoil will be used to cover the topsoil pile footprint to aid in vegetation growth.

***** The excess 4,690 cubic yards will be used to provide additional topsoil depth throughout the site.

Note in the table above, the hard armored areas consist of an estimated 40% void space. This space is accounted for in Item 7 and is subtracted from the total cut in Item 1. The volume of the topsoil pile is added back in which gives an excess of 4,690 cubic yards of material. This additional material will be spread throughout the site to increase the depth (approximately 1⅓ inches) of the planting medium. Also note that only 7,000 cubic yards is utilized in the reclamation of the mine site when Table 500-1 showed a volume of 7,862 cubic. Approximately

862 cubic yards will be utilized at the topsoil pile site to enhance the growth medium in this area. Depth of topsoil in this area will be approximately 10 inches.

Upon completion of backfilling and grading and topsoil placement, the entire area will be pocked to minimize (or eliminate) erosion and sediment transport from the reclamation site. Pocks will be constructed on slopes on 4:1 or greater using the bucket of a track-hoe or similar machinery to an approximately size of 3.0' diameter x 1.5' deep. Slopes flatter than 4:1 will be roughened using a harrow or similar implement. Reclamation of the soil placement area will be conducted as outlined in R645-301-200.

R645-301-553.100 Disturbed Areas

Generally, all slopes are on a 2:1 or less grade. All slopes will be constructed to achieve a minimum long-term safety factor of 1.3 and will prevent unstable slopes. The two highwalls created by the initial portal development will be completely eliminated to meet approximate original contour provisions. All slopes will be compatible with the postmining land use of the area and will provide adequate drainage.

Since the subdrainage areas in the reclaimed area are ephemeral and rarely receive flow, the drainage systems through the site will be armored with rock but not designed as a riprapped channel. Final surface configuration (Map 500-5) will channel any drainage that may occur from the undisturbed area through the reclaimed armored channels. Drainage will then be conveyed to road culverts (refer to Figure R645-301-500c for location) to direct flow beneath the EC#306 (see R645-301-542.600, Roads). Culvert outlets will extend beyond the south side of EC#306. Runoff will then flow overland through the buffer area for an average of approximately 50 feet before contacting Rilda Creek. Silt fences or other approve sediment control will be placed so that the disturbed runoff will be treated prior to entering the Rilda Creek. After two years of vegetation growth, these structures will be removed.

R645-301-553.130 Slope Stability Analysis

With the soil conditions, slope, and aspect being similar to that of the Des Bee Dove Mine site, the recommendations made by RB&G Engineering (refer to Des Bee Dove Mine, Appendix XIV, Phase 1 Reclamation, Engineering Section, Appendix C) for slope stability will be used for the Rilda Canyon Portal Facility reclamation. Their analysis assumed strength parameters for foundation fills and embankment fills. It was assumed that the foundation soils consisted of loose to medium dense granular fill extending to a depth of at least 10 feet below the existing level surface. A friction angle of 32° with zero cohesion was conservatively assumed for this material. All reclaimed slopes should be equal to or less than 2 horizontal and 1 vertical.

Based upon the results of their analysis and experience in the compaction of similar material in the Phase 1 and Phase 2 Des Bee Dove Mine reclamation project, slope stability can achieve at least a 1.3 safety factor by compacting lifts not exceeding 1 foot in thickness a

minimum of four passes with a rubber-tired dozer or sheepsfoot. The Geotechnical Study by AMEC Earth and Environmental Inc. (Volume 11 Appendix Volume - Engineering: Appendix F) concurs with RB&G recommendations. However, their recommendations use only two passes of construction, spreading, or hauling equipment.

No slope failures have occurred at the Des Bee Dove reclaimed site since completion in 2003.

The forest trail which was constructed in association to the mine facilities will left in place so that recreationalist can park at the existing trailhead below the cattle guard on the Emery County Road #306

As a final step in reclamation of the Rilda Canyon portal facilities, the entire reclaimed area will be seeded and hydromulched as outlined in the Biology Section.

R645-301-560 PERFORMANCE STANDARDS

Coal mining and reclamation operations will be conducted in accordance with the approved permit and requirements of R645-301-510 through R645-301-553.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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Remove Appendix A and Entire Contents

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Figures Section – Replace R645-301-500c

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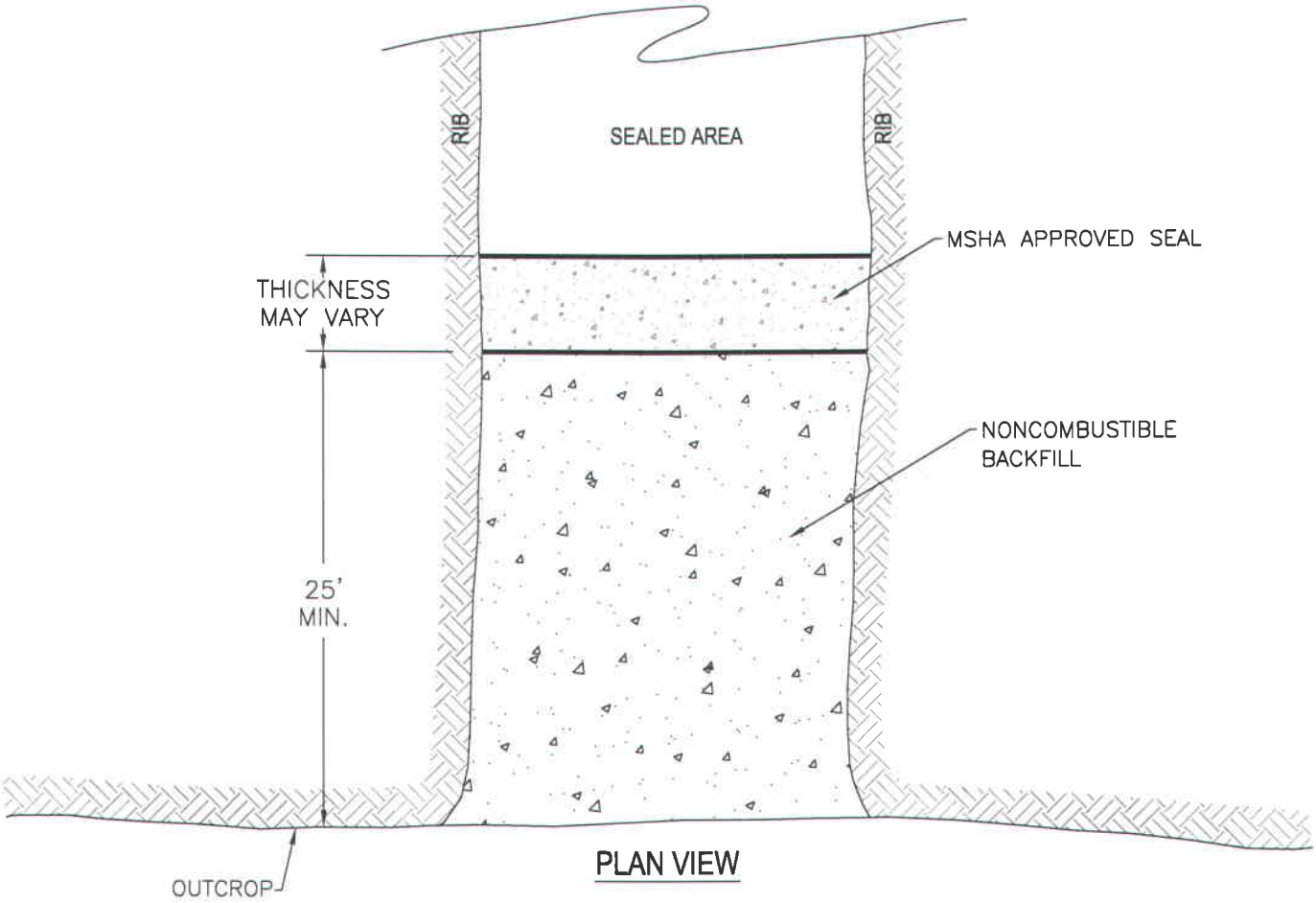
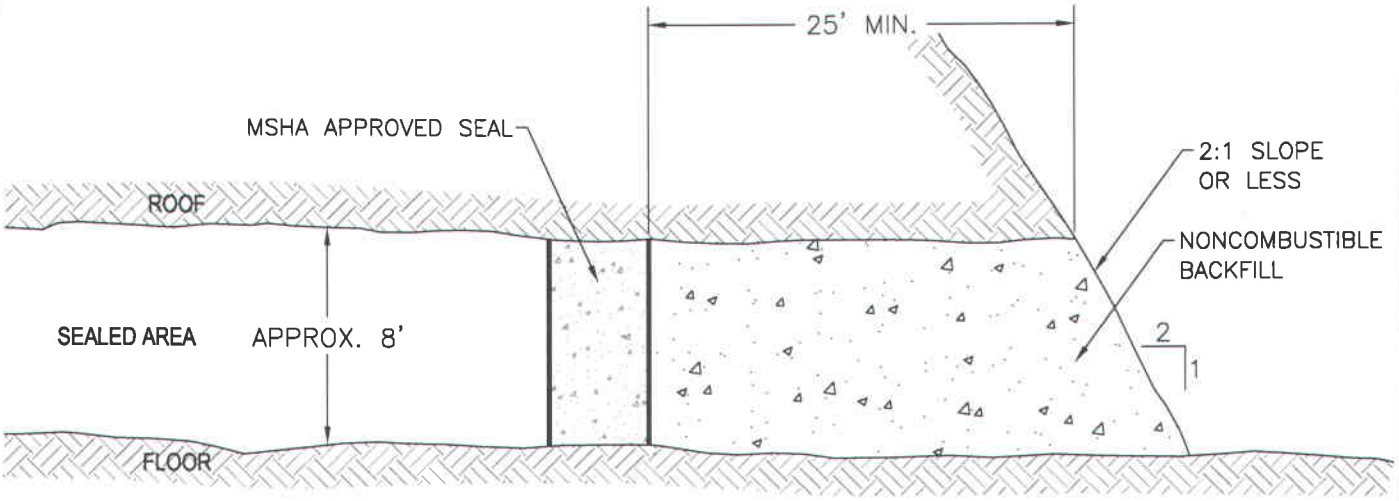
Figures Section – Replace R645-301-500d



PLAN VIEW



ELEVATION VIEW

NOTE:

SEAL DESIGN MAY VARY DEPENDING ON THE MSHA REGULATIONS AT THE TIME OF SEALING

CAD FILE NAME/DISK#: MSHA Approved Portal Seal

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

TYPICAL PORTAL SEAL

DRAWN BY:	K. LARSEN	Figure R645-301-500d	
SCALE:	NONE	DRAWING #:	
DATE:	JUNE 22, 2010	SHEET 1 OF 1	REV.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

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Maps Section – Replace TOC Cover Sheet

Deer Creek Coal Mine
Rilda Canyon
Portal Facilities

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Engineering Maps Section

Permit No. C/015/018
December 2004
Amended June 2010

Volume 11

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Maps Section – Replace Maps 500-1(1of 3 thru 3 of 3), 500-3, 500-4 (1of 4 thru 4 of 4), and 500-5

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Deer Creek Mine

C/015/0018

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Maps Section – Add Rilda Facility Plans Package by Jones & Demille Engineers and Suveyors

PacifiCorp

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Deer Creek Mine

C/015/0018

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R645-301-600 GEOLOGY SECTION

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R645-301-610 INTRODUCTION

This part of the application provides a detailed description of the geology of the coal resources, surrounding strata, and surface features within the North Rilda Area including the North Rilda Canyon Portal Facility area.

Since 1971, detailed data on the geology of the coal deposits within the permit and surrounding area have been collected, compiled, and analyzed by PacifiCorp and several government agencies. Information collected by PacifiCorp is the result of exploratory drilling, field investigations, geologic mapping, field sampling, aerial photography, and mapping of underground mine workings.

PacifiCorp has also used numerous geologic reference works by previous authors and agencies specifically written about the coal deposits of this area for the preparation of this section.

R645-301-611 General Requirements

The geology within PacifiCorp's mining areas is discussed in Sections R645-301-620 through R645-301-627.

R645-301-611.200 Proposed operations as given under R645-301-630

Proposed mining operations are discussed in section R645-301-500, including mine layout and sequencing.

R645-301-612 Certification

All maps, drawings and figures within R645-301-600 have been prepared by a licensed professional geologist.

R645-301-620 Environmental Descriptions

In 1997 PacifiCorp received approval to expand its mining operations in Rilda Canyon (Refer to Introduction Section Figures A: Blind Canyon Seam and Figure B: Hiawatha Seam). This expansion involved increasing the size of the Deer Creek adjacent area by 1,960 acres. An additional 50 acres was added in 1998 upon completion of a lease modification to Federal Lease U-06039 (modification Number 2). In 2001, PacifiCorp applied and received approval to modify Federal Lease U-06039 for third time for an additional 65.7 acres (Modification Number 3). Because of its northern location relative to the existing adjacent area and Rilda Canyon, the area of expansion is simply called the "North Rilda Area".

The Wasatch Plateau is one of several high plateaus in central Utah located along the western boundary of the Colorado Plateau geological province. The geology of this region is characterized by flat-lying sedimentary rocks, ranging in age from Paleozoic to Recent, with simple geologic structures such as gentle folds and mostly normal faulting. This thick "layer-cake" of sedimentary rocks has been deeply dissected by erosion. The North Rilda and Mill Fork areas consists of the surface and subsurface coal resources that underlie the north end of East Mountain, one of several high, narrow east-west ridges that make up the Wasatch Plateau. Elevations range from 7,500 feet in the lowest areas to over 9,600 feet at the ridge top, resulting in a broad diversity of climatic conditions and flora and fauna over the area. Annual rainfall in the region ranges from about 10 inches per year in the lower canyon bottoms to over 30 inches per year in high elevation areas. The dry climate of this area promotes erosion by inhibiting plant growth at lower elevations and on south-facing slopes.

A. REGIONAL GEOLOGY:

The Energy West Mining Company mines mining operations are located in the central portion of the Wasatch Plateau Coal Field in Emery County, Utah. Generally, this area is a series of high, flat-topped mesas flanked by heavily vegetated slopes which extend downward to precipitous cliffs. Below these cliffs, steep slopes gradually flatten out into a broad flat valley (Castle Valley) below. Topographic relief of up to 5,000 feet can be measured from the top of the plateau to Castle Valley below. Horizontal coal seams occur within the strata of the Wasatch Plateau, about halfway between the valley floor and the top. The following discussion summarizes the stratigraphy and structural geology of the region and within the North Rilda Area. The regional geology of the Colorado Plateau in which the Wasatch Plateau coal field is situated is fairly simple. Sedimentary rocks have been accumulating in this region since Permian time (refer to Figure GF-1, Figure Tab).

A broad, high, flat region that encompasses southeastern Utah, southwestern Colorado, northwestern New Mexico, and northern Arizona, the Colorado Plateau has been an area of relative stability while mountain-building episodes have occurred in surrounding regions. The thick accumulations of sedimentary rocks in this region are being deeply dissected by erosion, leaving the most recent coal reserves in the higher plateaus, where they are now being mined. The Energy West adjacent area covers portions of East Mountain and Trail Mountain, which are separated by Cottonwood Canyon, a deep, partially glaciated valley.

During late Cretaceous (Campanian) time, from 75 - 85 million years ago, the Wasatch Plateau region lay at the edge of the Western Interior Cretaceous Seaway, with the sea to the southeast and a range of mountains (the Sevier Orogeny) to the northwest. Streams from these mountains brought eroded sediments southeast to the sea. Stagnant areas between these stream and river channels contained swamps in which peat accumulated. These stream channel and coal swamp deposits are now called the Blackhawk formation, a member of the Mesaverde Group of Cretaceous formations. During Campanian time, the sea advanced and receded several times, leading to the formation of several stacked coal seams within the Blackhawk sediments. The coal seams present in the Energy West adjacent area are named from lowest (oldest) to highest (youngest) the Hiawatha, Cottonwood,

and Blind Canyon Seams. The Hiawatha and Blind Canyon seams are separated by 30 – 140 feet of interburden.

B. REGIONAL GEOLOGY SEDIMENTARY FORMATIONS:

Numerous sedimentary rock formations are exposed in the Wasatch Plateau both above and below the coal bearing Blackhawk formation. Mining and construction activities affect a number of these, and the composition, arrangement, and physical characteristics of these formations greatly affect the mining and hydrologic characteristics of the area.

The geologic formations exposed in the Energy West adjacent area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age (refer to Figures GF-1 and GF-2 [Figure Tab] and Volume 12 Mill Fork Lease Geologic Section Map MFU1823D). These formations, in ascending order from oldest to youngest, are the Masuk Shale member of the Mancos Shale, the Star Point Sandstone, the Blackhawk Formation, the Castlegate Sandstone, the Upper Price River Formation (all Cretaceous), and the North Horn Formation. The coal deposits are restricted to the lower portion of the Blackhawk Formation, about 2,500 feet below the top of the Plateau. Recent geologic deposits include numerous stream terrace gravels along streams and rivers, glacial till deposits in the upper reaches of Cottonwood Canyon, and alluvial and colluvial fills in all of the significant drainages.

The Masuk Shale is the upper-most marine member of the Mancos Shale and consists of light to medium gray marine mudstones. This formation weathers readily, forming gray slopes that are often covered by debris and little or no vegetative cover. The Masuk shale is several hundred feet in thickness, and is the lowest and oldest of the geologic units exposed in the adjacent area. This formation is generally devoid of groundwater.

Overlying and intertonguing with the Masuk Shale is the Star Point Sandstone; a beach-front sandstone. In the East Mountain area the Star Point Sandstone usually consists of three prominent massive cliff-forming beach-front sandstones totaling about 400 feet in thickness. These sandstone "tongues" are named from bottom to top: the Panther, the Storrs, and the Spring Canyon. In between the three tongues are beds of the Masuk Shale. The intertonguing of the Star Point and Masuk shale represents three transgression / regression episodes along the shoreline of the Cretaceous Interior seaway. The upper contact of the Star Point Sandstone is usually abrupt and readily identifiable on outcrops. Even though the Star Point Sandstone underlies almost the entire permit and adjacent area, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. The Star Point Sandstone occasionally exhibits aquifer characteristics in localized areas. These are isolated occurrences where regional faults have created secondary permeability and have been intersected by major canyons with perennial streams. An example of this type of occurrence is Little Bear spring located in Huntington Canyon.

The Blackhawk Formation consists of alternating mudstones, siltstones, sandstones, and coal. Although coal beds are generally found throughout the Blackhawk Formation, the thickest

economically mineable seams are restricted to the lower 150 feet of the formation. The sandstones contained within the Blackhawk Formation are mostly fluvial stream channel deposits and increase in number in the upper portions of the formation. Fluvial sandstone channels that are in contact with the top of the coal seams occasionally cut into the coal (due to the erosion of peat by stream erosion during deposition) and create thinned coal zones called "scours." Many of the tabular sandstones and sandstone channels contain perched water, mostly in fractures, joints, and bedding planes. The permeability of these sandstones is relatively low. Mudstones surrounding these channels usually function as aquicludes. The total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet. The Blackhawk Formation usually forms a broad, consistent slope between the Star Point Sandstone cliffs below and the Castlegate Sandstone cliffs above.

The Castlegate Sandstone is the lower member of the Price River Formation. The Castlegate Sandstone sits on top of the Blackhawk Formation and forms a prominent 300-foot cliff in highly eroded areas of the southern outcrops of the permit and adjacent areas (the southern end of the Cottonwood and Trail Mountain mines), steep blocky slopes in moderately eroded areas (Rilda Canyon), and occasional blocky outcrops in forested or heavily vegetated areas (Mill Fork Canyon). The Castlegate Sandstone consists of about 200 to 400 feet of coarse-grained, arkosic, light tan fluvial sandstones, pebble conglomerates, and minor layers of mudstone.

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 600 to 800 feet thick and forms slopes which extend upward from the Castlegate Sandstone escarpment. The Upper Price River Formation is comprised predominantly of fine to course-grained sandstone but commonly contains mudstone beds between the point bar deposits. Although some mudstones are present, fine-grained, poorly sorted (occasionally conglomeratic) sandstones dominate the Upper Price River Formation.

The North Horn Formation is about 500 to 1000 feet thick in the East Mountain area. The North Horn Formation spans the Cretaceous-Tertiary boundary (65 million years ago). Mudstones and claystones dominate the rock types present and are generally gray to light brown in color, although black, pink, purple and greenish colors have been seen. The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone. Localized, lenticular sandstone channels are present throughout the formation. The sandstone beds are more common near the upper and lower contacts of the formation. The North Horn formation, because of the soft rock types present, is prone to slumping. Widespread areas of slumping and hummocky terrain are present in North Horn outcrops.

The Flagstaff Limestone is the youngest (Paleocene) and highest formation exposed in the permit and adjacent areas and consists of dense, white to light gray lacustrine limestone with abundant fossil shells. Resistant to erosion, remnants of 100 to 150 feet of this formation remain, forming caps on the highest plateaus.

Between the time of sediment accumulation and erosion, the sedimentary rocks of the Wasatch plateau were intruded by widely scattered igneous dikes. The approximate age of these dikes ranges from 8 to 24 million years. Though more common in the northern parts of the Wasatch Plateau,

several dikes are known to exist within the Genwal Mine, just to the north of the northern adjacent area boundary. These dikes are only a few feet or inches wide, and are traceable for only a few hundred feet. The extent and continuity of these dikes at depth is unknown, and the effects on mining, if any, are unknown at this time.

Stream terrace gravels have been deposited along the major rivers and valley floors at various historic erosional levels, and lay unconformably on top of the Masuk shale. These terrace gravels are extensively used locally for construction gravels. Some are partially cemented together by caliche – type calcareous cement. None of these terrace gravels occur at or above the coal mining levels. None of these gravels contain groundwater.
Glacial-till deposits are present in the upper half of Cottonwood Canyon. The classic 'U"- shaped valley and presence of a terminal moraine show that this valley contained a small glacier during the last Pleistocene ice age (10,000 to 12,000 years ago). The depth of this till ranges from 80 to 150 feet thick at the valley floor. The groundwater characteristics of this till and the groundwater hydrology of Cottonwood Canyon are being closely monitored by Energy West Mining Company.

Most of the main drainages and side canyons in the permit and adjacent areas contain alluvial fill as a valley floor material. The depth of this fill material can be up to 100 feet in some of the major stream valleys. Seasonal streams, ground water, and various springs are present in these alluvial fills. The groundwater and surface water hydrology of these alluvial materials are closely studied and monitored by Energy West Mining Company.

C. STRUCTURAL FEATURES:

Several important structural features, the Straight Canyon Syncline, Flat Canyon Anticline and Huntington Anticline, the Roans Canyon Fault Graben, Mill Fork Fault Graben, Left Fork Fault Graben, Pleasant Valley Fault, and the Deer Creek Fault, have been identified adjacent to and within the Mill Fork adjacent mining area (refer to Volume 12 R645-301-600 Map MFU-1823D, Geologic Formations Map).

Folding:
Strata in the Mill Fork area are gently folded in two broad structural features. The Flat Canyon Anticline crosses the southeastern portion of the adjacent area. This anticline trends southwest to northeast, and plunges to the southwest. Dips in the anticline range from two to six degrees with the south limb dipping the steepest.

To the north, the north limb of the Flat Canyon Anticline becomes the south limb of the Crandall Canyon Syncline, a flat-bottomed syncline. This syncline also trends southwest to northeast. Dips on the northwest side are much steeper than on the southeast side.

Faulting:
The only known faulting near the North Rilda Area is the Mill Fork fault graben. The Mill Fork fault graben passes to the southeast of the adjacent area (refer to Volume 12 R645-301-600 Map MFU-1823D, Geologic Formations Map). This fault graben was crossed in ARCO's Huntington

Canyon #4 Mine in Mill Fork Canyon and has a displacement of about twenty five (25) feet on the each side. The trend of this fault zone is approximately N 40° E. Based on projections from maps of #4 Mine, this graben should pass by the through the northwest corner of the North Rilda Area, between the Mill Fork lease and the existing Deer Creek Mine. Where it crosses the northern end of East Mountain, the fault has been mapped to have a displacement of thirty (30) feet down on the northwest side. Deer Creek mine workings have intercepted a small fault of 7' displacement, down on the west side in the Mill Fork Access mains at XC-29, followed by a very small displacement (<1') fault, upthrown on the west side. This small fault "graben," though not inline with the projected fault zone, is surely related to it. This fault zone does not appear in any surface outcrops.

The Joes Valley Fault form the western boundary of the Mill Fork reserves. Displacement is over 1,500 feet, down thrown to the west, forming the Joes Valley graben.

D. GEOLOGY OF THE NORTH RILDA CANYON PORTAL FACILITIES:

Geology of the North Rilda Canyon Portal Facility consists of following formations in ascending order: Star Point Sandstone, Blackhawk, Castle Gate Sandstone and Upper Price River (refer to Figure GF-2, Figure Tab). As discussed in the Land Use Section, the Rilda Canyon Facilities are located near an area previously disturbed by coal mining activities (refer to R645-301-400 Map 400-1).

The disturbed area associated the North Rilda Canyon Portal Facilities is situated in the interface between the Quaternary Colluvium Deposits and the Cretaceous Star Point Sandstone and Blackhawk formations. Colluvium deposits of Rilda Canyon consist of slopewash materials of sandy gravel with varying amounts of silt and clay and sandstone boulders and blocks of varying thickness. Near the forks of Rilda Canyon, outcrops of the Star Point Sandstone Formation are restricted to the upper member referred to as the Spring Canyon Member. At the east end of the disturbed area in the location of the sediment pond, geotechnical trenching exposed the upper portion of the middle member, referred to as the Storrs Member. Members of the Star Point Sandstone are separated by intertonguing of the Mancos Shale. Blackhawk Formation exposures at the facility area consist of alternating layers of mudstones, siltstones, sandstone and coal. Two main coal seams are present; in ascending order they are, Hiawatha situated directly above the Upper Member of the Star Point Sandstone - Spring Canyon Member and Blind Canyon located approximately 80 feet above the Hiawatha. Both seams are burnt on the outcrop, with the distinctive redish brown appearance; refer to map 600-1 for a plan view and cross section through the area.

Underground access to the North Rilda Canyon Portal Facilities is achieved by the continuation of a set of three entry 1st Right Submains and development of two rock slopes to the portal facility area near the intersection of the right and left forks. All of the development occurs in the Hiawatha coal seam. During the development of the North Rilda Canyon Portal Facilities two separate surface breakouts were constructed; 1) Mine Fan, and 2) Intake Access (refer to R645-301-500 Engineering Section). Both portals were developed as rocks slopes developed through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point in the Hiawatha Coal Seam.

R645-301-622 Cross-sections, Maps, and Plans

Map 600-1 (Drawing DS1882D), Rilda Canyon General Geology Well P-7 Cross Section & Profile and HM-9 (Volume 9 Hydrology) shows the locations and elevations on the surface of all exploration drillholes and test wells within the North Rilda Area. Twenty-four (24) coal exploration holes have been drilled within the North Rilda Area to date (August, 04). All of the drill holes completed were drilled by Energy West from 1978 to 1997.

R645-301-621.200 Nature, Depth, and Thickness of the Coal Seams to Be Mined

Mining operations at PacifiCorp's mines have historically mined the two major seams present in the area, the Blind Canyon (upper) and the Hiawatha (lower) seams. A minor, unsuccessful attempt to mine the Cottonwood seam (middle) was made in the Wilberg mine, but the seam was too thin. Cottonwood seam mine workings are insignificant in the overall operation. The coal-bearing portion of the Blackhawk formation is the lower half of the formation, with the Hiawatha seam at or just above the interface between the Blackhawk formation and the Star Point Sandstone below.

Both the Hiawatha and Blind Canyon coals are ranked as High-Volatile Bituminous 'B' low sulfur coals.

Remaining coal reserves in the Deer Creek are in both the Hiawatha and Blind Canyon seams. Where as; Coal reserves in the North Rilda and Mill Fork areas are supported by the development of the Rilda Canyon Portal Facilities located in the Hiawatha seam. Longwall mining of the North Rilda Ridge was completed during August 2004. Longwall mining of the Mill Fork reserves will continue from 2005 to approximately 2015. The Hiawatha and Blind Canyon seams are close together, usually within 80 vertical feet. The depths of both seams, therefore, are similar in those areas where both seams are present. Overburden depths (Volume 12 Mill Fork Lease R645-301-600 Geologic Section Maps MFS 1824D & MFS 1825D) range from 0 feet, where both seams outcrop at the surface, up to about 2,600 feet under the Flagstaff Limestone "caps" on East and Trail mountains. The overburden strata consist of those formations already listed in section R645-301-621:

- Flagstaff Limestone
- North Horn Formation
- Upper Price River Formation
- Castlegate Sandstone
- Blackhawk Formation

Localized rider coal seams are fairly common above both seams, occurring from 1 foot to 20 feet or more above the Hiawatha and Blind Canyon seams. None of these rider seams have been named or mined.

In this region of the Wasatch Plateau, the Hiawatha seam is the lowest coal seam present. In much of the mining area currently permitted by PacifiCorp, the Hiawatha seam rests directly on the Star Point Sandstone, a massive, medium-grained, brownish-gray sandstone, which makes a very good mine floor. In some areas, there are between 0 and 15 feet of interbedded softer mudstones and siltstones between the Hiawatha and the Star Point Sandstone.

Thickness of the coal seams is variable, ranging from as little as 0 feet up to 19 feet in the Blind Canyon and from 0 feet up to 19 feet in the Hiawatha. Coal thickness is dependent on two main factors – the amount of peat originally deposited in the Cretaceous swamps, which varies from region to region, and the amount of scouring or erosion of the peat that took place after the peat was deposited but before lithification of the sedimentary sequence. More coal was deposited in the center of the swamp areas than around the edges, where distributary stream channels either prevented deposition, or scoured away the peat already deposited.

At some point in time during peat swamp development, the environment of deposition changed and each successive peat swamp was overrun by sediments, mainly mudstones and sandstones. Stream beds that passed directly over the previously deposited peats eroded sinuous channels of various depths into the peat and left behind sand-filled "scours". This action cuts varying amounts of top coal from the original thickness. The sudden losses of coal height that occur under these localized scours have impacts on coal mining operations that range from mild to disastrous.

Regional variations in coal thickness in the Blind Canyon and Hiawatha seams have been documented to varying degrees by mining activities and exploration drilling funded by government agencies and industry. Regional thickness trends of these seams are fairly well known, but the localized thickness variations caused by channeling are not as well known due to the localized nature of channeling.

R645-301-621.300 All Coal Crop Lines of the Coal to Be Mined

Coal outcrop and projected outcrop lines are shown on Map 600-1(Drawing DS1882D). Coal outcrop lines are inferred where the outcrops are concealed by alluvium or colluvium.

Strike and dip of the coal seams are shown on Map MFU 1827D and MFU 1828D (Volume 12 Mill Fork Lease R645-301-600 Geologic Section). The strike of the coal seams varies as the coal beds and surrounding strata are folded by the different structures (Flat Canyon Anticline and Crandall Canyon Syncline) mentioned in the section on structures above. The dip of the coal beds in this area is usually gentle, with dips rarely exceeding 4 or 5 degrees.

R645-301-621.400 Location and Depth of Gas and Oil Wells

No oil & gas exploration activities have occurred within the North Rilda Area. A single gas well (Merit Energy Federal 32-23) is located adjacent to the mine workings in Section 23, T16S, R6E, SLB&M. A cooperative agreement between Merit Energy and PacifiCorp ensured that mine workings were confined in such a way that the well and associated pipeline were not impacted by mining or subsidence.

R645-301-623 Environmental Geologic Information

R645-301-623.100 Acid- and Toxic-Forming Strata

Extensive sampling and testing of overburden strata, coal, and surrounding rocks has shown that there are almost no materials present that are potentially acid- or toxic- forming media. Almost all samples show slight alkalinity. Yearly sampling of in-mine roof, coal, and floor materials continue to confirm these results. Detailed analyses are presented in Volume 12 Mill Fork Lease R645-301-600 Geologic Section Appendix C.

In addition, Energy West Mining Company drilled two (2) holes within 2nd Right development entries at cross cuts #6 and #10 (refer to Volume 11 Appendix Volume - Geology: Appendix B and Figure GF-3, Figure Tab). As discussed previously, two rock slopes have been developed through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point with the coal in 1st Right Submains. Excavated material from the slope (sandstone) is stored within the mine. These holes were drilled through the interval of the projected slope to document acid- and toxic-forming potential of the Upper Member (Spring Canyon) of the Star Point Sandstone. Each hole was sampled on approximately ten (10) foot intervals (refer to Soil Analysis Report in Volume 11 Appendix Volume- Geology: Appendix B). None of the samples were considered acid- and toxic-forming according to the specifications listed DOGM's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining".

R645-301-623.200 Reclamation Potential

With the acquisition of the Mill Fork State Lease 48258, underground operations at the Deer Creek Mine are expanding to the northeast. To improve overall transportation and economic considerations additional surface facilities are required in Rilda Canyon. This includes all support facilities for underground mining operations except coal transportation.

Surface facilities in Rilda Canyon includes the existing mine fan in the Left Fork of the canyon, and surface related facilities associated with the North Rilda Canyon Portal Facilities include; fuel dock, rock dust silo, fan, sediment pond, covered and open storage area, etc. The North Rilda Canyon Portal facilities are located approximately 20 feet below the Hiawatha Seam. To access the seam from this location, two rock slopes have been

constructed through the Star Point Sandstone. Refer to Section R645-301-521 for a detailed description of all surface facilities constructed at the North Rilda Canyon access to the Mill Fork Lease. Also refer to Volume 12 of the Deer Creek MRP for detailed information of the mining plan, mining production, and mining methods that are utilized within the Mill Fork Lease.

Early mining operations occurred near the Rilda surface facilities (refer to Map 4-1). These operations include the Rominger (Ferrell) Mine, Jeppson Mine, Leroy (Comfort) Mine, and Helco Mine. Mining occurred in thesemine in the 1940's and early 1950's. Abandoned Mine Lands (AML) reclaimed these mines in 1988. The sediment pond is located directly below the reclaimed Leroy Mine.

R645-301-623.300 Subsidence Control Plan

Surface subsidence of all of the Energy West permit and adjacent areas has been carefully surveyed, monitored and documented for almost 20 years. Subsidence is monitored by yearly comparison of new versus baseline aerial photography using sophisticated photogrammetric measuring techniques, and is tied to known surveyed control points on the ground. Overflights by helicopter of all mined areas are conducted at least annually to inspect the ground surface. A Subsidence Monitoring Report is published annually, and submitted to various regulatory agencies.

For the purposes of this section and the operations in the North Rilda Area, a subsidence control plan has been developed. Refer to R645-301-525 (Engineering) for plan details.

R645-301-624 Geologic Information

Numerous sedimentary rock formations are exposed in the North Rilda and Mill Fork areas on East Mountain both above and below the coal bearing Blackhawk formation. The composition, arrangement, and physical characteristics of these formations greatly affect the mining and hydrologic characteristics of the area.

The geologic formations exposed in the North Rilda Area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age (refer to Figure GF-1 and GF-2, Figure Tab). These formations, in ascending order from oldest to youngest, are the Masuk Shale member of the Mancos Shale, the Star Point Sandstone, the Blackhawk Formation, the Castlegate Sandstone, the Upper Price River Formation, and the lower part of the North Horn Formation (all Cretaceous), the upper part of the North Horn Formation, and Flagstaff Limestone (Tertiary). Recent geologic deposits include numerous stream terrace gravels along streams and rivers, glacial till deposits in the upper reaches of Cottonwood Canyon, and alluvial and colluvial fills in all of the significant drainages and in Joes Valley.

Vertical relief across the exposures of these formations is about 3,000 feet within the adjacent area. Overburden thickness above the lowest coal seam to be mined (the Hiawatha seam) ranges from about 200 feet up to about 2,600 feet.

This sedimentary sequence has been structurally modified only slightly over time. Three gentle fold structures, the Straight Canyon syncline, Flat Canyon anticline and the Crandall Canyon syncline, occur within the PacifiCorp mining leases. Dips of the beds are generally very gentle, less than 5 degrees. For detailed structure related to the North Rilda Area refer to Volume 12 Mill Fork Lease R645-301-600 Maps Geologic Formations, Blind Canyon Structure Contour and Hiawatha Structure Contour.

Faulting is present within the PacifiCorp mining leases. Three graben structures are present within and adjacent to the North Rilda Area, Roans Canyon, Left Fork and the Joes Valley (refer Volume 12 Mill Fork Lease R645-301-600 Maps Geologic Formations for the location of these structures in relationship to the North Rilda Area). A fourth graben-like structure, called the Mill Fork Fault, crosses the Mill Fork Access mains. In addition, numerous normal faults occur to the south and east of the North Rilda Area. No other faulting is known to exist within the North Rilda Area.

The Joes Valley Fault form the western boundary of the Mill Fork reserves. Displacement is over 1,500 feet, down thrown to the west, forming the Joes Valley graben.

Jointing of the sedimentary formations of the area is a significant and important feature. Jointing of the rocks surrounding the coal seams affects mine orientation and planning, as well as the hydrologic characteristics of the rocks. Joints in the area trend predominantly north – south to N 10^{o} E (parallel to the Joes Valley Fault), with a few secondary sets at other orientations.

Surface and groundwater hydrology has been extensively studied within the permit area and adjacent areas. Surface water originates from melting snow, with a significant runoff season every year. Yearly precipitation has varied widely over the past 20 years, resulting in fluctuations of surface water flows and surface spring discharges.

Alluvial fills in the bottoms of Rilda and Mill Fork canyons have been shown to transport significant quantities of sub-surface water downstream. For a complete discussion of the surface hydrology of Rilda Canyon refer to R645-301-721: Existing Surface Water Resources.

Subsurface water, including water that is intercepted in mine workings, is usually encountered in ancient, perched aquifers. These perched aquifers are usually tabular or stream channel sandstones, which have moderate porosity, but low permeability. Water also is encountered perched in the open joint systems within these rocks. Subsurface water has also been encountered in some isolated incidents in fault zones and structural synclines, notably the Roans Canyon fault zone and Straight Canyon syncline, about mile south of the North Rilda Area.

Extensive research has shown that the surface and underground hydrologic systems are not hydraulically connected. No impact to surface hydrologic systems is anticipated within the permit and adjacent area. Some perched water will be encountered underground during mining activities within the adjacent area. The location and quantity of water encountered underground will depend on the types of rocks, joint patterns and geologic structures that are present.

R645-301-624.200 Overburden Removal

All mining related to the North Rilda and Mill Fork areas is from underground operations. Analyses of overburden materials are presented in Volume 12 R645-301-600 Appendix C and Volume 11 Appendix Volume - Geology: Appendix B.

As discussed earlier, Energy West Mining Company drilled two (2) holes within 2nd Right development entries at cross cuts #6 and #10 (refer to Volume 11 Appendix Volume - Geology: Appendix B and Figure GF-3, Figure Tab). Two rock slopes were developed through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point in 1st Right Submains. Excavated material from the slope (sandstone) was stored within the mine. These holes were drilled through the interval of the projected slope to document acid- and toxic-forming potential of the Upper Member (Spring Canyon) of the Star Point Sandstone. Each hole was sampled on approximately ten (10) foot intervals (refer to Soil Analysis Report in Volume 11 Appendix Volume - Geology: Appendix B). None of the samples were considered acid- and toxic-forming according to the specifications listed DOGM's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining".

Surface facilities in Rilda Canyon includes the existing mine fan in the Left Fork of the canyon, and surface related facilities associated with the North Rilda Canyon Portal Facilities including; fuel dock, rock dust silo, fan, sediment pond, covered and open storage area, etc. The North Rilda Canyon Portal surface facilities are located near the intersection of the Right and Left forks of Rilda Canyon. To access the seam from this location, two rock slopes were constructed through the Star Point Sandstone. Refer to Section R645-301-521 for a detailed description of all surface facilities constructed at the North Rilda Canyon access to the Mill Fork Lease and R645-301-200 Soils Section for a complete discussion related to the soil survey and analysis for all disturbances. Also refer to R645-301-500 Engineering Section for detailed information of the mining plan, mining production, and mining methods that is utilized within the North Rilda Area and Volume 12 of the Deer Creek MRP for the Mill Fork Lease.

R645-301-624.230 Chemical Analyses of the Coal Seam for Acid- and Toxic-Forming Materials

Chemical analyses for the Blind Canyon and Hiawatha coal seams within the ~~permit~~ adjacent area are available from drill cores from Energy West drill holes and run-of-mine coal sampling (refer to Volume 8 Geology and Volume 12 Mill Fork Lease R645-301-600 Appendix A).

R645-301-624.310 Drill Hole Logs

Volume 11 Appendix Volume - Geology: Appendix A contains a tabulation of all drill hole logs within the adjacent area. All drill hole logs are available for review at Energy West Mining's main office in Huntington, including the proprietary holes completed by PacifiCorp.

R645-301-624.320 Chemical Analyses for Acid- or Toxic- Forming Materials

Volume 12 Mill Fork Lease R645-301-600 Appendix C contains a table of analyses for acid- and toxic- forming or alkalinity-producing materials above and below the coal seams to be mined. Volume 11 Appendix Volume - Geology: Appendix B includes acid- and toxic-forming or alkalinity-producing materials related to the Upper Member of the Star Point Sandstone.

R645-301-624.330 Pyritic and Total Sulfur Chemical Analyses

Sulfur forms data for the Blind Canyon and Hiawatha coal seams within the East Mountain mining area are available from drill cores and run-of-mine coal samples. Total sulfur content averages approximately 0.5% and generally ranges from 0.48% to 0.59%. Of this sulfur content, 79% is in the form of organic sulfur and 16% is in the form of pyritic including marcasite; the remainder is in the form of sulfate (refer to Volume 8 Geology and Volume 12 Mill Fork Lease R645-301-624.230).

R645-301-627 Description of Overburden

Overburden above the lowest seam to be mined (the Hiawatha Seam) is shown Figure GF-1, GF-2 (Figure Tab), Map MFU 1829D, Geologic Cross-Sections (Volume 12 Mill Fork Lease) and Volume 8. The overburden above the coal seams to be mined includes the Blackhawk Formation, the Castlegate Sandstone, the Upper Price River Formation, the North Horn Formation and Flagstaff Limestone.

The Blackhawk Formation consists of interbedded fluvial mudstones, siltstones, sandstones and coals. The vertical makeup of this formation is highly variable. Generally, the Blackhawk is sandier toward the top, and shalier toward the bottom. The mineable coal seams are usually within the bottom 300 feet of the formation, along with numerous rider seams and carbonaceous

mudstones. This formation usually forms a long, steep slope (about 40 degrees) with frequent outcrops of large channel sandstones. The Blackhawk Formation ranges from 600 to 800 feet thick in the permit and adjacent areas.

The Castlegate Sandstone, which comprises the lower half of the Price River Formation, is a prominent cliff-forming sandstone, which forms cliffs or steep blocky outcrops that are visible nearly everywhere in the permit and adjacent areas. The Castlegate is a massive, coarse grained, occasionally conglomeratic or arkosic sandstone. The prominent North - South joint set is usually clearly visible in outcrops of the Castlegate. The Castlegate Sandstone averages about 300 feet thick in the permit and adjacent areas.

The Upper Price River Formation consists of interbedded coarse-grained sandstones that resemble those of the Castlegate Sandstone, but are softer, and interbedded with occasional mudstones. The Upper Price River Formation forms a steep slope above the Castlegate Sandstone cliffs. The thickness of the Upper Price River formation is difficult to determine, due to its gradational contact with the overlying North Horn Formation, but is probably about 600 feet thick in the permit and adjacent areas.

The contact between the Upper Price River Formation and the North Horn Formation is difficult to discern on East Mountain, but is generally picked as the change in slope from the steeper outcrops of the Upper Price River Formation below to the gentler and more rolling slopes of the North Horn Formation above.

The North Horn Formation is a softer formation which forms the rolling, slumping, hummocky terrain near the top of East Mountain. The North Horn consists mostly of interbedded shales and clays, with occasional sandstone and fresh water limestone beds. The North Horn Formation has a characteristic orange to reddish purple color. Outcrops of the North Horn formation are rare, and usually seen on very steep eroded slopes or in landslide areas. The North Horn Formation is about 800 - 1,000 feet thick in the permit and adjacent areas.

The Flagstaff Limestone forms isolated "caps" on the highest peaks of East Mountain to the west of the North Rilda Area. The Flagstaff Limestone is a fresh water lacustrine limestone which is about 100 to 200 feet thick. This limestone is hard and resistant.

In terms of potential subsidence, this combination of hard and soft formations has a beneficial effect. The Castlegate Sandstone is generally considered a barrier to subsidence. It is so thick and massive that in some places such as Trail Mountain, the Castlegate essentially prevents subsidence cracking from reaching the surface. Only minor surface cracks have been detected on Trail Mountain. The softer formations above the Castlegate have a tendency to move and settle without major cracking due to their softer nature.

Most of the surface cracking in the Deer Creek mine area has occurred in shallow cover areas of Blackhawk Formation exposures, or along the edges of groups of longwall panels.

Because the Castlegate Sandstone is a prominent cliff-former, subsidence damage to the formations overlying the mines is concentrated in the Castlegate. This damage takes place when undermining cause's vertical and overhanging cliff faces and balanced rocks to fail. Cliff failures of this type have been isolated to Newberry Canyon and Corncob Wash above the Cottonwood mine, and a section of cliff above the Trail Mountain Mine, and represent a fraction of the total amount of Castlegate Sandstone cliffs undermined. Rock falls above the Deer Creek Mine on the south side of Rilda Canyon have also been documented. Energy conducted an extensive study of the effects of subsidence on the Castlegate sandstone cliffs on the north side of Rilda Canyon. The results of this study will determine the effectiveness of the empirical model developed and used to predict the likelihood of cliff failure.

R645-301-630 OPERATION PLAN

The adjacent area contains areas of mineable coal in both the Blind Canyon and Hiawatha seams.

Mine Plan: Access to the North Rilda reserves was achieved with the use of 5-entry set of mains referred to as 4th North Mains. The 4th North Mains are developed northwest (approximately 4000 feet) from the 4th North / 10th West Mains intersection. Mainline development, designated as 5th North, then changed course to a northeast bearing, with development proceeding under the Right Fork area of Rilda Canyon. Selection of the Right Fork stream crossing area was based on the results of an extensive surface exploration program conducted in the Right Fork of Rilda Canyon (refer to Volume 9 Hydrology Maps HM-9, HM-10 and HM-12). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the bedrock interface. Based upon the results of the surface exploration program, mining below the Right Fork of Rilda Canyon was re-located approximately 800 feet to the west of the original projection. Re-location of the mains to the west increased the overburden from approximately 120 to 200 feet.

Based on the information gained from the surface exploration program, a detailed plan was developed to position the 4th North/5th North intersection to optimize the "no-subsidence" design of the 5th North / Rilda Canyon Right Fork crossing route and rock slope access into the lower Hiawatha Seam as well as maximizing overall reserve recovery within the area.

From the 4th North/5th North intersection, mainline development will proceed to the northern boundary of Federal Coal Lease U-024317. Longwall gateroad development sections were driven due east from the 5th North Mains to the extent of mineable reserves. Six longwall panels were completed in the Blind Canyon Seam, and six longwall panels were completed in the Hiawatha Seam.

Hiawatha Seam Access: Access to the to North Rilda Hiawatha seam reserves was achieved with development of rock slopes and vertical shafts from the Blind Canyon seam to the lower seam.

From the bottom of the slopes, a 5-entry set of mains referred to as 6th North Mains were developed to the northeast for access to gateroad development in the Hiawatha seam. Main line development was reduced to three entries above 6th Right.

Mill Fork State Lease ML-48258 Access: Based on data acquired through surface coal exploration programs, Energy West developed a mine plan to access the Mill Fork State Lease with a set of 5-entry mains driven on a northwest bearing from the 6th North Mains. Mining within the Mill Fork Access corridor will be restricted to mainline development. To ensure long term stability, pillars will not be removed (refer to Volume 11 Appendix Volume - Engineering: Appendix 1 Map DU1688).

North Rilda Canyon Portal Facility Access: Based on data acquired through in-mine directional drilling program, Energy West developed a mine plan to access the North Rilda Canyon Portal Facility area with the continuation of a set of three entry submains referred to as 1st Right submains. Two rock slopes; intake and return, were developed through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point in 1st Right Submains. The slopes were constructed at the elevation of the mine facilities pad and sloped upward ranging from 3% to 8% for approximately 740 feet to the Hiawatha coal seam. The dimensions of the portals are a 20' x 9' foot rectangular opening.

R645-301-631 Casing and Sealing of Boreholes

Each coal exploration permit application will include a description of the methods used to backfill, plug, case, cap, seal or otherwise manage exploration holes or boreholes to prevent acid or toxic drainage from entering water resources, minimize disturbance to the livestock, fish and wildlife, and machinery in the permit and adjacent area. Each exploration hole or borehole that is uncovered or exposed by coal mining and reclamation operations within the permit and adjacent areas will be permanently closed, unless approved for water monitoring or otherwise managed in a manner approved by the Division. Use of an exploration borehole as a water monitoring or water well must meet the provisions of R645-301-731. The requirements of R645-301-731.400 do not apply to boreholes drilled for the purposes of blasting.

Exploration boreholes are plugged after use by filling the hole with type II portland cement from total depth through the coal zones, then the remainder of the hole is filled with "abantonite," a bentonite gel specifically made to seal drillholes. If circulation cannot be maintained within the borehole, enough cement and abantonite to fill the borehole completely plus 10% is pumped to the bottom of the hole, then the remainder of the hole is filled with bentonite chips or pellets to within the top 5' of the hole, and a cement surface plug containing a permanent hole identification marker is placed in the top of the hole. This hole plugging method is approved by the BLM and DOGM, and is used on all present and future exploration boreholes. If an exploration borehole is to be converted to a water monitoring well, the water well regulations of the State of Utah are used to construct the well completion.

R645-301-632 Subsidence Monitoring

All mining within the permit and adjacent areas will be underneath the uninhabited North Rilda Area of East Mountain. No dwellings or building structures or roads will be undermined.

One power transmission line is present within the North Rilda area. This transmission line is owned and operated by Utah Power, a subsidiary of PacifiCorp. The transmission line (25 KV) was constructed parallel to the Emery County Road #306 and transmits electricity from the Huntington Canyon mainline to the Left Fork facilities.

The method used to detect and document subsidence on East Mountain divides the land surface into separate study areas based on the second-mining areas in the mine plan. These areas are then studied using photogrammetric comparisons of each successive year of mining progress. The photogrammetry is tied to known survey baseline points that are flagged each year.

R645-301-641 Sealing of Boreholes

All exploration boreholes are sealed upon completion using the following method. The borehole is filled with cement/abantonite from bottom to top through the drill pipe or other pipe lowered into the hole. As much cement/abantonite is used to fill the hole, or if the hole does not fill, enough cement/abantonite to fill the hole plus 10% is pumped through the pipe into the hole. If the hole does not fill to the surface, the remainder of the hole is filled with bentonite chips to within 5' of the surface. A cement surface plug is placed in the hole, and a brass marker with the hole number and year is placed on top of the cement, two feet below surface grade (refer to Volume 11 Appendix Volume Geology: Appendix A for exploration drillhole Table 1, Existing Exploration Drillhole Completion Details).

Regulatory oversight authority for the various phases of exploration drilling and data analysis is delegated as follows:

a.	Determine if mineable coal reserves are present	BLM
b.	NEPA analysis	BLM/Surface Management Agency (SMA), DOGM comment on reclamation
c.	Exploration license or drill permit	BLM with SMA concurrence approval
d.	Inspections	BLM, SMA, DOGM (shared resources)
e.	Enforcement	BLM, SMA, DOGM with SMA cooperation
f.	Appeals	BLM, SMA, and/or DOGM

Additionally, over 500 holes have been drilled from within the mines of the area; all provide information about the geology of the area. Finally, coal seams exposed by outcrops and within

the mine workings have been mapped in detail, providing data and knowledge of the geology in the area.

REFERENCES

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, *in* Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

PacifiCorp

Energy West Mining Company

Deer Creek Mine

C/015/0018

Amendment Update the Deer Creek Mining and Reclamation Plan, Volume 11, North Rilda Canyon Portal Facilities, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah. Task I.D. #3613

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Maps Section – Replace TOC Cover Sheet

Deer Creek Coal Mine
Rilda Canyon
Portal Facilities

Geology
Maps Section

Permit No. C/015/018
December 2004
Amended June 2010

Volume 11

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R645-301-710 INTRODUCTION

This application provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within the permit and surrounding adjacent area (refer to Introduction: Figure 1, 2, and 3 of this Volume).

Since 1989 detailed data on the hydrology of the land within the permit and surrounding adjacent area have been collected, compiled and analyzed by PacifiCorp and several governmental agencies. Information collected by PacifiCorp is the result of exploratory drilling, field investigations, geologic mapping, aerial photography, spring surveys, groundwater tests, monitoring of numerous wells and stream stations, climatological monitoring, and investigations by independent consultants. The data collection program is part of a complete Hydrologic Monitoring Program which has been approved by the State of Utah, Division of Oil, Gas and Mining (DOGM) and the Office of Surface Mining (OSM). All data collected have been and will continue to be submitted to OSM, DOGM, United States Forest Service (USFS), and the Bureau of Land Management (BLM) each year in the annual Hydrologic Monitoring reports.

PacifiCorp has a policy of close cooperation with many agencies and has invited, encouraged, and permitted numerous agencies to conduct investigations and experiments within the permit and adjacent areas. The resulting information produced by these investigations is quite extensive and has been utilized throughout this application.

R645-301-711 General Requirements

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

R645-301-712 Certification

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.

R645-301-713 Inspection

Impoundments associated with the current Deer Creek Mine facilities including the Rilda Canyon Portal Facilities will be inspected as described under R645-301-514.300 of the Utah Coal Rules.

R645-301-720 ENVIRONMENTAL DESCRIPTION

R645-301-721 General Requirements

The existing pre-mining hydrologic resource of the East Mountain property is subdivided into the following sections:

A. EXISTING GROUNDWATER RESOURCES

1. Permit Area and Adjacent Area Groundwater Hydrology
2. Permit and Adjacent Area Geology
3. Permit and Adjacent Area Groundwater Characteristics
4. Springs and Seeps
5. Groundwater Quality
6. Mine Dewatering
7. Groundwater Rights and Users
8. North Emery Water Users Special Service District (NEWUSSD) Rilda Canyon Springs

B. EXISTING SURFACE RESOURCES

1. Permit and Adjacent Area Surface Water Hydrology
2. Surface Water Quality
3. Soil Loss and Sediment Yield

A. EXISTING GROUNDWATER RESOURCES

1. PERMIT AND ADJACENT AREA GROUNDWATER HYDROLOGY

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 North Rilda Area, a discussion of pertinent regional geologic features is presented below.

2. PERMIT AND ADJACENT AREA GEOLOGY

The East Mountain property is located in the central portion of the Wasatch Plateau Coal Field in Emery County, Utah. Generally, this area is a flat-topped mesa surrounded by heavily vegetated slopes which extend to precipitous cliffs dropping steeply to the valley below. Relief of up to 2,500 feet is measured from the Castle Valley lowland to the plateau above. The following discussion

summarizes the structural geology and stratigraphy of the permit and adjacent areas located within the East Mountain property.

Strata in the East Mountain permit and adjacent areas are gently down-folded in the area of the Straight Canyon Syncline which is present in the central portion of the East Mountain (see Volume 8 - Geologic Section of the Deer Creek MRP). The bearing of the Straight Canyon Syncline is approximately N30^{O}E and the structure plunges to the southwest. Dips in the syncline range from two to six degrees with the north limb dipping the steepest.

In the area south of the Straight Canyon Syncline the coal seam dips gently in a northwest direction toward the syncline; however, to the northwest of the Straight Canyon Syncline both the Hiawatha and Blind Canyon seams dip in a southeast direction at three to five degrees.

The strata within the property have been offset by a series of north-south trending normal fault zones. Generally, the faults are nearly vertical and do not have significant amounts of fault gouge or drag associated with them. One of the major faults present in the region, the Pleasant Valley Fault, has been intersected in both the Deer Creek and Cottonwood/Wilberg mines.

The Pleasant Valley Fault consists of two parallel faults about 150 feet apart. The fault's total displacement (where it was intersected in the Deer Creek Mine) to the north is 150 feet with its down thrown side on the east. The displacement diminishes to less than one foot where it was intersected in the Wilberg Mine near the south end of the property.

Another north-south trending fault, the Deer Creek Fault, is present to the east of the Pleasant Valley Fault. It limits the eastward development of the Wilberg/Cottonwood and Deer Creek mines. The displacement of the Deer Creek Fault ranges from 100 to 170 feet with the east block being down thrown.

A northeast-southwest trending fault system, the Roans Canyon Graben, is present along the axis of the Straight Canyon Syncline. The system contains up to six normal faults having displacements ranging from a few feet to over 150 feet. Coal deposits present to the north of the fault have been accessed through rock tunnels driven from the 3rd North section of the Deer Creek Mine.

The rock formations exposed in the East Mountain area range from Upper Cretaceous to Tertiary in age (see Volume 8 - Geologic Section of the Deer Creek MRP). The formations, in ascending order, are the Masuk Shale member of the Mancos Shale, Star Point Sandstone, Blackhawk, Castlegate Sandstone, Upper Price River, North Horn, and Flagstaff Limestone. The coal deposits are restricted to the lower portion of the Blackhawk Formation.

The Masuk Shale is the upper member of the Mancos Shale and consists of light to medium gray marine mudstones. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and intertonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive cliff-forming sandstones totaling about 400 feet in thickness. Generally, the sandstones are fine to medium-grained and moderately well-sorted. The upper contact of the Star Point Sandstone is usually quite abrupt and readily identifiable on the outcrop. Even though the Star Point Sandstone formation exists throughout the entire East Mountain property, the low permeability and lack of recharge (i.e., very little outcrop exposure and limited vertical groundwater migration caused by the mudstone layers of the North Horn and Blackhawk formations) limit its usefulness as a water producing aquifer. Locally, the Star Point Sandstone exhibits aquifer characteristics. These are isolated occurrences where regional faults have created secondary permeability and have been intersected by major canyons with perennial streams. An example is Little Bear spring located in Huntington Canyon.

The Blackhawk Formation consists of alternating mudstones, siltstones, sandstones, and coal. Although coal is generally found throughout the Blackhawk Formation, the economic seams are restricted to the lower 150 feet of the formation. The sandstones contained within the Blackhawk Formation are fluvial and increase in number in the upper portions of the formation. Many of the tabular sandstone channels form local perched water tables. The total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The Castlegate Sandstone, the lower member of the Price River Formation, generally caps the escarpment which surrounds the eastern limit of the property. The Castlegate Sandstone consists of about 250 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The Upper Price River Formation, which overlies the Castlegate Sandstone member, is about 350 feet thick and forms slopes which extend upward from the Castlegate escarpment. Although some mudstones are present, fine-grained, poorly sorted sandstones dominate the Upper Price River Formation.

The North Horn Formation is the youngest formation exposed in the North Rilda Area and is about 200 to 250 feet thick. Mudstones dominate the rock types present and are generally gray to light brown in color. Localized, lenticular sandstone channels are present throughout the formation. The sandstone beds are more common near the upper and lower contacts of the formation.

The Flagstaff Limestone Formation overlies the North Horn Formation and consists of white to light gray lacustrine limestone. An erosional remnant of 100 to 150 feet of this formation remains, forming a cap on the highest plateaus to the west and south of the North Rilda Area.

3. PERMIT AND ADJACENT AREA GROUNDWATER CHARACTERISTICS

Waters entering the groundwater system are mostly from snow melt. The amount of water which enters the groundwater system is highly variable from one site to another. The low surface relief on the top of East Mountain to the south of the North Rilda Area encourages the infiltration of melting snow. Conversely, in the North Rilda Area where steep slopes are common, infiltration is limited. All of the geologic formations which are exposed in the area have relatively low permeability which further reduces the amount of water entering the groundwater system. Probably less than five percent of the annual precipitation recharges the groundwater supply (Price and Arnow, 1974; U. S. Geological Survey, 1979).

Geology controls the movement of groundwater. Because of the low permeability of the consolidated sedimentary rocks in the East Mountain area, groundwater movement is primarily "through fractures, through openings between beds, and, in the case of the Flagstaff Limestone, through solution openings" (Danielson et al., 1981, p. 25).

The majority of the groundwater which infiltrates the Flagstaff Limestone flows down vertical fractures which intersect sandstone channel systems in the North Horn Formation. The majority of the groundwater reaching this point intersects the surface in springs located in the North Horn Formation. Very little recharge intersects the upper Price River Formation and Castlegate Sandstones; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. Due to the topographic configuration of the North Rilda Area, recharge is limited and only two springs and two seeps were located during spring and seep surveys. Data have been collected from numerous coal exploration drill holes, from within the mine workings, from surface drainages, and from the springs in the area. The data have identified two separate isolated aquifer systems on the East Mountain property; the first is localized perched water zones in the North Horn Formation, and the second is a combination of localized perched water tables in the Blackhawk Formation and the Star Point Sandstone which exhibits some limited potential as a regional aquifer. Stratigraphy is the main controlling factor restricting groundwater movement and development of regional and perched aquifer systems within the East Mountain property. A complete description of the various formations and how they influence the groundwater systems is located in Volume 9 - Hydrologic Section: *Regional Groundwater Characteristics*. A secondary factor controlling existence and movement of groundwater in North Rilda Area is topographic configuration (incised canyons) of the area. To document the geologic and hydrologic

characteristics of the North Rilda Area, a total of twenty three surface exploration holes have been completed, including a series of holes in the Right Fork of Rilda Canyon in the area of the proposed mainline development crossing of the Right Fork. Due to the limited surface area for infiltration, topographic configuration of the area (incised canyons), and outcropping of the Star Point Sandstone Formation around the entire North Rilda Ridge, the Star Point appears to be unsaturated within the North Rilda Area. The following table documents the holes completed, total depth, amount of non-sandstone lithology directly below the Hiawatha seam, amount of Star Point Sandstone penetrated and the hydrologic data.

NORTH RILDA SURFACE EXPLORATION DATA

Drill Hole #	Total Depth (feet)	Total Depth (below base of Hiawatha Seam) (feet)	Non-Sandstone Lithology Below Hiawatha Seam (feet)	Star Point Sandstone Penetrated (feet)	Hydrologic Data
EM-47	300	114.9	4.9	119.8	Est. @ 5 GPM from the Colluvial/Alluvial deposits
EM-48	1860	160.0		160	No Measureable Quantities
EM-49	1680	102.4		102.4	No Measureable Quantities
EM-50	1680	81.6	6.6	88.2	No Measureable Quantities
EM-51	1660	83.4	1.4	84.8	No Measureable Quantities
EM-52	1560	68.1	2.1	70.2	No Measureable Quantities
EM-53	716	7.7		7.7	Dry
EM-55	1680	63.9	2.9	66.8	No Measureable Quantities
EM-56C	422	29.9	26.4	29.9	Est. @ 15 GPM from the Colluvial/Alluvial deposits
EM-105	1620	84.9	0.9	85.8	No Measureable Quantities
EM-107	767	8.5		8.5	Dry
EM-153	796	12.1	1.0	13.1	Dry
EM-154	795	15.6	1.1	16.7	Dry
EM-155	716	14.5		14.5	Dry
EM-156	755	13.1		13.1	Dry
EM-157	436	17.0	4.6	21.6	Dry
EM-158	226	13.8	9.2	23.0	Est. @ 5 GPM from the Colluvial/Alluvial deposits
EM-159	227				Est. @ 5 GPM from the Colluvial/Alluvial deposits
EM-160	257	5.7	1.1	4.6	Est. @ 5 GPM from the Colluvial/Alluvial deposits
EM-161	287	6.4		6.4	Est. @ 2 GPM from the Colluvial/Alluvial deposits
EM-162	307	7.6	0.6	7.0	Est. @ 2 GPM from the Colluvial/Alluvial deposits
EM-163	327	9.6	3.4	6.2	Est. @ 2 GPM from the Colluvial/Alluvial deposits
EM-164	366	17.1	1.2	15.9	Est. @ 2 GPM from the Colluvial/Alluvial deposits

Structural Hydrologic Features

Structural features, such as the Roans Canyon Fault Graben, the Straight Canyon Syncline, and the Deer Creek Fault, had an influence on the hydrologic regime south of the North Rilda Area within the East Mountain adjacent area (detailed in Volume 9 - Hydrologic Section). Geology of the North Rilda Area is less complex than that of the central portion of the East Mountain property (see Volume 8 - Geology Section). A fault system referred to as the Mill Fork Canyon Graben is projected to intersect the western portion of Federal Coal Lease U-06039 (refer to Volume 9 map HM-9). The Mill Fork Canyon Graben was intersected and crossed to the north of the North Rilda Area mine extension in the Beaver Creek No. 4 Mine and consisted of series of faults with a total displacement of approximately thirty (30) feet. Beaver Creek No. 4 Mine was a relatively dry mine with only few isolated roof drippers associated with the Mill Fork Fault system. PacifiCorp has conducted extensive exploration programs to delineate the Mill Fork Graben including a series of close spaced drill holes in the Right Fork of Rilda Canyon. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the alluvial/bedrock interface. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location of the 4/5th North intersection to maximize the overburden in the Right Fork stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. In reviewing the exploration data and in-mine information from the development of the 5th North Mains, it appears that the eastern fault of the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon (refer to Volume 9 map HM-9). Deer Creek mine workings have intercepted a small fault of 7' displacement, down on the west side in the Mill Fork Access mains at XC-29, followed by a very small displacement (<1') fault, upthrown on the west side. This small fault "graben," though not in line with the projected fault zone, is almost surely related to it. This fault zone does not appear in any surface outcrops. No groundwater was associated with either fault. If mining intersects faulting related to the Mill Fork Graben during development, permanent seals will be installed to control groundwater if present.

Alluvial Aquifers

Utah regulations require that the presence of alluvial valley floors in or adjacent to the mine project area be identified. The regulations define an alluvial valley

floor as "unconsolidated stream-laid deposits holding streams with water availability sufficient for sub-irrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits formed by unconcentrated runoff or slope wash together with talus, or other mass-movement accumulations, and wind blown deposits". The drainage systems of the North Rilda Areas are examples of colluvial deposits, consisting of alluvium in part and containing angular rock fragments, talus, cliff debris, and material from avalanches. Even though these deposits are defined as colluvial/alluvial, mining below the stream segments in the North Rilda Area will be restricted to first mining only (refer to Volume 9 maps HM-9, HM-10, and Engineering Section, R645-301-500, of this document for mine plan layouts and subsidence impacts). Alluvial deposits in and adjacent to the North Rilda permit area have been mapped and reported in Doelling's "Wasatch Plateau Coal Fields" (1972). The report indicated that alluvia in the area are found solely along Huntington Creek below the Rilda Canyon confluence in the Huntington drainage system. A complete description of the alluvial aquifers is outlined in Volume 9 - Hydrologic Section. Additional studies conducted by PacifiCorp documented the characteristics of colluvial/alluvial deposits in Rilda Canyon within the proposed disturbed area (refer to geotechnical study, Volume 11 Appendix Volume - Engineering: Appendix F.

4. SPRINGS AND SEEPS

The 1979 water reconnaissance program of East Mountain Springs was initiated with an aerial survey of East Mountain properties via helicopter. During the survey, the locations of 102 possible springs were plotted on aerial photographs. Subsequent field work confirmed the locations of forty-eight (48) springs producing measurable amounts of water. The remaining sightings proved to be minor seeps, dry or runoff from other springs. Between 1979, the time PacifiCorp began monitoring springs on East Mountain, and 1991, additional field reconnaissance projects increased the number of springs from less than fifty (50) to nearly eighty (80). Each spring site on East Mountain has been studied to determine the geologic circumstances that cause the springs to occur. The mode of occurrence for each spring has been tabulated on the "Springs Geologic Conditions Inventory" sheets located in the annual Hydrologic Monitoring reports (refer to Volume 9 - Hydrologic Support Information). The springs on East Mountain originate in several different ways (see Volume 9 - Hydrologic Section or Annual Hydrologic Monitoring Reports); however, many springs share the same mode of occurrence and, in some cases, are related.

The most frequent occurrences of springs are those located about 150 to 350 feet below the top of the North Horn Formation (see Volume 9 - Hydrologic Section: Figure HF-6). The drill hole data show a predominance of fluvial siltstone and sandstone at that stratigraphic interval. These sedimentary rocks represent many isolated fluvial systems which are water-bearing. The springs are formed where the fluvial channels intersect the land surface. Because the fluvial channels within this zone are generally not interconnected, the springs are not interrelated but share the same mode of occurrence.

Numerous springs located in the lower portion of the North Horn Formation occur when water flowing through fluvial sandstones, which are underlain by a thin zone of impervious mudstone at the base of the North Horn Formation, intersect the land surface. The surface drill hole data indicate that impervious mudstone units occur at the upper and lower portion of the North Horn Formation. Even though these individual mudstone layers are discontinuous, the occurrence of this type of strata exists throughout the East Mountain Property. As part of Volume 9 - Hydrologic Support Information, logs of representative holes from the East Mountain exploration programs are included to document the occurrence of this type of strata (additional drill hole data are located at PacifiCorp's Salt Lake or Huntington offices). The springs related to this mode of occurrence are not generally interrelated because they are fed by waters flowing through isolated fluvial channel sandstones and siltstones.

Several springs are located along the Roans Canyon Fault Graben. Generally, the springs are located within the North Horn Formation along the fault zone. Few springs are located in the area below the base of the North Horn Formation below where the impervious mudstone is located; supporting the fact that water percolating down a fracture or fault is stopped from further downward travel when it reaches the impervious clay zone which forms a seal along the fracture. Many of the largest springs on East Mountain are located along this fault system. Because the fault system is located along the trough of the Straight Canyon Syncline, water from both the north and the south flows toward the fault where it is allowed to migrate to the land surface. The springs located along this fault zone are generally interrelated.

A few springs are located within both the Flagstaff and Price River formations; however, their occurrence is insignificant in comparison to springs located in the North Horn Formation.Generally springs with discharges exceeding 50 gpm are associated with faulting where permeability has been increased by fracturing. The discharge of the springs varies directly with the amount of precipitation and also varies seasonally. Discharge is greatest during the snow melt period, normally from late April through the month of June. Following periods of groundwater recharge the discharge recedes fairly rapidly at first, then gradually, indicating a double porosity effect. At the end of the water year the remaining discharge is only twenty to thirty percent (20-30%) of the peak discharge.

Annual variations and historical comparisons are depicted in the annual Hydrologic Monitoring reports. During reconnaissance surveys of the North Rilda Area, only two springs were located within the extended mining area, spring 80-50 in Section 29 and the Rilda Canyon Springs located in Section 28. In addition to the springs, two minor seeps were located within the extended mining area, one along the trace of the Mill Fork Canyon fault, and the second seep is located at the formational contact between the Blackhawk/Star Point Sandstone (refer to Volume 9 - Hydrologic Section).

5. GROUNDWATER QUALITY

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reports a range in dissolved solids from 50 to 750 mg/l for samples from 140 springs in the region issuing from the Star Point Sandstone and overlying formations (Danielson et al., 1981). Danielson et al. (1981) identified the regional trends of decreasing water quality from north to south and west to east across the Wasatch Plateau. Waters percolating through the underlying Mancos Shale quickly deteriorate, with total dissolved solids concentrations frequently exceeding 3000 mg/l.

Additional studies by PacifiCorp have confirmed the primary findings of the USGS concerning regional trends in quality. Originally, decreasing quality from north to south was believed to depict the groundwater flow direction, and the quality decreased as a function of the time it traveled through the strata. The time travel component is probably an important factor. In 1985 a surface exploration program identified the existence of an area of residual heat from an ancient burn on the outcrop throughout the southern portion of East Mountain. The high temperature was also explored within the mine and a portion of reserves were lost because of the situation. It is now theorized that the high temperature water dissolved the mineral constituents of the formations, thereby altering the water chemistry. The quality also decreases vertically because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of Figure HF-7 (refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP) indicates that a relationship exists between elevation and the total dissolved solids concentration of the springs and the surface streams. A distinct relationship exists with respect to surface and water emanating from the springs. The data indicate that concentrations of dissolved materials increase with diminishing elevation for both surface streams and springs. The change in quality is a function of the differences in the chemical character of geologic formations which outcrop at different elevations (see Table HT-2 for East Mountain springs water quality, refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP).

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. These percentages have been graphically represented as cation-anion diagrams in the annual Hydrologic Monitoring reports. The purpose of the diagrams is to identify groups of related springs by water chemistry. The diagrams clearly show the similarity of water quality of springs originating in the same geologic formation. To better visualize this concept, the cation-anion diagrams are presented by the geologic formation in which they originate. A general pattern for the Flagstaff Limestone and Price River formations can be recognized for each year in which the cation/anions were analyzed. A consistent pattern for the North Horn Formation is less obvious due to the complex geology of the formation itself. One aspect the cation-anion diagrams demonstrate is that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist.

PacifiCorp began in-mine water quality monitoring in 1977 with the collection of numerous samples throughout the extent of the mine workings. The quality has remained relatively constant (refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP, Maps HM-2 and HM-3). As with the springs, quality varies from individual sites, but quality from the individual sites remains constant versus time (refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP Figure HF-8). The overall quality collected from each mine is shown in Volume 9 - Hydrologic Section of the Deer Creek Mine MRP Table HT-3.

The predominant dissolved chemical constituents of the groundwater from both surface springs and samples collected in the mine are calcium, bicarbonate, magnesium, and sulfate. Concentrations of magnesium are normally about one-half the concentration of calcium. Sulfate concentrations are typically higher in water from springs issuing from the Starpoint-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned early, water quality degrades from the north to the south and also vertically.

6. MINE DEWATERING

Water encountered within the Deer Creek mine has generally been confined to the perched aquifer systems and fractures and faults associated with the Blackhawk Formation. Water enters the mines through various avenues including roof drippers from overlying fluvial sandstone channels, bolt holes, tension cracks in the overlying strata, longwall caved areas, and where fractures or faults have been intersected by the mine workings. The lower Blackhawk/Star Point Sandstone Formation appears to be unsaturated within the North Rilda Area. This is due to the limited surface area for infiltration, topographic configuration of the area (incised canyons), and outcropping of the Blackhawk and Star Point Sandstone formations around the entire North Rilda

Ridge. Based on extensive surface exploration data, (refer to PERMIT ADJACENT AREA GROUNDWATER CHARACTERISTICS), intercepted groundwater in the North Rilda ridge will be limited primarily to perched aquifers in the lower Blackhawk Formation. Mountain Coal's No. 4 Mine located to the north of the North Rilda Area with a similar topographic location intercepted only minor quantities of groundwater and discharge from the mine was not required. Excess water intercepted in the mine will be pumped to storage areas or discharged from the mine under approved UPDES permits (refer to Volume 9 - Hydrologic Section: Appendix B for UPDES permit information). A complete description of the quality and quantity is reported in the Annual Hydrologic Monitoring reports and also in the PHC (Section 728).

7. GROUNDWATER RIGHTS AND USERS

Nine springs have been developed in Huntington Canyon or its tributaries to provide for domestic, industrial, and commercial water needs. Currently, Huntington City utilizes two springs in Huntington Canyon, Big Bear Canyon Springs and Little Bear Canyon Springs. The North Emery Water Users Special Service District (NEWUSSD) also utilizes springs in Huntington Canyon to provide for domestic and industrial water needs in areas outside of Huntington City. Along with springs in Huntington Canyon, NEWUSSD is currently utilizing water from three springs in Rilda Canyon (refer to map HM-1, HM-5 and HM-8 Volume 9 - Hydrologic Section of the Deer Creek MRP).

8. NORTH EMERY WATER USERS SPECIAL SERVICE DISTRICT (NEWUSSD)

Of concern to PacifiCorp-Fuel Resources is the proximity of mining activities in Rilda Canyon to the Rilda Canyon Springs which currently serve as a culinary water source to the North Emery Water Users Special Service District (NEWUSSD) serving some 410 connections. Due to the importance of these springs, a separate discussion is provided herein describing the nature of NEWUSSD's Rilda Canyon Springs and the sources of the waters issuing from them. The structural geologic setting is described, followed by an analysis of spring flow quality and quantity.

Although no significant north-south trending faults are known to exist in the area of the Rilda Canyon springs, other physical features in the area indicate that the major springs issuing from the Star Point Sandstone in the Huntington Canyon, and Little Bear Canyon are fault or fracture related (refer to Map HM-6 [Volume 9 - Hydrologic Section of the Deer Creek MRP] for spring locations). A noteworthy feature related to the occurrence of the principal Starpoint springs is the location of each spring with regard to a known fault or the location with regard to the linear orientation of significant north-south trending side drainage channels. As illustrated on Map HM-6, Little Bear Spring is directly in line with the western edge of the graben identified in Beaver Creek Coal Company's No. 4

Mine. The Rilda Canyon Springs lie directly in line with a north-south trending side canyon to the south as well as one to the north. From examination of topographic features of the area under a stereoscope, it appears that the linear relationship of side drainage channels (or lineament) can be traced through Mill Fork Canyon to the north, intersecting the northeast-southwest trending graben (encountered by Beaver Creek Coal) near the northern ridge of Mill Fork Canyon. Two separate geophysical techniques were employed in Rilda Canyon to assist interpreting the occurrence and movement of groundwater. First, Very Low Frequency Electromagnetic Analysis (VLFEM) and second, resistivity and induced polarization were utilized to verify the existence of fracture zones in line with the lineament traced from Rilda into Mill Fork Canyon.

The VLFEM study consisted of two transects in an east-west direction across the Rilda Canyon Spring area, one along the road that bypasses the springs to the north and one along the road bypassing the springs to the south. Data from the east-west transect are shown on Figure HF-9B (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). In both transects, a significant subsurface anomalous condition was encountered in the vicinity of the springs and directly in line with the north and south canyons. In addition to the east-west transect, three north-south transects were conducted in order to delineate possible fracture zones parallel to the stream. Data from the north-south transect are illustrated in figures HF-9D through 9E (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP) and location of the transect are shown on Figure HF-9F (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). Analysis of the north-south transect shows an anomalous area, which might indicate the existence of a fault or fracture in the westernmost transect as shown on Figure HF-9C (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). This anomalous area was also evident on the resistivity-IP survey which will be discussed below. The two transects which were conducted lower in the canyon do not show strong evidence of any anomalous areas [see figures HF-9D and 9E (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP)].

VLFEM surveys conducted in Rilda Canyon were performed by Hansen Allen & Luce (HA&L) of Salt Lake City, Utah. Survey procedures utilized by HA&L consisted of selecting a transmitter station which provides a field approximately parallel to the traverse direction (i.e., approximately perpendicular to the expected strike of a conductor). VLFEM transmitter stations are located at several points around the globe. They broadcast at frequencies close to 20,000 Hz, which is low compared to the normal broadcast band. Data were collected utilizing a hand held instrument manufactured by Corne Geophysical Limited on fifty-foot intervals along the transect with two readings collected at each location: 1) field strength, and 2) dip angle (in degrees from a horizontal plane). It should be stressed that data collected during VLFEM surveys are very sensitive to sharp changes in topography and natural and manmade metallic material such as fences, pipelines, etc. In Rilda Canyon very little manmade

materials exist except for wire fence which surrounds the NEWUSSD spring collection area shown on Figure HF-9B (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). Pipelines used to collect and transport the spring water in Rilda Canyon are constructed of PVC and are considered to have little or no adverse impact on the data that was collected. It should also be stressed that the VLFEM data should only be considered one facet of the hydrologic investigation conducted in Rilda Canyon and not the sole source of hydrologic interpretation.

PacifiCorp contracted Geowestern to conduct a resistivity and induced polarization (I.P.) survey in Rilda and Mill Fork canyons in the summers of 1989 and 1992 (refer to Volume 9 - Hydrologic Support Information). The intent of the survey was to identify fractures in the strata and the depth of alluvium in Rilda Canyon by contrasting areas of Resistivity and I.P. response. As with the VLFEM data, resistivity-I.P. assisted in the hydrologic interpretation and was utilized to plan the location and depth of wells constructed for hydrologic drawdown conducted in November 1990.

Resistivity-I.P. surveys have been utilized for many years to map out subsurface occurrences of groundwater or mineralization. Because groundwater within the Wasatch Plateau tends to be concentrated along fractures, Resistivity-I.P. surveys can effectively identify fractures, faults included. Where strata are present at depths having highly contrasting resistivity or I.P. response, displacement along a fault can be detected by the offset of the depth to the contrasting beds. Where faults are present within a survey area but the strata is fairly uniform in resistivity and I.P. response, no displacement will be recognized in the data collected but the fault plane itself will most likely be easily detected. The latter scenario is normally the case within the adjacent area; therefore, the surveys will identify water-filled fractures and faults but will not always differentiate between the two. Most of the anomalies identified will be fractures, and differentiating between faults and fractures requires additional geologic data provided by field mapping or published data.

The resistivity-I.P. survey was conducted on nine separate lines, eight in Rilda Canyon and one in Mill Fork Canyon (see Map HM-7 [refer to Volume 9 - Hydrologic Section of the Deer Creek MRP]). Three of the lines (longitudinal) were along roads in the canyon bottoms in both Rilda and Mill Fork canyons. Six lines were transverse, across Rilda Canyon, and were designed to identify the depth of alluvial fill in the canyon bottom.

The resistivity survey used the pole-dipole configuration with station intervals of fifty (50) feet on longitudinal lines and twenty (20) feet on transverse lines. Resistivity and I.P. values were measured at separate intervals of 100, 200, 300, and 400 feet on each of the longitudinal lines and 20, 40, 60, and 80 feet on the transverse lines. These separations in data collection allowed the recovery of data that revealed conditions up to 400 feet in depth on both the longitudinal and

transverse lines. The I.P. survey used the time-domain method and reflects areas where the ground has a greater electrical capacitance, a condition normally caused by disseminated sulfides which, on our property, would most likely be minor amounts of pyrite along fractures.

Rapid changes in the resistivity or I.P. response of the surveys are almost always associated with fractures in a geologic setting and can follow a distinct trend at depth which allows the determination of the angle of dip of the fracture. The Resistivity-I.P. survey identified several anomalies indicating fractures and/or faults. The fractures which cause the anomalies dip steeply in a westerly direction or are vertical. The degree of dip associated with each fracture is shown on Map HM-7 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). Each of the anomalous areas representing fractures was examined in the field and on aerial photographs to determine the significance of the anomalies. The geophysical data was then compared with geologic data collected in the field and from publicly available reports, making it possible to locate a fault graben (Mill Canyon Graben) system trending in a northeast direction which cuts across the western portion of our northern reserves (see Map HM-7 [refer to Volume 9 - Hydrologic Section of the Deer Creek MRP]). The southernmost fault of the graben was intersected in Beaver Creek Coal Company's #4 Mine in Mill Fork Canyon and has a displacement of about twenty (20) feet down on the northwest side. Where it crosses the northern end of East Mountain, the fault has been mapped to have a displacement of thirty (30) feet down on the northwest side. All other faults in the graben system have a relative displacement which is up on the northwest side.

Several anomalies to the southeast of the Mill Fork Canyon Graben were identified by the Resistivity-I.P. survey. No displacement is identified on any of them. The anomalies are on the same geologic trend as areas mined in the Beaver Creek Coal Company #4 Mine where no faults exist; therefore, in all probability they are water saturated fractures having no vertical displacement.

The transverse lines (R-3 through R-5, and R-7 through R-9) were designed to provide data regarding the depth of the alluvium in the canyon bottom. The alluvial/bedrock contact is identifiable on the profiles and provides important information on the hydrology of the springs located in the canyon. The alluvial floor is up to seventy (70) feet thick as indicated by resistivity profiles R-3 through R-5 and drill hole information obtained from P-6 and P-7 (see Figure HF-10 [refer to Volume 9 - Hydrologic Section of the Deer Creek MRP]). Again, it should be stressed that the resistivity data should only be considered one facet of the hydrologic investigation conducted in Rilda Canyon and not the sole source of hydrologic interpretation.

Description of NEWUSSD Spring Collection System

The NEWUSSD spring system consists of a series of collection lines extending westward up Rilda Canyon and southward up a small side drainage as shown on Map HM-8 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). The NEWUSSD spring system is metered at four locations. Meter 1 (Side Canyon Spring) is located at the downstream end of a collection line which enters Rilda Canyon from the South. Meter 2 (Side Canyon Spring plus South Spring) is located near the bottom of the main east-west trending collection line which lies to the south of Rilda Canyon Creek at a point just upstream (west) of the main spring collection box. Meter 2 records combined flows from both the Side Canyon (Meter 1) as well as additional inflows which enter the system below Meter 1 known as South Spring. Meter 3 (North Spring) records flows for the east-west central collection line which was constructed through the central portions of the valley near Rilda Canyon Creek. Meter 4 (North Spring) collects data from the north collection line located on the north side of Rilda Canyon Creek. Meter 3 and Meter 4 were combined in 1995 during the Rilda Canyon road improvement project.

In addition to the main spring collection lines, there are two flumes in the vicinity which monitor flow rates within Rilda Canyon Creek. The upper flume, RCF-2, is located adjacent to the extreme west end of the spring collection system monitored by Meter 4. Flume RCF-3 is located in Rilda Canyon Creek adjacent to spring collection Meter 2.

Initially five shallow wells were located in the area surrounding the spring collection system to monitor groundwater level fluctuations through time. The locations of the wells are shown on Volume 9 Map HM-9. Wells 1 through 5 are relatively shallow wells which were constructed prior to 1989. In 1990 two additional large diameter wells were developed, (Wells 6 and 7) adjacent to wells P-2 and P-3, respectively, in order to obtain more complete groundwater data through aquifer testing. Wells P-2 and P-3 were abandoned and sealed in 1995.

Quantity

Through the cooperative efforts of PacifiCorp and NEWUSSD, flow meters were installed in September 1990 to isolate individual spring areas for quantity and quality [refer to Map HM-8 (Volume 9 - Hydrologic Section of the Deer Creek MRP)]. Flow from Rilda Canyon Springs is directly related to the spring runoff (i.e. precipitation received from the previous winter). Spring output ranges from approximately 300 GPM during high runoff to approximately 75 GPM during the winter months. Based on measurements collected prior to the time when Meters 3 and Meter 4 were combined, the majority of the flow was from Meters 3 and 4, approximately 46% and 49%, respectively (refer to Annual Hydrologic Reports for detailed flow information). The seasonal variation of the monthly average flow from all NEWUSSD's Rilda Canyon Springs is shown in the Annual Hydrologic Monitoring Reports. With the installation of the flow meters, individual spring contribution to the total flow can be plotted over time.

PacifiCorp contracted Hansen, Allen & Luce (HA&L) in 1990 to conduct a hydrologic test in Rilda Canyon. The overall purpose of the hydrologic testing was to determine to the degree possible: 1) general hydrologic conditions associated with the NEWUSSD springs, including the general direction of groundwater movement; 2) the potential origin of waters feeding the NEWUSSD springs; and 3) a determination of general aquifer characteristics, including transmissivity. Earlier reports (April 1983 and March 1984) prepared by Vaughn Hansen Associates identified the source of water from the North Spring to originate from two general sources. The earlier report concluded that the source of water originated from a north-south trending subsurface anomaly which may be a strike slip fault located immediately downstream of the main North Spring area. The latter, using additional data collected, concluded that there also appears to be an east-west trending anomaly which intersects the north-south anomaly just north of the North Spring. Water collected in the east-west anomaly from surface and/or fault sources located higher in the canyon may issue forth at the North Spring as the water comes in contact with the north-south trending anomaly. It was believed at the onset of the project that the source of water (whether from the north-south trending anomaly or from sources farther up the canyon) could be determined by pumping strategically placed wells near the sources of water.

Upon initiation of the project PacifiCorp and HA&L met to determine the most efficient method of proceeding with the proposed pumping tests. It was mentioned that because of the proximity of Well P-6 to the main spring collection area, pumping Well P-7 might produce clearer test results. Pumping P-6 would have an impact upon the main spring collection system; however, any attempts to determine the source of spring water could be masked by the influence of the drawdown cone. That is, by pumping P-6 both sources of recharge to the North Spring would be drawn upon, thereby making the attempt at isolation more difficult.

Soon after initiation of the project it was decided that the most complete data could be obtained by pump testing P-7 because of its location up gradient of the main spring collection area. If P-7 could be pumped sufficiently, the potential source of recharge water feeding the North Spring from the alluvial canyon fill west of the spring could be reduced without affecting water recharging the springs from the north-south trending anomaly or fault system. The level of impact due to pumping P-7 would then be an indicator of the general source of water issuing from the NEWUSSD springs.

The purpose of the pump test performed on P-7 was to pump the well to its maximum potential for a period of time sufficient to note and record impacts upon the NEWUSSD springs or other wells located in the vicinity. The amount of pumping and the level of impact on the local systems was used subsequent to the test to help document the source of water discharging into the NEWUSSD spring collection system. A pump test was run on P-7 continuously from 4:00 p.m. on November 13 through 12:30 p.m. on November 20, 1990. Throughout this period records were kept related to pumping conditions and flow rate discharging P-7, water levels in wells P-1 through P-7, and spring flows recorded at NEWUSSD spring collection meters 1 through 4. Well P-3 was dry throughout the test.

Aquifer Characteristics

The local groundwater system in the vicinity of the NEWUSSD springs consists of an unconfined alluvial valley fill aquifer as well as bedrock and fracture systems. Resistivity data provided by PacifiCorp indicate that the total maximum depth of alluvium ranges from 50 to 73 feet at the three locations where cross sections were taken. The locations of the resistivity cross sections within Rilda Canyon are shown on Map HM-7 (refer to Volume 9 - Hydrologic Section). The width of the unconfined aquifer varies due to the influence of side drainages which also feed the area.

Water moving throughout Rilda Canyon appears to originate from at least three sources (Vaughn Hansen Associates, 1983, Hydrologic Support Information: Rilda Canyon Pump Test and personnel communication with governmental agencies). The first and most obvious source is through the alluvial valley fill, the second is through an east-west trending fracture which is believed to lie to the north of the canyon floor, and the third is potentially through a north-south trending fracture which bisects the canyon just west of the NEWUSSD spring collection system. Extensive exploration conducted in Rilda and Mill Fork canyons parallel to the trend of the fracture systems outlined in earlier reports have failed to identify structural features which could contribute to the groundwater system. More is mentioned about water quality from these sources later in this document.

Springs within Rilda Canyon are believed to indicate and verify the locations of changes in geologic structure. Examples of local geologic structures and their impact on hydrology have been verified historically through stream and spring flow observations. The canyon drainage west (or above) the interface with the upper contact of the Star Point Sandstone is generally a discharging stream section. When alluvial waters come in contact with the more impermeable members of the upper Star Point Sandstone/Mancos Shale interface, they are often forced to the surface, creating springs. Local NEWUSSD springs confirm a recharging stream section. When these more impermeable formations are crossed, the stream once more becomes a losing stream until subsurface waters again come in contact with the more impermeable members of the Star Point Sandstone and underlying Mancos Shale formations. Some sections of the stream within Rilda Canyon gain flow, thereby evidencing the locations where subsurface water is forced to the surface by the tighter formations.

Data collected during and following the pump test of P-7 were used to provide estimates of local valley fill aquifer characteristics. For these analyses, data from both pumped Well P-7 and from observation Well P-6 were used during both the drawdown and recovery portions of the test. Well P-6 was used as an observation well over other local wells because 1) it is the closest to the pumped well, 2) it is up gradient from the north-south trending anomaly associated with the spring, 3) it showed the most response to pumping, and 4) the data were more consistent than other data collected.

In order to analyze the data in an acceptable fashion, the data sets were broken into three separate portions. The first data set has been termed the "initial" data set and includes time and drawdown data from P-7 for the beginning period of the test where the flow rate was recorded

to be equal to 8.22 gpm. The "intermediate" data set includes data subsequent to that time when the flow rate was increased to an average value over time of 16.4 gpm. The third data set includes data taken during the "recovery" portion of the test after the pump in P-7 was shut off.

Three basic analytical methods--the Cooper-Jacob, Theis, and Neuman methods--were used to estimate aquifer transmissivity for the data contained herein. Each method, along with applicable data, is discussed separately in the following sections.

Cooper-Jacob Drawdown and Recovery Analyses

*Drawdown Methods*The Cooper-Jacob straight line method of analysis utilizes a semi-log plot for the display and analysis of the data as shown on Figure HF-12 (refer to Volume 9 - Hydrologic Section). The data shown on the plot entitled "PacifiCorp P-7 Initial Data Q=8.22 gpm" have three general slopes. The first few data points are usually ignored in a pump test because they reflect initial drawdown anomalies generally due to evacuation of the well drill stem or casing. The next set of data, beginning at two minutes and running through 100 minutes, show a good aquifer response and an associated transmissivity of approximately 35,650 gpd/ft. The plot, however, shows that a change in the slope of the data occurred at about 100 minutes. Such a change in grade generally indicates the presence of a boundary condition which, in the case of Rilda Canyon, reflects the bedrock of the canyon walls. Generally under such conditions the slope of the curve after the time in which the boundary was encountered will double (refer to Figure HF-13, Volume 9 - Hydrologic Section). The slope of the straight line for the latter part of the data shows a transmissivity on the order of 21,100 gpd/ft, a forty percent decrease. Based upon this data it is believed that the initial transmissivity of the alluvial valley is on the order of 35,000 gpd/ft for the initial period of pumping, during which time the aquifer is unaffected by distant barriers. After a barrier influences groundwater hydrology, the transmissivity reduces to the estimated 21,100 gpd/ft.

Intermediate data provide similar results. The barrier effects discussed occurred within the first 100 minutes of pumping, before data was collected for this data set; therefore, the majority of the impacts due to the barrier already will have been accounted for although some effects should occur due to an increased pumping rate. With this in mind, the straight line Cooper-Jacob analysis produces a transmissivity of 17,550 gpd/ft, as shown in Figure HF-14 (refer to Volume 9 - Hydrologic Section). Although slightly less, this value is similar in nature and magnitude to that found for the last half of the initial data set.

An analysis of the intermediate data was also made by using data collected from P-6 located approximately 500 feet to the east of P-7. The analysis shown in Figure HM-15 (refer to Volume 9 - Hydrologic Section) indicates that the long-term transmissivity for this data set is in the rage of 23,800 gpd/ft. Again, this is in the general range of estimates already made above.

Recovery Methods - Straight line methods of analysis are also used for well recovery data taken after the pump is shut off. In the case of P-7 the recovery curves are shown as Figures HM-16 and HM-17 (refer to Volume 9 - Hydrologic Section). Immediately after pumping ceases in a

well, water levels recover at an abnormally high rate in a similar fashion to what occurred during the first two minutes of the pumping test as shown in Figure HM-12 (refer to Volume 9 - Hydrologic Section). By taking the next set of data, a straight line can be fit to obtain an approximation of long-term transmissivity on the order of 13,700 gpd/ft, as shown in Figure HF-16 (refer to Volume 9 - Hydrologic Section). Although this estimate is a little low compared to the estimate given above, it is of the same order of magnitude.

Short-term transmissivity is checked for the recovery data by fitting a straight line through the low end of the data. The transmissivity under short-term pumping is estimated at 35,900 gpd/ft, which matches very well the 35,650 gpd/ft estimate made by utilizing the Cooper-Jacob straight line drawdown analysis discussed above.

Theis Drawdown Analysis

The Theis method of solution utilizes a log-log plot of drawdown versus time as shown on Figure HM-18 (refer to Volume 9 - Hydrologic Section). The solution is achieved by matching a well function curve to the data as shown. It should be noted that the data utilizing this method of solution does not readily show the boundary condition which was identified by the Cooper-Jacob solution method. There is a slight curvature of the data at about the 100-minute time mark as shown on the plot; however, without other methods it is unlikely that a boundary condition would have been identified for this data set. Since the solution does not identify a boundary condition, the solution reached is a mix of both short- and long-term transmissivities. An analysis using this approximation method (resulting in an average transmissivity) results in an estimate of 28,450 gpd/ft.

A check of the estimate can be made by averaging transmissivities for both the initial short-term and intermediate long-term data sets obtained using the Cooper-Jacob method. The average of 35,650 and 21,100 gpd/ft is 28,380 gpd/ft, which is within one-half of a percent of the estimate given above using the Theis method.

An analysis of the intermediate data shown on Figure HM-19 (refer to Volume 9 - Hydrologic Section) shows that the estimated long-term transmissivity using the Theis method is on the order of 17,900 gpd/ft, which can be compared to the 17,550 gpd/ft estimate made using the Cooper-Jacob method. The estimates indicated are within two percent of each other, again showing good correlation.

Neuman Drawdown Analysis

The third method of analysis is based upon unconfined aquifer solutions as determined by Neuman. His analysis utilizes two basic curve types. The "Type A" curve is characteristic of that shown on Figures HM-20 and HM-21 (refer to Volume 9 - Hydrologic Section) where the curve is a power curve asymptotic to the horizontal line. "Type B" curves bend in the opposite direction, i.e., they start relatively flat and turn upward as one moves to the right on the plot. Slight trends toward both the "Type A" and "Type B" curves can be seen on Figure HM-20 (refer to Volume 9 - Hydrologic Section). A "Type A" curve could be fit to the data between

times 1 and 30, and a "Type B" curve could be fit to the data between times 30 and 1000; however, because the data is influenced by the presence of a boundary condition (as discussed above) and because the Neuman solution does not identify boundary conditions in its methodology, such an analysis would provide inaccurate results. As a compromise, an average solution is attempted by analyzing the data based upon the complete data set wherein an estimate of 13,150 gpd/ft is obtained. Although lower than some of the earlier estimates made, this estimate again has the same relative order of magnitude.

The intermediate data set was also analyzed using the Neuman approach as shown in Figure HM-21 (refer to Volume 9 - Hydrologic Section). From the data it is seen that this solution predicts a low value of transmissivity. It is believed that the other predictions of transmissivity given above are more accurate and reliable than this estimate because of the reasons discussed in the previous paragraph.

Aquifer transmissivities as determined by the methods listed above range from a low of 6,100 gpd/ft to a high of 35,900 gpd/ft. As a summary of values determined, the following table is provided. The table contains a column identified as "Credibility of Results" which is intended to be a guide to the numbers given. A high credibility rating indicates that the method basically accounts for conditions believed to exist within Rilda Canyon. A medium credibility indicates that the numbers are within the range expected but that the solution may not be as accurate as another method. A low credibility indicates that, for these conditions, the solution does not appear to fully account for identified field conditions. As outlined in the table, it is believed that long-term transmissivities are on the order of 20,000 gpd/ft and short-term transmissivities are on the order of 35,000 gpd/ft. The variation in results appears to be due to boundary effects created by the canyon walls. If used for further analyses, the short-term transmissivity estimates should govern.

SUMMARY OF CALCULATED TRANSMISSIVITIES

Analysis Used	Data Type	Well Data Used	Estimated Transmissivity (gpd/ft)		Credibility of Results		
			Short-Term	Long-Term	High	Medium	Low
Cooper-Jacob	Drawdown	P-7	35,650	17,550-21,000	✖		
Cooper-Jacob	Drawdown	P-6		23,600	✖		
Cooper-Jacob	Recovery	P-7	35,900	13,700	✖	✖	
Theis	Drawdown	P-7	28,450	17,900	✖	✖	
Neuman	Drawdown	P-7	13,150	6,100			✖

Quality

Initial water quality investigations (sampling consisted of wells P-1 through P-5 and three spring collection areas) conducted by West Appa Coal Company in the fall of 1982 indicated two distinct classes of groundwater (primarily defined by sulfate concentrations). Illustrated on Figures HF-22, 23, and 24, (refer to Volume 9 - Hydrologic Section), are the percent reacting values for major cations and anions for the five piezometers and three spring collection areas as determined from samples collected on September 16, October 15, and December 6, 1982, respectively. As illustrated on the figures, there are two distinct groupings of data from the various sources with regard to sulfate concentrations and total dissolved solids (TDS) concentrations. In general, the Side Canyon Spring, the South Spring collection zone, and well P-4 contain groundwater higher in TDS and sulfate concentrations than do the North Spring collection zone, wells P-2 and P-5.

Differences in the above-referenced groupings of data reflect differences in the groundwater source or the origin of groundwater for the various springs issuing within the Rilda Springs area. The Side Canyon Spring is located at or near the base of the Blackhawk Formation. The higher sulfate concentrations and TDS concentrations from the spring are characteristic of waters associated with the Blackhawk Formation. The similarity in water quality between the Side Canyon Spring and the South Spring collection area, Meter 2, would indicate that South Spring waters are also primarily of Blackhawk origin. The slightly better quality of South Spring water over the Side Canyon Spring water indicates that some of the South Spring water is derived from waters moving within the alluvial deposits.

As illustrated by TDS concentrations on Figures HF-22, 23, and 24, (refer to Volume 9 - Hydrologic Section), waters issuing from the North Spring, (Meters 3 and 4), collection area are of a better quality than waters from the Side Canyon and South Spring collection areas. Waters issuing from the North Spring originate primarily from water moving within the alluvial valley sediments and are not derived from the Blackhawk Formation.

Additional water quality sampling conducted by PacifiCorp during 1990 confirmed the early results obtained by West Appa. In summary, water quality of the North Spring does not generally correlate well with waters originating from the south as measured by Meter 1 (Side Canyon) and Meter 2 (South Spring), and are similar to surface waters monitored within Rilda Canyon. The water appears to be more highly correlated with waters moving toward the NEWUSSD springs from the west. Water movement from the west is most likely through alluvial deposits associated with Right and Left forks of Rilda Canyon. Additional sources may be through faulting and fracturing systems within Rilda Canyon or through the north-south anomaly which passes through the west end of the spring collection system. Extensive exploration conducted in Rilda and Mill Fork canyons parallel to the trend of the fracture systems outlined in earlier reports have failed to identify structual features which could contribute to the groundwater system. The waters originating through the alluvial valley fill appear to have different water quality characteristics than those of the southern springs (refer to Annual Hydrologic Monitoring Reports for a detailed analysis of the water characteristics of the individual springs and Rilda Canyon Creek).

Piezometric Surface

Water level data collected at each of the wells or piezometers within Rilda Canyon has been compiled to indicate the general orientation and direction of groundwater within the vicinity of the NEWUSSD springs as shown on Map HM-8 (refer to Volume 9 - Hydrologic Section). Note from the map that the general direction of groundwater continues to be to the east along the axis of Rilda Canyon with flow contributions being received by the drainage entering from the south. Water table gradients for the area are dependent upon the time of year as well as overall groundwater recharge characteristics. For example, from the map it can be found that the average slope of the monitored water table lying between wells P-7 and P-5 was 4.3 percent in November 1990. At the same time, the average water table gradient increases down gradient of P-5 where it was found to be 6.4 percent. The fact that the water table gradient increases downstream of P-5 still tends to confirm the presence of the north-south anomaly, (stratigraphic interface or fracturing). A check of water table gradients during high flow periods shows larger values than were noted in the latter part of 1990. Analysis of historic data shows that, although flow patterns are relatively unchanged during high flow periods, the water table gradient above P-5 may have been as high as 7.4 percent in 1987.

Groundwater Quantity Based on Pump Test Results

An approximation of the total groundwater flow moving eastward down Rilda Canyon was made using data collected from the resistivity studies completed by PacifiCorp and from data collected at local area wells. The flow approximation was made by applying the general flow equation Q=VA. The area of groundwater flow was determined using the inferred cross sectional area identified in the resistivity study as "R-3" (see Map HM-7 Volume 9 - Hydrologic Section) for the canyon adjacent to P-7. The velocity of groundwater movement was determined from the relationship between hydraulic permeability and groundwater gradient, V=ki. Permeability was determined from the estimate for short-term transmissivity obtained using the methods discussed earlier. It was felt that under flow conditions uninfluenced by man, the short-term transmissivity is most representative of natural conditions. Using these relationships, the estimated amount of groundwater moving down Rilda Canyon was determined for both high and low flow conditions.

Based on historic data, low flow conditions were found to dominate during the period of the 1990 pump test; however, it has been noted by PacifiCorp that a rise in water level occurs within Rilda Canyon wells each year as the groundwater aquifer responds to snow melt runoff. Historical data reproduced in Figure HF-25 (refer to Volume 9 - Hydrologic Section) for wells 1 through 5 shows seasonal and annual water level fluctuations. Note the relative change in water level between wells. Little overall variation is noted except for P-3 which shows changes over time totaling approximately thirteen to fourteen (13-14) feet. Changes recorded in P-3 are likely greater than those indicated by Figure HF-25, (refer to Volume 9 - Hydrologic Section) because P-3 is only thirty-eight (38) feet deep and water levels have been known to drop below the bottom of the well. A comparison of water level variations between P-3 and adjacent P-7 indicates that the total water level fluctuation may be as much as twenty-two (22)

feet(actual data collected from 1990 through 1996 reveals the maximum rise in water level of approximately twenty eight [28] feet, refer to Annual Hydrologic Monitoring Reports).

Low Flow. The first condition analyzed was based upon the relatively low flow condition found in November 1990. Using the relationship Q=VA as discussed above, the total alluvial valley aquifer flow in the area of P-7 was estimated to be approximately 151 gpm. Subtracting an average pumped Volume of 16.4 gpm from P-7, an estimated flow of 135 gpm bypassed P-7 and continued downstream toward the NEWUSSD spring collection system. Impacts noted upon the NEWUSSD spring system as a result of pumping P-7 appear to be confined to a reduction in flow from the springs on the order of ten percent. Before pumping began, total combined spring flows were approximately 85 gpm. During the later stages of pumping, just prior to termination of the test, spring flows had reduced to approximately 77.5 gpm, indicating a reduction in flow of 7.5 gpm during the pump test. Additional reductions in flow will probably occur as flows continue to stabilize.

High Flow. High flow conditions were estimated by adding to the 151 gpm base flow calculated for the November 1990 period the additional flow which would move down the canyon given a twenty-two (22) foot rise in water level which would occur during a wet year. The additional flow projected to occur during wet years was estimated by 1) measuring the cross sectional area which would result from a twenty-two (22) foot rise in the water table and 2) by applying the flow relationship Q=kiA. As indicated earlier, the water table gradient (i) used in this equation was found to be greater in 1987 than during the November 1990 test. Based on these assumptions, increased water levels measured during the high flow period of 1987 resulted in an estimated alluvial valley aquifer flow rate of 372 gpm.

B. EXISTING SURFACE RESOURCES

Presented within this section of the report is the regional hydrologic setting as well as the site specific description of hydrologic surface water characteristics of the permit and adjacent areas.

1. REGIONAL AND PERMIT AND ADJACENT AREA SURFACE WATER HYDROLOGY

The PacifiCorp permit and adjacent area is located in the headwater region of the San Rafael River Basin (refer to Volume 9 - Hydrologic Section: Figure HF-26). The surface drainage system of the North Rilda area is confined exclusively to the Huntington Creek drainage system (refer to Volume 9 - Hydrologic Sction: Map HM-1). Huntington Creek drains approximately 190 square miles of the Wasatch Plateau in central Utah. Altitude changes rapidly across the Wasatch Plateau with steep canyon sides and high mountain peaks. Altitudes range from 6,000 to 10,700 feet. Average precipitation generally increases with altitude and ranges from ten (10) inches near the town of Huntington to thirty (30) inches in the upper reaches of Huntington Creek. Most of the precipitation occurs during winter months in the form of snow.

Water use upstream from Castle Valley (the monoclinal valley containing most of the agricultural land noted in Figure HM-27 [refer to Volume 9 - Hydrologic Section]) is primarily for stock watering and industrial purposes (coal mining and electrical power generation). Within Castle Valley, agriculture and power production utilize nearly all of the inflowing water (Mundorff, 1972) with minimum flows in the gaged streams occasionally approaching zero. Transbasin diversions occur throughout the area.

In general, the chemical quality of water in the headwaters of the San Rafael River Basin is excellent, with these watersheds providing most of the domestic water needs to the people below; however, quality rapidly deteriorates downstream as the streams cross shale formations (particularly the Mancos Shale in and adjacent to Castle Valley) and receive irrigation return flows from lands situated on Mancos-derived soils (Price and Waddell, 1973). Dissolved solids concentrations range from about 100 to 600 mg/l in the mountain regions and from 600 to 6000 mg/l in Castle Valley.

Huntington Creek above the USGS stream gaging station (0318000) near the town of Huntington drains approximately 190 square miles. Storage reservoirs regulate runoff from fifty-four square miles in the upper part of Huntington Creek. The average channel gradient of Huntington Creek above Huntington is about 100 feet per mile (1.9 percent). Danielson et al. (1981) estimate the average annual precipitation on the Huntington Creek drainage to be on the order of twenty-six (26) inches. The average discharge at the USGS gage near Huntington is approximately ninety-six (96) cubic feet per second (70,000 acre-feet per year). The USGS estimates that "during most years, about 65 percent of the annual discharge at the Huntington Creek station (09318000) occurs during the snowmelt period (April-July)" (Danielson et al., 1981, p. 110). For example, the monthly distribution of flows for Huntington Creek near Huntington for the water year 1978, corrected for the influence of Electric Lake Dam, is shown on Figure HF-28 (refer to Volume 9 - Hydrologic Section). The annual peak flows recorded for the USGS station near Huntington are plotted on Figure HM-29. While the majority of stream flows are due to snow melt, thunderstorms of high intensity are common in the area during the summer months. A review of the discharge records for Huntington Creek near Huntington shows that twenty-two of seventy-one (31 percent) measured annual peak flows occurred during July, August, or September. The largest annual peak flows have been caused by thunderstorms. Of the measured annual peak flows on Huntington Creek near Huntington, eight annual events have been greater than 1600 cfs (about a 10-year return period), all of which occurred during July, August, or September. The peak discharge of record was 2500 cfs on August 2 or 3, 1930.

The North Rilda area is drained by two drainage systems, Rilda, and Mill Fork canyons (refer to Volume 9 Map HM-9,). Listed below is the individual breakdown for each individual mine plan area including stream classification.

MINE PLAN AREAS	DRAINAGE SYSTEM	STREAM CLASSIFICATION
North Rilda	Rilda	Ephemeral-Perennial
	Mill Fork	Ephemeral-Intermittent

The upper reaches of Rilda and Mill Fork canyons are ephemeral. Rilda Canyon Creek is considered perennial below the springs located along the western border of Section 28, Township 16 South, Range 7 East, Mill Fork Canyon is intermittent from Section 21, Township 16 South, Range 7 East to the confluence of Huntington Canyon. Most of the streams in the mine plan area are spring fed. PacifiCorp has monitored all of the surface waters since 1979 and will continue to monitor them in the future. The data collected is included in each annual Hydrologic Monitoring Report.

North Rilda Adjacent Area Watershed Characteristics

All of the streams within the extended mine plan boundary are ephemeral-intermittent/perennial, as mentioned earlier. Elevations in the adjacent area range from approximately 7000 feet to near 10,400 feet. General land slopes in the adjacent area range from near vertical along the Castlegate escarpment to less than four percent. Vegetative cover consists of sagebrush, juniper, and grasses on the south-facing slopes and dense conifer and aspen complexes on the north-facing slopes.

Water sources within the mine plan area include springs and seeps, which were discussed earlier in the Existing Groundwater Resources section of this report. There are no major water bodies located within or immediately adjacent to the mine plan area.

Rilda Canyon Geomorphology Investigation
To evaluate and document the geomorphology characteristics of Rilda Creek, PacifiCorp retained EarthFax Engineering to conduct a field investigation of Rilda Creek from above the forks to below the proposed location of the sediment pond, refer to Volume 11 Appendix Volume - Hydrology: Appendix C. The following is an outline of the study objectives:

- Establish permanent benchmarks and cross sections at six locations along Rilda Canyon. One of these will be established on the right fork above to the proposed surface facilities, one on the left fork (also adjacent to the proposed facilities), and four along the main channel (two adjacent to the proposed upper facilities, one between the two NEWUSSD spring collection areas, and one downstream from the lower collection area). This will allow data to be collected from areas of planned (upper) or potential (lower) surface facilities.

- ✧ Survey channel cross-sections and gradients at the established locations in accordance with USFS guidelines. During the field surveys, collect sufficient information to classify the stream sections in accordance with the Rosgen procedure. Also, gather information concerning stream bed materials.
- ✧ Prepare drawings showing surveyed cross section and profile data.
- ✧ Evaluate data collected previously by PacifiCorp from piezometers installed in Rilda Canyon, supplemented by field observations. This will include information concerning:
  - Water table fluctuations relative to the elevation of the adjacent stream channel
  - Stratification of alluvial sediment within the stream corridor
  - Composition of stream bank material
  - Identification of zones of seasonally saturated and infrequently saturated soils
  - Evaluate historic streamflow data collected by PacifiCorp from Rilda Canyon
- ✧ Calculate flood-flow magnitudes based on regional regression equations
- ✧ Plot various streambank zones on a plan map of the canyon, based on field observations and data collected by Mt. Nebo Scientific (i.e., riparian zone, bank zone, overbank zone, and upland zone).

For complete discussion related to the geomorphology characteristics of Rilda Creek refer to Volume 11 Appendix Volume - Hydrology: Appendix C.

Biological Organisms and Their Habitat within Rilda Canyon
In addition to the geomorphology characteristics study of Rilda Creek, the Division of Wildlife Resources conducted biological organism and habitat study of Rilda Creek through the years 2004 -2008, refer to Volume 11 Appendix Volume - Biology: Appendix C. As stated in the report entitled "*Macroinvertebrate and Fish Surveys to Determine Evvects of Energy Development*", representatives of the Utah Division of Wildlife Resources (UDWR) Southeastern Region were asked by the Utah Division of Oil, Gas and Mining to participate in an on-site meeting, discuss the impacts of this project on the biota within Rilda Canyon, and aid in the development of a comprehensive EA. During this and subsequent meetings it was decided that UDWR would conduct pre and post-disturbance evaluations of macroinvertebrate populations and identify resident fish populations in Rilda Creek. This report marks the completion of the pre- and post- disturbance sampling effort. Details on the methodology employed during macroinvertebrate and fish sampling and a limited results section are included in this report; refer to Volume 11 Appendix Volume - Biology: Appendix C for a copy of UDWR's comprehensive report.

Along with the DWR, PacifiCorp retained the services of Cirrus Ecological Solutions and Socio-Ecological Concepts to conduct the post-disturbance surveys that were conducted in the spring and fall of 2006, 2007 and 2008. Construction of the surface facilities began in April of

2006. A comprehensive report entitled "*Assessment of Pre- and Post-Disturbance Condition of Macroinvertebrates and Fish at Rilda Creek, Emery County, Utah (2004-2008)* is also found in Volume 11 Appendix Volume – Biology: Appendix C.

The overall results of the surveys suggest that the aquatic invertebrate community has not changed drastically following the construction activities in Rilda Canyon and suggests that water quality conditions have also remained stable. It was not possible to associate the differences observed (above and below the disturbance) to the construction activities. These variations were observed at all study sites.

2. WATER QUALITY AND QUANTITY

PacifiCorp maintains an extensive surface monitoring program to evaluate both quantity and quality of the two major drainage systems which incorporate the permit and adjacent area. The following will be divided into major and contributing tributary drainage systems.

Huntington Creek Drainage System

a) *Huntington Creek*

Huntington Creek is comprised of many smaller tributary systems that feed the main stream. Rilda and Mill Fork canyon creeks are the only tributaries to Huntington Creek that emanate from within and adjacent to North Rilda mine plan area.

Huntington Creek flow data are recorded on a continuous basis by UP&L at two locations; one station is located near the Huntington Power Plant, the other below Electric Lake which is about twenty-two miles upstream from the Huntington Plant. Flow records are maintained by UP&L in order to determine water entitlements and reservoir storage allocation for the various users on the river.

The UP&L station near the plant was established in the fall of 1973. Prior flow records were obtained from the USGS station located about one mile downstream from UP&L's existing station. The USGS station was established in 1909 and discontinued in 1970 after determination of available water supply for the Electric Lake Dam. The dam was completed in December 1973, and water storage commenced shortly afterward.

The calculated natural flow rates, which consider actual flow recorded at the plant, plant diversions, Electric Lake storage, and lake evaporation along with yearly comparisons, are reported annually in the Hydrologic Monitoring Report.

Huntington Creek water quality information is compiled on a monthly basis for stations above and below the Huntington Plant, while samples for Huntington Creek below Electric Lake and the Right Fork are taken quarterly. The location of water quality sampling stations on Huntington Creek that were considered for this report are listed below (refer Volume 9 - Hydrologic Section: Map HM-1).

Below Electric Lake+*
Above the Forks+*
Below the Power Plant Diversion*
Below the Power Plant*
+Not listed on map due to scale
*The sites listed above are not considered part of PacifiCorp's Hydrologic Monitoring Program but will be included in the annual report as long as data is available.

In addition to the sites monitored by Huntington Plant-Environmental Service, three sites were added on Huntington Creek near the Deer Creek confluence in conjunction with the Deer Creek discharge permit.

Specific water quality data as well as yearly comparisons are reported annually in the Hydrologic Monitoring Report. This practice will continue throughout the life of the permit.

In general, the water shows a gradual increase in concentration of dissolved minerals as the flow proceeds down Huntington Canyon.

The values at the station below Electric Lake do not express the actual natural drainage water quality characteristics because of the lake effect, but it appears that the surface flow in Huntington Canyon is of very high quality in the upper reaches with some natural degradation occurring as the flow proceeds to the canyon mouth.

b) *Rilda Canyon Creek*

Rilda Canyon Creek is a tributary of Huntington Creek and is monitored according to the following schedule (see Hydrologic Monitoring Schedule refer to Volume 9 Appendix A).

Locations:

(1) Right Fork of Rilda - RCF1*
(2) Left Fork of Rilda - RCLF1 (Field data only)
(3) Left Fork of Rilda - RCLF2 (Field data only)
(4) Rilda Canyon - RCF2 (Field data only)
(5) Rilda Canyon - RCF3
(6) Rilda Canyon - RCW4 (Map HM-1, Volume 9 - Hydrologic Section and, Volume 9 Map HM-10).

* During mining of the North Rilda leases, an additional site has been added upstream of RCF1 (adjacent to EM-163) to monitor surface/groundwater flow relationships. Flow will be measured yearly during base flow conditions.

Flow information is collected during the first or second week of each month. 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 Operational Quality. The program was initiated in June 1989. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed at the perennial stream locations (i.e., RCF3 and RCW4) monthly in conjunction with quantity measurements. Data regarding flow in Rilda Canyon Creek is presented in the annual Hydrologic Monitoring Report.

As stated above, flow information is collected monthly throughout the year with the use of three Parshall flumes and one V-notch weir (Volume 9 - Hydrologic Section: Map HM-1). Hydrographs comparing yearly flows are reported in the annual Hydrologic Monitoring Report and also as Figure HF-33 Volume 9 - Hydrologic Section: Map HM-1.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis will be for a two-year period, 1989-90 (refer to the respective Annual Hydrologic reports). Baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1989; results of the samples collected are presented in Table HT-7, (Volume 9 - Hydrologic Section: Map HM-1), and in the Hydrologic Monitoring Report.

c) *Mill Fork Canyon Creek*

Mill Fork Canyon Creek is a tributary of Huntington Creek and was included in PacifiCorp's monitoring program starting in 1997. Monitoring of Mill Fork will be conducted according to the following schedule (see Hydrologic Monitoring Schedule refer to Volume 9 Appendix A).

Locations:

(1) Above old mines - MFA1
(2) Mill Fork Canyon Culvert - MFB2 (Volume 9 - Hydrologic Section).

Flow information is collected during the first or second week of each month. 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 Operational Quality. The program was initiated in 1997. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed at the perennial stream locations, monthly in conjunction with quantity measurements. Data regarding flow in Mill Fork Canyon Creek is presented in the annual Hydrologic Monitoring Report.

As stated above, flow information is collected monthly throughout the year (Volume 9 - Hydrologic Section: Map HM-1). Hydrographs comparing annual flows are reported in the annual Hydrologic Monitoring Report.

Historical monitoring data collected by Beaver Creek Coal Company - No. 4 Mine and the United States Geological Survey (site No. 76: Open File Report 81-539) has been incorporated in PacifiCorp's hydrologic database. Operational water quality monitoring was conducted during 1997 and 1998 (refer to the Quarterly Hydrologic submittals). Baseline quality analysis was initiated in November 1998. In accordance with the Hydrologic Monitoring Plan, baseline quality analysis will conducted be for a two-year period, forth quarter 1998 - fourth quarter 2000 (refer to the respective Annual Hydrologic reports). Thereafter, baseline analysis will be repeated once every five (5) years.

3. SOIL LOSS AND SEDIMENT YIELD

Sediment load concentrations in the permit and adjacent area vary dramatically depending on the percentage of disturbed areas, ruggedness of the terrain, geologic formations present, the amount of precipitation the area receives, and stream flow volume.

As part of the U.S. Geological Survey water monitoring program in Utah coal fields (Open File Report #81-359), fourteen water samples associated with the permit and adjacent area were collected between August 1978 and September 1979 at gaging station 09318000 on Huntington Creek to determine suspended-sediment concentrations and loads. Three samples each were collected at gaging stations 09317919, 09317920, and 09324200 in Crandall and Tie Fork canyons. Five additional samples were collected by project personnel from these and other

streams in the study area. Representative suspended-sediment concentrations and loads of streams in the study area are listed below.

As indicated from the samples collected by the USGS, the suspended-sediment concentrations varied widely among the drainages analyzed. The relatively low concentrations of suspended sediment were attributed to well established channels, low flow periods, and a scarcity of roads. Higher concentrations appeared to be associated with the activities of man and erosion of large exposures of the Mancos Shale formation in the lower reaches of the drainages. Sediment concentrations generally increased with increased stream discharge. Note that the highest values at all of the locations occurred during the spring runoff period, but not enough data were available to compute daily sediment discharge.

Stream	Site No.	Suspended Sediment		
		Date	Concentration (mg/l)	Load (tons/day)
Huntington Creek (gaging station 09318000)	88	8/12/1978	104	27
		11/16/1978	72	2.5
		6/12/1979	114	66
		8/6/1979	44	15
Crandall Creek (gaging station 09317919)	51	8/11/1978	49	0.14
		11/17/1978	60	0.08
		6/13/1979	15	0.41
		8/5/1979	56	0.15
Tie Fork Canyon	67	8/12/1978	12	0.03
		11/17/1978	57	0.12
		6/13/1979	38	0.68
		8/5/1979	66	0.17
Bear Creek	81	10/24/1978	8860	1.9
Deer Creek	87	6/13/1979	609	3.1

PacifiCorp has collected samples on a quarterly basis from the streams within and adjacent to the permit area. Samples taken at periods of both high and low flow have been tested for total suspended solids (TSS) to identify stream stability and are reported annually in the Hydrologic Monitoring Report. Tables HT-5 through HT-8 show the TSS results for streams monitored by PacifiCorp (refer to Volume 9 - Hydrologic Section).

R645-301-723 Sampling and Analysis

Water quality sampling and analysis of samples collected by PacifiCorp will be conducted according to the "Standard Methods for the Examination of Water and Wastewater." Refer to Volume 9 Appendix A for sample documentation and analytical methods and detection limits).

R645-301-724 Baseline Information

PacifiCorp maintains an extensive groundwater and surface monitoring program to characterize pre-mining and any mining-related impacts both to quality and quantity. As an integral part of the permit application, an annual Hydrologic Monitoring Report is prepared by PacifiCorp and submitted to appropriate government agencies. Baseline information for the East Mountain property will be divided into the following categories: 1) Groundwater, and 2) Surface Water.

Groundwater

The characteristics of the 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 characterize the baseline quality and to document the existence of seasonal variations, PacifiCorp developed a groundwater monitoring program which includes sampling both surface springs and in-mine groundwater sources. The program was initiated during a period from 1977 through 1979. Routine monitoring continues to support the quality data collected during the initial phase. In general, data from the springs and in-mine sources are representative of the groundwater quality in the geologic strata from which the groundwater sources issue. Cation-anion diagrams have been utilized to depict the groundwater characteristics and to monitor quality trends. Results of the data collected have shown that, in both the surface springs and in-mine groundwater sources, variations in quality from individual sources do exist, but the quality from the individual sources remains consistent with time. Spring water is mostly calcium-bicarbonate with some magnesium and sulfate. As discussed in the General Requirement Section - R645-301-711, quality decreases with increasing downward vertical movement and from north to south with sulfate becoming a major constituent. Cation-anion diagrams have been included in the Annual Hydrologic Reports to support the lack of seasonal variation. A copy of the 1991 quality information is included in Volume 9 - Hydrologic Support Information, Baseline Section (additional information concerning groundwater quality can be found in the Annual Hydrologic reports).

Surface Water

The North Rilda mine plan area is drained by two drainage systems: Rilda Canyon, and Mill Fork Canyon. PacifiCorp has documented that all of the stream reaches emanating from within the North Rilda mine plan area with the exception of the lower portion Rilda Canyon creek cease flowing in the fall or winter, suggesting that they are not perennial but ephemeral/intermittent. Flow in the drainage is a combination of snow melt and springs. Most of the runoff occurs

during the months of April through July. Even though the drainage systems are ephemeral, except for the lower reaches of Rilda Canyon, variations in quality do exist. Total dissolved solids increase gradually in concentration as flow proceeds from the upper plateau areas to the confluences of the major drainage of Huntington Canyon. Surface waters in the mine's extended adjacent area are predominantly bicarbonate, calcium, and magnesium in the upper reaches with sulfate becoming a major constituent in the lower reaches. The increase in sulfate concentration is due to the influence of the Mancos Shale, a marine shale which outcrops in the lower reach of each of the drainage systems. Seasonal total suspended solids variations also occur with the highest concentrations occurring during the initial runoff period. An annual summary sheet for each drainage is included in Volume 9 - Hydrologic Support Information, Baseline Section.

In addition to the water quality and quantity baseline data collected related to Rilda Canyon, PacifiCorp has included baseline studies which document the geomorphology characteristics and biological organisms of Rilda Creek. Refer to North Rilda Adjacent Area Watershed Characteristics for complete details pertaining to these studies.

R645-301-724.100 Groundwater Information

A detailed description of the ownership of existing wells, springs, and other groundwater resources, including seasonal quality and quantity of groundwater and usage, is given in sections R645-301-721 and 722.

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.

R645-301-724.300 Geologic Information

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

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).

Precipitation

The climate of the permit and adjacent areas has been described by the U.S. Geological Survey, which states that it is semi-arid to sub-humid and precipitation generally increases with altitude. The average annual precipitation ranges from about ten (10) inches in the lowest parts of the permit area (southeast) to more than twenty-five (25) inches in the highest parts (northwest). PacifiCorp's weather station, located in Section 26, Township 17 South, Range 7 East, has provided data which shows that the summer precipitation in the form of thundershowers averages about the same as the

winter precipitation in the form of snowfall. Because much of the summer precipitation runs off without infiltration, the winter precipitation has the greatest impact on groundwater.

Precipitation amounts have been and will continue to be recorded at the Hunter and Huntington power plants, at Electric Lake Dam, and on East Mountain. Precipitation data can be found in the annual Hydrologic Monitoring Report (refer to Volume 9 - Hydrologic Section: Table HT-9 for East Mountain data).

Temperatures

Air temperatures vary considerably both diurnally and annually throughout the permit and adjacent areas. Midsummer daytime temperatures in lower areas commonly exceed 100° F, and midwinter nighttime temperatures throughout the area commonly are well below 0° F. The summer temperatures are accompanied by large evaporation rates. Although not recorded, there probably also is significant sublimation of the winter snowpack, particularly in the higher plateaus which are unprotected from dry winds common to the region. Temperature information is collected at the UP&L weather stations at each power plant, at Electric Lake, and on East Mountain. These data will continue to be included in the annual Hydrologic Monitoring Report (refer to Volume 9 - Hydrologic Section: Table HT-9 for East Mountain data).

Winds

The winds in the area are generally variable. The wind rose presented in Figure HF-36 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP) displays the variability for the Meetinghouse Ridge area for January to December 1978.

R645-301-724.600 Survey of Renewable Resources Lands

Information describing the existing groundwater resources, including descriptions of permit and adjacent area aquifers and areas of recharge can be found in section R645-301-721. Impacts related to mine subsidence can be found in section R645-301-728.

R645-301-724.700 Alluvial Valley Floors

Utah Regulations require that the presence of alluvial valley floors in or adjacent to the mine project area be identified. A detailed description of the alluvial valley floor deposits were described in the "REGIONAL GROUNDWATER CHARACTERISTICS" (refer to Volume 9 - Hydrologic Section).

R645-301-725 Baseline Cumulative Impact Area Information

Hydrologic and geologic data required toassess 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.

R645-301-728 Probable Hydrologic Consequences (PHC) Determination

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

The North Rilda mine plan area is located in the central portion of the Wasatch Plateau coal field in Emery County, Utah. Generally, this area is a flat-topped mesa surrounded by heavily vegetated slopes which extend to precipitous cliffs leading to the valley below. Much data has been collected regarding the geology and the hydrology of the East Mountain property. In all, over 120 drill holes have been completed from the surface, over 500 from within the mines; and a comprehensive hydrologic data collection program is ongoing, all of which have provided data used in this PHC. The most applicable data have been included in this document. For a review of additional data it is suggested that the reader refer to the annual Hydrologic Monitoring Report.

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).

Mining Methods

Mining of the North Rilda mine plan area will be conducted entirely by underground mining methods consisting of continuous miner and longwall techniques. Two minable coal seams exist within the property. In ascending order they are the Hiawatha and Blind Canyon (see operational plans of each separate permit application).

The chemical and physical properties of the overburden have been identified and described in the Geologic section (refer to Volume 8 and R645-301-600 Geology Section of this volume).

Because mining is limited to underground mining techniques, only minor amounts of overburden directly in contact with the seam, either roof or floor, will be removed during mining operations.

Surface Water System

A detailed description of the permit and adjacent 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 North Rilda area is divided into two drainages; the southern portion forms part of Rilda Canyon Creek, and the northern portion contributes to Mill Fork Canyon. The Rilda Canyon drainage covers seventy-four percent (74%) of the North Rilda leases held by PacifiCorp. PacifiCorp has observed that all of the streams reaches emanating from within the permit and adjacent area boundary, with the exception of the lower portion of Rilda Canyon Creek, cease flowing in the fall or winter and periods of drought, suggesting that they are not perennial but ephemeral/intermittent. Rilda Canyon Creek is perennial below the springs located along the western border of Section 28, Township 16 South, Range 7 East, as it flows year round there. Most of the streams are spring fed. PacifiCorp has monitored all of the surface waters since 1989 and will continue to monitor them in the future (Mill Fork Canyon was monitored in the past by Beaver Creek Coal Company). The data collected is included in each annual Hydrologic Monitoring Report.

Impacts to surface water due to the underground operations of Deer Creek - North Rilda area will be minor, both in terms of quality and quantity. Due to the type of mining and limited surface disturbance, surface water impacts are minimal. 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 drainages conveying runoff away from permit and adjacent areas are streams in Rilda, and Mill Fork canyons. Second mining (ie. longwall extraction, room & pillar) of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining (ie. mainline, gateroad development) will occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 5th North Mains development within the area of the right fork of Rilda and the long-term stability analysis refer to the Volume 11 Appendix Volume - Engineering: Appendix A. To protect the alluvial/colluvial system of the right fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the right fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15° to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MRP).

The angle of draw of subsidence produced by full-extraction mining can be influenced by many factors. These include the size of the area mined, number of seams mined, fractures or faults in the overburden, adjacent mine workings, and adjacent areas of burned coal and clinker. If mine workings extend to an area of burned coal, experience has shown that the overburden stresses above the mined area can be transferred to the adjacent burned coal and clinkers which can cause the clinkered areas to fail. In this case, the angle of draw may appear to be very shallow, when the crushing of the clinkered areas are the source of subsidence outside the normal area of influence.

Faults can also influence the angle of draw. If mining occurs adjacent to an existing fault, the area of subsidence will follow the natural plane of weakness formed by the fault. In this case, the angle of draw will be the same as the dip of the fault.

Based on data collected by the U.S. Bureau of Mines and eighteen years of subsidence data collection on East and Trail mountains, the angle of draw is found to be between 0 and 15 degrees from vertical. In some limited areas, the angle of draw is greater than 15 degrees, but in every case, the angle is greater due to the influence of one of the other factors mentioned above.

For planning purposes, any barrier of protection left in the mine to protect surface features should use a 15 degree angle of draw unless one of the factors mentioned above is known to exist in the immediate area.

In the majority of cases, cracking due to subsidence is not anticipated to extend to the surface; therefore, surface runoff patterns will not be significantly affected. Data collected by PacifiCorp over a eighteen-year period concerning subsidence and surface drainages has not detected any surface stream impacts. Consequently, subsidence should not cause significant impacts to the surface water system.

Underground coal mines in the Wasatch Plateau coal field typically intersect groundwater from strata surrounding the coal seams. Both Deer Creek and Wilberg/Cottonwood mines have intersected quantities of water in excess of operational needs and therefore have discharged intercepted groundwater. Dewatering of Deer Creek has had only a minor impact on surface quality and quantity on a regional basis; however, on a site specific basis the flow in Deer Creek has increased from pre-mining conditions. During periods of high runoff changes in quality are insignificant; however, in low flow conditions some degradation is likely due to the fact that the mine discharge waters are higher in TDS than the surface waters. It is difficult to assess the degradation because it is not known from where or how much of the water discharged from the mine would naturally have been discharged into the receiving streams by natural groundwater flow. The section below will describe the dewatering of Deer Creek area and related surface impacts.

Excess water not utilized in the mining operation or for domestic use is either pumped to storage areas or discharged from the mine at the Deer Creek portals. (Quality and quantity is reported in the Annual Hydrologic Report.) Flow meters are utilized to record the amount of water

discharged from the mine, after which it passes through underground sedimentation sumps (refer to Volume 9 - Hydrologic Section: Figure HF-38).

Potential effects to the Hydrologic Balance - Surface Water System as the result of expansion of mining operations to include additional surface facilities in Rilda Canyon include:

A. Alteration to Rilda Creek Stream Morphology
B. Increased Sediment Production to Rilda Creek
C. Increased Salinity in Rilda Creek
D. Increased Flow to Rilda Creek - Mine Water Discharge
E. Interference to Rilda Springs (Quality)
F. Alteration to the Biologic Communities

To minimize the effects to the hydrologic balance; site development (completed in fall of 2008) has been designed to include the following:

A. ALTERATION TO RILDA CREEK STREAM MORPHOLOGY

All surface developments are north of Rilda Creek, thereby eliminating the need to place the main drainage in a culvert. The undisturbed areas adjacent to the disturbance associated with the Rilda Canyon Portal Facilities are drained by ephemeral drainages on the south facing slope of North Rilda Ridge which are tributaries to Rilda Creek. The undisturbed drainages report to Rilda Creek through a series of culverts passing beneath the facility. Stream buffer zones are maintained along Rilda Creek. Portions of the facilities are within one hundred (100) feet of Rilda Creek. Buffer signs have been installed along Rilda Creek to indicate the area which beyond no disturbance shall take place.

Water quality of Rilda Creek is protected from potential impacts associated with the Rilda Canyon Portal Facilities through a combination sediment control structures and revegetation (refer to R645-301-300 Biology Section for interim revegetation and Volume 11 Appendix Volume - Hydrology: Appendix B for Drainage and Sediment Control Plan).

B. INCREASED SEDIMENT PRODUCTION TO RILDA CREEK

The site has been graded and paved to allow construction of the mine entries, facilities pad, and ancillary facilities on relatively flat areas. All grading and paving has been sloped away from the receiving stream and drains to a drop drain and culvert system that is diverted to a sediment basin which minimizes potential impacts. Site disturbance has been held to the minimum required while leaving as many trees and existing vegetation as feasible. All disturbed surfaces were revegetated immediately after completion of the construction phase (refer to Volume 11 Appendix Volume - Hydrology Section: Appendix B for details related to Alternative Sediment Control Areas (ASCA's).

Sediment control measures include practices carried out within and adjacent to the disturbed area. The sedimentation storage capacity of practices in and downstream from the disturbed

areas will reflect the degree to which successful mining and reclamation techniques are applied to reduce erosion and control sediment. Sediment control measures consist of the utilization of proper mining and reclamation methods and sediment control practices, singly or in combination. Sediment control methods include, but are not limited to:

a. Retaining sediment within disturbed areas;
b. Diverting runoff away from disturbed areas;
c. Diverting runoff using protected channels or pipes through disturbed areas so as not to cause additional erosion;
d. Using straw dikes, riprap, check dams, mulches, vegetative sediment filters, dugout ponds and other measures that reduce overland flow velocities, reduce runoff volumes or trap sediment.
e. Paving.

C. INCREASED SALINITY IN RILDA CREEK

PacifiCorp has developed a Drainage and Sediment Control Plan to protect the surface (Rilda Creek) and groundwater resources (Rilda Canyon Springs) in the area of the Rilda Canyon Portal Facilities which includes: the fan portal access, mine facilities, topsoil storage area. The Drainage and Sediment Plan will ensure protection of water resources by handling soil, overbuden and refuse from previous mining activities in such a manner to minimize discharge of pollutants to the hydrologic regime. Details of the Drainage and Sediment Control Plan is presented in Volume 11 Appendix Volume - Hydrology: Appendix B

During winter months snow removal will be required along the entire length of this road. As this is the responsibility of the Emery County Road Department, PacifiCorp may find the need to assist the road department by clearing snow from EC#306 by contracting this activity out. The contractor will use a deicing product as specified by Emery County on the county portion of the road to make the road safe for mine personnel and other local traffic. The deicing product will not be stored on-site but will be acquired off-site. No salt will be used within the disturbed areas of the Rilda Canyon Portal Facilities.

D. INCREASED FLOW TO RILDA CREEK - MINE WATER DISCHARGE

All mine discharge water is routed through the underground reservoirs in the old workings or specialized sump areas and discharged at the Deer Creek Mine portals located in Deer Creek Canyon. Monitoring will be in accordance with UPDES permit standards and state and federal regulations.

E. INTERFERENCE TO RILDA SPRINGS (QUALITY)

Site development related to the Rilda Canyon Portal Facilities is up gradient of the Rilda Canyon Springs. The site has been graded and paved to allow construction of the mine entries, facilities pad, and ancillary facilities on relatively flat areas. All grading and paving has been

sloped away from the receiving stream/Rilda Canyon Springs and drains to a drop drain and culvert system that is diverted to a sediment basin minimizing potential impacts.

As stated previously, two separate drainage systems are provided at the Rilda Canyon portal facility site and are classified as "undisturbed" and "disturbed" collection systems. The "undisturbed" system collects overland runoff water above the portal site and from side slopes adjacent to the site and conveys it past the disturbed area into the natural channel of Rilda Canyon Creek. The "disturbed" collection system collects runoff from the portal and storage areas and conveys it to a temporary sedimentation basin east of the facilities pad. Flows that exceed the holding capacity of the sediment basin is diverted to the sediment pond.

Development plans for the Rilda Canyon Portal Facilities include construction of single sedimentation pond located at the eastern extent of the disturbed area (refer to R645-301-500 Engineering Section Map 500-2). Analysis utilized to determine the size and hydraulics related to the construction and operation of the sedimentation pond is included Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan. The sediment pond was strategically located below Rilda Canyon Springs to minimize the effects to the springs and collection system.

F. ALTERATION TO THE BIOLOGIC COMMUNITIES

PacifiCorp developed a Drainage and Sediment Control Plan to protect the surface (Rilda Creek) and groundwater resources (Rilda Canyon Springs) in the area of the Rilda Canyon Portal Facilities. The Drainage and Sediment Plan will ensure protection of water resources by handling soil, overbuden and refuse from previous mining activities in such a manner to minimize discharge of pollutants to the hydrologic regime. Refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan for complete details related to development of the Rilda Canyon Portal Facilities. As stated previously, sediment control measures consist of the utilization of proper mining and reclamation methods and sediment control practices. Sediment control methods include, but are not limited to:

a. Retaining sediment within disturbed areas;
b. Diverting runoff away from disturbed areas;
c. Diverting runoff using protected channels or pipes through disturbed areas so as not to cause additional erosion;
d. Using straw dikes, riprap, check dams, mulches, vegetative sediment filters, dugout ponds and other measures that reduce overland flow velocities, reduce runoff volumes or trap sediment.
e. Paving.

PacifiCorp and governmental agencies have conducted several baseline studies of Rilda Creek to establish existing surface and groundwater characteristics. These studies included; quality and quantity monitoring of Rilda Creek, Rilda Canyon Springs, installation of groundwater wells and pump testing, geomorphology investigation and biological organisms assessments. Baseline data has been compared to hydrologic monitoring results to evaluate the effectiveness

of the drainage and sediment control plan. The results indicate that there has been no conclusive evidence that shows construction activities of the Rilda Portal facilities having a negative impact on the hydrologic regime of Rilda Creek. The results of the biological assessment study are included in Volume 11 Appendix Volume - Biology: Appendix C.

Mitigation and Control Plans

To minimize potential effects to Rilda Creek, all mine discharge water will be routed through the underground reservoirs in the old workings or specialized sump areas and discharged at the Deer Creek Mine portals located in Deer Creek Canyon. Monitoring will be in accordance with UPDES permit standards and state and federal regulations. (refer to Volume 9 - Hydrologic Section: Appendix B for UPDES permit information.) As described previously and in the Drainage and Sediment Control Plan (refer to Volume 11 Appendix Volume - Hydrology: Appendix B) the site development in Rilda Canyon has been designed to minimize the potential effects to the hydrologic balance. Baseline studies have been conducted to assess the quality, quantity, geomorphology and biologic resources of Rilda Canyon.

The effects of the mining operation on the surface water system will continue to be analyzed through the surface water monitoring plan described below. In the event that monitoring shows that the surface water system is being adversely affected by mining activities, additional steps will be taken to rectify said impacts in cooperation with local, state, and federal regulatory agencies.

Surface Monitoring Plan

A hydrologic surface monitoring program, initiated in 1979 (sites in Meetinghouse and Rilda canyons were added in 1986 and 1989, respectively, [Mill Fork Canyon was monitored by Mountain Coal Company from 1984-95 and was included in PacifiCorp's hydrologic monitoring in 1997]), has been underway at each of the surface monitoring stations shown on Map HM-1 (refer to Volume 9 - Hydrologic Section). An additional surface site was added in 1997 in Rilda Canyon in the right fork above the mainline development to monitor the surface/groundwater relationship of the right fork. Stations were established to monitor water quality and quantity above and below the mine permit areas. The parameters for laboratory analyses are those established by DOGM in "Guidelines for Surface Water Quality" (refer to Volume 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 phase of the mine. The quarterly monitoring during the mine operational phase will include flow and quality to delineate seasonal variation and assess changes in water quality.

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.

Post-mining 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.

Groundwater System

PacifiCorp has collected an extensive database of information pertaining to the groundwater quality and quantities of the East Mountain region and adjacent areas. Included in the database is long-term quality and flow information both for springs and for groundwater intercepted by mining.

Detailed descriptions of the regional and area groundwater resources have been presented in previous sections and will not be duplicated here (refer to R645-301-722). In general, the majority of all natural groundwater discharge points located on the East Mountain property is in the form of seeps and springs. PacifiCorp has mapped approximately eighty (80) springs ranging in discharge from <1 gpm to as high as 450 gpm (refer to Volume 9 - Hydrologic Section: Map HM-4).

The USGS has conducted extensive studies to determine the regional groundwater system for the central Wasatch Plateau Coal Field. The studies indicate a regional aquifer exists in the coal-bearing sequence of the Blackhawk and the underlying Star Point Sandstone formations. The studies have also concluded that several isolated or perched aquifers existed above the Blackhawk-Starpoint aquifer. PacifiCorp agrees with conclusions of the USGS studies concerning the perched aquifers above the coal-bearing sequence of the Blackhawk Formation but has some reservations about the significance of the Blackhawk-Starpoint aquifer which will be discussed below. The majority of the groundwater is discharged from the perched aquifers which occur along the base of the North Horn Formation in the form of seeps and springs (refer to Volume 9 - Hydrologic Section: Map HM-4, Figure HF-6, and Table HT-1). Several other perched aquifers exist mainly along the formational contacts with the North Horn Formation, including the upper contact with the Flagstaff Limestone and the lower contact with the Price River Formation.

The majority of the groundwater recharge on East Mountain comes from the winter snowpack which melts and infiltrates into the surface of East Mountain. The water flows down vertical fractures which intersect sandstone channel systems in the North Horn Formation. The majority of the groundwater reaching this point intersects the surface in springs located in the North Horn Formation. Very little recharge intersects the upper Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. As discussed earlier in the Groundwater Section, recharge to the North Rilda area is very limited due to the topographic configuration of the region (refer to Volume 9 Map HM-9).

The hydrogeologic characteristics of the coal-bearing Blackhawk and overlying formations effectively limit the extent of impacts to the hydrologic system. Impacts to water quality are negligible and may be slightly beneficial. As discussed previously, two separate aquifers-water bearing zones occur on the East Mountain property: 1) perched aquifers associated mainly with the North Horn Formation, and 2) Blackhawk-Starpoint regional aquifer, which exhibits limited potential as a property wide, water saturated zone. The following hydrologic balance section will segregate the two zones and describe the significance and possible impacts to each zone.

Hydrologic Balance - Groundwater

Mining within the North Rilda area will have negligible impact on the regional hydrologic balance, but there could be some possible local impact. This section discusses the possible mining-related impact on the hydrologic balance due to:

A. Subsidence - Perched Aquifer Systems,
B. Mining in the Rilda Canyon Area - NEWUSSD Springs, and
C. Interception of Groundwater by Mine Workings
D. Mining Below the Right Fork of Rilda Canyon
E. Mill Fork State Lease ML-48258 Access (Hiawatha Seam)

A. SUBSIDENCE: PERCHED AQUIFER SYSTEMS ABOVE THE MINE HORIZON

As discussed earlier, most of the groundwater in the permit and adjacent areas discharges in the form of seeps and springs. No springs are undermined in the North Rilda area. Only two springs are within the North Rilda mine plan area, 80-50 located in Section 29 and the Rilda Canyon Springs located in Section 28 (refer to Volume 9 Map HM-9 for the location of the springs and Volume 9 - Hydrologic Section of the Deer Creek MRP: Appendix A for sampling sites and monitoring schedule). A Spring Geologic Conditions Inventory sheet has been completed for each spring inventoried on the East Mountain Property and can be found in Volume 9 - Hydrologic Support Information.

PacifiCorp has conducted a series of exploration programs to identify the geologic and hydrologic characteristics of the North Rilda area including the crossing of the right fork of Rilda Canyon (refer to Volume 9 Map HM-10). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the alluvial\bedrock interface. Mainline development below the Right Fork of Rilda Canyon did not intercept any groundwater, and has remained "dry" since initial development.

To identify any mining related impacts PacifiCorp monitors a significant number of springs which have been undermined or will be undermined within the next five years (refer to Volume

9 - Hydrologic Section: Hydrologic Monitoring Schedule and Map HM-5). A field verification meeting will be held each year with the government agencies involved to determine if changes in the springs monitored are required. Each year in the annual Hydrologic Monitoring Report spring flow rates are compared to East Mountain climatology as to how closely spring discharge follows local annual precipitation or to verify any mining related impacts.

Data collected by PacifiCorp continues to show the relationship between the variation in groundwater discharge quantity and precipitation. Hydrologic monitoring completed on the East Mountain property has failed to identify any changes in the quantity or quality of groundwater discharge from the springs which have been undermined. The U.S. Bureau of Mines completed an independent study (1994) of the mining impacts on the Hydrology of East Mountain (Response of Springs to Longwall Coal Mining at the Deer Creek and Cottonwood Mines, Wasatch Plateau, UT., Informational Circular 9405, U.S. Bureau of Mines). PacifiCorp personnel collected the data in this study from springs determined to represent hydrologic conditions on East Mountain. This determination was made by an ad hoc committtee including representatives of DOGM and the Forest Service. This study failed to find any springs that have been impacted by mining (refer to Volume 11 Appendix Volume - Engineering: Appendix A).

B. MINING IN THE RILDA CANYON AREA-NEWUSSD SPRINGS

As discussed in R645-301-721, North Emery Water Users Special Service District (NEWUSSD) collection system, a major concern to PacifiCorp, is located immediately below the mining activities in Rilda Canyon.

PacifiCorp contracted Hansen, Allen & Luce (HA&L) to conduct a hydrologic test in Rilda Canyon. (Refer to Volume 9 - Hydrologic Support Information, Rilda Canyon Pump Test.) The findings from this test were then compared to the Wellhead/Drinking Water Source Protection criteria to determine the appropriate mitigation measures. The local groundwater system in the vicinity of the NEWUSSD springs consists of an unconfined alluvial valley fill aquifer as well as bedrock and fracture systems. Resistivity data provided by PacifiCorp indicate that the total maximum depth of alluvium ranges from 50 to 73 feet at the three locations where cross sections were taken. The locations of the resistivity cross sections within Rilda Canyon are shown on Map HM-7 (refer to Volume 9 - Hydrologic Section). The width of the unconfined aquifer varies due to the influence of side drainages which also feed the area.

Water moving throughout Rilda Canyon appears to originate mainly from the alluvial deposits associated with the right and left forks of Rilda Canyon. Earlier studies indicated two other potential sources; an east-west trending fault which is believed to lie to the north of the canyon floor, and the third is potentially through a north-south trending fault which bisects the canyon just west of the NEWUSSD spring collection system. Extensive surface exploration conducted in Rilda and Mill Fork canyons parallel to the trend have failed to identify structural features which would contribute to the groundwater system.

Springs within Rilda Canyon are believed to indicate and verify the locations of changes in stratigraphy. Examples of local stratigraphy and their impact on hydrology have been verified historically through stream and spring flow observations. The canyon drainage west (or above) the interface with the upper contact of the Star Point Sandstone is generally a discharging stream section. When alluvial waters come in contact with the more impermeable members of the upper Star Point Sandstone formation, they are often forced to the surface, creating springs. Local NEWUSSD springs confirm a recharging stream section. When these more impermeable formations are crossed, the stream once more becomes a losing stream until subsurface waters again come in contact with the more impermeable members of the Star Point Sandstone and underlying Mancos Shale formations. Some sections of the stream within Rilda Canyon gain flow, thereby evidencing the locations where subsurface water is forced to the surface by the tighter formations.

Data collected during and following the pump test of Well P-7 were used to provide estimates of local valley fill aquifer characteristics. For these analyses, data from both pumped P-7 and from observation Well P-6 during both the drawdown and recovery portions of the test were used.

Aquifer transmissivities as determined by the methods described in R645-301-721 range from a low of 6,100 gpd/ft to a high of 35,900 gpd/ft. As a summary of values determined, the following table is provided. The table contains a column identified as "Credibility of Results" which is intended to be a guide to the numbers given. A high credibility rating indicates that the method basically accounts for conditions believed to exist within Rilda Canyon. A medium credibility indicates that, for these conditions, the solution does not appear to fully account for identified field conditions. As outlined in the table, it is believed that long-term transmissivities are on the order of 20,000 gpd/ft and short-term transmissivities are on the order of 35,000 gpd/ft. The variation in results appears to be due to boundary effects created by the canyon walls. If used for further analyses, the short-term transmissivity estimates should govern.

SUMMARY OF CALCULATED TRANSMISSIVITIES

Analysis Used	Data Type	Well Data Used	Estimated Transmissivity (gpd/ft)		Credibility of Results		
			Short-Term	Long-Term	High	Medium	Low
Cooper-Jacob	Drawdown	P-7	35650	17,550-21,000	✖		
Cooper-Jacob	Drawdown	P-6		23600	✖		
Cooper-Jacob	Recovery	P-7	35900	13700	✖	✖	
Theis	Drawdown	P-7	28450	17900	✖	✖	
Neuman	Drawdown	P-7	13150	6100			✖

Groundwater Quantity Based on Pump Test Results

An approximation of the total groundwater flow moving eastward down Rilda Canyon was made using data collected from the resistivity studies completed by PacifiCorp and from data collected at local area wells. The flow approximation was made by applying the general flow equation Q=VA. The area of groundwater flow was determined using the inferred cross sectional area identified in the resistivity study as "R-3" (refer to Volume 9 - Hydrologic Section: Map HM-7) for the canyon adjacent to P-7. The velocity of groundwater movement was determined from the relationship between hydraulic permeability and groundwater gradient, V=ki. Permeability was determined from the estimate for short-term transmissivity obtained using the methods discussed earlier. It was felt that under flow conditions uninfluenced by man, the short-term transmissivity is most representative of natural conditions. Using these relationships, the estimated amount of groundwater moving down Rilda Canyon was determined for both high and low flow conditions.

Based on historic data, low flow conditions were found to dominate during the period of the 1990 pump test; however, it has been noted by PacifiCorp employees that a rise in water level occurs within Rilda Canyon wells each year as the groundwater aquifer responds to snow melt runoff. Historical data reproduced in Figure HF-25 for wells 1 through 5 shows seasonal and annual water level fluctuations (refer to Volume 9 - Hydrologic Section). Note the relative change in water level between wells. Little overall variation is noted except for P-3 which shows changes over time totaling approximately thirteen to fourteen (13-14) feet. Changes recorded in P-3 are likely greater than those indicated by Figure HF-25 because P-3 is only thirty-eight (38) feet deep and water levels have been known to drop below the bottom of the well. A comparison of water level variations between P-3 and adjacent P-7 indicates that the total water level fluctuation may be as much as twenty-two (22) feet, (actual data collected from 1990 through 1996 reveals the maximum rise in water level of approximately twenty eight [28] feet, refer to Annual Hydrologic Monitoring Reports).

Low Flow. The first condition analyzed was based upon the relatively low flow condition found in November 1990. Using the relationship Q=VA as discussed above, the total alluvial valley aquifer flow in the area of P-7 was estimated to be approximately 151 gpm. Subtracting an average pumped Volume of 16.4 gpm from P-7, an estimated flow of 135 gpm bypassed P-7 and continued downstream toward the NEWUSSD spring collection system. Impacts noted upon the NEWUSSD spring system as a result of pumping P-7 appear to be confined to a reduction in flow from the springs on the order of ten percent. Before pumping began, total combined spring flows were approximately 85 gpm. During the later stages of pumping, just prior to termination of the test, spring flows had reduced to approximately 77.5 gpm, indicating a reduction in flow of 7.5 gpm during the pump test. Additional reductions in flow will probably occur as flows continue to stabilize.

As stated above, not all the water moving down Rilda Canyon in the alluvial valley aquifer was collected through pumping of P-7. In order to obtain an estimate of the total possible impact should the entire alluvial aquifer be eliminated as a source of water, a straight line extrapolation was made of pumped flows versus decreased spring flows. A straight line extrapolation of the data in this fashion should be considered an approximation only, not an accurate method of determining precise impacts. At an average pump rate of 16.4 gpm at P-7, NEWUSSD spring flows decreased by approximately ten percent. Assuming all alluvial valley recharge bypassing P-7 was eliminated as a potential source of water, the estimated impact to the NEWUSSD springs (using the straight line extrapolation method) could be approximately 69 gpm. The estimated spring impact based in percent would then be 69 gpm over an uninfluenced flow rate of 85 gpm or eighty-one percent. Using this methodology, the remaining nineteen percent of the flow contributing to the NEWUSSD springs appears to be coming from other sources.

High Flow. High flow conditions were estimated by adding to the 151 gpm base flow calculated for the November 1990 period the additional flow which would move down the canyon given a twenty-two (22) foot rise in water level which would occur during a wet year (actual data collected from 1990 through 1996 reveals the maximum rise in water level of approximately twenty eight [28] feet, refer to Annual Hydrologic Monitoring Reports). The additional flow projected to occur during wet years was estimated by 1) measuring the cross sectional area which would result from a twenty-two (22) foot rise in the water table and 2) by applying the flow relationship Q=kiA. As indicated earlier, the water table gradient (I) used in this equation was found to be greater in 1987 than during the November 1990 test. Based on these assumptions, increased water levels measured during the high flow period of 1987 resulted in an estimated alluvial valley aquifer flow rate of 372 gpm.

Data shows that total NEWUSSD spring flow during high flow periods is typically on the order of 400 gpm (refer to Volume 9 - Hydrologic Section: Figure HF-11). If all alluvial flow entered the springs, then the total impact to the springs resulting from the loss of said flow would be on the order of ninety-three percent (372 gpm/400 gpm). An alternate method of approximating the potential impact is through the use of the same impact ratio as was determined from the low flow pump test completed on P-7. Using this method, the total expected decrease in spring flows during high flow periods would be approximately 170 gpm, or a forty-three percent decrease (170 gpm expected decrease/400 gpm total spring flow).

Wellhead/Drinking Water Source Protection

The State of Utah has been required by the federal government under the Federal Safe Drinking Water Act to establish a Wellhead Protection Program to protect groundwaters that supply drinking water to public water supply systems. Included in this classification is the NEWUSSD spring collection system within Rilda Canyon. During the time frame of the NEWUSSD springs investiagation, (1989-90), the wellhead protection rules were in draft form and were being considered for adoption by the Utah Safe Drinking Water Committee. A brief summary of the proposed draft rules is included as Table HT-11 (refer to Volume 9 - Hydrologic Section). The wellhead protection rules were adopted by the Utah Safe Drinking

Water Committee and referred to as the *"DRINKING WATER SOURCE PROTECTION"* rules, R309-113, on July 26, 1993. Delineation of protection zones and management areas remained unchanged from the draft guidelines listed in Table HT-11 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP).

Based upon information contained in the table, it appears that the property included within Zone 1, a 100-foot radius around the NEWUSSD spring collection system, should be owned by the water supplier and be fenced. In addition, Zone 1 should be protected against anthropogenic sources of contamination. The "Master List of Potential Anthropogenic Sources of Contamination in Utah" as given in R449-113-8.1 includes coal companies within the designation, "Concrete, asphalt, tar and coal companies." Note the designation difference between new and existing sources in the table just discussed in that "new sources" indicates a definitive action whereas "existing sources" indicates that the action "should" be done. This distinction implies that existing facilities will be treated with more latitude than new facilities. It appears that this wording has been added to take into account the many possible configurations of public water supplies wherein little can be done to modify or correct long standing conditions.

Because the area has a characteristically high groundwater velocity, the criteria identified by zones 2 and 3 in the table do not apply. For example, a 250-day travel time for water found within the alluvial aquifer (using a permeability of 167 ft/day as estimated by the pump test results) would be 7.9 miles. Since the criteria require that the zone not extend beyond the natural hydrologic boundaries, the zone is reduced to the limit or extent of the canyon in which the NEWUSSD springs are located. Using this criterion, the north and south limits would include the land to the ridgeline of Rilda Canyon. The west boundary line would be placed at a two mile radius from the NEWUSSD spring collection system, and the east boundary would be located along the contour line 100 feet lower in elevation from the groundwater source. A map showing the approximate groundwater protection zone boundary as defined by the preliminary draft regulation is presented in Figure HF-41 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). It should be noted that this boundary is only an approximation of the two mile radial zone as defined in the regulation, and refinement will be needed as the regulation is further defined.

Spring Impacts

Impacts noted on NEWUSSD springs during the pump test completed in November 1990 were found to be in the range of approximately ten percent. The impacts are based upon the pump test, water level data collected from P-7, other local piezometers, and spring discharge data. Continued pumping beyond the length of the test completed will likely result in additional declines beyond those noted during the seven-day test. The impacts to the springs based upon varying local conditions and flow patterns have been reviewed as a result of this reporting effort. Some of the changes which could potentially occur to the local groundwater system, thereby impacting local springs, are discussed below.

Total Elimination of Alluvial Flow. In the event that all alluvial aquifer flow from the west up Rilda Canyon was eliminated as a spring recharge source, impacts to the NEWUSSD springs may be more severe than forty-two of the ninety-three percent estimate made through the use of pumping test data. Impacts to the NEWUSSD springs would be most severe in the event that local alluvial water provides the majority of the head driving the spring collection system during peak periods. Based on the large fluctuations noted in Well P-3, (replaced with P-7), this appears to be the case. Other flows, including those related to faults and fractures may provide a relatively constant base flow to the spring collection system; however, the majority of impact potential to the springs at this time appears to be related to alluvial recharge.

Elimination of Other Sources. Other sources of spring recharge water include fractures as well as alluvial flow in the side canyon located adjacent to the NEWUSSD springs to the south. Should recharge waters feeding the fractures originate from areas proposed to be mined and mining diverts the water from its natural course, impacts to the springs could be cumulative with those resulting from a reduction of alluvial flow as discussed above. Obviously, under these conditions the impacts will be greater than those estimated herein based upon alluvial flow near P-7 alone.

With the exception of P-3, little seasonal variation was noted in the water level within the wells shown in Figure HF-25 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). The variation noted in P-3 is insufficient; however, to account for the total flow variation measured in the NEWUSSD springs between high and low flow years. High and low flow alluvial recharge from the main canyon area was estimated earlier to be approximately 372 and 151 gpm, respectively. The increase in alluvial recharge is then the difference between the two values, which is 221 gpm; however, the increase in spring discharge between high and low flows has been reported to be approximately 320 gpm, thirty-one percent higher than the total alluvial flow increase originating from the main canyon area. This may indicate that the remaining portion of NEWUSSD spring flows come from either other "non alluvial" sources or additional alluvial flow from the south tributary.

Overall Impact Potential. PacifiCorp conducted a pump test project in Rilda Canyon to determine the groundwater characteristics and source. As documented by the pump test, the major source of groundwater to the Rilda Canyon Springs is from the alluvial deposits (refer to Volume 9 - Hydrologic Support Information, Rilda Canyon Pump Test). The majority of the recharge to the alluvial deposits is from the right fork of Rilda Canyon. Recharge to the alluvial deposits of Rilda Canyon occurs above the Castlegate Sandstone to the west of the mine plan boundary (refer to Volume 9 Map HM-9). Little impact to spring flow may actually occur unless geologic conditions change as a result of mining. Subsidence could potentially result in the development of cracking or fracturing of the subsurface geologic stratum above the mine workings. Local recharge crossing these hypothetically subsided areas could be lost from the spring recharge system, thereby directly affecting local spring flows. Mining below the right fork of the Rilda Canyon drainage will consist of first mining only (main entry development) which will

minimize the potential impacts related to subsidence (refer to Volume 9 Map HM-10 and the approved Deer Creek R_2 P_2 [Refer to Volume 5, Maps 3-6 and 3-7]). Mitigation for the loss of spring flow has been based on the elimination of the alluvial recharge which is unlikely to occur based upon the projected extent of the mine compared to the recharge area. Mitigation efforts based on the worst case scenario have been outlined in the following section.

Mitigation

Through intensive negotiations and investigations of possible alternatives, PacifiCorp and NEWUSSD agreed upon mitigation plan on August 12, 1993. The plan included construction of a slow sand water treatment plant with a 0.5 million gallon storage reservoir (the mitigation alternative information is found in Appendix G of Volume 9 - Hydrologic Section). Construction of the plant and reservoir began in March of 1994 and was completed in November 1994. The plant was brought on-line in November 1994 utilizing Rilda Springs as one of the sources of water. PacifiCorp will continue monitoring springs in Rilda Canyon for potential mining related impacts (refer to Volume 9 - Hydrologic Section: Appendix A).

To alleviate concerns with the Rilda Canyon Portal Facilities, PacifiCorp and North Emery Water Special Service District (NEWSSD) investigated re-locating the Rilda Canyon Springs collection system from their current location to the mouth of the right fork of Rilda Canyon above the portal facilities. The proposed collection system study is shown on Engineering Section Map 500-2. PacifiCorp submitted an investigation plan to the Division outlining hydrologic objectives of the site investigation (refer to Volume 11 Appendix Volume - Hydrology: Appendix D). PacifiCorp has completed the following project phases of the investigation:

1. Drilling a series of hydrologic monitoring wells,
2. Well development and groundwater sampling,
3. Aquifer testing.

Results of the study and field work found the project to be ineffective and economically unfeasible. However, PacifiCorp continued to cooperate with NEWUSSD to develop a cost effective, long term mitigation plan that would offset any loss of spring flow that could potentially be impacted by underground mining activities.

In 2008, PacifiCorp partnered with NEWUSSD to develop an additional water source of Elk Springs and a related spring labeled as 89-61. This complex is located on East Mountain within the main fork of Meetinghouse Canyon (refer to Volume 11 Appendix Volume - Hydrology: Appendix E). The development of these springs as a drinking water source could provide an additional 250-500 gallons per minute to the NEWUSSD culinary system.

Standard source development structures are used to collect water and discharge into a transmission pipeline. The transmission pipeline is routed underground to the steep, vertical decline in the left fork of Meetinghouse Canyon. A horizontal directional borehole was

developed 700 vertical feet through the Castlegate Sandstone outcrop to the canyon floor. A 6 inch transmission pipeline is routed through this borehole and connects to a lower trenched pipeline segment. This lower pipeline route follows a previously disturbed transmission power line corridor to the mouth of the canyon and into the slow sand treatment plant operated by the NEWUSSD. The project allows the NEWUSSD to meet drinking water standards, protect public health and provides the necessary culinary services for the current and projected culinary water use within its service area. This project was completed in the spring of 2009. Additional information needed for this project can be gained by contacting the NEWUSSD.

C. INTERCEPTION OF GROUNDWATER BY MINE WORKINGS

As previously discussed in this section, the Blackhawk Formation consists of interbedded layers of sandstone and mudstone separated by various minable and non-minable coal seams. The sandstone beds-fluvial channel systems are generally massive while the mudstone layers are fine textured and have a tendency to swell when wet and decompose into an impervious clay. Because of the aquiclude formed by mudstone layers in the North Horn Formation and topography, recharge to the Blackhawk Formation is limited, even along major fault systems. Due to the lithologic characteristics of the Blackhawk, both vertical and horizontal migration is constricted.

The interception of groundwater varies and is dependent on several factors. One of the most significant is that when the mine enters previously un-mined country, a significant amount of water is liberated. In virtually all cases the amount of water which flows into the mine exceeds the recharge and, in time, the water inflow decreases in volume. If new areas are not mined, the discharge from the mine will decrease accordingly. As reported in the annual Hydrologic Monitoring reports, flow rates for individual areas including fault zones normally decrease to less than ten percent of the initial flow rate.

Long-term monitoring of water producing zones in both Deer Creek and Wilberg/Cottonwood mines has established that once base flow has been reached, the flow is consistent over time. Monitoring has not indicated any seasonal or yearly variations (refer to the Annual Hydrologic Monitoring reports for in-mine long-term flow information).

As pointed out by Theis (1957), water discharged from a well or, in this case, underground mines, must be balanced by 1) an increase in recharge to the groundwater system, 2) a decrease in natural discharge from the system, or 3) a decrease of groundwater in storage, or by a combination of all of these. As hydrologic studies have shown and monitoring of intercepted groundwater has verified, recharge into the underground workings is limited even in areas of faults and fractures. Based on the hydrologic characteristics of the Blackhawk and the underlying Star Point Sandstone (low porosity and hydraulic conductivities) and data from surface hydrologic monitoring, decrease in the natural discharge of the system is considered to be only a minor factor; therefore, groundwater intercepted in the mine plan area is concluded to be from storage. One factor which verifies this conclusion is rapid dewatering of intercepted groundwater with no apparent change in the surface hydrological system. As the USGS

pointed out in Open File 81-539 and monitoring by PacifiCorp has shown, the majority of surface flow is due to the runoff from the winter snowpack and not from groundwater recharge.

D. MINING BELOW the RIGHT FORK of RILDA CANYON

A portion of the Right Fork area of Rilda Canyon lies within the North Rilda Canyon Permit Application area of the Deer Creek Mine. Due to the environmental sensitivity of the Right Fork area (specifically the sub-surface hydrologic alluvial system and associated surface riparian vegetation zone), a complete analysis of a "no-subsidence / long term stability" design of the 5th North Mains development within the area of the right fork of North Rilda Canyon has been conducted addressing the long term ground stability and subsidence protection of the area with regards to mining. All pre-mining and post-mining conditions have been evaluated based on the best geologic and engineering information currently available (refer to Volume 11 Appendix Volume - Engineering: Appendix A).

The 4th North Mains consists of a 5-entry development section, bearing northwest from the Deer Creek 10th West Mains. Initial location of the 10th West/4th North intersection was based on the following:

(1) Existing Blind Canyon Seam conditions encountered with regard to 10th West Mains development.
(2) Proximity to the projection of the Mill Fork Fault Graben.
(3) Most practical access route to the North Rilda - Blind Canyon and Hiawatha coal reserves, across the North Rilda Canyon Forks area.

A complete analysis of the to location and long term ground stability of the 4th North / 10th West Mains and the Left Fork of Rilda Canyon was prepared and submitted by PacifiCorp to the BLM on November 15, 1996. Approval to proceed with relocation and development of the 4th North Mains was given by the BLM (per letter) February 13, 1997.

With regard to PacifiCorp's North Rilda Area Permit Application, the 4th North Mains were originally projected to be developed northwest (approximately 3000 feet), from the 4th North / 10th West Mains intersection. The mainline development, designated as 5th North, then changed course to a northeast bearing, with development proceeding under the Right Fork area of Rilda Canyon. Selection of the Right Fork stream crossing area was based on the results of an extensive surface exploration program conducted in the Right Fork of Rilda Canyon (refer to Volume 9 Maps HM-9, HM-10). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the alluvial/bedrock interface. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location of the 4/5th North intersection to maximize the overburden in the Right Fork

stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. A fault system referred to as the Mill Fork Canyon Graben is projected to intersect the western portion of Federal Coal Lease U-06039 (refer to Volume 9 Map HM-9). The Mill Fork Canyon Graben was intersected and crossed north of the North Rilda Area mine plan extension in the Beaver Creek No. 4 Mine and consisted of a series of faults with a total displacement of approximately thirty (30) feet. Beaver Creek No. 4 Mine was a relatively dry mine with only few isolated roof drippers associated with the Mill Fork Fault system. In reviewing the exploration data and in-mine information from the development of the 5th North Mains, it appears that the eastern fault of the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon. Deer Creek mine workings have intercepted a small fault of 7' displacement, down on the west side in the Mill Fork Access mains at XC-29, followed by a very small displacement (<1') fault, upthrown on the west side. This small fault "graben," though not in line with the projected fault zone, is almost surely related to it. This fault zone does not appear in any surface outcrops. No groundwater was associated with either fault. If mining intersects faulting related to the Mill Fork Graben during development, permanent seals will be installed to control groundwater if present.

During the development of the 5th North Mains, PacifiCorp monitored intercepted groundwater from all sources including roof drippers and groundwater inflow from floor of the mine as specified in R645-301-200: Groundwater Monitoring. Surface water/groundwater interrelationships were monitored above and below the mine crossing as specified in R645-301-200: Surface Water Monitoring. Mainline development below the Right Fork of Rilda Canyon did not intercept any groundwater, and has remained "dry" since initial development.

E. MILL FORK STATE LEASE ML-48258 ACCESS (HIAWATHA SEAM)

Mill Fork State Lease ML-48258 Access: Based on data acquired through surface coal exploration programs, Energy West developed a mine plan to access the Mill Fork State Lease with a set of 6-entry mains driven on a northwest bearing from the 6th North Mains. Mining within the Mill Fork Access corridor will be restricted to mainline development. To ensure long term stability, pillars will not be removed.

As stated earlier, in Structural Hydrologic Features, a fault system referred to as the Mill Fork Canyon Graben is projected to intersect the western portion of Federal Coal Lease U-06039 (refer to Volume 9 Map HM-9). The Mill Fork Canyon Graben was intersected and crossed to the north of the North Rilda Area mine plan extension in the Beaver Creek No. 4 Mine and consisted of series of faults with a total displacement of approximately thirty (30) feet. PacifiCorp has conducted extensive exploration programs to delineate the Mill Fork Graben including a series of close spaced drill holes in the Right Fork of Rilda Canyon. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvial/colluvial fill (estimated at 2 - 5 GPM) near the alluvial/bedrock

interface. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location of the 4/5th North intersection to maximize the overburden at the Right Fork stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. In reviewing the exploration data and in-mine information from the development of the 5th North Mains, it appears that the eastern fault of the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon (refer to Volume 9 map HM-9).

Deer Creek mine workings have intercepted a small fault of 7' displacement, down on the west side in the Mill Fork Access mains at XC-29, followed by a very small displacement (<1') fault, upthrown on the west side. This small fault "graben," though not in line with the projected fault zone, is almost surely related to it. This fault zone does not appear in any surface outcrops. No groundwater was associated with either fault.

Hydrologic studies conducted in association with the coal leasing to the north and northwest of the North Rilda Area identified the Mill Fork Graben as a potential source of recharge for the Little Bear Spring. PacifiCorp participated in these studies and provided funding for the second phase.

Little Bear Spring is a large spring (average flow of approximately 300 gpm) which issues from the lowest member of the Star Point Sandstone (Panther Member) located approximately two miles to the northeast of the North Rilda Area in Section 9, Township 16 South, Range 7 East. The spring was developed in 1960 by Huntington City and is currently maintained by Castle Valley Special Service District (CVSSD). Little Bear Spring provides sixty five (65) percent of the culinary water for the cities of Huntington, Cleveland and Elmo.

As stated in the Mill Fork Environmental Assessment (EA) competed in 1997, Little Bear Spring flows continuously, with average monthly discharge ranging from two hundred (200) to four hundred forty (440) gpm (CVSSD, 1997). Flow varies seasonally, with a typical increase of twenty (20) to forty (40) percent in response to spring runoff. The lowest average monthly baseflow recently measured was one hundred ninety eight (198) gpm in April 1995. Isotopic analyses performed to evaluate the age of water indicated that the spring discharges modern water, and is similar in composition to water in both Crandall and Huntington Creeks (Mayo and Associates, 1997). Further chemical analyses show that water from Little Bear Spring is very similar to surface water in both Little Bear and Huntington Creeks. Water quality in the spring is good, requiring only chlorine treatment before it is suitable for consumptive use.

Based on previous reports and field observations, the spring emanates from western fault of the Mill Fork graben. The graben is approximately one thousand (1,000) feet wide and trends from the southwest to the northeast at approximately north thirty (30) degrees east. Much of the geologic and hydrologic detail concerning the fault system was derived from the mining history of the Beaver Creek #4 Mine located in Mill Fork Canyon. Mining in the #4 Mine encountered the eastern fault (down thrown approximately thirty (30) feet on the west) of a

small graben as entries were driven northwest from the portals in Mill Fork Canyon. Rock slopes were developed through the fault system down to the coal seam level. Mining proceeded across the graben to the western up thrown fault (up thrown approximately twenty nine (29) feet on the west). A second set of rock slopes were developed to access coal reserves to the west of the graben. Coal reserves diminished rapidly to the west and the mine was eventually closed and reclaimed. Mining across and within the graben encountered only minor quantities of groundwater and flow of Little Bear Spring was not impacted.

The potential source of recharge for the graben system identified in these studies was Mill Fork Canyon. Water flowing down Mill Fork Canyon enters the alluvial system above/near the southern trace of the graben and provides recharge to the fault systems associated with Little Bear Spring.

Physically, the North Rilda Area (including the Mill Fork State Coal Lease Access) is separated from Little Bear Spring by Mill Fork Canyon. As indicated above, the Mill Fork Canyon Graben was intersected and crossed to the north of the North Rilda Area in the Beaver Creek # 4 Mine. The mine was a relatively dry mine with only few isolated roof drippers associated with the Mill Fork Fault system and Little Bear Spring was not impacted due to mining.

The potential for mining activities in the North Rilda Area (including the Mill Fork State Coal Lease ML-48258 Access) to impact Little Bear Spring is believed to be minimal for several reasons;

1) Little Bear Spring is located two miles north of the North Rilda Area,
2) There is a physical barrier between the North Rilda Area and Little Bear Spring - Mill Fork Canyon,
3) Exploration data and in-mine information from the development of the 5th North Mains, indicates that the displacement associated with the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon,
4) Mining within the Mill Fork State Coal Lease access will be restricted to development mining only (no subsidence is projected),
5) Mining in the Mill Fork State Coal Lease access will be within the Hiawatha coal seam which is located approximately two hundred feet stratigraphically above the source of the Little Bear Spring,
6) Mining north the North Rilda Area (Beaver Creek #4 Mine) which intercepted and penetrated the Mill Fork Graben (identified as a potential source of groundwater recharge) did not impact the flow of Little Bear Spring.

Little Bear Spring Mitigation: If mining intersects faulting related to the Mill Fork Graben during development, permanent seals will be installed to control unusual or atypical groundwater if present. PacifiCorp will utilize a pressure grout system to limit groundwater infiltration. In addition, PacifiCorp will monitor groundwater as detailed in the following section; R645-301-731.200: Water Monitoring: Groundwater B: In-Mine.

Depletion of Storage

Three main areas-types of groundwater depletion have been documented to occur within the East Mountain mine plan area. They include: 1) fluvial sandstone channel systems, 2) faults and fractures, and 3) structural low areas. Each area-type will be discussed separately as it pertains to the North Rilda area.

1. *Fluvial Sandstone Channel Systems*

The majority of the intercepted groundwater was confined to dewatering or perched fluvial sandstone systems. The sandstone channels (ancient river systems) overlie and scour into the underlying strata (refer to Volume 9 - Hydrologic Section: Maps HM-2 and HM-3). The locations of the channels shown on HM-2 and HM-3 are based on data collected from in-mine mapping and numerous drill holes, both in-mine and surface, thathave been completed on the property. These channel systems were part of a deltaic depositional setting active during and after the coal-forming peat accumulation. The largest influx of water originates from the roof when mining advances beneath sandstone top. The sandstone, which is semi-permeable and porous, affords an effective route of water transport. Mudstone, siltstone, and interbedded materials generally act as aquicludes which impede water flow unless fracturing of the formation has allowed for secondary permeability. Of the water producing areas, those closest to the active mining face exhibit the greatest flows. As mining advances, the area adjacent to the active face continues to be excessively wet and previously mined wet areas experience a decrease in flow. Data collected from 1978 through 1996 indicate a ninety percent reduction in water flows from roof sampling sites over a five-month period (or less) as the mining face is advanced (review annual Hydrologic Monitoring reports). It has also been noted that the outermost entries of a multiple entry system remain wet for a longer period of time than the inner entries. It appears that the water source is being dewatered since excavated areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, i.e., a perched aquifer, or have a limited recharge capacity, i.e., poor horizontal and vertical permeability. Figure HF-42 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP) depicts an idealized view of the dewatering process.

To monitor and to quantify the effects of dewatering the perched aquifers overlying the coal seams and on the Star Point Sandstone, PacifiCorp installed a series of holes both in the Deer Creek and Cottonwood/Wilberg mines. These holes are located in main development entries and are shown on maps HM-2 and HM-3 (hole development information can be found in Volume 9 - Hydrologic Support Information). Holes in the Cottonwood/Wilberg Mine were developed in the upper member of the Star Point Sandstone - Spring Canyon. Pressure transducers were installed and monitored on a continuous basis to quantify the impacts to the Star Point Sandstone due to dewatering of the isolated perched aquifers above the Hiawatha Seam. As shown in Figure HF-44 (refer to Volume 9 - Hydrologic

Section of the Deer Creek MRP) the water elevations remained constant over time with no apparent evidence of an impact-cone of depression due to dewatering of the perched aquifers. In the Deer Creek Mine a series of holes was developed in the lower portion of the Blackhawk and upper member of the Star Point Sandstone. These holes are located along the axis of the Straight Canyon Syncline and are in close proximity to the Roans Canyon Fault system (see HM-2). Monitoring of these wells has shown a decline of between two to seven feet in elevation thought to be related to interception of groundwater in the development entries off 4th South, Deer Creek Mine. Mining in the 4th South area was completed in May of 1992 and seals were installed in 4th South between crosscuts 24 and 25 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP: Figure HF-45). Monitoring of a well adjacent to the sealed area (3rd North xc-8) revealed the level of the water returned pre-mining level within approximately two years of the seal installation (refer to the 1995 Hydrologic Monitoring Report). To develop an possible area of influence-cone of depression on a regional basis, PacifiCorp installed a series of groundwater monitoring wells in Cottonwood Canyon downgradient of future mining north of the Roans Canyon Fault system (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP: Appendix F).

Lithologic and hydrologic characteristics of the North Rilda area were evaluated through a series of exploration programs conducted from 1979 through 1996. A total of sixteen (16) surface exploration holes were completed utilizing both conventional drilling techniques and helicopter supported operations. Even though sandstone deposits exist overlying the coal seams no measurable water quantities were detected during the drilling operations.

2. *Faults and Fractures*

Another source of intercepted groundwater is faults and fractures, especially in the Deer Creek Mine. As discussed in the permit and adjacent area geology (see R645-301-721) the strata within the property have been offset by a series of north-south trending fault zones. Generally, the faults are nearly vertical and do not have significant amounts of fault gouge or drag associated with them. One of the major faults present in the region, the Pleasant Valley Fault, has been intersected in both the Deer Creek and Wilberg mines.

The Pleasant Valley Fault consists of two parallel fractures about 150 feet apart. The faults' total displacement (where it was intersected in the Deer Creek Mine) to the north is 150 feet with its down thrown side on the east. The displacement diminishes to less than one foot where it was intersected in the Wilberg Mine near the south end of the property. Where the fault has been intersected by mine workings, groundwater inflow has been insignificant.

Another north-south trending fault, the Deer Creek Fault, is present to the east of the Pleasant Valley Fault. It limits the eastward development of the Wilberg/Cottonwood and Deer Creek mines and also forms an aquiclude

preventing water migration to the east. The displacement of the Deer Creek Fault ranges from 100 to 170 feet with the east block being down thrown.

A northeast-southwest trending fault system, the Roans Canyon Graben, is present along the axis of the Straight Canyon Syncline. The system contains up to six normal faults having displacements ranging from a few feet to over 150 feet. Coal deposits present to the north of the fault have been accessed through rock tunnels driven from the 3rd North section of the Deer Creek Mine.

Based upon the extensive surface exploration programs and surface mapping, no faulting is projected within the proposed mine plan (refer to Volume 9 Map HM-9). The projection of the Mill Fork Canyon fault system is to the west of the proposed mine plan area (refer to Volume 9 Map HM-9).

3. *Structural Low Areas*

Structural features such as the Roans Canyon Fault Graben, the Straight Canyon Syncline, and the Deer Creek Fault, had an influence on the hydrologic regime south of North Rilda within the East Mountain mine plan area (detailed in Volume 9 - Hydrologic Section). Geology of the North Rilda Area is less complex than that of central portion of the East Mountain property (see Volume 8 - Geology Section). The fault system that crosses Mill Fork canyon (referred to as the Mill Fork Canyon fault system) trends to the west of the projected mine workings. The Mill Fork Canyon fault system was intersected and crossed to the north of the North Rilda mine plan extension in the Beaver Creek Coal Company No. 4 Mine. The graben consisted of series of faults with a total displacement of approximately thirty (30) feet. Beaver Creek No. 4 Mine was a relatively dry mine with only few isolated roof dippers associated with the Mill Fork Fault system.

Water Quality

The mines in the coal fields of the Wasatch Plateau tend to act as interceptor drains. The groundwater that is brought to the surface has a lower dissolved solids content than would have existed were the water to continue its downward movement through shale layers, dissolving increased amounts of salt with distance (Southeastern Utah Association of Governments, 1977; Vaughn Hansen Associates, 1979; Danielson et al., 1981). The quality also decreases vertically because of the influence of marine sediments as well as along the trend of decreasing quality from north to south.

Post Mining

The monitoring of in-mine water sources has shown that the long-term water flow from a given area is much less than ten percent (10%) of the initial flow from the area. Most of the current inflow into the mine workings is from areas where water storage has not been depleted. After the storage has been depleted, the flow will reduce to roughly equal the recharge rate which is

expected to be less than ten percent (10%) (data presented earlier in this report) of the current discharge rate.

Post mining discharge from the North Rilda Area is not anticipated due to the limited extent of the groundwater resources. As discussed in section 721: GENERAL REQUIREMENTS - EXISTING GROUNDWATER RESOURCES: PERMIT AND ADJACENT AREA GROUNDWATER CHARACTERISTICS groundwater resources in the the North Rilda Area is limited due to several factors including; stratigraphic controls, limited surface area for infiltration, topographic configuration of the area (incised canyons), and outcropping of the Star Point Sandstone Formation around the entire North Rilda Ridge. If intercepted perched aquifers are encountered in the North Rilda Area, water will migrate downdip to the south/southeast, (refer to Volume 8 - Geologic Section of the Deer Creek MRP for structual contour maps of the Blind Canyon and Hiawatha seams). If the impounded water exceeds the capacity of the abandoned workings, water from the North Rilda Area will migrate to the northern portion of 3rd North and eventually flow to the south/southwest.

R645-301-729 Cumulative Hydrologic Impact Assessment (CHIA)

The Division provides an assessment of the probable cumulative hydrologic impacts of the coal mining and reclamation operation and all anticipated coal mining and reclamation operations upon surface and groundwater systems in the cumulative impact area. The CHIA can be reviewed at the Division's offices in Salt Lake City.

R645-301-730 OPERATION PLAN

Water Monitoring Location Map: refer to Volume 9 - Hydrologic Section: Map HM-1.

R645-301-731 General Requirements

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 of the individual PAP's). Volume 11 - North Rilda Area details the plan to minimize disturbance to the hydrologic balance related to the Rilda Canyon Portal Facilities, to prevent material damage, and to support approved post-mining land use.

R645-301-731.100 Hydrologic Balance Protection

R645-301-731.110 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.

R645-301-731.120 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. PacifiCorp developed a Drainage and Sediment Control Plan to protect the surface and groundwater resources in the area of the Rilda Canyon Portal Facilities which includes: the fan portal access, mine facilities, topsoil storage area. The Drainage and Sediment Plan will ensure protection of water resources by handling soil, overbuden and refuse from previous mining activities in such a manner to minimize discharge of pollutants to the hydrologic regime. Details of the Drainage and Sediment Control Plan will be presented in Volume 11 Appendix Volume - Hydrology: Appendix B.

R645-301-731.200 Water Monitoring

Groundwater

Groundwater within the East Mountain mine plan area (including North Rilda area) will be monitored according to the schedules in Appendix A (refer to Volume 9 - Hydrologic Section). Monitoring equipment, structures used in conjunction with monitoring the quality and quantity of groundwater on-site and off-site will be properly installed, maintained, operated, and will be removed by PacifiCorp when approved by the Division.

Groundwater will be monitored and data will be submitted in an electronic format to the Division's Coal Water-Quality Database quarterly for each monitoring location. Monitoring subimittals will include analytical results from each sample taken during the quarter. When the analysis of any groundwater 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.

PacifiCorp has conducted baseline and operational monitoring of the groundwater resources in and adjacent to the North Rilda mine plan area. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining. Monitoring of the following groundwater resources will proceed through mining and continue during reclamation until bond release. Removal of the groundwater monitoring structures, *(Rilda Canyon piezometers)*, will be approved by the Division in conjunction with the Utah State Division of Water Rights.

A. *East Mountain Springs*: No springs will be undermined in the North Rilda area. Only two springs are within the North Rilda mine plan area, 80-50 located in Section 29 and the Rilda Canyon Springs located in Section 28 (refer to Volume 9 Map HM-9). Spring 80-50 will be monitored during the months of July and October (included in the East Mountain Spring Monitoring Program, refer to Volume 9 - Hydrologic Section: Appendix A). Rilda Canyon Springs will be monitored in cooperation with NEWUSSD on a monthly basis for flow and quarterly for quality. Parameters analyzed

are those listed in the "DOGM Guidelines for Groundwater Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A).

B. *In-Mine*: Intercepted groundwater sampling sites, (either roof drippers or contribution from the floor), will be established according to the Special Condition Stipulation in the Deer Creek permit renewal, (February 6, 1996), "*If during entry development, sustained quantities of groundwater are encountered which are greater than 5 gpm from a single source in an individual entry, and which continue after operational activities progress beyond the area of groundwater production, PacifiCorp must monitor these flows for quality and quantity under the approved monitoring plan*". In addition to the standard plan described above, if mining encounters significant quantities of groundwater which issues from a fault zone, PacifiCorp will; quantify the volume, sample for water quality according to the approved monitoring plan (baseline parameters for two year period), conduct isotopic sampling using a systematic approach (phase 1: tritium analysis, phase 2: depending the results of the tritium sampling, perform carbon age dating). Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A).

C. *Waste Rock Wells:* One water sample will be collected and analyzed per location quarterly. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A).

D. *Rilda Canyon Springs - NEWUSSD:* One water sample will be collected and analyzed per location quarterly. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A).

E. *Rilda Canyon Wells - NEWUSSD Spring Area:* Water level will be monitored on a monthly basis depending upon access (refer to Volume 9 - Hydrologic Section: Appendix A).

Surface Water

PacifiCorp has conducted baseline monitoring of surface waters within and adjacent to the mine plan area (refer to Annual Hydrologic Monitoring Reports). Long-term monitoring sites in Rilda Canyon have been equipped with Parshall style flumes to facilitate monitoring. 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 the 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 Volume 9 - Hydrologic Section).

Surface water will be monitored and data will be submitted in an electronic format to the Division's Coal Water-Quality Database quarterly 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

To characterize the acid-forming potential of the strata encountered during mining, PacifiCorp collected samples of the immediate roof, mid-seam, and floor. All samples were analyzed by a certified laboratory according to the "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. Data collected and reported in R645-301-600 Geologic Section and Volume 11, Mill Fork Lease Geologic Section, reveals overburden encountered in the mine is non-acid/non-toxic forming; refer to R645-301-600 Geologic Section. As discussed in the R645-301-500 Engineering Section, all coal produced from the North Rilda/Mill Fork Lease will be transported to the facilities in Deer Creek Canyon. Under normal operations, waste rock encountered in the mine will be left in-place or transported to the Deer Creek Waste Rock Storage Site, refer to Volume 10. In addition, a temporary containment area will be designated at the Rilda Canyon Portal Facilities for incidental quantities of waste rock which will be transported to the Deer Creek Waste Storage Site for final placement.

R645-301-731.400 Transfer of Wells

Before final release of bond, exploratory or monitoring wells will be sealed in a safe and environmentally sound manner in accordance with R645-301-631, R645-301-738, and R645-301-765. With the prior approval of the Division, wells may be transferred to another party for further use. However, at a minimum, the conditions of such transfer will comply with Utah and local laws and the Permittee will remain responsible for the proper management of the well until bond release in accordance with R645-301-529, R645-301-551, R645-301-631, R645-301-738, and R645-301-765.

R645-301-731.521 Surface Entries and Accesses to Underground Workings

Underground access to the Rilda Canyon Portal Facilities is achieved by the continuation of a set of three entry 1st Right Submains and development of two rock slopes to the portal facility area near the intersection of the right and left forks. All of the development has occurred in the Hiawatha coal seam or the Starpoint Sandstone just beneath it. During the development

of the Rilda Canyon Portal Facilities two separate surface breakouts were constructed; 1) Mine Fan; and 2) Intake Access (refer to R645-301-500 Engineering Section). Both portals were developed from underground as rocks slopes developed through the upper member of the Star Point Sandstone (Spring Canyon Member). The slopes extend from the portal facility area to an interception point in the Hiawatha Coal Seam. Inclination (dip) of the Hiawatha seam prevents water from discharging at the portal facilities. No groundwater ~~is~~ was intercepted during the development of the intake rock slope therefore, no post mining gravity discharge from the Rilda Portal is expected.

R645-301-731.530 State-appropriated Water Supply

PacifiCorp will promptly replace any State-appropriated water supply that is contaminated, diminished or interrupted by UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES conducted after October 24, 1992, if the affected water supply was in existence before the date the Division received the permit application for the activities causing the loss, contamination or interruption. The baseline hydrologic and geologic information required in R645-301-700 will be used to determine the impact of mining activities upon the water supply.

R645-301-731.600 Stream Buffer Zones

Mining related activities will not occur within 100 feet of a perennial or intermittent stream unless the Division authorizes such activities.

As mentioned in the PROBABLE HYDROLOGIC CONSEQUENCES DETERMINATION section, (728: Hydrologic Balance - Surface Water System), the drainages conveying runoff away from the mine plan areas are streams in Rilda, and Mill Fork canyons. Second mining (ie. longwall extraction, room & pillar, of the North Rilda area) will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining (ie. mainline, gateroad development) will occur below the right fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence" design of the 4/5th North Mains development within the Right Fork of Rilda and the long-term stability analysis, refer to the Volume 11 Appendix Volume - Engineering: Appendix A. To protect the alluvial/colluvial system of the Right Fork of Right Fork of Rilda Canyon, a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the right fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted from full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood,

and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

The undisturbed area, adjacent to the disturbance associated with the Rilda Canyon Portal Facilities, are drained by ephemeral drainages on the south facing slope of North Rilda Ridge which are tributaries to Rilda Creek. The undisturbed drainages report to Rilda Creek through a series of culverts passing beneath below the facility. Stream buffer zones ~~will be~~ are maintained along Rilda Creek. Portions of the facilities will be within one hundred (100) feet of Rilda Creek. Buffer signs have been installed along Rilda Creek to indicate the area which beyond no disturbance shall take place.

Water quality of Rilda Creek is protected from potential impacts associated with the Rilda Canyon Portal Facilities through a combination sediment control structures and revegetation (refer to R645-301-300 Biology Section for interim revegetation and Volume 11 Appendix Volume - Hydrology: Appendix B for Drainage and Sediment Control Plan).

R645-301-731.700 Cross Section and Maps

A water supply intake system known as "North Emery Water Users Special Service District - Rilda Canyon Springs" is located in Section 28, Township 16 South, Range 7 East (refer to Volume 9 Map HM-9, a detailed drawing of the collection system is provided in Volume 9 - Hydrologic Section of the Deer Creek Mine MRP). The intake system consists of a series of french drains collecting near surface alluvial water as a supply source for culinary water (for complete description of the NWEUSSD system refer to R645-721 "Existing Groundwater Resources").

R645-301-731.800 Water Rights and Replacement

In order to fulfill the requirements to restore the land affected by applicant's mining operations to a condition capable of supporting the current and post-mining land uses stated herein, the applicant will replace water determined to have been lost or adversely affected as a result of applicant's mining operations if such loss or adverse impact occurs prior to final bond release. The water will be replaced from an alternate source in sufficient quantity and quality to maintain the current and post-mining land uses.

As outlined in the Existing Groundwater and Surface Resources and Probable Consequences Determination, second/full extraction mining of the North Rilda Area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur below the stream channels of these canyons. No springs will be undermined in the North Rilda Area. First mining (ie. mainline, gateroad development) will occur below the right fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence" design of the 4/5th North Mains development within the Right Fork of Rilda and the long-term stability analysis refer to the Volume 11 Appendix Volume - Engineering: Appendix A. To protect the alluvial/colluvial system of the right fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the lowest seam to be mined -

Hiawatha Seam. The riparian zone within the right fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill and the canyon's side slopes. The angle of draw was calculated from the lowest seam to be mined, Hiawatha, horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. If necessary to prevent groundwater infiltration below the right fork of Rilda Canyon, PacifiCorp will utilize a pressure grout system similar to the technique applied at the Roans Canyon Fault to limit groundwater infiltration.

R645-301-732 Sediment Control Measures

732.100 Siltation Structures. Siltation structures will be constructed and maintained to comply with R645-301-742.214 (refer to R645-301-740). Any siltation structure that impounds water will be constructed and maintained to comply with R645-301-512.240, R645-301-514.300, R645-301-515.200, R645-301-533.100 through R645-301-533.600, R645-301-733.220 through R645-301-733.224, and R645-301-743.

R645-301-732.200 Sedimentation Ponds

Sedimentation ponds whether temporary or permanent, will be designed in compliance with the requirements of R645-301-356.300, R645-301-356.400, R645-301-513.200, R645-301-742.200 through R645-301-742.240, and R645-301-763. No permanent structures including sediment ponds are planned for the Rilda Canyon Portal Facilities. A Temporary sediment pond has been constructed below the surface facilities designed with a emergency spillways that will safely discharge a 25-year, 6 hour precipitation event (refer to R645-301-742.220 and Volume 11 Appendix Volume - Hydrology: Appendix B).

The sediment pond was designed to contain the volume of a 10yr/24 hour event over an area of approximately 9.0 acres. This was the acreage of the original facilities design. Because the site area that actually reports to the pond has been reduce to approximately 3.5 acres, and includes a sediment basin with a water holding capacity, it is not expected that the emergency spillway will ever be used.

R645-301-732.300 Diversions

All diversions have been constructed and will be maintained to comply with the requirements of R645-301-742.100 and R645-301-742.300.

R645-301-732.400 Road Drainage

All roads have been constructed and will be maintained and reconstructed to comply with R645-301-742.400.

R645-301-733 Permanent and Temporary Impoundments

No permanent structures including impoundments are planned for the Rilda Canyon Portal Facilities. A Temporary impoundment (sediment pond and containment berms) has been designed and constructed as specified by the R645-301-733 and R645-301-743 (refer to R645-301-743 and Volume 11 Appendix Volume - Hydrology: Appendix B for design specifications).

R645-301-734 Discharge Structures

Discharge structures have been constructed and will be maintained to comply with R645-301-744.

R645-301-735 Disposal of Excess Spoil

Excess spoil material generated during the construction of the return and intake portals to access the Hiawatha coal seam was stored underground.

R645-301-736 Coal Mine Waste

An area designated for the disposal of coal mine waste and coal mine waste structures has been constructed and will be maintained to comply with R645-301-746 (refer to Volume 11 Map 500-2 for the location of coal mine waste temporary storage area).

R645-301-737 Non-Coal Mine Waste

Non-coal mine waste will be stored and final disposal of non-coal mine waste will comply with R645-301-747.

R645-301-738 Temporary Casing and Sealing of Wells

Each well which has been identified in the approved permit application to be used to monitor ground water conditions will comply with R645-301-748.

R645-301-740 DESIGN CRITERIA AND PLANS

R645-301-741 General Requirements

PacifiCorp will design, construct and maintain sediment control measures using the best technology currently available to:

a. Prevent, to the extent possible, additional contributions of sediment to stream flow or to runoff outside the permit area;
b. Meet the effluent limitations under R645-301-751; and
c. Minimize erosion to the extent possible.

Sediment control measures include practices carried out within and adjacent to the disturbed area. The sedimentation storage capacity of practices in and downstream from the disturbed areas will reflect the degree to which successful mining and reclamation techniques are applied to reduce erosion and control sediment. Sediment control measures consist of the utilization of proper mining and reclamation methods and sediment control practices, singly or in combination. Sediment control methods include, but are not limited to:

a. Retaining sediment within disturbed areas;
b. Diverting runoff away from disturbed areas;
c. Diverting runoff using protected channels or pipes through disturbed areas so as not to cause additional erosion;
d. Using straw dikes, riprap, check dams, mulches, vegetative sediment filters, dugout ponds and other measures that reduce overland flow velocities, reduce runoff volumes or trap sediment.
e. Paving.

R645-301-742.200 Siltation Structures

Additional contributions of suspended solids and sediment to streamflow or runoff outside the permit area will be prevented to the extent possible using the best technology currently available.

742.212 Siltation structures for an area will be constructed before beginning any coal mining and reclamation operations in that area and, upon construction, will be certified by a qualified registered professional engineer to be constructed as designed and as approved in the reclamation plan.

742.213 Any siltation structures which impounds water will be designed, constructed and maintained in accordance with R645-301-512.240, R645-301-514.300, R645-301-515.200, R645-301-533.100 through R645-301-533.600, R645-301-733.220 through R645-301-733.224, and R645-301-743.

For complete details concerning design, construction and maintenance of sediment control measures, siltation structures, sedimentation pond, and impoundments refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan.

R645-301-742.220 Sedimentation Pond

The Rilda Canyon Portal Facilities include construction of a single sedimentation pond located at the eastern extent of the disturbed area (refer to R645-301-500 Engineering Section Map 500-2). Analysis utilized to determine the size and hydraulics related to the construction and operation of the sedimentation pond is included Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan.

The sediment pond for the Rilda Canyon Portal Facilities includes the construction of single sedimentation pond designed and constructed to store the volume of two consecutive 10-year, 24-hour precipitation event. Sedimentation pond designs ~~will~~ comply with R645-301-742.220 and does not meet the sizing criteria of the MSHA, 30 CFR 77.216(a).

Therefore, as required by R645-301-742.223, the pond has been design and constructed that primarily on storage to control runoff and is equipped with a single non-erodible open channel. This spillway is designed to safely discharge a 25-year, 6-hour or larger precipitation event.

Decanting of the pond, as required, will be accomplished by use of a portable pump with an inverted inlet, and pumping capacity of 100 gpm or greater. Decanting activities will only occur with Division of Water Quality approval with concurrence from DOGM.

R645-301-742.230 Other Treatment Facilities

Site development related to the Rilda Canyon Portal Facilities is up gradient of the Rilda Canyon Springs. The site has been graded and paved to allow construction of the mine entries, facilities pad, and ancillary facilities on relatively flat areas. All grading and paving has been sloped away from the receiving stream/Rilda Canyon Springs and drains to a drop drain and culvert system that is diverted to a sediment basin minimizing potential impacts.

As stated previously, two separate drainage systems are provided at the Rilda Canyon portal facility site and are classified as "undisturbed" and "disturbed" collection systems. The "undisturbed" system collects overland runoff water above the portal site and from side slopes adjacent to the site and conveys it past the disturbed area into the natural channel of Rilda Canyon Creek. The "disturbed" collection system collects runoff from and storage areas and conveys it to a temporary sedimentation basin east of the facilities pad. Flows that exceed the holding capacity of the sediment basin is diverted to the sediment pond.

R645-301-742.240 Exemptions

It is anticipated during the design process that disturbed areas which cannot be reasonably treated by the sedimentation pond due to remote geographic locations and small areas not justifying a sediment pond but which cannot meet effluent limitations without treatment are considered Alternative Sediment Control Areas (ASCA). These areas will be treated by the

best control technology available which includes, but is not limited to: silt fences, berms, catch basins, strawbales, gravel filter dikes, check dams, sediment traps and mulches. A list of the ASCA's including type of treatments within the Rilda Canyon Portal Facility area is discussed in Volume 11 Appendix Volume - Hydrology: Appendix B. Locations of each ASCA is found on Map 700-5.

R645-301-742.300 Diversions

Two separate drainage systems will be provided at the Rilda Canyon Portal Facility site and will be classified as "undisturbed" and "disturbed" collection systems. The "undisturbed" system collects water above the portal site and from side slopes adjacent to the site and will convey it past the disturbed area into the natural channel of Rilda Canyon Creek. The "disturbed" collection system collects runoff from portal area, storage areas and conveys it to a temporary sedimentation basin east of the facilities pad. Flows that exceed the holding capacity of the sediment basin are diverted to the sedimentation pond.

Undisturbed Drainage System
The undisturbed drainage control plan consists of a series of properly designed ditches and culverts which effectively divert undisturbed drainage beneath the disturbed area to Rilda Creek.

Disturbed Drainage System
The "disturbed" collection system collects runoff from roads, storage areas, and portal area conveying it to a temporary sedimentation basin east of the facilities pad. Flows that exceed the holding capacity of the sediment basin are diverted to the sedimentation pond. This system will consist of concrete catch basins, small-diameter CMP culvert and open ditches designed to adequately collect and pass peak flow from a 10 yr./6 hr. precipitation event (refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan for details related to the design and construction of the diversion structures).

Maintenance on the above drainage system consists of annual inspection and cleaning of all culverts, inlets and ditches. Trash and debris are removed and the system is checked for damage which might require repair to ensure proper operation of the system.

During mine-site reclamation, all diversions will be removed and the drainages re-established. Details are included in Volume 11 Appendix Volume - Hydrology: Appendix B.

R645-301-742.320 Diversion of Perennial and Intermittent Streams

The location and placement of the Rilda Canyon Portal facilities eliminates the need to divert any perennial or intermittent streams.

R645-301-742.330 Diversion of Miscellaneous Flows

742.331 Miscellaneous flows, which consist of all flows except for perennial and intermittent streams, are diverted away from disturbed areas if required or approved by the Division. Miscellaneous flows include ground-water discharges and ephemeral streams. Undisturbed runoff from un-named ephemeral drainages is collected by culvert inlet structures and conveyed through a corrugated steel pipe system to Rilda Creek. Side slopes adjacent to the ephemeral drainages will be collected through a series of designed ditches, drop inlets and culverts located at the toe-of-slopes and conveyed to the undisturbed bypass culverts (refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan).

742.332 The design, location, construction, maintenance, and removal of diversions of miscellaneous flows meet or will meet all of the performance standards set forth in R645-301-742.310. Refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan for design, location and maintenance schedule related to the diversion of miscellaneous flows. Removal and reclamation of the diversion structures is covered in R645-301-550 of this volume.

742.333 The requirements of R645-301-742.312.2 have been met as the temporary diversions for miscellaneous flows are designed so that the combination of channel, bank and floodplain configuration is adequate to pass safely the peak runoff of a 2-year, 6-hour precipitation event for a temporary diversion (refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan).

R645-301-742.400 Road Drainage

742.410 All roads associated with the Rilda Canyon Portal Facilities have been designed to ensure environmental protection and safety appropriate for their planned duration and use, including consideration of the type and size of equipment used, the design and construction or reconstruction of roads will incorporate appropriate limits for surface drainage control, culvert placement, culvert size, and any necessary design criteria established by the Division.

742.412 The Rilda Canyon Portal Facilities is located adjacent to Emery County Road #306. No part of any road is located in the channel of an intermittent or perennial stream and is in accordance with applicable parts of R645-301-731 through R645-301-742.300.

742.413 Roads are located to minimize downstream sedimentation and flooding.

R645-301-742.420 Primary Roads

To minimize erosion, all primary roads are located, insofar as practical, on the most stable available surfaces. Design of the Rilda Canyon Portal Facilities includes one (1) primary road - Facility Access Road (refer to R645-301-534).

R645-301-742.423 Drainage Control

The facility access road has been designed, constructed or reconstructed and will be maintained to have adequate drainage control, using structures such as specified in R645-301-534. The drainage control system has been designed to pass the peak runoff safely from a 10-year, 6-hour precipitation event, or an alternative event of greater size as demonstrated to be needed by the Division.

R645-301-743 Impoundments

No permanent structures including impoundments are planned for the Rilda Canyon Portal Facilities. A Temporary impoundment (sediment pond and containment berms) have been designed and constructed as specified by the R645-301-733, 743 and R645-301-512 (refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan for design specifications).

R645-301-744 Discharge Structures

744.100 Discharge from the Rilda Canyon Portal Facility sedimentation pond, temporary impoundments, and diversions are controlled, by energy dissipators, riprap channels and other devices, where necessary, to reduce erosion and to prevent deepening or enlargement of stream channels and to minimize disturbance of the hydrologic balance (refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Control Plan).

744.200 Discharge structures have been designed according to standard engineering design procedures.

R645-301-746 Coal Mine Waste

An area designated for the disposal of coal mine waste and coal mine waste structures has been constructed and will be maintained to comply with R645-301-746 (refer to R645-301-500 Engineering Map 500-2 for the location coal mine waste temporary storage area). All coal mine

waste generated at the Rilda Canyon Facility will be disposed of at the Deer Creek Waste Rock Facility.

R645-301-747 Disposal of Noncoal Mine Waste

747.100 Noncoal mine waste, including but not limited to grease, lubricants, paints, flammable liquids, garbage, machinery, lumber and other combustible materials generated during coal mining and reclamation operations will be placed and stored in a controlled manner in a designated temporary storage site and disposed of at a state-approved solid waste disposal area (refer to R645-301-500 Engineering Section Map 500-2 for the location of the non-coal waste storage site).

R645-301-750 PERFORMANCE STANDARDS

All coal mining and reclamation operations will be conducted to minimize disturbance to the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area and support approved postmining land uses in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302. For the purposes of SURFACE COAL MINING AND RECLAMATION ACTIVITIES, operations will be conducted to assure the protection or replacement of water rights in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

R645-301-751 Water Quality Standards and Effluent Limitations

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 U.S. Environmental Protection Agency set forth in 40 CFR Part 434.

If the site receives a storm greater than the of the sediment pond, discharge from the sediment pond will be routed through the designed emergency spillways and into the Rilda Canyon Creek (refer to Volume 11 Appendix Volume - Hydrology: Appendix B). Discharge from the sediment pond would constitute an emergency situation and comply with State of Utah Department of Environmental Quality Division of Water Quality storm water regulations.

R645-301-752 Sediment Control Measures

Sediment control measures will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-760 (refer to Volume 11 Appendix Volume - Hydrology: Appendix B: Drainage and Sediment Plan for

design, construction and maintenance of sediment controls for the Rilda Canyon Portal Facilities).

752.100 Siltation structures and diversions are located, maintained, constructed and will be reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-763.

752.200 Road Drainage. Roads are located, designed, constructed, reconstructed, used, maintained and will be reclaimed according to R645-301-732.400, R645-301-742.400 and R645-301-762 and to achieve the following:

752.210 Control or prevent erosion, siltation and the air pollution attendant to erosion by vegetating or otherwise stabilizing all exposed surfaces in accordance with current, prudent engineering practices;

752.220 Control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area;

752.230 Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under R645-301-751;

752.240 Minimize the diminution to or degradation of the quality or quantity of surface- and ground-water systems; and

752.250 Refrain from significantly altering the normal flow of water in streambeds or drainage channels.

R645-301-753 Impoundments and Discharge Structures

Impoundments and discharge structures have been located, maintained, constructed and will be reclaimed to comply with R645-301-733, R645-301-734, R645-301-743, R645-301-745 and R645-301-760.

R645-301-754 Disposal of Excess Spoil, Coal Mine Waste and Non-Coal Mine Waste

Disposal areas, coal mine waste, and non-coal mine waste are located, maintained, constructed and will be reclaimed to comply with R645-301-735, R645-301-736, R645-301-745, R645-301-746, R645-301-747 and R645-301-760.

R645-301-755 Casing and Sealing of Wells

All wells will be managed to comply with R645-301-748 and R645-301-765. Each water well will be cased, sealed, or otherwise managed, as approved by the Division. There are no wells that currently exist in, or are planned to be installed within the Rilda Canyon Portal Facilities disturbed area.

R645-301-760 RECLAMATION

Before abandoning a permit area or seeking bond release, the PacifiCorp will ensure that all temporary structures are removed and reclaimed, and that all sedimentation ponds, diversions, impoundments and treatment facilities meet the requirements of R645-301 and R645-302 for permanent structures, have been maintained properly and meet the requirements of the approved reclamation plan for permanent structures and impoundments. PacifiCorp will renovate such structures if necessary to meet the requirements of R645-301 and R645-302 and to conform to the approved reclamation plan. For complete discussion related to the reclamation plan for the Rilda Canyon Portal Facilities refer to R645-301-540 and Volume 11 Appendix Volume - Hydrology: Appendix B.

LIST OF REFERENCES

Danielson, T.W.; Remillard, M.D.; Fuller, R.H., Hydrology of the Coal-Resource areas in the Upper Drainages of Huntington and Cottonwood Creeks, Central Utah; U.S. Geological Survey-Water Resource Investigations, Open-File Report 81-539.

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, in Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

Graham, M.J.; Tooley, J.E.; Price, D., Preliminary Hydrological Evaluation of the North Horn Mountain Coal-Resource Area, Utah, U.S. Geological Survey, Open-File Report 81-141.

Lines, G.C., The Ground-water System and Possible Effects of Underground Coal Mining in the Trail Mountain Area, Central Utah, U.S. Geological Survey, Open-File Report 84-067.

Mundroff, J.C.; 1972 Reconnaissance of Chemical Quality of Surface Water and Fluvial Sediment in the Price River Basin , Utah, Utah Department of Natural Resources Technical Publication.

Price, D.; Arnow, T., Summary Appraisals of the Nation's Groundwater Resources-Upper Colorado Region, U.S. Geological Survey Professional Paper 813-C, Washington, D.C.

Price, D.; Waddell, K.M.., 1973, Selected Hydrologic Data in the Upper Colorado River Basin: U.S. Geological Hydrologic Invetigations Atlas HA-477.

Southeastern Utah Association of Governments, 1977 Waste Water Quality Management Planning Program (208) for Emery, Carbon, and Grand Counties, Utah, Price, Utah.

Theis, C.V., 1957, The Source of Water Derived from Wells, Essentials Factors Controlling the Response of an Aquifer Development, U.S. Geological Survey Ground Water Notes 34.

Vaughn Hansen Associates, 1981, Hydrologic Inventory of the Skyline Property and Adjacent Areas, Carbon and Emery Counties, Utah, Report Prepared for Costal States Energy Company, Salt Lake City, Utah.

Vaughn Hansen Associates, 1983, Impact Analysis - NEWUA Rilda Canyon Springs, Report Prepared for West Appa Coal Company, Price, Utah.